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# 3rd National Conference on Enhancement in Biomedical Engineering and Healthcare

Organised by

Department of Biomedical Engineering Adhiyamaan College of Engineering,
Dr. M. G. R.Nagar, Hosur, Tamil Nadu, India
In association with
Biomedical Engineering Society of India

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# COGNOFIT - A Game for Cognitive Impaired Patients: A Prelim Study

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## ABSTRACT

People with permanent cognitive impairment need to be frequently assessed and monitored. There exists a various number of clinically validated cognitive assessment tools, but they need to be administered by the therapists in clinical settings often. This serves as a major barrier for frequent monitoring of cognitive function. In this proposed work, we introduce COGNOFIT a collection of innovative mobile games that allows one to self-administer the assessment of their cognitive function. The game performance is analyzed and thus converted into a clinical-accepted measure of cognitive function, specifically the Mini Mental State Examination (MMSE) score, improving the impact of the system in real-world clinical settings. To validate the feasibility of the approach, we will collect game-specific performance data from patients, which will be used to train a supervised machine learning model to estimate the corresponding MMSE score.
**Keywords :** Cognitive Impairment, MMSE, MMSE Score, Mobile Games.

## I. INTRODUCTION

Number of people with permanent cognitive disabilities is increasing due to the trend of aging society . For these individuals, it is important to evaluate and track their cognitive functional/impairment level, which is often done using clinically validated assessment tools, such as the Mini Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA) test. Unfortunately, these tests need to be performed under the supervision of trained staff in clinical settings.

The constraint of requiring the presence of a trained clinical physician during the assessment sessions, various approaches have been studied, including administering the conventional assessment tools, and self-administered computer-based or mobile-device assessments [8], [9]. The cognitive assessment tools have great potential to enable patient-centered care by monitoring individual-level out comes over time inpatients own environments [9]. Brandt et al. devised a new technique that can be administered by trained physician over the phone, so the assessments can be made easily [6]. Similarly, recent work by Absolahi et al. demonstrated the feasibility of administrating the MoCA through video conferencing [7]. Although these approaches enable frequent, remote assessment of the patients, they still require the presence of trained physicians and have minimal impact on the optimal utilization of the resources. There have been a lot attempts to enable self-administered cognitive assessments using computers or smart mobile devices [9], but they stop short , at reporting software-specified assessment scores rather than widely accepted assessment scores, such as MMSE or MoCA. This poses a significant limitation, and it is necessary for physicians to undergo

additional training to interpret their results along with the scores.

In this, we introduce COGNOFIT, that will be specifically to challenge and measure confound cognitive function in patients. We further propose a supervised machine learning approach that can translate the gaming-specific performance features that were extracted from the patients' engagement with COGNOFIT, to the MMSE score directly. The performance of the proposed system will be evaluated based on the data collected from the patients with cognitive impairment who will visit the clinic the results and the proposed approach can be self-administered by patients and accurately estimate MMSE scores, opening up new possibilities to assess cognitive function and their impairment.

## II. LITERATURE SURVEY

Hwee-Xian (2018) proposed a technique for IoT based cognitive impairment administering results in the gradual decline in a person's cognitive abilities, and subsequently an increased risk of developing dementia.Timely medical and clinical interventions can be administered to elderly people who have been diagnosed with the MCI, to decelerate the process of further cognitive declines. Multi-modal sensors are placed in the residences of elderly, to monitor their Activities of Daily Living (ADL), as well as to detect signs of forgetfulness, Early results are potentially pick up signs of early cognitive decline in the elderly.[1].

Kyle Leduc-McNiven- identifies the mild cognitive impairment (MCI) and subtle changes to cognitive abilities that need therapeutic treatment programs. Two games are been developed. War CAT is based on the familiar card game, War, and "Lock Picking" is a optimal score search, akin to finding the combination that opens up a lock. Both games provide players with the immediate feedback but engage in different algorithms and heuristics to solve the respective problems at hand. They employ machine learning methods to detect subtle changes in an individual's cognitive processes over time [2].

Bing wang (2016), presented software toolkit is presented to identify mild cognitive impairment conversion, an early stage of Alzheimer's disease, from medical images. This toolkit extracts effective features from medical images,i.e., magnetic Resonance Imaging and position emissiontomography, to infer whether the patients in the stage of mild cognitive impairment convert to Alzheimer's disease or not. [3].

P. Garda Baez et al, (2015) proposed a assist in a CPN based system using a combination of neuro-psychological scales and some modifying factors. They presentedthe preliminary results exploiting the public ADNI dataset. This system is embodied in a clinical virtual environment, EDEVITALZH, provide an e-health solution for diagnosis of MCI, AD and other dementias. EDEVITALZH guides through their workflow and aids in diagnosis, prognosis and follow-up tasks. [4].

Shohei Katoet al,(2013)provided computer aided diagnosis for dementia, they developed a non-invasive screening system of the elderly with cognitive impairment. The system was constructed by SPCIR (Speech Prosody-Based Cognitive Impairment Rating) based cutoff as the 1st screening, and, as the 2nd screening, two-phase Bayesian classifier for discriminating among elderly individuals with these three clinical groups: elderly individuals with a normal cognitive abilities (NC), patients with a mild cognitive impairment (MCI), and an Alzheimer's disease (AD). Paper also reports the screening

examination and discrimination performance of the system for early detection of cognitive impairment in elderly subjects. [5].

Dmytro Domashenko(2017), proposed experiment for analyzing MRI images of the brain of patients with Alzheimer's disease (AD), mild cognitive impairment (MCI) and normal control (NC). new methods of extracting features from MRI images and selecting the most relevant features. The values of cortical thickness in regions of interest are used as features for MRI images. . The results of this paper are used for building a classifier in space of selected features. [6].

Tanaka Osamu et al,(2014), proposed Caregiving for a person suffering from dementia or loss of brain cognitive ability due to aging. A system for assisting caregivers at home. The system monitor the patient; assess possible risks ; and alert the caregiver on emergency by delivering video, audio and text to his mobile phone or PC. The technologies applied for sensing, communication, assessment and user-interface, and presented a prototype system implementation. [7].

## III. CONCLUSION

In the proposed system a novel means to accurately estimate and analyze the clinically validated cognitive assessment scores that can be self-administered with or without the supervision of trained physicians. A collection of mobile games will be developed, COGNOFIT, and that can translate game performance into the MMSE score using different machine learning algorithm. The results will be obtained from individuals with mild cognitive impairments shows that the approach can accurately estimate the MMSE score .The proposed system has the potential to allow the patients to self evaluate themselves without any supervision of any trained physicians. Which will be more convenient and user engaging activity through a series of mobile games.

## IV. IV. FUTURE SCOPE

As far as now we try to developed only two mobile games for self-evaluation of cognitive impairment. Games for selective attention, sequential memory, vigilance memory, visual investigation are yet to be developed. And the scores will be further sent to the doctor’s desk as the assessment is complete.

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# Detection of Follicles In Polycystic Ovaries-A Review

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## ABSTRACT
Polycystic Ovaries in females has become a very common disease in this 21st century. This obstructs the natural fertility of the female and causes many issues like hyperinsulinemia, abdominal obesity, hypertension dyslipidemia, breast cancer and cardiovascular diseases. The effective method to diagnose this disorder is the pelvic ultrasound scan, which gives a picture of the number of small cysts in the periphery of the ovaries. In the conventional method, manual assessment of the follicles is made by the sonologist, later verified by the second person. There are many possibilities for overlapping of the follicles during sonography, which can lead to the inappropriate diagnosis. Due to this inconvenience automatic detection and follicle counting methods using image processing applications are on the role of deciding on the disorder. This paper surveys various applications and their comparative study to diagnose the ultrasound images of the ovary. Performances of some of the previous works are identified and compared for future research directions to improve on some of the observed limitations.

**Keywords :** Hyperinsulinemia, Abdominal Obesity, Hypertension Dyslipidemia, Breast Cancer, Cardiovascular Diseases.

## I. INTRODUCTION

Computer assisted methods of detection of follicles and PCOS diagnosis ease the laborious work faced by Ultrasound imaging systems are one of the common and easy methods for the viewing of internal parts of the body using high-frequency sound waves. The ultrasound scanning machine is used widely because it is inexpensive, not harmful unlike, the X-rays which causes ionizing effects with the tissues. This sonographic method is used to scan various body parts especially, the Ovaries and uterus to detect pathological changes such as tumour, cancer and polycystic ovary. Polycystic Ovarian Syndrome (PCOS/PCOD) is one of the most prominent disorder of women under the age of 35. The PCOS diagnosis re ly largely on the number and various sizes of the immature follicles. PCOS is the major cause of infertility in women of child bearing age. Early diagnosis and treatment are required to prevent ovarian failure, cancer, type- 2-diabetes and high blood pressure five percent to ten percent of women worldwide physicians [3]. Various forms of image processing techniques ranging from image de-noising, segmentation, morphological operations, feature extraction etc. [4] have been applied to detect follicles and diagnose PCOS.

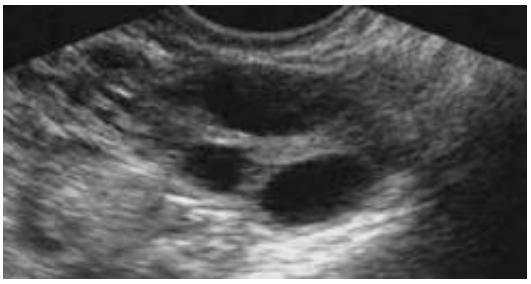

Figure 1a: Ultrasound Image of a Normal Ovary

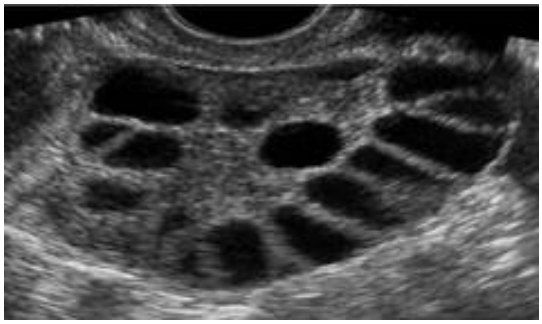

Figure 1b: Ultrasound Image of a Polycystic Ovary

## II. ARTIFICIAL INTELLIGENCE BASED APPROACHES

Artificial Intelligence based approaches using various computerized techniques such as fuzzy logic, Artificial Neural Network (ANN) and Support Vector Machine (SVM) has been implemented for the classification of follicles in Polycystic Ovarian Syndrome (PCOS) diagnosis. Works of different researchers Lawrence [5], Tegnoor [6] and Hiremath [7] are sources for this research.

Lawrence et al., [5] proposed one of the recent approaches to distinguish between the polycystic ovary and the normal ovary. Segmentation was done using region growing algorithm and the extraction features like Surface Density (SD), Volume Density (VD), number of follicle regions per image (Profile), Mean follicle Diameter (meanD), and Maximum follicle Diameter (maxD) were found from the segmented regions. Then, the obtained features were used to build a feature vector for classifying the follicles present in the images of the ovaries. Linear discriminant, K-Nearest Neighbor (KNN) and SVM were used to classify the image based on the extracted features. Their accuracies were 92.86%, 91.43% and 91.43%, respectively. However, misidentification rate of 31.1% was high.

Tegnoor et al., [6] implemented an automated method for the classification of ovarian images as normal, cystic or polycystic. The classification was based on the numbers of follicles and sizes of follicles in an ovarian image. The algorithm employed contourlet transform for de-speckling, active contours without edge for segmentation and Support Vector Machine (SVM) for classification. The follicle recognition rate was 98.89%. The segmentation technique used could not handle intensity inhomogeneity present on the boundary of the follicles which was a drawback of this method. This led to over-segmentation of the follicular boundaries, simultaneously causing increase in FAR (False Acceptance Rate).

Hiremath and Tegnoor et al., [7] proposed the contourlet transform for de-noising the ovarian images and to enhance the contrast of the images Histogram equalization techniquewas applied. Then, an active contour without edge method was applied to segment the enhanced images followed by morphological erosion to eliminate any spurious regions caused by noise. Fuzzy logic was finally applied to classify the ultrasound images with seven geometric features of the ovary. Though, the follicle detection rates for two different datasets were 97.61% and 98.18%, but FAR of 9.05% and 4.52% were high. This could lead to wrong diagnosis of PCOS.

Bedy Purnama et al., [8] focuses on the follicle detection technique for easy diagnosis. The preprocessing techniques used is the low pass filter, balance histogram, binarization, and morphological processes to acquire paired follicle images. The next step is the segmentation process done using edge detection, marking, and cropping the follicle in the images. The following step is to highlight extraction using Gabor wavelet. The cropped follicle images are categorized into two surface highlights: (1) Mean, (2) Mean, Entropy, Kurtosis, Skewness, and Variance. This outcome in 2 datasets arranged for the classification process, i.e. (1) informational collection A which has 40 images that consist of 26 ordinary images, and 14 PCOS indicated images. (2) Dataset B

has 40 images consist of 34 typical images and 6 PCOS indicated images. The last step is the classification which recognizes the highlights of PCOS and non-PCOS follicles, for these three classification processes are compared:

Neural Network-Learning Vector Quantization (LVQ) strategy, (2) K-Nearest Neighbor (KNN) - Euclidean distance, and (3) Support Vector Machine (SVM). The best accuracy picked up from SVM on C=40. It demonstrates that dataset A reaches 82.55% while dataset B that got from KNN-Euclidean distance classification on K=5 reach 78.81%.

Ramamoorthy et al., [9] This paper focus to monitor the change/growth in PCOD cysts for pre- and post-treatment. Initially pre-processing is done to remove the speckle noise which is usually found in ultrasound images, then Sub-filters with decomposition layers are used to remove speckles and retain the subtle feature. Various quality metrics were used to analyze the preprocessed images using PSNR, SNR, and SSIM and is concluded that DWT db2 filter is opted for ultrasound images to remove speckles and diagnose pathological part of PCOS scanned images. For the feature extraction, the correlation coefficient is used and finally, optimization is done by applying an affine transformation to find the follicles overlapping. The advantages of this system are that it detects PCOS at the earlier stage with an accuracy of 93%. Hence this would help expert's diagnosis PCOS and decide the necessary treatment regarding the patient's condition in its early stages avoiding infertility crisis.

B. Cahyono et al., [10] approached deep learning methods for the classification of ultrasound images. CNN (Convolutional Neural Network) was used for the extraction of features. Optimization of CNN was quite difficult, thus later the author proposed more dropout rate and better weight initializations. Ultrasound images were classified using Convolutional Neural Network to PCOS and non PCOS class had a good and a robust result since the system extract the feature of each image spontaneously. This system attained a performance range of 100% micro-average f1-score with an average of 76.36% in the testing phase [8].

Potocnik et al., [12] proposed an algorithm based on Cellular Neural Network (CNN). Firstly, the dominant follicle was detected by assumptions of the two inputs that are successively connected to CNN; the first CNN estimated the position of the follicle, the second CNN detected follicles at the border. Followed by which the follicular positions were approximated. Further, the positions of the recessive follicles were determined. Finally, the previous results were merged to distinguish between the real and phantom follicles. The follicle recognition rates were low as 73%. Also, a misidentification rate of 15% was high.

## III. II.EDGE AND REGION GROWIN BASED SEGMENTATION

Various researches where possessed using different techniques that could be easy in the detection of follicles in ovaries some of them are by Potocnik [10] and Hiremath [13, 14].

Mehrotra et al., [15] developed an automated method for the detection of follicles in the ultrasound image of the ovary using a multiscale morphological approach for contrast enhancement and segmentation using vertical and horizontal scanline thresholding. By setting the standard deviation as threshold the horizontal and vertical thresholded image was obtained by estimating the mean and the standard deviation of the row sub-image for horizontal and, the mean and the standard deviation of the column sub-image for vertical. The sub-images were fused to

form a segmented image. But the major drawback was that the false regions were detected as follicles and in turn, it increased the false acceptance rate (FAR).

Potocnik and Zazula et al., [10] produced an automated ovarian follicle detection algorithm. Homogenous regions were determined and grown, their growth depended on average grey level and weighted gradient of the image. Using the threshold and area of the bounding box the extraction of potential follicles was done. The follicle recognition rate was low as 88%.

Hiremath and Tegnoor et al., [13] used contourlet transform to suppress the speckle noise in the image and contrast of the image was enhanced by applying histogram equalization. Then, segmentation was done using an active contour without edge method. Finally, five geometric characteristics of the follicles were extracted to classify the segmented regions into follicles or non-follicles. The Follicle recognition rate was 92.3% and False Acceptance Rate (FAR) of 12.6% showed high results so it can lead to the wrong diagnosis of PCOS.

Hiremath and Tegnooret al., [14] considered two speckle-noise reduction methods namely Gaussian low pass filter and contourlet transforms to remove speckle noise in the ultrasound images of the ovary. Then, the edge-based method (canny operator) was used to segment the image. Two geometric features (major axis length and minor axis length) were extracted and these features were used to generate a set of rules for the classification of the identified regions as either follicles or non-follicles. The contourlet transforms method with a follicle detection rate of 75.2%, FAR of 22.5% and False Rejection Rate (FRR) of 24.1% performed better compared to Gaussian low pass filter method with a follicle detection rate of 62.3%, FAR of 22.5% and FRR of 37.6%.

Chen et al., [16] developed a framework for quantifying follicles in the 3D ultrasound image of the ovary. The object recognition approaches were used to estimate thesizes and locations of the follicles. In order to avoid problems relating to multiple object detection, a clustered marginal space learning approach was introduced. Follicles are then detected using a database guided graph-cut segmentation approach. Therefore, Missed Detection (MD) and False Detection (FD) rates were approximated to be 19.7% and 22.5% respectively and the values were too high.

Deng et al., [17] proposed an automated system to diagnose PCOS using adaptive morphological filtering process to suppress speckle noise from the ultrasound images and an enhanced labelled watershed algorithm was used to extract contours of the objects. A cost map was figured using object growing algorithm for the detection of follicles using their assigned cost functions, the follicles were automatically selected. The follicle recognition rate was 89.4% but the Misidentification Rate (MR) of 7.45% was shown high. Also, the sizes of the recognized follicles were small which could have negative effect on automated monitoring of the follicular growth.

Kumar and Srinivasan et al., [18] employed a series of steps for improving the Total Variation (TV) filter with an aim of suppressing the speckle noise in polycystic ovarian images. A quadratic penalty was employed to bring about the similarity between the input and the output images. To achieve the Improved Total Variation (ITV) filter, speckle noise models were constructed and local statistics such as mean and variance were also estimated. All these estimations were done with the help of Mean Square Error (MSE), Peak Signal-to-Noise Ratio (PSNR),

Similar Structure Index Mean (SSIM) and Feature Structure Index Mean (FSIM) metrics. However, ITV method had high computational complexity.

## IV. III.TEXTURE-BASED APPROACH

Features found in the textures can discriminate pathological changes in an image.

Bian et al., [19] worked on eight different texture features to discriminate between dominant follicles in women during their natural cycles and women using oral contraceptives. Follicular wall regions were selected manually texture features were extracted from the manually selected follicles. It was shown that four of the texture features including Gray Level Co-occurrence Matrix (GLCM) energy, GLCM homogeneity, edge density and edge contrast could differentiate between the dominant follicles with higher accuracy. MATLAB classifier was used based on the texture features to differentiate between the follicles. The drawback is that only dominant follicles were considered.

## V. IV.DATA CLUSTERING TECHNIQUES

In this approach, work of the author: Ashika [20] implemented an algorithm to distinguish between PCOS patient and normal patient using ultrasound images of the ovary. The images were de-noised by applying a thresholding function, then morphological approaches for contrast enhancement was applied to enhance and improve the quality of the image. And finally, fuzzy c means algorithm was used to segment the ultrasound images. The limitation of this work is that it lacked automation at the level of classification. Also,poor quality edges were detected. Thus it had the probability to increase FAR.

Kiruthika and Ramya et al., [21] evolved an automated method of follicle detection in ultrasound images of the ovary. The image was transformed into L*a*b* colour space to measure visual differences first. The images were despeckled using discrete wavelet transform. Using k-means clustering algorithm the ultrasound images were segmented. Further, Laplacian of Gaussian edge operator was applied to detect the edges of the potential follicles. Texture parameters were suggested to reduce the classification error. The limitations of this work were that the segmented follicles overlapped and the segmented images were characterized with irregular edges that could lead to an increase in FAR.

## VI. V.CONCLUSION

This paper discusses the various works of researchers who relied on producing an effective method for the detection of follicles, their sizes and the follicles overlapping in the detection of PCOD using ultrasound images. The methods reviewed, offers a wide range of analysis using statistical, clinical and computer-assisted technologies in predicting the severity of the disease. Therefore, an efficient noise reduction and follicle detection techniques are surveyed briefly to reduce the usage of time for diagnosis by doctors.

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# An Unobtrusive Device For Visually Challenged Persons – Using Python Language

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## ABSTRACT

This paper is presented to help visually disabled people in their navigation. Finding things with multi- mixed contents with "an unobtrusive assistive system for blind people". A camera-based assistive text reading framework to help blind persons read text labels and product packaging from hand-held objects in their daily lives. To isolate the object from cluttered backgrounds or other surrounding objects in the camera view and the image is processed and the output is given in the form of voice output. The whole setup will be fixed in a cap.
Keywords : Blind navigation, Python CV, Raspberry-pi, Ultrasound sensor.

## I. INTRODUCTION

Blindness is inability to see anything, even light if you are partially blind then you have limited vision. For example you may have blur vision or the inability to distinguish the shapes of objects. Complete blindness means that you cannot see at all and are in total darkness. Legal blindness refers to vision that is highly compromised. If a person can see from 200 feet away, but legal person can see only from 20feet away. Globally, it is estimated that approximately 1.3 billion person live with some form of vision impairment. With regards to distinct vision, 188.5 million people have mild vision impairment, 270 million people have moderate to severe vision impairment and 36 million people are blind. With regards to near vision, 826 million people live with a near vision impairment. Globally the leading cause of vision impairment is uncorrected refractive error and cataracts. Approximately 80% of all vision impairment globally is considered avoidable. The majority of people vision impairment is over the age of 50 years.

## II. RELATED WORKS

Extensive researches have been made towards visuallyimpaired persons for their navigation. Here, it has been discussed about the different assistive device that is being used by the blind persons for navigation.The following discussed methods are some of them.

RFID used in blind navigation[1] An RFID-based system for navigation in a building for blind people is visually impairment. The system relies on the location information on the tag, a user psilas destination, and a routing severe psilas current location to the destination. The navigation devices communicate with the routing severe using GPRS network. The tags stores location, information and gives it to any reader that is within a proximity range which can be up to 10 to 15meters for UHF RFID system. It is found that there are delay problem in the device which are the communication delay due to the file transfer

delay due to the file transfer delay from a MMC module.

A. Ultrasound Navigation Systems for Blind[2]

It is based on a microcontroller with synthetic speech out. This aid is portable and gives information to the user about urban walking routes to point out what decision to make. On the other hand, in order to reduce navigation difficulties of the blind, an obstacle deduction using ultrasounds and vibrators is added to this device. In this system it detects the nearest obstacle via stereoscopic sonar system and sense back vibro-tactile feedback to inform the visually impaired persona about its location.

**B. Mobile blind navigation system [3]**

The technologies that are used in this system are: the blind mobile device, RFID and readers, GPS, text to speech, voice recognition and wi-fi.the systems detects the bind location using GPS ,if the internet connection is available and uses RFID tags fixed outdoors and indoors on the building in the path, Wi-Fi routes are used indoors to detect the location. This system uses voice recognition and text to communicate with the bind to lead him to his destination and to give him a direction. The result shows performance in obstacles avoidance and in blind guidance. This navigation system was first introduced in King Saud University campus area for their student's employee and guests to navigate within the campus.

**C. Smart cane with range notification for blind[4]**

It is designed to develop a smart cane with distance measurement system .The system comprises of an ultrasonic sensor as input and earphone as an output. Ultrasonic sensor is used to measure the distance from the obstacle. Data is then send national instrument myRIO-1900 controller for processing which later produce beep sound as an output. The process was graphically performing using lab view with FPGA as the intended target. Performance of the system has been ascertained to several verification test. In general the, device will alert blind people of the obstacle through the audio output.

## III. PROPOSED SYSTEM

In the section it is discussed about the method by which our proposed system is explained its working and block diagram.

**A. Programming in Raspberry-pi**

The raspberry-pi 3B+ is used for programming the whole system. For the programming we have used python software. The python Open Cv software is easily accessible, and is user friendly. The raspberry-pi used here as the processor speed ranges from 700MHZ to 1.2GHZ, on-board memory ranges from 256 MB to 1GB RAM. Secured digital cards (SD card) are used to store the Operating System (OS) and programming memory either SDHD or Micro SDHD sizes. The board has one to four USB ports. For video output, HDMI, and composite videos are supported, with a standard 3.5mm phono jack for audio output. Low-level output by a number of GPIO pins which supports common protocols like I2C. The B+- model has an 8P8C Ethernet port and the pi-3 and pies zero W have onboard Wi-Fi 802.11n and Bluetooth.

**B. Voice processing**

The input given in the form of voice module. The voice output is converted into text form by using speech recognition method (Fig 1). The converted speech text is store in the data file which is then processed and saved for the later use. Here for the data conversion, processing and storage is done using raspberry-pi, where the program is loaded.

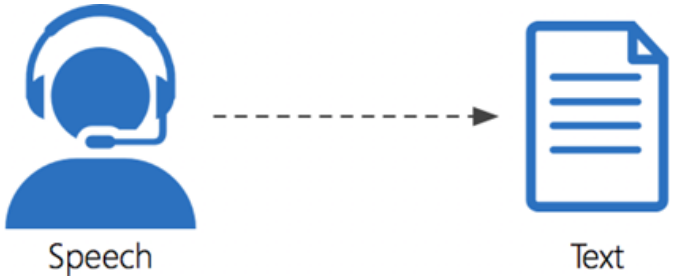


**Fig 1** Text to speech conversion

### C. Program processing

Here the program is coded according to the requirement of the paper which is been presented. Here the command code "imports RPi.GPIO as GPIO" (general processing input output) indicates the general processing to be imported to the raspberry pi. The code such as "import osimport thread import time" these commands are given for importing the operating system time and the program processing the raspberry pi. The programming code indicates that the process that been done in the operating system for the voice output. There the import and osthread runs parallel. For the whole program we have a separate add, delete and start and stop command and that is programmed separately. Here the add program and start stop program runs parallel while the delete program is stopped.

### D. Stepwise explanation

STEP 1: Voice input- the input to the raspberry pi given as a voice input through the add command.
STEP 2: Voice input is converted into as text files and stored in data file.
STEP 3: Image is captured by giving input through the start/stop command.
STEP 4: Processing of the captured image. STEP 5: The processed image is compared with the text file.
STEP 6: If the text and images are matched, the output is given to the headphones with approximate distance.

### E. Schematic representation

In the schematic representation (Fig 2) raspberry pi plays a major role which is connected to IR sensor to detect the obstacle, camera module to capture the images and mic to give the voice in put which severs as a input to raspberry pi. The speaker which is connected to the raspberry pi that serves as an output.

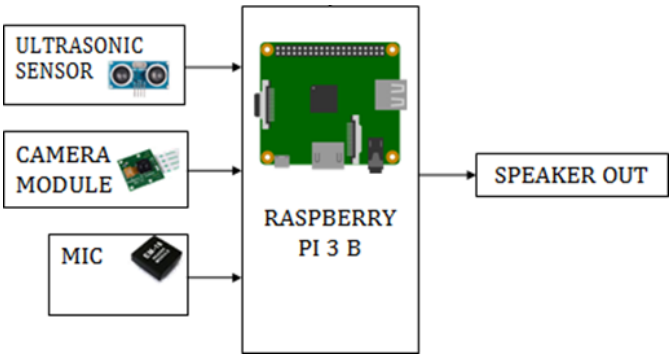


Fig 2 Block diagram

## IV. RESULT

The database in the section III is evaluated to perform the proposed method. A primary experimental setup is to guide the blind people for the navigation. From this input method the program and the data that is being given to the raspberry-pi is processed (Fig 3) and the output is given in the form of voice (Fig 4). Here the primary method is to capture the image (Fig 5). The image is processed and converted to the text format (Fig 6).

The image which is converted as text after being processed again converted to the voice input (Fig 7) using a pulse code modulation. These voice modules will help the blind people in navigation.

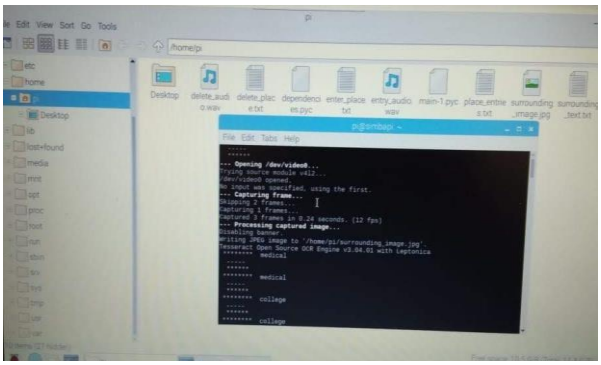

**Fig 3** voice recognition process

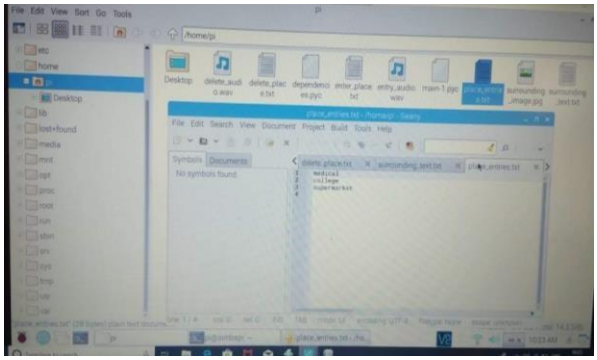

**Fig 4** voice converted into text and stored

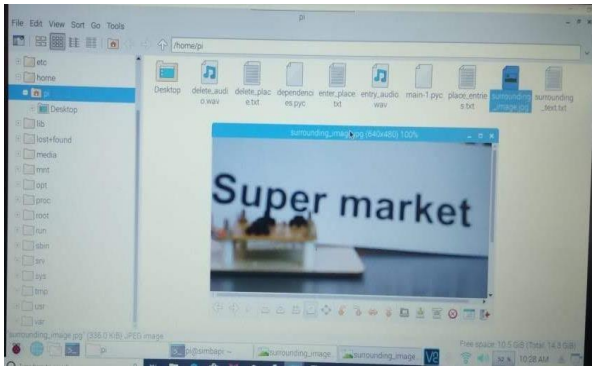


**Fig 5** Image captured

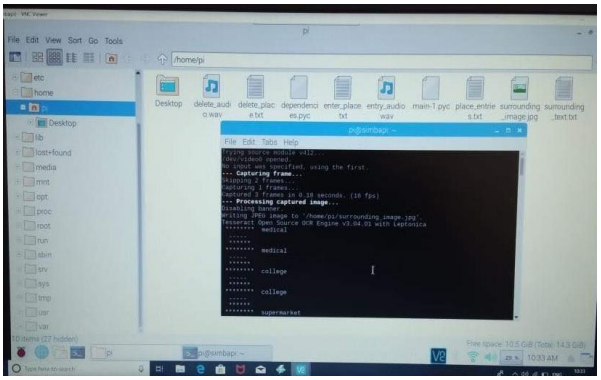

**Fig 6** Image processing

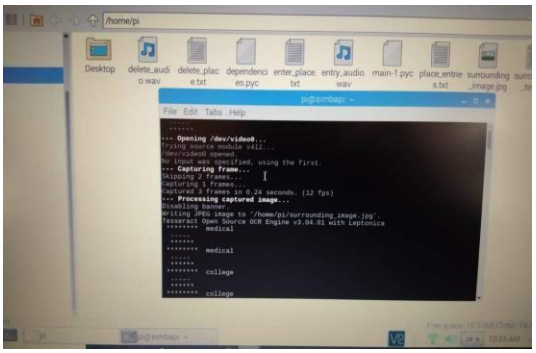

**Fig 7** Processing for voice output

## V. CONCLUSION

In this paper, an obstructive device for visually challenged person, it allows the blind person to independently navigate without the guidance of others. It helps the blind to fulfill their needs using this device. The whole device as a product is fixed in the form of a cap so that it will be more comfortable and convenient for the users to wear. The extension of this project can be done using an IOT device with more information added to it. The information such as tracking their location, sending text message to their relative can also be added to this.

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# Methods of Blood Pressure Estimation Using Deep Learning : A Review

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## ABSTRACT

This paper presents a review of different deep learning methods used in blood pressure estimation. The recent technique adopted the cuff-less method for blood pressure estimation. One of the common cuff-less methods uses the correlation between Pulse Wave Velocity (PWV) and ECG. But these methods do have some limitations, such as the necessity for periodic calibration as PWV and ECG varies from person to person. With the advent of Deep Learning, many new techniques are used for the estimation of BP. The VGGNet and CNN have automatics feature extraction and learning ability. Thus, these two techniques are found to be the best among all the techniques.

**Keywords :** Machine Learning, Deep Neural Network (DNN), Convolutional Neural Network (CNN), RNN, Blood pressure estimation

## I. INTRODUCTION

Maintaining normal blood pressure is very important to lead a healthy life. Hypertension occurs when blood travels through the blood vessels with more force than considered normal. Prolonged hypertension can damage the arteries and blood vessel walls over time. This results in diseases such as coronary artery disease, enlarged left heart, and heart failure. It also causes chronic diseases to the brain, kidneys, and eyes. The brain depends on the blood supply to function properly. High Blood Pressure causes several problems including, Transient Ischemic Attack (TIA), stroke, dementia and in some cases mild cognitive impairment. The kidney filters excess fluids and wastes from the blood. Healthy blood vessels are essential for the proper functioning of the kidney. High blood pressure damages blood vessels that lead to kidney diseases like, kidney failure and glomerulosclerosis. High blood pressure also damages tiny delicate blood vessels that supply blood to the eye, causing, retinopathy, choroidopathy and optic neuropathy.

Blood pressure can be measured either invasively or non-invasively. Invasive method involves placing a catheter into the artery. Non-invasive methods include binding sphygmomanometer to the arm which is cuff-based, and cuff-less methods uses correlation between PWV and ECG. Also Pulse Transit Time (PTT) is one of the widely used attributes for BP estimation. To determine PTT, signals collected from two different locations of the body are required. So, it is combined with Electrocardiography (ECG) signals. Pulse Transit Time (PTT) can be obtained by using Photoplethysmography (PPG) sensor. PPG works on the principle of pulse oximetry, wherein a sensor emits light to the skin and measures the intensity of light which is reflected back or transmitted through

the skin. PPG signal variations are caused by changes in arterial blood volume. The amplitude of the variations depends on the amount of blood rushing into the peripheral vascular bed, the optical absorption of blood, skin pigmentation, ambient light and the wavelength used to illuminate the blood [10]. In blood pressure measurements, physical, environmental and emotional states will lead to errors in measurements. The system must be calibrated periodically as PWV and ECG varies from person to person [3]. Thus, in order to overcome all these limitations a new revolution in technology, the Deep learning technique has arrived. Deep learning plays a vital role in diagnostic applications as it becomes more accessible, continuous analysis and more data storage. Deep learning is a type of Artificial Intelligence that trains a computer to perform human-made tasks, such as recognizing speech, identifying images or making predictions. Instead of organizing data to run through predefined equations, deep learning sets up basic parameters about the data and trains the computer to learn on its own by recognizing patterns using many layers of processing.

In this paper, various techniques of Deep Learning used in Blood Pressure estimation are discussed.

Table 1. Categories of Blood Pressure of American Heart Association [15]

| **Blood pressure Category** | **Systolic (mmHg) High value** | **AND/OR** | **Diastolic (mmHg) Low value** |
|---|---|---|---|
| Normal | <120 | AND | <80 |
| High | 129-120 | AND | 80-85 |
| Hypertension Phase 1 | 139-130 | OR | 86-90 |
| Hypertension Phase 2 | ≥140 | OR | ≥90 |
| Hypertension crisis | ≥180 | AND/OR | >120 |

## II. LITERATURE SURVEY

Zeng Ding Liu (2019) proposed a 16-layer VGGNet to construct cuff-less BP from Electrocardiogram (ECG) and Pressure Pulse Wave (PPW) signals, Here, feature extraction from raw signals is not needed. The deep network architecture can learn the features automatically. The CNN network based VGGNet (proposed by Visual Geometry Group) has the advantage of simple structure and outstanding feature learning ability.

The proposed method was tested on 89 subjects by the 5-fold cross validation (all subjects were randomly divided into 5 equal sets) [5].

**Performance of accuracy and precision:**

The Correlation Coefficient (CC) between estimated BP's and reference BP's, Mean Deviation (MD) and Standard Deviation (SD) of the estimation difference were used to evaluate the performance. The estimation errors for SBP and DBP were -2.06±6.89 mmHg and -4.66±4.91mmHg. These values met the AAMI standard for accuracy requirements of 5±8 mmHg. The correlation coefficients between the estimated BP and reference BP values were 0.91 and 0.89 respectively. This shows that there is a high correlation between the estimated BP and reference BP.

Ümit Şentürk (2018) proposed a new hybrid prediction model by combining Electrocardiogram (ECG) and PPG (Photoplethysmographic) signals with a Repetitive Neural Network (RNN) structure to estimate blood pressure continuously.

**Data collection:**

ECG, PPG, ABP database are collected from Physionet's MIMIC II (Multiparameter Intelligent Monitoring in Intensive Care).

The ECG and PPG signals obtained from the database have been cleared from noise and artifacts. And then ECG and PPG signals have been separated depending on the peak values of these signals.

Proposed method consists of two steps:
1) 22-time domain attributes (11 from ECG 11 from PPG) were obtained.
2) These time attributes are set as inputs to the RNN model and then BP is estimated.

The results have shown that RMSE (Root Mean Square Error) between the estimated SBP and the measured SBP with RNN model was 3.63 and the RMSE between the estimated DBP and the measured DBP values was 1.48 with RNN model. By changing the number of features of the system and the number of hidden layers of RNN, the system can get an optimum level. [3].

Yu-Fan Fang (2018) proposed the latest vision-based method for measuring SBP and DBP. Here, remote PPG (rPPG) has been used with Green Red Difference (GRD) and Euler Video Magnification (EVM) and Finite Impulse Response (FIR) band pass filter. Face cheek and radial artery (near palm) has been selected as the region of interest.

A.

A total of 24 features are collected from the signals after performing plane orthogonal to surface (POS) to the region of interest signal.Finite impulseresponse band pass filter is cascaded to make the rPPG signals smoother and with less noise [4].

B. Data collection:

The database is created with data from a total of 15 students in NCTU, each with 10 times of 45 second camera recording with their willingness. A total of 24 features are recorded in each data point. 12 male and 3 female subjects are involved with the age ranging between 20 to 33.

Prediction models

The proposed method was performed using K Nearest Neighbour (KNN), Deep Belief Network – Deep Neural Network (DBN-DNN) and Artificial Neural Network (ANN) to test the efficiency of the SBP and DBP and the obtained results are compared.

**Table 2.** The RMSE for KNN, DBN-DNN, ANN

| | KNN | DBN-DNN | ANN |
|---|---|---|---|
| SBP (mmHg) | 13.54 | 11.83 | 11.22 |
| PP (mmHg) | 9.93 | 8.87 | 7.83 |

From the table it is clear that ANN gives the best result and lowest RMSE when compared to other models [4].

Fan Pan (2019) proposed a novel CNN based automatic BP determination. In addition, using this CNN based method, the effects of stethoscope contact pressure and position on BP measurement was evaluated.

A total of 30 healthy subjects (13 male and 17 female) aged between 23 to 63 years were selected. There were 36 SBP and 36 DBP values from each subject. They were measured with, 2 stethoscope positions, 3 contact pressures, 3 repeated recordings, 2 BP determination by manual auscultatory method and by CNN based method.

Bland-Altman and Linear Regression analysis were done to assess the relationship between the BP's

obtained by manual auscultatory method and CNN based method.

The BP measurement errors of the proposed method were 1.4 ± 2.4 mmHg for SBP and 3.3 ± 2.9 mmHg for DBP from all the measurements. Also, the method demonstrated that there were small SBP differences between the 2 stethoscope positions, respectively at the 3 stethoscope contact pressures, and that DBP from the stethoscope under the cuff was significantly lower than that from outside the cuff by 2.0 mmHg.

**Limitation:**

The manual auscultatory BP's are determined by electronic playback method (computer mouse). So, the values may not exactly correspond to clinical auscultation [6].

Nabeel P M (2019) proposed a novel image-free ultrasound system using by deep learning technique for cuffless and continuous monitoring of arterial BP parameters and the pressure waveform. The developed deep learning model takes the following as input:

1) The feature of the local diameter waveform
2) The feature correlating to the pulse propagation speed obtained from the dual diameter waveforms that are determined from proximally spaced locations.

**Data collection:**

Data was collected by conducting an in-vivo study on 20 young subjects aged between 27 to 35 years.

The results have gained acceptable beat-to-beat repeatability with an RMSE of 4 mmHg for DBP and 6 mmHg for SBP [7].

Md. Sayed Tanveer (2019) proposed a waveform-based hierarchical Artificial Neural Network – Long Short-Term Memory (ANN-LSTM) model for BP estimation. The model consists of two hierarchy levels, The lower hierarchy level uses ANNs to extract important morphological features from ECG and PPG waveforms.

1) The upper hierarchy level uses LSTM layers to account for the time domain variation of the features extracted by the lower hierarchy level.

A.

B. **Data collection:**

The ECG, PPG and ABP signals were collected from Physionet's MIMIC I database. Also, data from 39 patients in ICU have been collected and preprocessed.

C.

D. **Preprocessing:**

To remove baseline wandering and unnecessary noise, the windowed signals are bandpass filtered using Tunale-Q wavelet transform (TQWT)

The proposed model can extract the necessary features without requiring any feature extraction technique and is also able to learn the variations of the features with time.

The results show that, the mean absolute error (MAE) and the root mean square error (RMSE) for SBP estimation are1.10 and 1.56 mmHg, respectively, and for DBP estimation are 0.58 and 0.85 mmHg, respectively [8].

Ahmadreza Argha (2019) proposed a novel deep-learning based method for BP measurement trained with beat-by-beat (BBB) time-domain features extracted from OWs.

Initially, six time-domain features from each beat of the Oscillometric Wave (OW) was extracted, relative to the preceding beat. Then, using the extracted BBB

features along with the equivalent cuff pressures, a feature vector for each OW beat was determined and mapped it in one of three different classes, namely pre-systolic (PS), between systolic and diastolic (BSD) and after diastolic (AD).

The proposed DBN-DNN classification can efficiently learn the complex nonlinear relationship between the artificial feature vectors and target classes adopting a 5-fold cross-validation scheme.

**Data collection:**

Totally 350 data records were collected from 155 individual subjects, (87 males, 68 female) aged between 23-97. Arm circumference ranged from 10-1) 35 cm.

The results obtained from DBN-DNN model gave an2) average, mean absolute error of 1:1±2:9 mmHg for SBP and 3:0±5:6 mmHg for DBP relative to reference values [9].

Soojeong Lee (2016) developed a DBN-DNN to analyze the complex nonlinear relationship between the artificial feature vectors obtained from the oscillometric wave and the reference blood pressures using the DBN-DNN based-regression model.

**Data collection:**

Oscillometric BP measurements were obtained using an automated wrist BP monitors from 85 healthy subjects aged from 12 to 80 with 37 females and 48 males. 5 sets of measurements were taken from each volunteer, so totally 425were obtained. SBP and DBP was estimated using DBN-DNN model.

The results of the proposed method were 69.52 % (≤ 5 mmHg), 90.00 % (≤ 10 mmHg), and 95.48 % (≤ 15 mmHg) for the SBP and 76.19 % (≤ 5 mmHg), 95.71 % (≤ 10mmHg), and 98.82 % (≤ 15 mmHg) for the DBP [1].

Soojeong Lee (2017) developed a DBN-DNN with mimic features based on the bootstrap inspired technique to understand the complex nonlinear relationship between the mimic feature vectors obtained from the oscillometric signals and the target blood pressures.

There are two problems in using DBM-DNN technique for BP measurement Input feature vectors are very small, which is a drawback for training DBN-DNN technique.

The special pre-training phase can trigger unstable estimation because there many random initialized assigns such as training datasets, weights and biases.

In order to rectify these limitations, the bootstrap inspired technique is used as a fusion ensemble estimator based on the DBN-DNN based regression model, which is used to create the mimic features to estimate the SBP and DBP.

The results of the proposed DBN-DNN based fusion ensemble regression estimator were 71.06 % (≤5 mmHg), 90.82 % (≤10 mmHg), and 95.53 % (≤15 mmHg) for the SBP and 81.18 % (≤5 mmHg), 96.24 % (≤10 mmHg), and 99.29 % (≤15 mmHg) for the DBP [2].

Sanghyun baek (2019) proposed a calibration free, cuffless BP prediction method based on a deep convolutional neural network (CNN)

The proposed End to End CNN model,

1) can use raw signals for training without the feature extraction of PWV

2) automatically learns the characteristics of biomedical
signals from other people.

**Data collection:**

ECG PPG, ABP signals are collected from Physionet's MIMIC II database. For preparing the training dataset, we sampled random segment from the raw signals to make all datasets the same length.

**Preprocessing:**

The preprocessing technique used are

1) random cropping
2) Fast Fourier Transform
3) Increasing input depth using its derivatives.

The accuracy of BP prediction was found to be SBP 9.60 ± 9.53 and DBP 5.14 ±5.10 for calibration-free, and SBP 5.98 ±6.17 and DBP 3.81 ±3.96 for calibration based respectively [11].

Gašper Slapni˘car (2019) proposed a method for estimating BP with PPG using spectro-temporal deep neural network.

**Data collection:**

The PPG and ABP waveforms are obtained from Physionet's MIMIC III database of 510 subjects The PPG with its first and second derivative are used as inputs into a novel spectro-temporal deep neural network with persisting connections. The spectro-temporal DNN takes into account both temporal and frequency information contained in the PPG waveform and its derivatives.

Leave-one-subject-out experiment was conducted so that the network is able to model the dependency between PPG and BP, achieving mean absolute errors of 9.43 for systolic and 6.88 for diastolic BP [13].

Peng Su (2018) proposed a novel deep recurrent neural network (RNN) consisting of multilayered Long Short-Term Memory (LSTM), networks, which are incorporated with A bidirectional structure to gain larger-scale factor information of input sequence, Residual connections to allow gradients in deep RNN to propagate more efficiently.

1)

2)

**A. Data collection:**

a. *Static continuous BP dataset:* The dataset, including ECG, PPG and BP were obtained from 84 healthy subjects consisting of 51 males and 33 females. ECG and PPG signal were obtained from Biopac system and reference continuous BP was estimated by Finapres system simultaneously in each experiment.

b. *Multi-day continuous BP dataset:* Matching dataset was determined from 12 healthy subjects including 11 males and 1 female. The BP, ECG and PPG data of each subject were recorded for 8 minutes at the rest status in a multi-day period, namely 1st day, 2nd day, 4th day and 6 months after the first day.

The proposed deep RNN model was assessed on a static BP dataset, and it gained root mean square error (RMSE) of 3.90 and 2.66 mmHg for systolic BP (SBP) and diastolic BP (DBP) prediction respectively, exceed the accuracy of traditional BP prediction models. On a multi-day BP dataset, the deep RNN obtained RMSE of 3.84, 5.25, 5.80 and 5.81 mmHg for the 1st day, 2nd day, 4th day and 6$^{th}$ month after the 1st day SBP prediction, and 1.80, 4.78, 5.0, 5.21 mmHg for corresponding DBP prediction, respectively, which transcend all previous models with notable progress[12].

Xiaomao Fan (2019), proposed a novel attention-based multitask network with a weighting scheme for BP estimation by analyzing and modeling single lead electrocardiogram (ECG) signals. The proposed method consists of a sharing BiLSTM network, three

identical two-layer fully connected task-specific networks with task-specific parameters for SBP, DBP, and MAP estimation task, and an attention layer appending to each task-specific network. To balance error losses among SBP, DBP, and MAP estimation sub-network, based on the AAMI standard requiring estimation error falling in ± 5 mmHg, we develop a conditioned error loss function as the optimized objective of the proposed method. PSO is evaluated to search the optimal task-specific weights of error losses of three BP estimation tasks.

Experiment results shows that this method could achieve mean error of SBP, DBP, and MAP estimation in levels of 0.18 ±10.83 mmHg, 1.24 ± 5.90 mmHg, and 0.84 ±6.47 mmHg, respectively.

Xiaoman xing (2016), a beat-to-beat optical blood pressure (BP) estimation paradigm using only photoplethysmogram (PPG) signal from finger tips. This method estimates subject-specific contribution to PPG signal and filters most of its influence by proper normalization. Key features such as amplitudes and phases of cardiac components were extracted by a fast Fourier transform and were used to train an artificial neural network, which was then used to estimate BP from PPG.

**Data collection:**

Totally 69 patient's data was collected from the MIMIC II database and 23 volunteers were involved for testing.

Result showed a difference of –1.67 ± 2.46mmHg for SBP and –1.29 ± 1.71mmHg for DBP.

Bing Zhang (2019), proposed a novel blood pressure prediction method based on the support vector machine regression (SVR) algorithm to work out the key gap between the requirement for continuous measurement for prophylaxis and the deficiency of an effective method for continuous measurement. The results of the algorithm were compared with those estimated from two classical machine learning algorithms, i.e., linear regression (LinearR), back propagation neural network (BP), with respect to six evaluation indexes (accuracy, pass rate, mean absolute percentage error (MAPE), mean absolute error (MAE), R-squared coefficient of determination *R*2 and Spearman's rank correlation coefficient).

The results shows that all four error ranges (±3 mmHg, ±5 mmHg, ±7 mmHg, ±10 mmHg). The accuracy of the SVR model predictions for Pd and Ps are 97.14% and 96.43% in the range (–3 mmHg,+3 mmHg), which is much higher than those of LinearR and BP.

Bing zhang (2017), proposed CART model for *BP* prediction based on biological attributes data ECG (AVR, AVL, AVF), PPG, PTT, SPO2 and HR collected from a health monitor. To verify the effect of the model, CART model were com- pared with other classical methods such as linear regression, ridge regression, SVM and neural networks in matrix of accuracy rate, *RMSE*, deviation rate and *TIC*. Pearson correlation coeffcient was also applied to selecting the most correlated variables.

**Result**

The experimental results show that the prediction result of CART model outperformed the other four models, with prediction accuracy rate of more than 90% within error range of [□5 mmHg, C5 mmHg]; Finally, by the feature correlation analysis, it is found that PTT and HR are the most related attributes to *BP* prediction.

Rui He (2016), proposed a random forest method to systematically explore the inherent connections betwwen PPG signal;s, ECG signals and ABP.

**Data collection:**

All the available data from physionet's MIMIC II database were collected and 18 features were extracted from PPG and ECG signals

Several models with most related features as inputs and beat-to-beat ABP as outputs were trained and tested on the collected data.

**Result:**

In the RF technique 4.44±3.72 mmHg for DBP and 8.29±5.84 mmHg for SBP, and in LR technique 4.98±4.31 mmHg for DBP and 9.32±7.65 mmHg for SBP were achieved.

Jialun Zhang (2019), proposed the feasibilty of convolutional autoencoder (CAE) to estimate continuous BP without calibration and hand-crafted feature extraction. 62 subjects were recruited in this experiment. First, the CAE on all the data were trained to extract the unsupervised features. Then, a regressor was trained to estimate BP values using the features learning from the CAE. 10-fold cross-validation tests were used to analyse the performance of our models.

**Result:**

Mean absolute error (MAE) and standard deviation (SD) of absolute error are used as evaluation criteria. The error for SBP is 9.61±7.75 mmHg and for DBP is 6.73±5.13 mmHg.

Jun Xu (2017), proposed a novel BP estimation method combining a classical PWTT model and a Back Propagation Neural Network (BPNN) model.

The novel method is consists of five steps: signal pre-processing, feature extraction, initial PTT model selection, model correction by neural network model, and final PTT model identification.

**Data collection:**

Data for validation was collected from Physionet's MIMIC database. Also 10 subjects ranging from 21 to 73 years were also involved in this experiment.

**Result:**

Mean value of error of DBP estimation is within 3.4±82.44 mmHg and mean value of error of SBP estimation is within 4.5±161.44mmHg.

Yue Zhang (2017), proposed a Support Vector Machine (SVM) method for continuous blood pressure estimation from a PPG Signal

**Data collection:**

The Dataset we selected was The University of Queensland Vital Signs Dataset, which covers a wide range of BP values, recorded from 32 surgical cases

**Result:**

Thel results shows that the correctness of the proposed method. The mean error is 11.6415±8.2022 mmHg for SBP and 7.617±6.7837 mmHg for DBP

## III. CONCLUSION

The standard requirement of SBP and DBP according to Association of Advancement of Medical Instrumentation (AAMI) is 5±8 mmHg. According to the AAMI standards most of the above mention techniques satisfies the requirement. Many methods are based on manual feature extraction which cannot identify the complex relationship between the physiological signals and BP. Thus, automatic feature extraction and feature learning technique would be more feasible and accurate. Thus, the VGGNet and CNN have automatic feature extraction and learning ability and would give the best prediction of BP.

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# A Review on Breast Cancer Detection Using Ultrasound Images

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## ABSTRACT

In order to diagnose the breast cancer radiologists prefer to use mammogram and breast ultrasound imaging techniques. To identify cancer, the Region of Interest (ROI) is mapped in the tumor location. The segmentation process becomes difficult if the image is noisy, blurred and of low contrast. Pre-processing is the first step done to enhance the contrast and to remove the unwanted information from the image. Various segmentation techniques have been proposed in the literature to identify the Region of Interest (ROI) and to analyze the size and the shape of the tumor. This paper provides a detailed review of these techniques, particularly for ultrasound images.

**Keywords :** Breast Cancer, Classification, Segmentation, Region Of Interest

## I. INTRODUCTION

Breast cancer is a disease in which abnormal cells form in the tissues of the breast. According to a survey in 2019, an estimated of invasive breast cancer was 268,600 new cases and non-invasive was62,930 new cases in U.S. Although rare, men get breast cancer too. The lifetime risk for U.S. men is about 1 in 1,000[22]. According to the cancer society, 14.5% population in India are affected with breast cancer.
Radiologists use different imaging modalities such as Computed Tomography (CT),Ultrasound, Mammogram (low energy X ray of breast) and Magnetic Resonance Imaging (MRI) for screening and early diagnosis. Out of all these modalities Ultrasound and Mammographic techniques are used to detect breast cancer.The advantage of ultrasound over the breast mammogram is that the sensitivity of the ultrasound is high in the case of young women whose breast density is high. Mammogram uses a low level radiation and in ultrasound, no radiations are used as it employs sound wave propagation. An ultrasound is useful to obtain additional characteristics of the area of concern in order to determine if the lump/change are benign or cancer.

In this paper different types of segmentation and classification techniques for early diagnosis of breast cancer are reviewed.

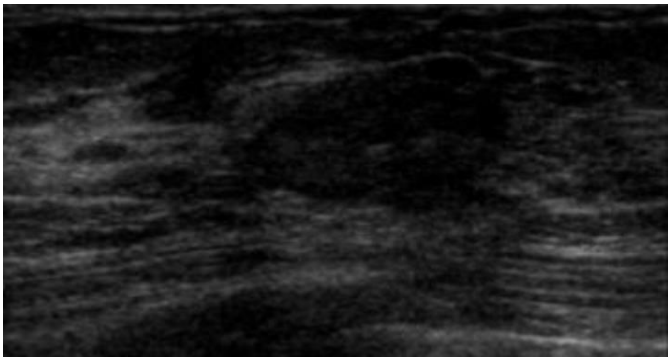

Fig 1: a) Breast Ultrasound Image

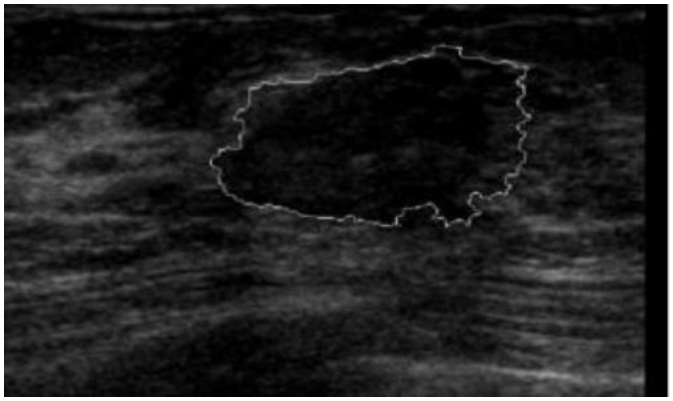

Fig.1: b) ROI of tumor [21]

## II. LITERATURE SURVEY

Zhincheng et al., [1] proposed a method in which a Convolutional Neural Network (CNN) serves as a feature extractor and Support Vector Machine (SVM) as a classifier, and the accuracy was found to be 97% using Digital Database for Screening Mammography (DDSM) dataset.

Yousif et al., [2] proposed a system for image enhancement was done using Adaptive Mean Filter (AMF), Balance Contrast Enhancement Technique (BCET)and segmentation using Fuzzy C Means clustering. The Feature extraction was done using Discrete Wavelet Transform (DWT) and the area of the tumor was calculated. The classification was done using Probability Neural Network (PNN), and the accuracy of the system was 90%

Mahendra et al., [3] used a Radial Based Function Neural Network [RBFN] as an image analysis tool to classify the image as "benign" or "malignant". The automatic analyses of the stained breast cancer histopathological images are done. All the parameters which are extracted are converted to computational representation from the image. The correlation based feature subset selection algorithm was used to uncorrelate the parametric values. This uncorrelated parameter was used to stimulate RBFN to classify the input features.

ParvinYousekamal [4] used level set algorithms on Fuzzy C Means clustering and classification was done using CNN. Block Matching and 3D filtering (BM3D) algorithm was employed to reduce the noise during the second stage. An accuracy of 90% was achieved using Naïve Baves classifier which is better when compared to other classifiers.

Karthikeyan et al., [5] the Watanabe's Ugly Duckling algorithm was proposed for the feature selection. An accuracy of about 90-94% was achieved as a result of the use of combined classifier's – SVM, Linear Discriminant Analysis (LDA), Eigen faces approach, Decision trees and Markov random model.

John Arevalo et al., [6] extracted the ROI by using Local Contrast Normalization (LCN) and the supervised learning algorithm was carried out by CNN. The classification was done using the Support Vector Machine (SVM)

LotheSavitha [7] used a Computer Aided Diagnosis (CAD) in the pre-processing step, the noise was removed using the median filtering, the contrast was enhanced using Adaptive Histogram Equalization Enhancement with Discrete Fourier Transform (DFT) and region growing method was done for the segmentation of the mass. The SVM showed a sensitivity of 92.3%, specificity of 62.5% and accuracy of 86.84%. The disadvantage observed was that it was a time consuming error work.

Varsha J. Gaikwad [8] used SVM classifier for classification of the breast lesion and the Watershed transform was applied, light pixels were marked as high (1) and dark pixels as low (0). The system provided with an accuracy of 83%.

Vishrutha et al., [9] in the first step the region of interest was found, followed by wavelet and feature

extraction of ROI. The classification of the extracted feature was done by SVM classifier. The method was evaluated using Mini Mammographic Image Analysis Society (Mini – MIAS) dataset. An Accuracy of about 92% was achieved.

Abdul Kadir Jumaata et al., [10] used active contour to identify the boundaries and they adopted mathematical concepts for energy minimization. Balloon Snake algorithm is used as a segmentation tool for the ultrasound breast images. The accuracy of the Balloon Snake algorithm was calculated by comparing the masses between the radiologist's observation and the Balloon Snake model and it was found to be 95.53%.

J.Arevalo et al., [11] used a combined method of Unsupervised Feature Learning (UFL) and BOF (Bag of Feature) representation as an image classification technique. Scale Invariant Feature Transform (SIFT) and Discrete Cosine Transform (DCT) were used as descriptors to represent BOF as patches. UFL was trained to represent the patches, by topographic UFL method. An accuracy of 93% was achieved.

Geoff Curie et al., [12] explained about the basicconcepts of Convolutional Neural Network (CNN), Artificial Neural Network (ANN), and application oriented explanation was provided. The emergence of these neural networks has the potential to enhance the ecosystem and biodiversity. It was concluded that implementation of AI must follow ethics and patient centered approach.

M Shen et al., [13] employed lesion segmentation in ultrasound images using SVM with Radial Basis Function(RBF) kernels. Media Access Control (MAC) model was employed for bidirectional force. The disadvantage of this model was that it has the interference of speckle noise. This model caused leakage when dealing with the weak edges because the pressure force may push the snake curves out of the boundary.

Valraprakash Gurursamy et al., [14] the methods employed are edge detection, thresholding and segmentation. Segmentation was done by three methods namely i) region based (single seeded region growing)ii) adaptive thresholding iii) feature based clustering (k-means clustering). On observation, edge detection yields better result. Thresholding technique is suitable for images that have few specific features. Clustering is used to segment the color portions of the image, typically known as the grouping. Thus after analyzing the results, thresholding yields a better result compared to edge detection and clustering.

Anuj Kumar Singh et al., [15] used simple image processing techniques like thresholding and averaging,Max-Mean and Least Variance technique for tumor detection. The computational speed was fast and simple. The disadvantage of this method was that the threshold parameter and the size of the averaging filter has to be manually selected.

A.D.Belsare et al., [16] the features such as GLCM (Gray Level Co-occurrence Matrix), GRLM (Graph Run Length Matrix) and Euler number were extracted. The methodology employed here was that the breast histology images were extracted and the epithelial lining surrounding the breast lumen were studied. LDA (Linear Discriminant Analysis), spatio-color-texture graph segmentation was used for the classification of the histopathological images. The classification was done using LDA and the effectiveness was evaluated and compared using kNN (k- Nearest Neighbors) and SVM (Support Vector Machine). This comparative study revealed that, LDA performs better.

Swetha et al., [17] employed the use of combination of Hybrid image segmentation and Otsu's thresholding technique for identifying the size of tumor. The results obtained were comparatively more accurate than from the segmentation method used individually. It has reduced the cost of computing.

Suying Lee et al., [18] employed a graph based segmentation method for detecting the breast tumor in ultrasound images. The automatic detection of tumor and the segmentation of lesions were based on the minimum spanning trees in a graph which has been generated from the image. The proposed method was much more robust to noise and the accuracy has also increased.

Minavathi et al., [20] used Gaussian smoothing, anisotropic diffusion filters for pre-processing to remove the multiplicative noise. Spiculations which constitute the breast mass have irregular boundaries so in order to detect the boundary, receiver operating characteristic curve was used. A sensitivity of 92.7% and 0.88 area under curve. The measure of curvature at each angle was measured.

Peyman Rahmati et al., [23] The Computer Aided Diagnosis (CAD) was presented to segment suspicious lesions based on novel Maximum Likelihood Active Contour Model using Level Sets (MLACMLS). The algorithm separates the lesion from the background by using gamma distribution. The Adaptive Level Set-based Segmentation Method (ALSSM) and the Spiculation segmentation using level sets (SSLS) approach showed higher segmentation accuracy. The results were compared with Active Contour Without Edge (ACWOE) and it showed a better performance.

## III. CONCLUSION AND FUTURE SCOPE

In this paper, different techniques for diagnosis of breast cancer were studied. Various imaging techniques have been analyzed and the result proves that ultrasound images are useful in the diagnostic procedure. In future an intelligent system can be developed by using SVM and Neural Network along with AI which would provide a better insight about the size, location and the nature of the tumor.

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# A Comparative Study on Mechanical Heart Valve and Bio-Prosthetic Valve

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## ABSTRACT

Artificial heart valves are engineered devices used for replacing diseased or damaged natural valves of the heart. Most commonly used for replacement are mechanical heart valves and biological valves. This paper briefly outlines the evolution, designs employed, materials being used, and important factors that affect the performance of mechanical heart valves and bio prosthesis valves.

**Keywords :** Mechanical Heart Valves, Bio Prosthesis Valves, Valve Design, Valve Performance.

## I. INTRODUCTION

An artificial heart valve is a device implanted into the heart of a patient to replace a dysfunctional native heart valve The human heart contains four valves: tricuspid valve, pulmonic valve, mitral valve and aortic valve. Their main purpose is to keep blood flowing in one direction through the heart, and from the heart into the major blood vessels connected to it (the pulmonary artery and the aorta). Heart valves can malfunction for a variety of reasons, which can impede the flow of blood through the valve (stenosis) and/or let blood flow backwards through the valve (regurgitation). Both processes put strain on the heart and may lead to serious problems, including heart failure. Although some dysfunctional valves can be treated with drugs or repaired, others need to be replaced with an artificial valve. Aortic valve replacement (AVR) has been performed since the 1950s. Since then, the surgical procedure has been optimized to reduce the risk of procedure-related complications.Technical advances in the design of valves have significantly improved long-term prognosis. After the initial use of mechanical ball-caged valves, numerous monoleaflet and bileaflet valves have been introduced and evaluated. Prosthetic heart valves which are used for the definitive treatment of disease and dysfunctional native heart valves came to use since the mid 1960s. They are broadly divided into mechanical heart valves (MHVs) and bio prosthetic heart valves (BHVs). MHVs are made of synthetic material (e.g., polymers, metal, and carbon), where as BHVs are made of biologic tissues which are mounted on a fabric covered plastic frame, called a stent. MHVs are more durable, but their thrombogenicity and need for long-term anticoagulant therapy make them unsuitable for patients in some age groups especially older age groups. In contrast, BHVs are safe to implant, functionally similar to the native aortic valve, do not require long-term anticoagulant therapy, and are hence associated with reduced risk of haemorrhage.

As they were introduced in the mid 1960s. Many tissues and different animal species aortic valves have been tried with varying results. Today, the most commonly used BHVs are those from porcine aortic valves and from calf pericardium. While the use of BHVs are done according to patient's age and other considerations, the trend in the United States and Europe has been towards greater use of tissue rather than mechanical valves. Currently, mechanical valves are preferred except in elderly patients or those who cannot be put under anticoagulant therapy, like women who may still wish to bear children, or hemolytic patients.

## II. Classification of heart valves

There are mainly three types of artificial heart valves: (a) mechanical heart valves (b) bio prosthesis heart valves (c) tissue-engineered valves. But tissue engineered valves are not used much. Bio prosthetic heart valves are used most commonly in US, UK, and the European union. Whereas mechanical heart valves are preferred in Asia and Latin America

### A. Mechanical heart valves

Mechanical heart valves are made from materials such as titanium and carbon. They usually consist of two leaflets and a metal ring surrounded by a ring of knitted fabric, which is sewn onto the heart in place of the original valve. There are several different models available for aortic and mitral replacement surgeries. The main advantage of mechanical valves is that they are very durable. However, these valves provide a surface on which blood clots can form easily. As a result, anyone who has been implanted with a mechanical valve needs to be on lifelong blood-thinning medication, such as warfarin, to prevent the development of blood clots that can cause heart attack or stroke. These valves should be avoided in women of child-bearing age, as warfarin is not for use in pregnancy, and those with a high risk of falls or bleeding.

### B. Bio prosthetic heart valves.

Tissue valves, also known as biological or bio prosthetic valves, are composed of animal or human tissue. The valves are derived from animal tissue such as porcine (pig), bovine (cow) and equine (horse) models, and then fixed with a preserving solution that may be mounted on a flexible frame to assist in deployment during surgery. As with mechanical valves, the bottom of a tissue valve is often surrounded by a ring of knitted fabric that is sewn onto the heart. In addition to animal-derived valves, a human tissue valve from a donor human heart, known as an allograft or homograft, may also be used as a replacement valve. Tissue valves can be used in open heart surgery or in a minimally invasive aortic operation known as transcatheter aortic valve implantation (TAVI). Advantages of tissue valves compared to mechanical valves include the avoidance of lifelong warfarin therapy to prevent the development of blood clots. A disadvantage is their relatively poor durability compared to mechanical valves, with many requiring a re-operation in 10 to 20 years.

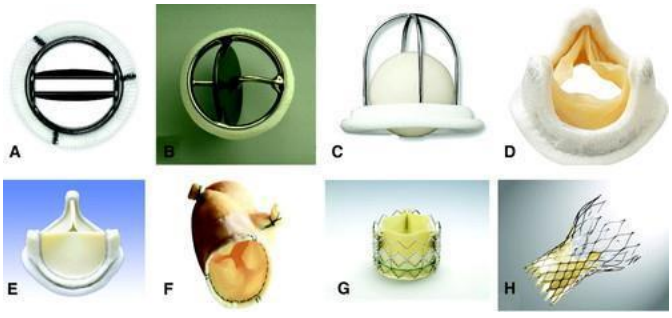


**Fig 1 :** Different types artificial heart valves.

## III. Types of mechanical heart valves.

### A. Caged ball valves

The first artificial heart valve was the caged ball valve, in which a ball is housed inside a cage. When the heart contracts and the blood pressure in the chamber of the heart exceeds the pressure on the outside of the chamber, the ball is pushed against the cage and allows blood to flow. When the heart finishes contracting, the pressure inside the chamber drops and the ball moves back against the base of the valve forming a seal. In 1952, Dr Charles Hufnagel, Professor of Experimental Surgery at Georgetown Medical Center in Washington, DC, implanted the ball valve as in the figure 1. In the late 1940s, Dr. Hufnagel experimented in an animal preparation with methacrylate tubes for arterial replacement; this led to animal implants with a ball valve similar to that depicted in Figure 1 [4]. The methacrylate chamber containing the methacrylate ball could be inserted in the descending thoracic aorta during a brief cross-clamp period because of ingenious fixation rings (Fig 1). The methacrylate ball was subsequently replaced with a hollow nylon ball coated with silicone rubber to reduce valve noise.

**The below are the different types of cage ball valves:**

i. Hufnagel Ball Valve
ii. Harken-Soroff Ball Valve
iii. Starr-Edwards Ball Valve
iv. Magovern-Cromie Ball Valve
v. Smell off-Cutter Ball Valve
vi. DeBakey-Surgitool Ball Valve
vii. Braunwald-Cutter Ball Valve

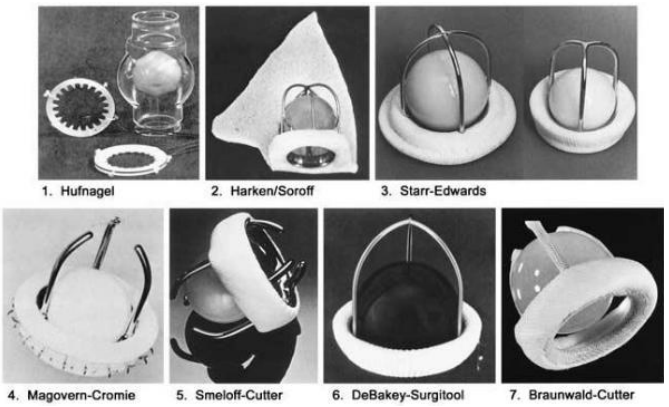


**Fig 2 :** Types of caged ball valves.

### B. Tilting Disc Valves

Introduced in 1969, the first clinically available tilting-disc valve was the Bjork-Shiley valve. Tilting-disc valves are made of a metal ring covered by an ePTFE fabric. The metal ring holds, by means of two metal supports, a disc that opens when the heart beats to let blood flow through, then closes again to prevent blood flowing backwards. The disc is usually made of an extremely hard carbon material (pyrolytic carbon), enabling the valve to function for years without wearing out.

The below are the different types tilting disc valves:

i) Bjork-Shiley Flat Disc Valve
ii) Bjork-Shiley Convexo-Concave Tilting Disc Valve
iii) Lillehei-Kaster Tilting Disc Valve
iv) Omniscience Tilting Disc Valve
v) Hall-Kaster and Medtronic-Hall Tilting Disc Valves

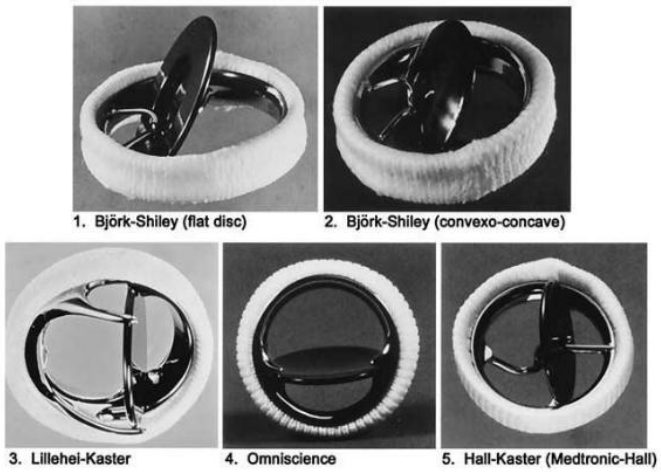


**Fig 3 :** Types of tilting disc valve.

### C. Bileaflet Valves.

Introduced in 1979, bileaflet valves are made of two semicircular leaflets that revolve around struts attached to the valve housing. With a larger opening than caged ball and tilting-disc valves, they carry a lower risk of blood clots. They are vulnerable to blood backflow. The below is different types of Bileaflet Valves:

i) Gott-Daggett Bileaflet Valve
ii) Kalke-Lillehei Bileaflet Valve
iii) St. Jude Medical Bileaflet Valve
iv) Carbomedics Bileaflet Valve

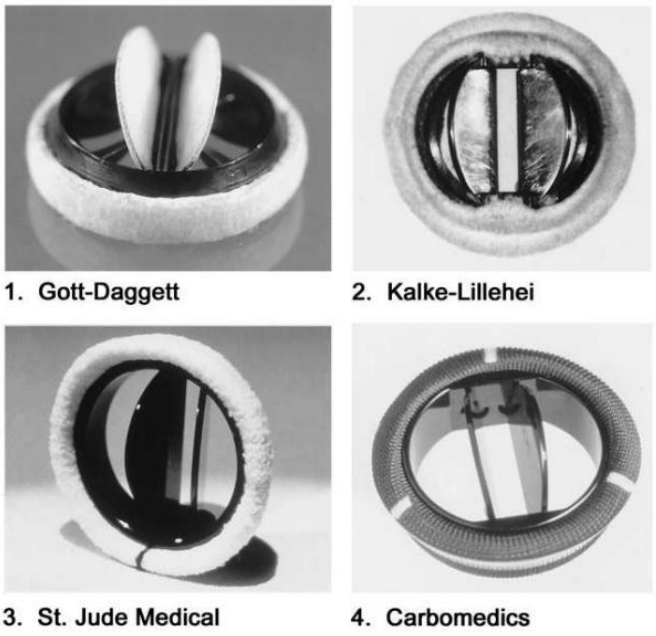


**Fig 4 :** Types of Bileaflet Valves.

### D. Bileaflet Valves.

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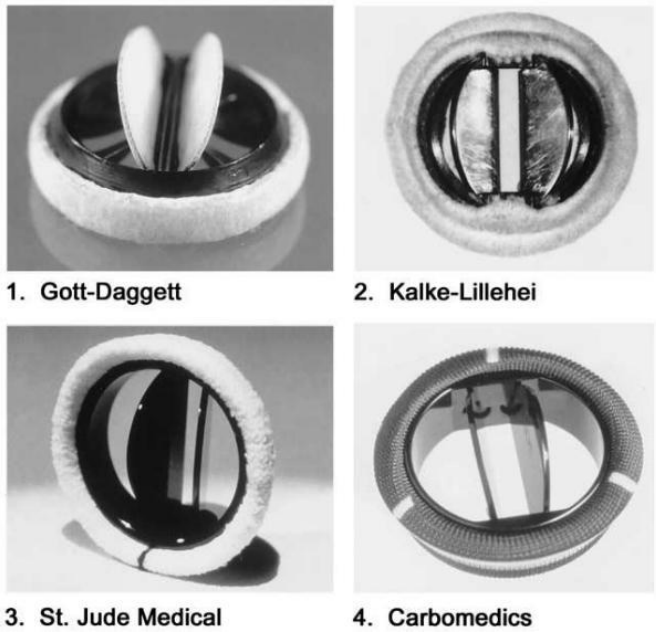


**Fig 5 :** Types of Bileaflet Valves.

### IV. Disadvantages of Mechanical heart valves

One of the major drawbacks of mechanical heart valves is that they are associated with an increased risk of blood clots. People with mechanical valves need to take anticoagulants.

Some patients with mechanical valves can hear clicks as their valve closes, which some find disturbing.

Cavitation is the rapid formation of vaporous microbubbles in a fluid due to a local drop of pressure below the vaporization pressure at a given temperature. Cavitation in the blood can lead to mechanical heart valve failure.

### V. Advantages of Mechanical heart valve

The major advantage of mechanical valves over bio prosthetic valves is their greater durability. Made from metal and/or pyrolytic carbon, they can last 20–30 years.

### VI. Classification of Bio – prosthetic heart valve.

Bioprosthetic valves are usually made from animal tissue (heterograft/xenograft) mounted on a metal or polymer support. Bovine (cow) tissue is most commonly used, but some are made from porcine (pig) tissue.The tissue is treated to prevent rejection and calcification.

### A. Homograft.

These are derived from cadaveric (human) aortic valves. They are cryopreserved and are implanted into the aortic root without a stent. Autograft. Patient's own valve was taken from one site (pulmonary) and implanted at another site, for example, pulmonary valve grafted into the aortic site. This predominately occurs in children with diseased native aortic valves.

B. Xenograft or Heterograft. These are developed from animal tissues the most common being the porcine aortic valve followed by calf (bovine) pericardium. Porcine aortic valve. In porcine BHV, the valve tissue is sewn onto a fabric covered metal wire stent, made from a cobalt-nickel or another alloy. A Dacron fabric covers the entire stent and a sewing skirt is fashioned and attached to the base of the wire stent. Contemporary models of these valves are durable and last for 10–15 years.

C. Bovine Pericardial Valve. Similar in design to porcine valves in that they imitate the tricuspid aortic valve, except that the metal cylinder joining the ends of stent wire is located in the middle of one of the stent post loops. At 10 years after implantation, the hemodynamics and durability of pericardial valves are equal to or greater than the porcine valves

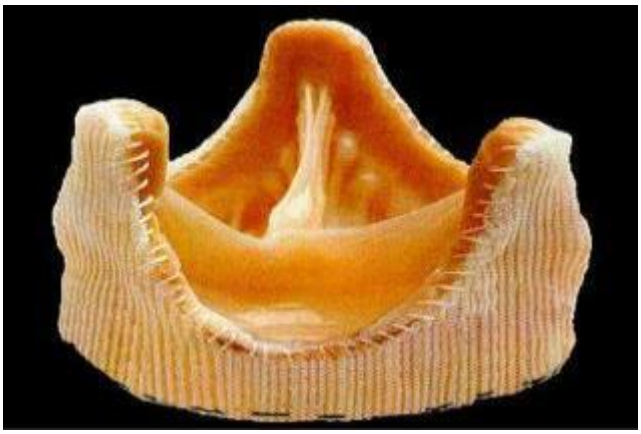

**Fig 6 :** Bio-prosthetic heart valve

## VII. Types of Bio – prosthetic heart valve.

### A. Stented Bioprostheses

The design of bioprostheses purports to mimic the anatomy of the native aortic valve Porcine bioprosthetic valves consist of 3 porcine aortic valve leaflets cross-linked with glutaraldehyde and mounted on a metallic or polymer supporting stent. Pericardial valves are fabricated from sheets of bovine pericardium mounted inside or outside a supporting stent.

### B. Stentless Bio - prostheses

In an effort to improve valve hemodynamic and durability, several types of stentless bio-prosthetic valves have been developed. Stentless bio - prostheses are manufactured from whole porcine aortic valves or fabricated from bovine pericardium.

### C. Percutaneous Bio - prostheses

Percutaneous aortic valve implantation is emerging as an alternative to standard aortic valve replacement (AVR) in patients with symptomatic aortic stenosis considered to be at high or prohibitive operative risk .The valves are usually implanted using a percutaneous transfemoral approach. To reduce the problems of vascular access and associated complications, a transapical approach through a small thoracotomy may also be used. At present, the procedure appears promising, but it remains experimental and is currently undergoing further investigation.

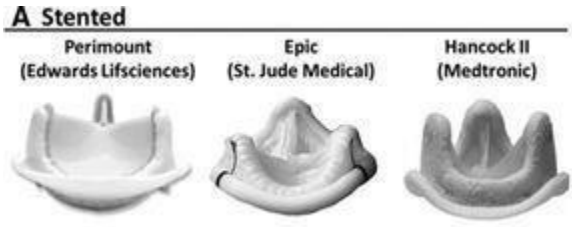


**Fig 7 :** Image of stented bio-prosthesis.

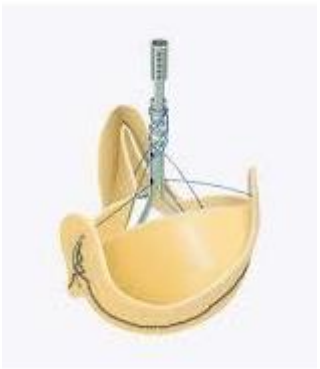

**Fig 8 :** Image of stentless bio-prosthesis.

## VIII. Disadvantages of Bio – prosthetic heart valve.

Tissue valves are less durable than mechanical valves, typically lasting 10–20 years.

Bioprosthetic valves tend to deteriorate more quickly in younger patients.

### IX. Advantages of bioprosthetic heart valves

Bioprosthetic valves are less likely than mechanical valves to cause blood clots, so do not require lifelong anticoagulation.

people with bioprosthetic valves have a lower risk of bleeding that those with mechanical valve.

## X. CONCLUSION

From the comparison done in the paper we can conclude that the usage of Mechanical heart valves are more are more useable then Bio-prosthetic heart valve. As mechincal heart valves are more durable.

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# Efficacy of An Aural Rehabliltation Intervention with Adult Cochlear Implant Users

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## ABSTRACT

Cochlear implants are small electronic devices that allow people to hear sounds. A cochlear implant can help a person with very little or no natural hearing ability. The number of people who use cochlear implant keeps growing. More than 3,24,200 people across the world use cochlear implants. 40 percent of children who are born profoundly deaf now receive a cochlear implant, which is a 25 percent increase from 5 years ago according to a survey conducted in 2014. The main idea of this paper is to evaluate up to what extent intervention of aural rehabilitation (AR) can improve outcomes for adult cochlear implant users. The AR protocolswill include auditory training, communication strategies training and informational counselling. The proposed paper will examine whether an aural rehabilitation program consisting of auditory training (combining top-down/synthetic and bottom-up/analytic approaches) in the above-mentioned criteria can significantly improve the speech recognition abilities and psychosocial outcomes of post lingually deafened adult cochlear implant users.

**Keywords :** Cochlear Implant, Aural Rehabilitation, Auditory Training, Rehabilitation Program, Speech Recognition Ability

## I. INTRODUCTION

AR is the process of identifying and diagnosing a hearing loss, providing different types of therapies to clients who are hard of hearing, and implementing different amplification devices to aid the clients hearing abilities.

AR can reduce one's perception of hearing difficulties, improve one's perception of quality of life, help one to become more effective user of hearing technology and communication strategies, and improve one's personal adjustments to living with hearing loss. Aural rehabilitation evaluates the effectiveness of training to improve outcomes to adult cochlear implant users. Aural rehabilitation falls within the scope of practice of both audiologists and SLP's.

The aural rehabilitation process is comprised of several components including

1. Hearing aid fitting and orientation
2. Counselling
3. Auditory visual training
4. Conversational strategies
5. Environmental training
6. Consumer organisations

Under a project by Rehabilitation Engineering Research Centreon hearing enhancement a total of thirty adult cochlear implant users were randomly assigned to either the AR intervention protocol or the control group. Each group met for a six-week program for one and half hours each week. Multiple outcome measures were completed preintervention and again immediately following treatment and again at two month and six months post treatment. Measures included speech recognitionperformance on recorded topic related sentences (CasperSent) and a series of self-assessment measures of psychosocial function including personal adjustment participation or withdrawal from activities and quality of life.

## II. COCHLEAR IMPLANTS AND COMMUNICATION FUNCTIONS

A cochlear implant is suitable for people with a severe to profound hearing loss, who do not benefit from standard hearing aids. Cochlear implants are generally most successful for people who had a relatively short length of deafness.

- Increasing numbers of adults receiving CIs and many are achieving high levels of speech perception. However, a proportion of adults still struggle in daily life and seek greater communication competency.
- CI does not resolve all communication issues. Residual issues can negatively impact psychosocial function and quality of life.

Some individuals demonstrate limited outcomes, as shown by poor speech recognition and/or evidence of significant hearing handicap. Others have good speech recognition, but not sufficient to meet the communication demands of their daily life.

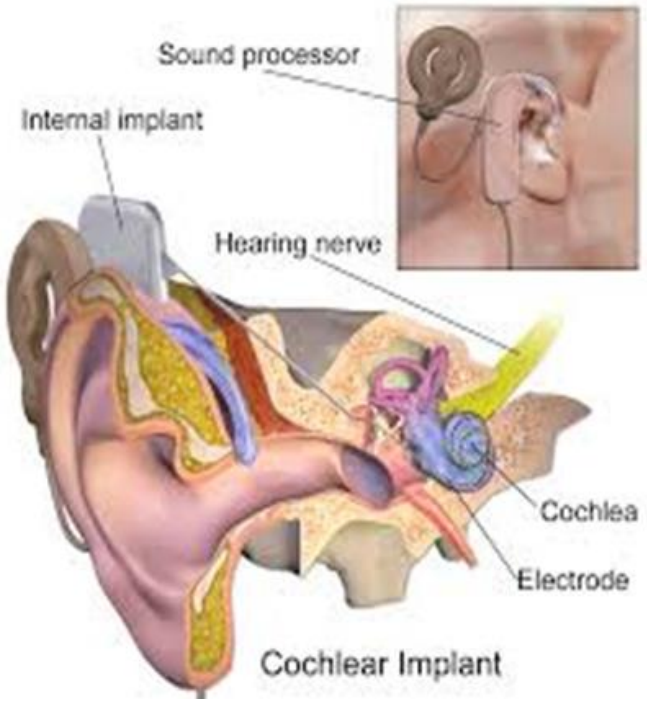


**Fig 1** : A typical modern cochlear implant system that converts sound to electric impulses delivered to the auditory nerve.

## III. AURAL REHABILITATION PROTOCOLS

### A. Auditory training

Auditory training is an intervention method used in rehabilitative audiology that aims to help individuals with hearing loss use their residual hearing maximally. It emphasizes the development of listening skills to improve the recognition and interpretation of speech sounds despite limited hearing ability. The auditory training will exercise the auditory abilities in the attempt to minimize the functional deficits presented by the individual. It consists of listening tasks, in which the patient will perform the functions of auditory detection, auditory discrimination auditory recognition and auditory understanding.

One of the principles of the auditory training is to develop the central nervous system neuroplasticity in

order to generate changes in morphology and in auditory performance after the training auditory stimulation allowing the patient to give a new significance to resignify to each sound that he hears.

- **Auditory training outcomes:**

- Renewed interest in auditory training to improve speech recognition
- Role of auditory experience, especially focused auditory training, may be key to maximize functional outcomes in CI
  Users.
- Systematic review of evidence-based practice in Audiology, and more recently,cite evidence in support of benefits of auditory training, but recommend that future studies include a control group in order to establishthe efficacy of training.

### B. Communication strategies training

Your hearing device will help you hear better in some situations, but for better results using a range of communication skills will help you make the most of your hearing and your hearing device. There are other things you can do to give yourself the best chance of hearing and understanding well. These are commonly known as “communication tactics”. The best thing about these tactics is that they are useful for everyone, whether or not they have a hearing loss or use a hearing device.

The three main techniques under communication strategies training include Sentence identification, vowel and consonants contrasts, KTH speech tracking.

- **KTH speech tracking:**

KTH speech tracking is an easy to use approach in which a story is read by the clinician a line at a time, requiring the client to repeat it back verbatim. The first step in the KTH speech tracking procedure is to set a number of parameters for the session. The receivers name and the testing condition are entered, along with the number of repeats of a blocked word and the duration (in minutes) of the tracking session. These include an elapsed time window and a record of all words which are presented via the LED display. Once these parameters have been set, the tracking session can begin.

### C. Informational counselling

Informational counseling is the imparting of information to families about a broad range of topics throughout childhood, including, but not limited to, the following:

1. Audiogram interpretation
2. Amplification/technology options
3. Educational options
4. Communication options
5. Advocacy and public health and educational policies

Informational counselling focuses on providing education to the person with hearing loss or related disorders and their family/significant others about the disorder, associated symptoms, prevention and wellness, and the rationale for specific treatment intervention

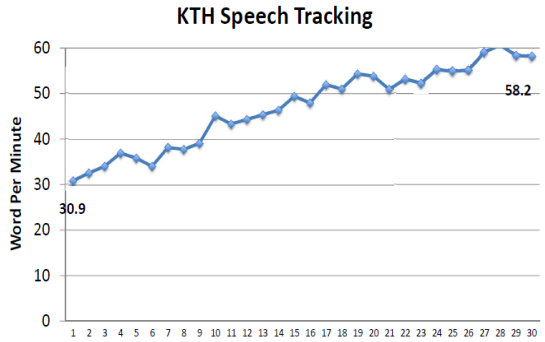


**Fig 2** : AR group: Speech tracking for 30 5minute trials over six sessions(N=8).

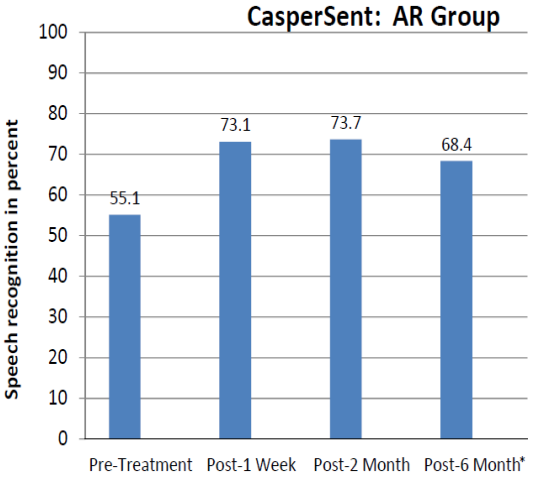


**Fig 3 :** Sentence recognistion pre and post intervention(N=8) *post 6 months(N=6).

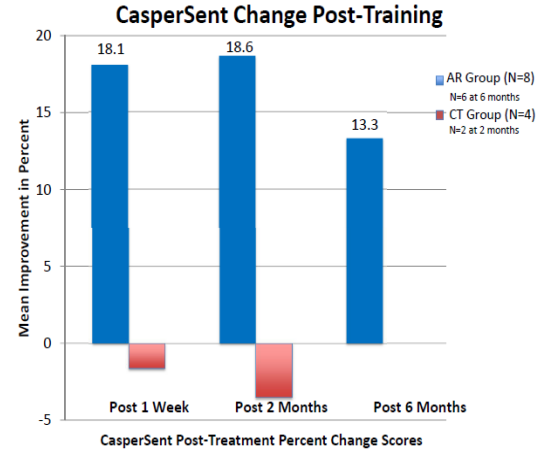


**Fig 4** : CasperSent post treatment percent change scores.

## IV. CONCLUSION

Referring to the figures above we can conclude that the participants had an improved word per minute count under the KTH speech tracking, numbered to increase from 30.9 words to 58.2 words per minute. Also, speech recognition in percent increased from a 55.1 (pre-treatment) to a whopping 73.7 (post two month) in the CasperSent. The main improvement in percent post training showed an increase of 18.1 to 18.6 increases but further declined to 13.3 post six months.

The summary of preliminary of speech recognition measures and psychosocial measures grouped for CT and AR is explained below

a) CT Group
- Participants showed no improvement in sentence recognition following training.
- Minimal improvement was seen on the Client Orientated Scale of Improvement (COSI).
- Minimal improvement basic speech domains, but none in psychosocial function.
- No reduction in self-perceived hearing handicap.

b) AR Group
- All participants showed improved speech recognitionpost-training (from 6.5% to 28.3%).Mean improvement post-training was
  - 18.1% at one-week post-training
  - 18.6% at two months post
  - 13.3% at six months post
- Improvement seen in personal goals (COSI).
- Improvement seen in social participation, self-assessed communication, and psychosocial function.

- Reduction of self-perceived hearing handicap.
- Primarily we can confirm that AR intervention contributed to increased speech recognition and to self-perceived improvement in psychosocial function. This preliminary data suggests that short-term AR can maximize outcomes for adult CI users.

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# A Study in Sleep Disorders Classification and Comprehensive Analysis

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## ABSTRACT

Sleep is a vital, often neglected, component of every person's overall health and well-being. Sleep is important because it enables the body to repair and be fit and ready for another day. It is reported that in India 30% suffer from occasional insomnia and according to a study conducted by a consumer products giant,nearly 93% of Indians are sleep deprived. Sleep, that familiar yet inexplicable condition of repose in which consciousness is in abeyance, is obviously not abnormal, yet it is most appropriately considered in connection with abnormal phenomena because there are a number of interesting and common irregularities of sleep, some of which approach serious extremes. In this paper we have discussed about the classification of sleep disorders, methods of diagnosis and treatment and discussed the technologies used to the treat sleep disorders and their types. Technologies developed for the treatment of sleep disorders such as Continuous positive airway pressure (CPAP), hypoglossal nerve stimulator, sleep apps, wearable s and fitness trackers and many other as discussed in the paper.

**Keywords :** Sleep Disorders, Classification, Sleep Detection Methods, CPAP, Polysomnography.

## I. INTRODUCTION

Sleep is a naturally recurring state of mind and body, characterized by altered consciousness, relatively inhibited sensory activity, reduced muscle activity and inhibition of nearly all voluntary muscles during rapid eye movement (REM) sleep, and reduced interactions with surroundings. It is distinguished from wakefulness by a decreased ability to react to stimuli, but more reactive than a coma or disorders of consciousness, with sleep displaying very different and active brain patterns. Sleep, as everyone knows, is an elemental phenomenon of life and an indispensable phase of human existence. It represents one of the basic 24-h (circadian) rhythms, traceable through all mammalian, avian, and reptilian species. The neural control of circadian rhythms is thought to reside in the ventral-anterior region of the hypothalamus—more specifically, in the suprachiasmatic nuclei. Lesions in these nuclei result in a disorganization of the sleep-wake cycles as well as of the rest-activity, temperature, and feeding rhythms.

There are several factors considered in analyzing the sleep i.e., external factors such as lighting, sleep environment, jetlag, shift - based work, medication and internal factors such as anxiety, stress, body pains and many other factors in our daily life. There are a number of factors that could be negatively affecting your sleep like caffeine, sleeping pills, marijuana, special diet and other food intakes too.

There are two types of sleep that generally occur in a pattern of three-to-five cycles per night:

- Rapid eye movement (REM) – when most dreaming occurs
- Non-REM – has three phases, including the deepest sleep

The quality of our sleep directly affects our mental and physical health and the quality of our waking life, including our productivity, emotional balance, brain and heart health, immune system, creativity, vitality, and even our weight. No other activity delivers so many benefits with so little effort. There is a big difference between the amount of sleep we can get by on and the amount we need to function optimally. According to the National Institutes of Health, the average adult sleeps less than seven hours per night. In today's fast-paced society, six or seven hours of sleep may sound pretty good. In reality, though, it's a recipe for chronic sleep deprivation.While sleep requirements vary slightly from person to person, most healthy adults need between 7 to 9 hours of sleep per night to function at their best. Children and teens need even more. And despite the notion that our sleep needs decrease with age, most older people still need at least 7 hours of sleep.

## II. SLEEP DISORDERS

Sleep disorders include problems mainly with the quality, timing and amount of sleep, which cause problems with functioning and distress during the daytime. Sleep disorders are linked to both physical, mental and emotional problems. Sleep problems can both contribute to or accelerate mental health conditions and can become the reasons for several other persisting health conditions.

Sleep disorders are classified into eight major categories :

1. Insomnias
2. Sleep-related breathing disorders
3. Hypersomnias of central origin
4. Circardian rhythm sleep disorders
5. Parasomnias
6. Sleep-related movement disorders
7. Isolated symptoms, apparently normal variants and unresolved issues
8. Other sleep disorders

1. INSOMNIAS

The term insomnia signifies a chronic inability to sleep despite adequate opportunity to do so; it is used popularly to indicate any impairment in the duration, depth, or restorative properties of sleep.

Two general classes of insomnia can be recognized
- Primary: one in which there appears to be a primary abnormality of the normal sleep mechanism and Secondary: in which the sleep disturbance is secondary to a medical or psychologic disorder.

Diagnosis : Depending on the situation of the patient, the diagnosis of insomnia and the search for its cause includes :

→ Physical exam - If the cause of insomnia is unknown, a physical test is done to look for science and symptoms indicating insomnia.

→ Sleep Habits review - The doctors ask sleep related questions and the patient maybe asked to fill a questionnaire to determine the sleep-wake pattern.

→ Sleep Study - Tests are done to monitor and record a variety of body activities when the patient is asleep including brain waves, breathing, heartbeat, eye movements and body movements.

Treatment : Changing sleep habits and addressing issues such as stress, medical conditions etc., which maybe associated with insomnia, normal sleep can be restored in many people.

→ Stimulus Control Therapy
→ Relaxation Techniques
→ Sleep Restriction
→ Remaining Passively Awake
→ Light Therapy

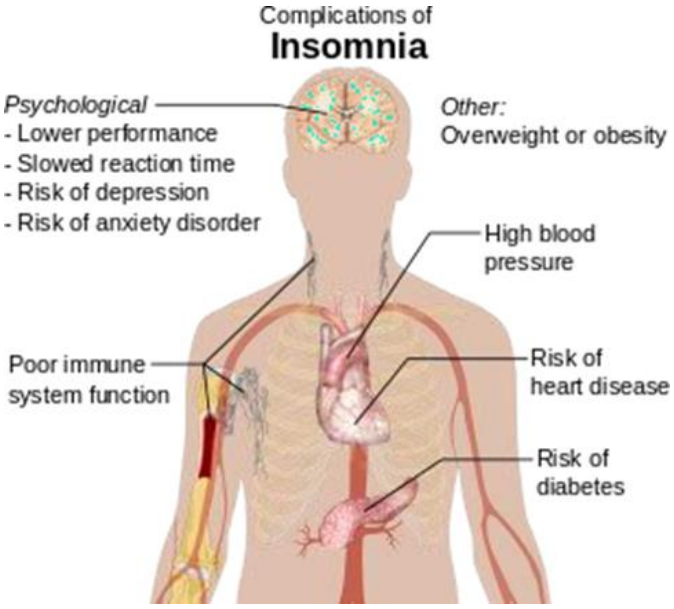


**Fig 1 :** Complications of insomnia

## 2. SLEEP-RELATED BREATHING DISORDERS

They are characterized by abnormal respiration during sleep. They are grouped into primary central apnoea, central Apnoea due to Cheyne Stokes Breathing, Central Apnoea due to High Altitude Periodic Breathing, Central Apnoea due to Medical Condition not Cheyne Stokes, Central Apnoea due to Drug or Substance, Obstructive Sleep Apnoea Sleep Related Hypo ventilation/Hypoxemic Syndromes, Sleep Related Hypo ventilation/Hypoxemia due to Medical Condition, Due to pulmonary parenchymal or vascular pathology, Due to lower airways obstruction, Due to neuromuscular & chest wall disorders, Other Sleep Related Breathing Disorders, Sleep apnoea/Sleep related breathing disorder, unspecified.In-laboratory attended diagnostic polysomnography or portable home sleep testing can be used to diagnose sleep apnoea. Continuous positive airway pressure (CPAP) therapy is the first-line treatment for OSA in adults.

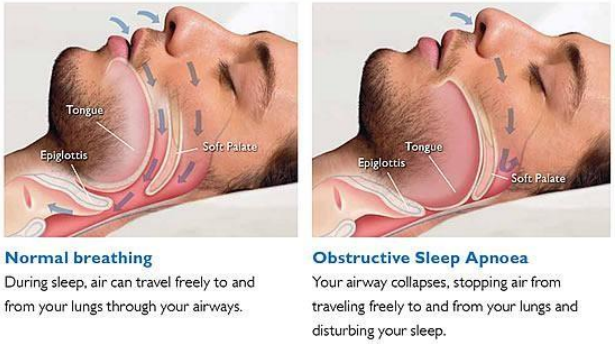


**Fig 2 :** Comparison of airways in normal breathing and sleep apnoea

## 3. HYPERSOMNIAS OF CENTRAL ORIGIN

Hypersomnia is a frequently encountered symptom in clinical practice. The cardinal manifestation is inappropriate daytime sleepiness, common to all types of hypersomnias. Hypersomnias of central origin are a rare cause of excessive daytime sleepiness, much rarer than the Hypersomnia related to other pathologies, such as sleep-disordered breathing.

## 4. CIRCARDIAN RHYTHM SLEEP DISORDERS

CRSDs are caused by alterations of the central circadian time-keeping system, or a misalignment of the endogenous circadian rhythm and the external environment.Either disruption of the endogenous circadian control mechanism or misalignment between internal circadian rhythms with the 24-hour outside environment would result in circadian rhythm disorders with adverse consequences in sleep and many other aspects of human health, including metabolism dysfunction, cognitive impairment, cardiovascular abnormalities, gastrointestinal and genitourinary dysfunctions.

The diagnosis of CRSD is based on a detailed history of the patient's sleep and wake pattern, and diagnostic tools, such as a sleep diary and actigraphy. In addition, assessment of the timing of physiological circadian rhythm markers, such as core temperature and melatonin are useful diagnostic tools that can be used to confirm the diagnosis.

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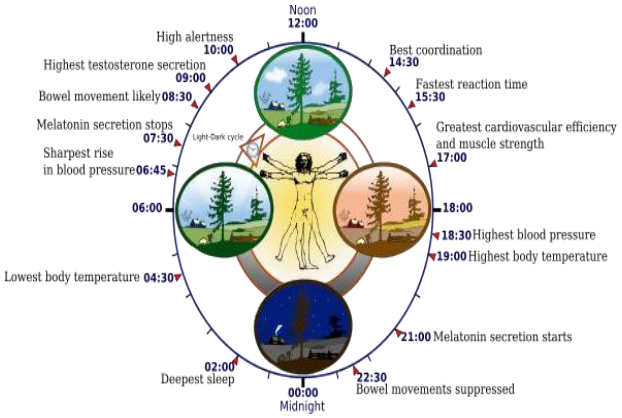


**Fig 3 :** Circardian rhythm cycle

PARASOMNIAS

Sleepwalking, sleep terrors, sleep talking and sleep paralysis are some of the behavioral manifestations from sleep known as Parasomnias — a group of sleep disorders defined as undesirable physical events or experiences that occur during the initiation of sleep, during sleep or during arousal from sleep. Although more common in children, parasomnias can occur at any age. All parasomnias occur from sleep, and NREM parasomnias usually occur among individuals aged 5–25 years with a family history of similar parasomnias and involve physical and verbal activity of varying complexity.

SLEEP - RELATED MOVEMENT DISORDERS

Several movement disorders may occur during nocturnal rest disrupting sleep. A part of these complaints is characterized by relatively simple, non-purposeful and usually stereotyped movements. Patients reporting poor sleep due to these abnormal movements should undergo non-pharmacological or pharmacological treatments.

7. ISOLATED SYMPTOMS, APPARENTLY ALL VARIANTS AND UNRESOLVED ISSUES

Long sleeper is a person who sleeps more in the 24-h day than the typical person. Sleep is normal in

architecture and quality. Usually, sleep lengths of 10 h or greater qualify for this diagnosis. Symptoms of excessive sleepiness occur if the person does not get that amount of sleep. A short sleeper is a person with a routine pattern of obtaining 5 h or less of sleep in a 24-h day. Sleep talking can be either idiopathic or associated with other disorders, such as REM sleep behavior disorder or sleep-related eating disorder.

8. OTHER SLEEP DISORDERS

Other organic disorders are frequently encountered in the differential diagnosis of sleep disorders, psychiatric/behavioral disorders frequently encountered in the differential diagnosis of sleep disorders.

## III. METHODS OF ASSESSMENT OF SLEEP

Current sleep assessment methods have been classified according to different criteria:

i) Medical Assistance:polysomnography, actigraphy etc
ii) Self-Assessment:sleep questionnaires, diaries etc

Medical Assistance

1. Polysomnograghy:

Polysomnography, also called a sleep study, is a test used to diagnose sleep disorders. Polysomnography monitors your sleep stages and cycles to identify if or when your sleep patterns are disrupted and why. The doctor recommends polysomnography if he suspects the patient has :

→ Sleep apnoea or another sleep-related breathing disorders
→ Periodic limb movement disorder
→ Narcolepsy
→ REM Sleep behavior disorder
→ Unusual behavior during sleep
→ Unexplained Chronic Insomnia

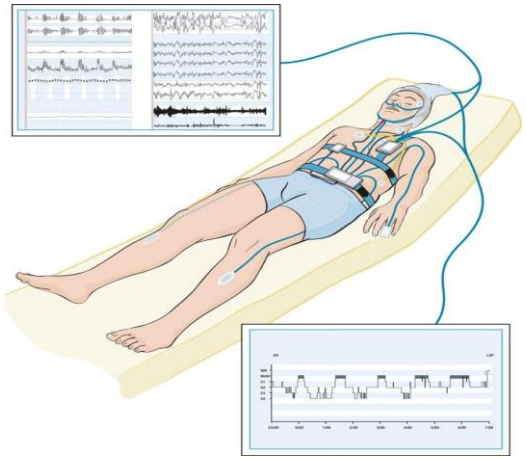

**Fig 4 :** Polysomnography

2. Multiple Sleep Latency Test:

The multiple sleep latency test (MSLT) tests for excessive daytime sleepiness by measuring how quickly you fall asleep in a quiet environment during the day. Also known as a daytime nap study, the MSLT is the standard tool used to diagnose narcolepsy and idiopathic Hypersomnia.The MSLT is a full-day test that consists of five scheduled naps separated by two-hour breaks. During each nap trial, patient will lie quietly in bed and try to go to sleep. Once the lights go off, the test will measure how long it takes for the patient to fall asleep. Patient will be awakened after sleeping 15 minutes. If the patient do not fall asleep within 20 minutes, the nap trial will end. Each nap will be taken in a dark and quiet sleep environment that is intended for patient's comfort and to isolate any external factors that may affect patient ability to fall asleep. A series of sensors will measure whether the patient is asleep. The sensors also determine patient sleep stage.

3. Maintenance of Wake fullness test:

The Maintenance of Wakefulness Test (MWT) is used to measure how alert you are during the day. It shows whether or not the patient is able to stay awake for a defined period of time. This is an indicator of how well the patient able to function and remain alert in quiet times of inactivity. The test is based on the idea that the patient ability to stay awake may be more important to know in some cases than how fast the patient fall asleep. This is the case when the MWT is used to see how well a sleep disorders patient is able to stay awake after. The MWT is used to see if someone with a sleep disorder is responding well to treatment. Results of multiple tests may be compared over a period of time. This can show if treatment is helping a patient overcome sleepiness. The MWT may be used to evaluate how well a person with a sleep disorder is able to stay awake. This is critical when the person's job involves public transportation or safety. The results of the test will be only one factor used to assess the potential risk of a work-related accident.

4. CPAP Titration Test:

A CPAP titration study is a type of in-lab sleep study used to calibrate continuous positive airway pressure (CPAP) therapy. CPAP is a common treatment used to manage sleep-related breathing disorders including obstructive sleep apnea, central sleep apnoea and hypo ventilation and hypoxaemia. Once the patient is diagnosed with one of these disorders, patient may need a CPAP study before beginning of treatment.In some cases, members of the sleep team may perform a CPAP titration study on the same night as an in-lab sleep study. This is known as a split-night sleep study. The CPAP titration occurs in the second half of the night. This is usually only offered if the sleep apnoea is severe and the diagnosis is clear.

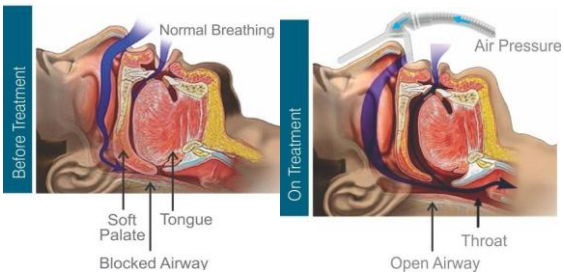


**Fig 5 :** CPAP Titration before and during treatment

Self - Assessment

1. Questionnaires

The questionnaire is a screening tool for physicians to assist their clinical evaluation of insomnias. It can be used to screen for a sleep disorder.

2. Sleep Diaries

A sleep diary is a record of a patient's sleep patterns and habits that can be extremely useful in helping doctors make a diagnosis of a sleep disorder and better determine if a sleep study should be prescribed. A sleep diary can serve the purpose of giving the patient a better of their sleep patterns and habits and can help maintain good sleep hygiene. This method also helps the patient monitor the effectiveness of his treatment.

3. Hardware Devices

i) Contact Devices: The sleep detection method which involves using wearables like wrist watches, head bands, ankle band and chest band.

Examples are: Fitbit ionic, Viatom O2, Misfit shine and many other.

**Fig 6 :** Viatom O2

ii) Non-Contact Devices: The sleep detection method which involves using devices like microphone, video

camera, echo based devices etc. Examples: SleepScoreMax, Sensors under the mattresses, beddit and many other.

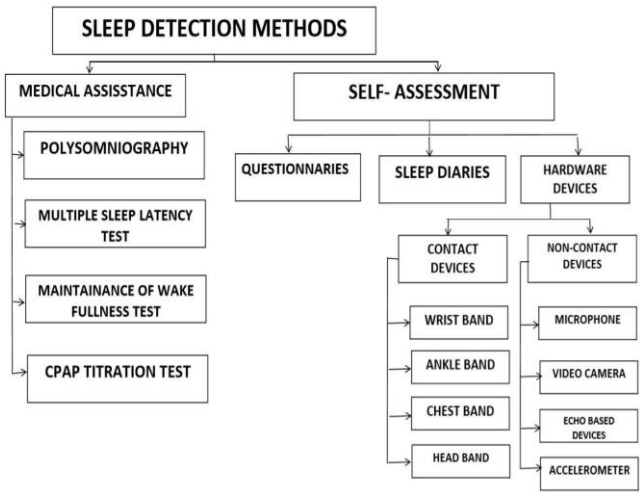


**Fig 7 :** Flowchart representation of sleep detection methods

## IV. CONCLUSION

Various sleep disorders are prevalent in our society due to a wide range of life style practices, genetic conditions or trauma. These conditions may be a primary or a secondary factor in accelerating or persisting the presence of other diseases. Several studies have been conducted and many new methods like polysomnography are being used to diagnose, treat sleep disorders. Many contact and non-contact devices have been developed to monitor and assess sleep patterns by the patient himself with the help of this.

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# Evolution of Virtual Training System for Endoscopic Surgery

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## ABSTRACT

Currently, the short of endoscopic surgeons has been identified as one of the medical issues in Japan. In order to increase the number of endoscopic surgeons, the training environments have been developed and widely used all over the world. However, neither the functions of correcting wrong operation nor instructing correct operation have been established in the existing training systems. Then, this study aims to develop a VR training system, where a trainee can experience the operation skill of an advising doctor. In this paper, the authors implemented the system validation with inexperienced doctors and skillful doctors. Virtual reality based surgical simulator systems are very elegant approach to enhancing traditional training in endoscopic surgery. This paper briefly introduces the VR training system we have developed and shows the experimental results.
**Keywords :** Component, Endoscopic Surgery, Virtual System, Surgical Simulator, Endoscopic Camera

## I. INTRODUCTION

Recently, endoscopic surgery has been recognized as one of the noninvasive surgeries in Japan. According to the development of surgical device and endoscopic camera, its target domain is expanding gradually; therefore the number of cases has been increasing.

Fig. 1 shows a scene of endoscopic surgery, where the surgeons operate the endoscopic forceps with viewing an intra-abdominal image via 2D monitor. The endoscopic camera and the forceps were inserted in the patient body through the trocars mounted on the patient body surface. Hence, the endoscopic forceps move symmetrically on the position of trocar.

In addition, the stereoscopic visual information of the surgical field disappears in the 2D monitor. These are the features of this operation procedure, and the doctors have been requested to experimentally overcome them before becoming an operating surgeon [7][8].

In the phase of training, it is important for doctors to cultivate the ability to consciously correlate the intra-abdominal image with the forceps operation necessary to complete the procedure. This study has called this ability as the feeling of forceps operation.

At present, a variety of training environments such as a simulator and an animal laboratory have been utilized all over the world [5][6]. Inexperienced doctors are using these training environments on the premise of learning appropriate knowledge and technique of endoscopic surgery by using some instructional text and the movies of operations. However, in order to cultivate the feeling of forceps operation, the authors considered that the functions instructing applicable operation and/or correcting erroneous operation should be mounted in the

training environment. By the way, it is difficult for us to transmit the operation skill by using languages to a trainee. In order to facilitate resolution of this issue, this study originally constructed the experimental devices that control the position of trainee's forceps.

In our previous studies, the training system enabled a trainee to repeatedly practice a linear motion of forceps by using the guidance function of the experimental device [1]. And, this study tried to quantitatively evaluate the operation skill of a trainee by the process of recovering from the deviation due to unexpected disturbance. Eventually, we could not find clearly the relationship between the coping ability for unexpected disturbance and the operation skill of a trainee [2]. According to our previous results, this study had to review our strategy to cultivate the feeling of forceps operation.

In this paper, this study aims to establish the function which enables a trainee to experience the feeling of forceps operation of an advising doctor. This study firstly constructed an advising data from the performance of an expert surgeon who performed transfixion suture for a mimic enteric canal sheet. This paper firstly describes a system structure and the method of utilization of our system. Finally, the experimental results with the surgeons will be shown.

Fig. 1 A scene of operation room in endoscopic surgery

## II. METHODS

### A. System Structure

Fig. 2 shows the training system we have developed in this study. This system is composed of a desktop computer, a dry box, and forceps control devices. An actual endoscopic forces can be mounted at the endo-effector of the forceps control device. The computer is running on Windows 7 (32bit-OS). The development environment is Visual Studio 2013. Both OpenGL and OpenCV are installed to draw virtual forceps on the movie of an advising data.

In this paper, transfixion suture is adopted as the target surgical procedure. Therefore, we mounted a needle-holder (Karl Storz Endoskope, K2617KAF) and a grasping forceps (Olympus, WA64160A, A60800A, A60210A) on left and right forceps control devices, respectively.

This study additionally mounted the linear potentiometers to measure the statement of opening and closing of the grippers as shown in Fig. 3 and Fig. 4. This information is important to inform the rotation angle of the forceps to a trainee. This study originally built the gear boxes and mounted them at the shaft of forceps in order to realize the angle control of the forceps. The DC servo motor with rotary encoder is set in the gear box, that realize the guide function dealing with the motion of rest. The authors considered that this function is helpful to transmit the feeling of forceps operation in training. The movements of forceps were tracked by the web camera mounted on the dry box. In the system, the image of box inside is shown on the monitor.

### B. Forceps' Control Device

Fig. 5 shows the forceps control device and its mechanism map. It has three degrees of freedoms and

the DC servo motor with rotary encoder is embedded in each joint. From Fig. 4(b), the forward kinematics can be derived as shown in the equations from (1) to (4). And, the inverse kinematics are written as the equations from (5) to (7).

$$l = d2\ \cos q2 + d3\ \sin q3 \quad (1)$$

$$x = l\ \cos q1 \quad (2)$$

$$y = l\ \sin q1 \quad (3)$$

$$z = d2\ \sin q2 + d3\ \cos q3 \quad (4)$$

$$q1 = \text{atan2}\ (y, x) \quad (5)$$

$$q2 = a\cos\left(\frac{1}{l^2+z^2} d^3 z\cos(q_2 + q_3) + \frac{l(l^2 + z^2 + d_2^2 - d_3^2)}{2d_2}\right) \quad (6)$$

$$q3 = a\sin\left(\frac{l - d_2\cos q_2}{d_3}\right)$$

The variables of q1, q2, and q3 are the rotation angles of each joint. The variable l is the length from the center of device to the end-effector. The length of each link d1, d2, and d3 are 210mm, 230mm, and 270mm, respectively.

### C. Utilization Procedure

This training system works with a supervised data. The advantage of this system is that any surgical procedure can be set as the supervised data. In order to make a supervised data, firstly an advising doctor needs to perform the forceps operation. While the doctor performs the forceps operation, the image of box inside and the motion of forceps are recorded as the supervised data, where the motion data of forceps can be derived from the forward kinematics shown in the equations from (1) to (4). In addition, the rotation angle of forceps is measured by the rotary encoder mounted in the gear box.

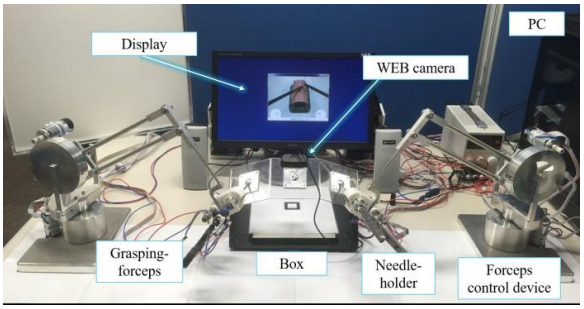



**Fig. 2** System structure for endoscopic surgery

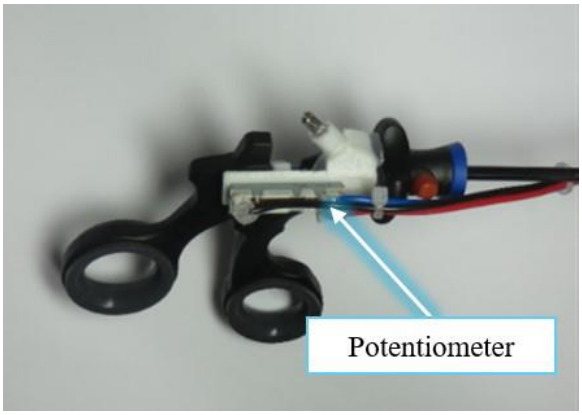



**Fig. 3** Potentiometer mounted on the hand gripper of holding forceps

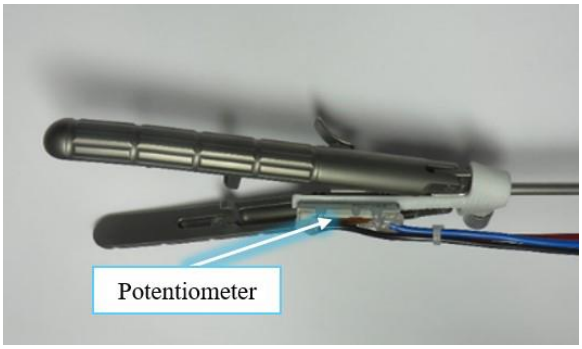
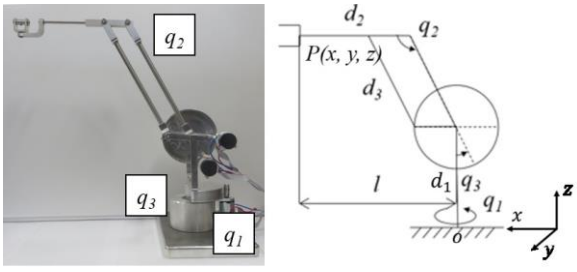



**Fig. 4** Potentiometer mounted on the hand gripper of needle-holder




(a) Overview (b) Mechanism map

**Fig. 5** Forceps control device

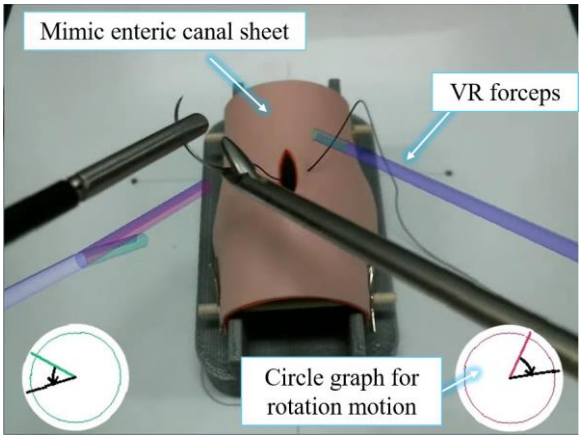



**Fig. 6** Monitor image of training system

The system provides three types of training contents as followings; (i) viewing the movie of the supervised data, (ii) tracing the forceps operation of the supervised data without using forceps guidance function, and (iii) tracing the forceps operation of the supervised data by using forceps guidance function. In the training (ii), the effectiveness can be expected as well as the related work [4], where the repeated practice of forceps operation with viewing the movie of a skilled surgeon's forceps operation has a good influence on the learning curve of a trainee. Fig. 6 shows an image that a trainee views in a training. The virtual forceps are drawn on the movie of supervised data, that indicates the position of trainee' forceps. Finally, in the training menu (iii), the forceps control devices guide the trainee's forceps to correctly trace the forceps motion of the supervised data.

## III. RESULTS

### A. Preparation of supervised data

The authors chosen transfixion suture as the target surgical procedure for the system validation. The coauthor surgeon who is a certifying doctor of endoscopic surgery performed transfixion suture to a mimic enteric canal sheet. Then, the time-series data of three dimensional coordinates of the tip of forceps and the image of box inside were recorded as the supervised data. The supervised data need to include the essence of forceps operation that an advising doctor likes to teach, such as the curve of thread, the length of short tail, and the angle of needle, etc. By the way, the inessential motion, such as retaking the needle and reforming the shape of thread, should not be included in the supervised data. Therefore, the certifying doctor did transfixion suture over five times. About thirty minutes was needed to complete the supervised data.

Table 1 Results of questionnaires

| A. Evaluation for Supervised Data | Score |
|---|---|
| 1. Transfixion suture is effective for training | 4.50(S.D. ±0.25, n=4) |
| 2. Skill level of supervised data is effective for training | 4.50(S.D. ±0.25, n=4) |
| B. Evaluation for Training System | |
| 1. Ease of forceps operation | 3.75(S.D. ±0.19 n=4) |
| 2. Ease of opening and closing | 3.75(S.D. ±0.19, n=4) |
| 3. Weight of gear box and forceps control device | 3.50(S.D. ±0.75, n=4) |
| 4. Definition of the image of supervised data | 3.75(S.D. ±0.19, n=4) |
| 5. Visual field of the image of supervised data | 3.50(S.D. ±0.75, n=4) |
| C. Evaluation for Display function | |
| 1. The forceps drawn by VR can be recognized as own forceps | 3.25(S.D. ±0.69, n=4) |
| 2. Circle graph is effective to learn the rotation motion | 3.50(S.D. ±1.25, n=4) |
| D. Evaluation for Guide Function | |
| 1. Guide function for translation is available | 4.50(S.D. ±0.25, n=4) |
| 2. Guide function for rotation is available | 4.25(S.D. ±0.19, n=4) |
| 3. Guide function is effective for training | 4.25(S.D. ±0.19, n=4) |

### B. Results of questionnaires

Before the experiment, this study explained the purpose and the contents of experiment to all test subjects. And this study gained the consent of participating to the experiment from all test subjects. Each test subject experienced three training menus and answered the questionnaires in respect to the specification and the function of the system.

Table 1 show the results of questionnaires, where the average score and standard deviation for each question were written. Each question was answered by five-grade evaluation.

The result of A-1 indicated transfixion suture is an adequate technique as the surgical procedure improving the operation skill of inexperienced doctors. Additionally, the result of A-2 confirmed that the supervised data of transfixion suture is effective for this experiment.

The results of B indicated that the forceps control devices and the gear boxes have little influence on the manipulation capability of the training system. And the visual information shown on the monitor was slightly wrong, because the specification of web camera was inferior than the endoscopic camera the test subjects commonly used in the operation room.
The results of C were significantly low. All test subjects were quite unused to virtual reality. Especially, virtual forceps were drawn on the image of supervised data, so they automatically recognize the forceps of supervised data as own forceps. And, the circle graph which showed the rotation angle of forceps was not helpful, since the test subjects already knew the importance of using rest in the procedure of transfixion suture. The authors considered that the circle graph would be effective in the training of inexperienced doctors.

The result of D indicated the guide function for not only translation but also rotation was highly appreciated. Especially, the guide function for rotational operation was effective because the rotary motion of right rest was necessary to correctly insert the needle to the sheet.

## IV. DISCUSSIONS

The test subjects were the surgeons grew up through viewing the operations performed by their advising doctors. They had interested on the following functions of the training system; a trainee can practice the forceps operation with the same view point of an advising doctor, the guide function corrects the overs and shorts of forceps operation in training. Actually, these were the issues in the instruction of forceps operation. The authors considered that this system would improve the efficiency of not only training but also instructing. Additionally, they highly evaluated that the system enables a trainee to experience the level difference from the advising doctor and to intuitively find the motion necessary to perform a surgical procedure.

In this paper, the experiment was done by using one advising data in respect to transfixion suture, so that the trainee's level the system works effectively could not be obvious. For future, this study will add the patterns of advising data and conduct the experiments on the different level of surgeons.

## V. CONCLUSIONS

This study aims to improve the training environment of endoscopic surgery in order to increase the number of the certifying doctor. The guide function of forceps operation is the advantage of the system, and it was highly evaluated by the surgeons. With the current advanced hardware and development in computer algorithms we can give our surgeons better tools to practice on . For future, this study likes to add the pattern of supervised data and the function which enables a trainee to adjust the strength of guide function according to his/her learning level. In addition, this study improves the system to make it possible to use a movie of actual surgery as a supervised data. The authors are expecting this function makes the system more practical.

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# Annual Fuel Demand Forecasting for International Aircraft by Fuzzy Logic

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## ABSTRACT

Forecasting is the prediction of future events and conditions and is a key element in service organizations,especially banks, for management decision-making. In preparing a projection of a company's future revenues and expenses, a sales forecast must first be prepared. Whereas expenses can be controlled by management on a day by day basis, sales occur only when outside parties make a proactive purchase decision. Management, by devising a successful marketing strategy, influences the buying decisions of its customers but cannot make the customers buy. Therefore, management must somehow predict or forecast how many units will be sold and at what price and during what time frames. Fuel is a major cost expense for air carriers. A typical airline spends 10% of its operating budget on the purchase of jet fuel, which even exceeds its expenditures on aircraft acquisitions. [1] Thus, it is imperative that fuel consumption be managed as wisely as possible. [8]This study explores the potential of the neurofuzzy computing paradigm to model the annual fuel demand forecasting for international aircraft in India. [8] The neurofuzzy computing technique is a combination of a fuzzy computing approach and an artificial neural network technique. Parameter optimization in the model was performed by a combination of back propagation and least squares error methods. [8] Performance of the neurofuzzy model was comprehensively evaluated with that of independent fuzzy and neural network models developed for the same basin. [11]Fuzzy based forecasted annual demand is further computed by time series analysis forecasting. Error and absolute deviations are predicted and tracking signal is evaluated for the same.

**Keywords :** Forecasting, Neurofuzzy, Annual Demand, Back Propagation, Time Series Analysis

## I. INTRODUCTION

Air carriers spend vast sums of money on fuel to operate their fleets of aircraft. This major cost area must be managed as wisely as possible. Extensive research is being conducted by a host of organizations, including government, industry, and academia, but the research is essentially confined to engineering related areas. Little exists in the literature on efforts to examine, on a routine basis, the fuel efficiency of operational air carrier aircraft to determine if improvements are possible. Estimation of aircraft fuel plays an important role in determining the impact of air traffic operations as well as in estimating the benefits of efficiency-enhancing procedures, and has been a topic of interest to the research community for several years. (1) Taxi-out fuel consumption is most often determined using the

fuel burn indices presented in the International Civil Aviation Organization (ICAO) engine emissions databank. The ICAO fuel burn indices provide fuel burn rates for only four engine power settings (corresponding to 7% or taxi/idle, 30% or approach, 85% or climb-out, and 100% or take-off), and are based on estimates provided by engine manufacturers. (3) Recently published studies(4), (5) have shown that the ICAO estimates can be quite different from the actual fuel burn, when considering the departure flight phase in the terminal area. The terminal area fuel burn considered in these studies includes the fuel consumed during taxi-out as well as the initial part of the climb. In contrast, in order to estimate the benefits of surface traffic management strategies, (6) it is necessary to have accurate estimates of annual demand for fuel. Since fuel is the important factor to be considered in the present era, the forecasting for fuel demand is necessary. On the other hand, an error for the demand has to be calculated, because many of the forecasting leads to failure. . To the best of our knowledge, this paper is the first attempt to develop models of forecasting the future annual demand.

## II. METHODS AND MATERIAL

### Fuzzy Logic

Economic growth is the most important index among the macroeconomic variables. This variable has been considered as an economical index of government, and its increasing rate shows the welfare condition of the society. Fuzzy logic provides a practicable way to understand and manually influence the mapping behave ours. In general, Fuzzy logic uses simple rules to describe the system of interest, rather than analytical equations, making it easy to implement. It is obvious that forecasting activities play an important role in our daily life. We usually forecast many things concerned with our daily life, such as the economy, stock market, population growth, weather, etc. forecasting with 100% accuracy may be impossible, but we can do our best to reduce forecasting errors. To solve forecasting problems, many researchers have proposed many different methods or models (Cheng, 2004). Fuzzy systems have supplanted conventional technologies in some scientific applications and engineering systems in the past decade (Cheng, 2004).Fuzzy logic has the ability to express the ambiguity of human thinking and translate expert knowledge into computable numerical data. A Fuzzy system consists of a set of Fuzzy if–then rules. Conventionally, the selection of Fuzzy if–then rules often relies on a substantial amount of heuristic observation to express the knowledge of proper strategies. Obviously, it is difficult for human experts to examine all the input–output data from a complex system to find proper rules for the Fuzzy system. To cope with this difficulty, several approaches to generating Fuzzy if–then rules from numerical data have been proposed (Cheng, 2004). An FIS (Fuzzy inference Systems) contains three main components, the; Fuzzification stage, the rule base and the defuzzification stage. The fuzzification stage issued to transform the so-called crisp values of the input variables into Fuzzy membership values. Then, these membership values are processed within the rule-base, using conditional „if-then" statements. The outputs of the rules are summed and defuzzified into a crisp analogue output value. The effects of variations in the parameters of a FIS can be readily understood and this facilitates calibration of the model. In Fuzzy-logic implemented system, six inputs and one output are used on the base on Principles or rules, of triangular with mathematical formulas. That real numbers of variables is converted to Fuzzy values. And then these Fuzzy values have been inserted to the basic process ("if-then" rules), and then are based on linguistic values levels: low, middle, high, very high and are graded by membership

functions.

**Neuro-Fuzzy-Fuzzy neural network**

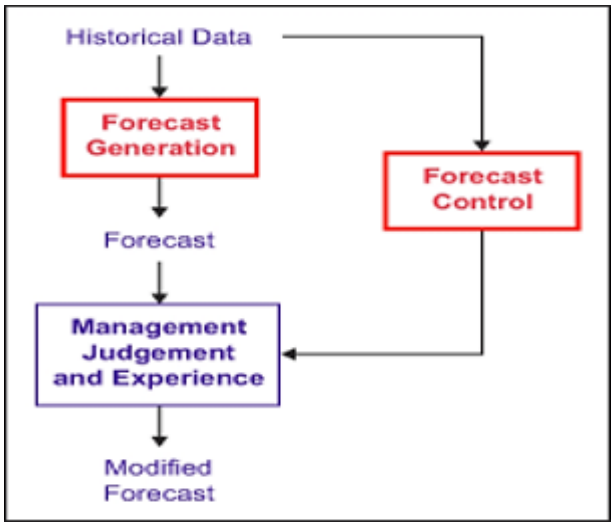
Artificial neural networks (ANN) appear to be particularly suitable to forecast the growth of time series, as they can learn highly nonlinear models, hold effective learning algorithms, handle noisy data, and use inputs of different kinds (Armano et al., 2005). ANNs have been designed to mimic the characteristics of the biological neurons in the human brain and nervous system (Zurada, 1992). An ANN creates a model of neurons and the connections between them, and trains it to associate output neurons with input neurons. The network learns by adjusting the interconnections (called weights) between layers. When the network is adequately trained, it is able to generate relevant output for a set of input data. One of the valuable properties of neural networks is that of generalization where by a trained neural network become able to provide a correct matching in the form of output data for a set of previously unseen input data.

Back Propagation (BP) is one of the most famous training algorithms for multilayer perceptions (Abraham and Baikunth, 2001; Kasabov, 1998). FNNs are a class of hybrid intelligent algorithms that integrate Fuzzy logic with ANNs.A Fuzzy neural network System is defined as a combination of ANN and Fuzzy inference system (FIS) in such a way that neural network learning algorithms are used to determine the parameters of FIS. [13]An even more important aspect is that the system should always be interpretable in terms of Fuzzy if-then rules, because it is based on the Fuzzy system reflecting vague knowledge (Sadeghi, 2008). A neural network - Fuzzy consists which of five levels, are as follow (Abrahim and Baikunth, 2001): 1) Input Layer, 2) Fuzzification Layer, 3) Rule Base Layer, 4) Fuzzy Outputs, 5) utput Layer. In designing neural networks – Fuzzy model, multi-layer feed forward neural network (MFNN) with learning algorithm, the propagation error and Fuzzy inference system "Sugeno" input function "difference between of Sigmoid functions" and the output function linear has been used in this system , on the other hand for to non-Fuzzy also moving average function has been used too. Through continuing changes number of layers and number of hidden neurons layer, and appropriate neural network topology, were evaluated.[13] Through continuous changes of membership functions, and number of membership functions, the suitable Fuzzy inference system was designed

**Forecasting Technique**

Forecasting product demand is crucial to any supplier, manufacturer, or retailer. Forecasts of future demand will determine the quantities that should be purchased, produced, and shipped [12].] Demand forecasts are necessary since the basic operations process, moving from the suppliers' raw materials to finished goods in the customers' hands, takes time. Most aircraft cannot simply wait for demand to emerge and then react to it. Instead, they must anticipate and plan for future demand so that they can react immediately to customer orders as they occur [21. In other words, most manufacturers "make to stock" rather than "make to order" – they plan ahead and then deploy inventories of finished goods into field locations. Thus, once a customer order materializes, it can be fulfilled immediately – since most customers are not willing to wait the time it would take to actually process their order throughout the supply chain and make the product based on their order. An order cycle could take weeks or months to go back through part suppliers and sub-assemblers, through manufacture of the product, and through to the eventual shipment of the order to the customer.

Aircraft that offer rapid delivery to their customers will tend to force all competitors in the market to keep finished goods inventories in order to provide fast order cycle times. As a result, virtually every organization involved needs to manufacture or at least order parts based on a forecast of future demand. The ability to accurately forecast demand also affords the firm opportunities to control costs through levelling its production quantities, rationalizing its transportation, and generally planning for efficient logistics operations. [21]In general practice, accurate demand forecasts lead to efficient operations and high levels of customer service, while inaccurate forecasts will inevitably lead to inefficient, high cost operations and/or poor levels of customer service. In many supply chains, the most important action we can take to improve the efficiency and effectiveness of the logistics process is to improve the quality of the demand forecasts. The schematic pictorial view is shown in fig.1.




**Data Collection:**

Data were been collected from International Civil Aviation Organization (ICAO). For one year with the period of 1 to 12 month of 2019 the demand for aircraft is shown in table.1.

**Table. 1.** Annual Fuel Demand

| Period | Month | Demand (Gallons) |
|---|---|---|
| 1 | Jan | 121772 |
| 2 | Feb | 996534 |
| 3 | Mar | 452202 |
| 4 | Apr | 250898 |
| 5 | May | 79323 |
| 6 | Jun | 85768 |
| 7 | Jul | 27850 |
| 8 | Aug | 490847 |
| 9 | Sep | 270853 |
| 10 | Oct | 450712 |
| 11 | Nov | 250700 |
| 12 | Dec | 210855 |

**Fuzzy Based Forecasting**

The basic concepts that comprise the neural network approach or fuzzy theory, such as weights, learning algorithm, fuzzy set, membership functions, the domain partitions, and fuzzy if-then inference rules are not reproduced in the body of this paper as that have been introduced in numerous hydrological papers and text books [Haykin, 1994; Hundecha et al., 2001; Xiong et al., 2001]. However, as the integration of both techniques is a relatively new concept, brief details of the method are presented in the following sections. [10] Neurofuzzy modelling refers to the way of applying various learning techniques developed in the neural network literature to fuzzy modelling or a fuzzy inference system (FIS). The basic structure of a FIS (Figure 1) consists of three conceptual components:[16] A rule base, which contains a selection of fuzzy rules; a database which defines the membership function (MF) used in the fuzzy rules; and a reasoning mechanism, which performs the inference procedure upon the rules and a given

condition to derive a reasonable output conclusion. [18]A FIS implements a nonlinear mapping from its input space to an output space. A FIS can utilize human expertise by storing its essential components in a rule base and database, and perform fuzzy reasoning to infer the overall output value. The derivation of if-then rules and corresponding membership functions depends heavily on the a priori knowledge about the system under consideration. [28]However there is no systematic way to transform experience of knowledge of human experts to the knowledge base of a FIS.[29] On the other hand, ANN learning mechanisms do not rely on human expertise. Because of the highly parallel structure of an ANN it is hard to extract structured knowledge from either the weights or the configuration of the ANN. The weights of the ANN represent the coefficients of the hyper plane that partition the input space into two regions with different output values. If one can visualize the hyper plane structure from the training data then the subsequent learning procedures in an ANN can be reduced. On the contrary, a priori knowledge is usually obtained from the human experts and it is most appropriate to express the knowledge as a set of fuzzy if then rules. The general schematic view of fuzzy logic is shown in fig.2.

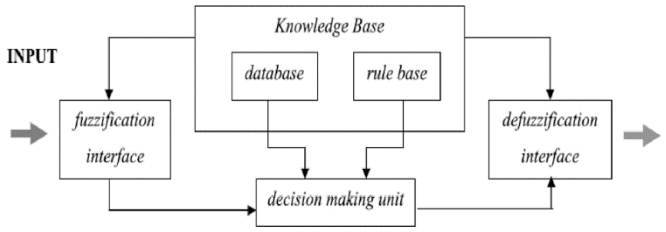
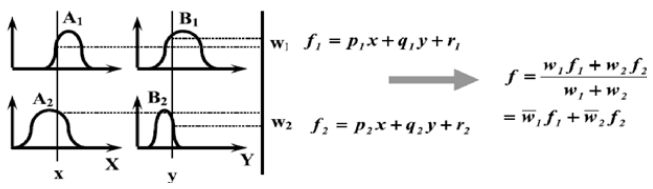
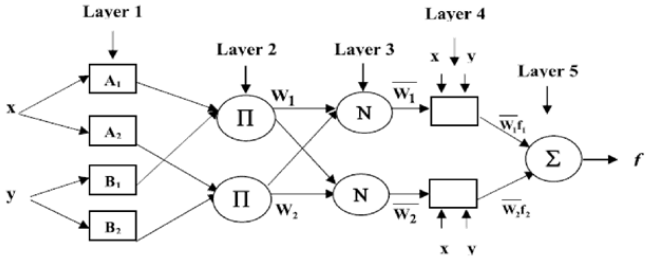



**Fig. 2.** *Schematic view of fuzzy logic*




(a)




(b)

***Fig. 3.*** Schematic of fuzzy and neurofuzzy paradigm: (a) Fuzzy inference system and (b) Equivalent neurofuzzy architecture

## III. RESULTS

The annual demand is forecasted using fuzzy logic. Back propagation algorithm is used to find the future demand and the calculated future demand is further analysed using time series analysis. Mean square error and Absolute deviation are also found. Eventually tracking signal is found and it shown in table.2.

**Estimation of tracking signal (Demand for the period of 2019)**

| Period | Month | Demand (Gallons) | Future Demand by Fuzzy(Gallons) | Tracking Signal |
|---|---|---|---|---|
| 1 | Jan | 121772 | 150443 | -1 |
| 2 | Feb | 996534 | 476678 | 1.8 |
| 3 | Mar | 452202 | 137202 | 5.5 |
| 4 | Apr | 250898 | 188279 | 5.3 |
| 5 | May | 79323 | 40827 | -5 |
| 6 | Jun | 85768 | 283282 | -4 |
| 7 | Jul | 27850 | 246790 | -12 |
| 8 | Aug | 490847 | 329631 | 10 |
| 9 | Sep | 270853 | 321014 | -8 |
| 10 | Oct | 450712 | 309126 | -6.4 |
| 11 | Nov | 250700 | 351854 | 1.05 |

## IV. CONCLUSION

The paper addresses the problem of forecasting the fuel demand for aircraft. The objective of the paper was twofold: one was to demonstrate the potential of the neurofuzzy computing forecasting in modelling the aircraft fuel process; and second was to evaluate the relative merits and demerits of this forecasting with reference to already popular time series analysis modelling approaches. The study suggests that the Neurofuzzy model is able to capture the linearity in the forecasting process better than the other forecasting technique, and is able to compare the forecasted method with time series analysis in advance. Avery close fit was obtained between computed and observed in time series analysis forecasting models, but only the Neurofuzzy model tends to preserve this performance at good forecasting with less error. A comparative analysis of prediction accuracy of these models in different ranges of annual demand indicates that the Neurofuzzy is better than the Time series Analysis. The very short computer time required for a single forecast (a fraction of a second when using a normal Pentium processor) does not lead to any constraints in the use of the method for real time annual demand forecasting. The results of the study are highly encouraging and suggest that an adaptive neurofuzzy approach is viable for developing short-term forecasts of annual fuel demands in aircrafts.

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# Optimization of The Ground Roll Distance of Boeing 747 Aircraft Using Fuzzy Logic Approach

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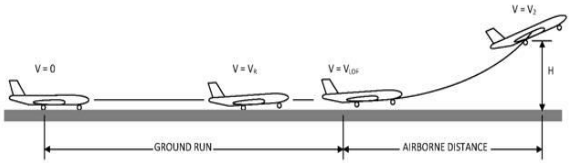
## ABSTRACT

A new take off method for Boeing 747-400 passenger aircraft is hereby suggested in this paper which is based on a mathematical model using optimization technique. In this paper, the ground roll distance is minimized using linear programming model, and validated by using fuzzy decisive set method [10] with the concept that as the consumption of fuel increases on account of increased thrust could be saved by reduction of distance [1]. It is also show that the total travel time of Boeing 747-400 passenger aircraft may be reduced. To improve the accommodation of air transportation frameworks, Short Take-Off and Landing (STOL) is an advantageous trademark for any size of the plane [9]. Applying fueled high-lift frameworks is a powerful strategy for accomplishing this objective. Notwithstanding, such frameworks normally require plane wings to be furnished with uncommonly planned streamlined fueled gadgets to accomplish the adequate lift [4]. Thus new method has been proposed to decrease ground-run distance using optimization technique.

**Keywords :** Ground Roll Distance, Optimization Technique, Linear Programming, and Fuzzy Decisive Set Method.

## I. INTRODUCTION

During ancient period transportation was by walk [4]. Later evolved the transportation modes like cycles, motors, bikes, bus, tram, and trains. Theses modes had very limited speed which led to invention of aircraft. Aircraft [9]; in the present scenario is the fastest mode of transport available for passenger and cargo transportation for the people to commute various places. This however requires a certain runway length for it to gain optimal velocity and lift. Here we optimize (minimize) the ground roll distance and ensure that air service be available to people of different topographic locations [1]. As well as it will be minimize the consumption of the fuel of the aircraft.




## OPTIMIZATION TECHNIQUE

Operation research is the study of have to form mathematical models of complex engineering and management problems and have to analyze them to gain insight about possible solutions. The

optimization problem comprises of expanding or limiting a genuine capacity by deliberately picking information esteems from inside a permitted set and processing the estimation of the capacity. The speculation of enhancement hypothesis and systems to different details includes an enormous territory of applied arithmetic. All the more, by and large, improvement incorporates discovering "best accessible" estimations of some target work given a characterized area, including a wide range of sorts of target capacities and various kinds of spaces. It deals with decision problems that concerned three fundamental issues they are decisions variables, constraints, objectives. Decision Variables: It is open to decision makers. The values of the variables are not known when you start the problem. The factors, as a rule, speak to things that you can alter or control, for instance, the rate at which to produce things. The goal is to find values of the variables that provide the best value of the Objective function. Constraints: It is limiting decision choices. Scientific articulations that consolidate the factors as far as possible on the potential arrangements.

## FACTORS INVOLVED IN THE GROUD ROLL DISTANCE

- LIFTOFF VELOCITY
- STALL VELOCITY
- LIFT COEFFIENT
- THRUST TO WEIGHT RATIO

### Data collection

| | |
|---|---|
| Stall velocity | 223km/h |
| Take off velocity | 268km/h |
| Thrust to weight ratio | 0.26 |
| Coefficient of lift | 2.6 |

Objective function

Minimize,

$Z=3x_1+3.29x_2+0.41x_3+4.17x_4$

Subjected to,

$X_1>=223$

$X_2>=268$

$X_3>=2.6$

$X_4>=0.26$

$X_1, x_2, x_3, x_4,>0$

The above objective function is obtained using the equation shown below.

$$S_g = \frac{1.21(\frac{W}{S})}{g\rho(Cl)\max\left[\frac{T}{W}-\frac{D}{W}-\mu\left(1-\frac{L}{W}\right)\right]} + 1.1N\sqrt{\frac{2}{\rho}\frac{W}{S}\frac{1}{CL}}$$

## SUMMARY OF OUT PUT

## SOLUTION BY USING SIMPLEX METHOD

Optimal solution found

Minimum Z = 2213.56m

| Variable | Value |
|---|---|
| X1 | 320.61 |
| X2 | 385.31 |
| X3 | 2.7 |
| X4 | 0.41 |

## FINDING

From the above observation it is inferred that the ground roll distance of Boeing 747-400 reduced to 2213.56m from 2990m.

## FUZZY DECISIVE SET METHOD

### Algorithm

**Step one.** Set $\lambda = 1$ whether a feasible set satisfying the constraints of the Problem exists or not using phase one of the simplex method. If a feasible set exists, set $\lambda = 1$; Otherwise, set $\lambda^L = 0$ and $\lambda^R = 1$ and go to the next step.

**Step two.** For the value of $\lambda = (\lambda^L + \lambda^R) / 2$; update the value of $\lambda^L$ and $\lambda^R$ using the Bisection method as follows:

Equivalent non-linear programming problem:

Min $\lambda$ Objective function,

$$\frac{3x1 + 3.29x2 + 0.41x3 + 4.17x4}{2213.56} \geq \lambda$$

Sub to,

$$\frac{223 - x1}{3x1 + 3.29x2 + 0.41x3 + 4.17x4} \geq \lambda$$

$$\frac{268 - x2}{3x1 + 3.29x2 + 0.41x3 + 4.17x4} \geq \lambda$$

$$\frac{2.6 - x3}{3x1 + 3.29x2 + 0.41x3 + 4.17x4} => \lambda$$

$$\frac{0.26 - x4}{3x1 + 3.29x2 + 0.41x3 + 4.17x4} => \lambda$$

$$0 <= \lambda <= 1$$

x1, x2, x3, x4,>=0

That is, Min $\lambda$ Objective function,

$3x1 + 3.29x2 + 0.41x3 + 4.17x4 >= \lambda\ (2213.56)$

Sub to,

$(1+3\lambda)\ x1 + \lambda(3.29x2 + 0.41x3 + 4.17x4) >= 223$

$(1+3.29\lambda)\ x2 + \lambda(3x1 + 0.41x3 + 4.17x4) >= 268$

$(1+0.41\lambda)\ x3 + \lambda(3x1 + 3.29x2 + 4.17x4) >= 2.6$

$(1+4.17\lambda)\ x4 + (3x1 + 3.29x2 + 0.41x3) >= 0.26$

Let's solve the problem by using the fuzzy decisive set method.

For $\lambda = 1$, the problem can be written as,

Min$\lambda$, Objective function,

$Z = 3.76x1 + 3.13x2 + 0.0039x3 + 15.05x4$

Sub to,

$4\ x1 + 3.29x2 + 0.41x3 + 4.17x4 >= 223$

$4.29x2 + 3x1 + 0.41x3 + 4.17x4 >= 268$

$1.41\ x3 + 3x1 + 3.29x2 + 4.17x4 >= 2.6$

$5.17\ x4 + 3x1 + 3.29x2 + 0.41x3 >= 0.26$

x1, x2, x3, x4,>=0

And since the feasible set is empty, by taking $\lambda^L = 0$ and $\lambda^R = 1$; the new value of $\lambda = (0+1)/2 = 1/2$ is tried.

Objective function,

$Z = 3x_1 + 3.29x_2 + 0.41x_3 + 4.17x_4$

Sub to,

$2.5x_1 + 1.64x_2 + 0.20x_3 + 2.08x_4 >= 223$

$1.5x_1 + 2.64x_2 + 0.20x_3 + 2.08x_4 >= 268$

$1.5x_1 + 2.64x_2 + 1.20x_3 + 2.08x_4 >= 2.6$

$1.5x_1 + 1.64x_2 + 0.20x_3 + 3.08x_4 >= 0.26$

$x_1, x_2, x_3, x_4, >= 0$

And since the feasible set is empty, by taking $\lambda^L = 0$ and $\lambda^R = 1$; the new value of $\lambda = (0+1)/2 = 1/2$ is tried.

If the feasible set is empty, the $\lambda^L$ value is same and $\lambda^R$ value changes, since the feasible set is non empty $\lambda^L$ changes, and $\lambda^R$ is same. The following values of $\lambda$ are obtained in the next iterations

$\lambda = 0.125$

$\lambda = 0.0625$

$\lambda = 0.3125$

$\lambda$ =0.01562

$\lambda$ =0.0078125

$\lambda$ =0.00390625

$\lambda$ =0.001953125

$\lambda$ =0.0009765625

$\lambda$ =0.000488281

$\lambda$ =0.0002441406

$\lambda$ =0.0001220703

$\lambda$ =0.0000610351

$\lambda*$=0.0000305175

Consequently, we obtain the optimal value of $\lambda$ at the 15th iteration by using the set method.

## II. COMPARISON

| **Comparison between simplex and Fuzzy decisive methods** | | | |
|---|---|---|---|
| **Simplex method** | | **Fuzzy decisive set method** | |
| **Variable** | **Value** | **Variable** | **value** |
| Stall velocity | 320.61km/h | Stall velocity | 320.68km/h |
| Lift off velocity | 385.31km/h | Lift off velocity | 385.40km/h |
| Coefficient of lift | 2.73 | Coefficient of lift | 2.74 |
| Thrust to weight ratio | 0.41 | Thrust to weight ratio | 0.37 |
| Ground roll distance= **2213.56m** | | Ground roll distance=**2212.32m** | |

## III. CONCLUSION

The actual ground roll distance is 2990m. From the obtain results we could conclude that we can minimize the ground roll distance to 2232.33m (approximately). Thus from this paper it can be concluded that .The fuel consumption can be reduced, because during the takeoff aircraft needs more Amount of thrust. Accidents can be prevented at the time of takeoff. The total travel time of the aircraft form source to destination can also be reduced.

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# Flow Prediction in Scramjet Engine Inlet

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## ABSTRACT

The primary purpose of an inlet for any air-breathing propulsive system is to capture and compress air for processing by the remaining portions of the engine. In a conventional jet engine, the inlet works in combination with a mechanical compressor to provide the proper compression for the entire driving force. For vehicles flying at supersonic ($1.5 < M < 5$) or hypersonic ($M > 5$) speeds, suitable compression can be attained by the inlet without a mechanical compressor. Because the inlet channel provides the airflow and compression ratios of the scramjet engine, an efficiently designed inlet is critical for the successful operation of the engine. Scramjet inlets are a key component in its function, and their design has stantial in several aspects. A computational study for scramjet inlet with different ramp angles and ramp lengths are analyzed to compress the air by sharp leading edge, fixing the whole cowl up or down. However, the performance of the inlet tends to degrade as Mach number range increases an air intake consisting of different ramps producing oblique shocks followed by a cowl shock. An imposing shock may force the boundary layer to separate from the wall,resulting in total pressure regaining losses and a reduction of the inlet efiiciency. Design an inlety to meet the necessities such as Low stagnation pressure loss, High static pressure and temperature increases and deceleration of flow to the desired value of mach number. A two-dimensional analysis was carried out in this project. ANSYS is used to create the Geometry. ICEM is used to create the mesh & FLUENT is used for analyzing the flow.

**Keywords :** Scramjet Inlet, Ramp angle, Ramp length, Cowl, Oblique shock, ANSYS

## I. INTRODUCTION

Scramjet Flight demands sustained combustion for producing necessary thrust to counter the enormous drag that prevails in hypersonic flight. The design of hypersonic inlet for scramjet engine is pivotal to ensure stable combustion. As the hypersonic flight exceeds Mach 5, the residence time of the air inside the combustion chamber drops to a very low value which engenders the difficulty of burning. Also, very low static pressure prevails at cruise altitude >20km which compounds to this difficulty. The inlet serves to counter this problem by slowing down the head stream and increasing the pressure to provide favorable flow conditions for combustion. The current project involves comparison of performance.

Parameters for scramjet inlet which estimated as a result of FEM Computation of 2-D turbulent flow field for three ramp scramjet inlet geometry with no cowl lip deflection angle.

The boundary and initial conditions are select to the free stream conditions that pertain to a cruise altitude

of 30km. The simulations achieved for four free stream Mach number 5, 6, 7 & 8. Thus from the obtained result, comparative studies of performance parameters are carried out by parameterizing geometrical variables and free stream Mach number. It is necessary to simulate the inlet design to obtain the appropriate inlet channel performance. Computational Fluid Dynamics (CFD) is used to analyze flight simulations in both steady and unsteady flow. A time-averaged, viscous, 2 Dimensional, CFD scheme used to compute aero-thermodynamic quantities including boundary layer effects. A variety of turbulent models available ranging from one to four equations transport models. Oblique shock waves, expansion waves and shock wave interactions measured. Accuracy of the solution is dependent on many parameters like size of the control volume, orientation of boundaries, discretization and its order of accuracy.

## Scramjet inlet

Hypersonic air-breathing vehicles, the inlet channel is responsible for delivering much of the compression essential for combustion, and, as a result, vehicle function can be very complex to the inlet channel geometry. Variable geometry inlets have often been proposed or tested as a way to improve the performance of a vehicle that must achieve over a wide range of Mach numbers. For if the inlet designed for a single condition, the performance may be poor at all other requirements. At the same time, creating the inlet channel for a wider range of Mach numbers tends to decrease the performance at each condition. With a variable-geometry inlet, the configuration changes with Mach number so that the performance does not fall off as considerably. Constructing a variable-geometry hypersonic inlet presents numerous technical challenges. This paper does not address these physical aspects of the problem, but it aims to measure the potential benefit of allowing simple changes to the inlet geometry (changes ramp length, ramp (slope) angle).

The design of the critical inlet channel component alters the overall performance of the engine the principal purpose of the air inlet is to compress the supersonic flow into the subsonic flow and too rambling the condition such that proper combustion takes place. Also to provide the required amount of air to the engine to make sure a steady flow and to retain the total pressure loss minimum. In hypersonic case, inlets often called as Inlet diffusers. Here the compression is achieved by shocks both external and internal to the engine, and the angle of the outer cowl about the free stream can be made to minimize external drag. These inlets are classically longer than external compression alignments, but also spill flow when operated below the design Mach number. Dependent on the amount of internal compression, however, mixed compression inlets may need variable geometry to start.

## Shock Wave

A shock is a discontinuity in a supersonic flow fluid. Fluid crossing a stationery shock front rises suddenly and irreversibly in pressure and decreases in velocity. It also deviates its direction and except when passing through a shock that is perpendicular to approaching flow direction.

## Normal Shock

The shock wave is normal to the flow direction. If the shock wave is perpendicular to the flow direction called normal shock wave. After the normal shock wave, the flow will be subsonic whether the upstream of the flow is supersonic.

## Oblique Shock

An oblique shock wave is inclined to the incident upstream flow direction. It will occur when a supersonic flow encounters a corner that effectively turns the flow into itself and compresses. The upstream streamlines uniformly deflected after the shock wave. The most common way to produce oblique an oblique shock wave is to place a wedge into the supersonic compressible flow. Similar to the normal shock wave, the oblique shock wave contains a slight region across which nearly discontinuous changes in the flow properties of a gas occur. While the upstream and downstream flow.

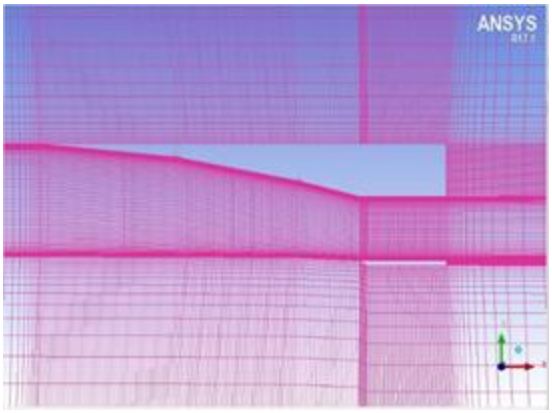
Direction is unchanged across normal shock, they are difficult for flow across an oblique shock wave. The given Mach number M1 and corner angle θ, oblique shock angle β, downstream Mach number M2 can be calculated. M2 is always less than M1. Unlike after normal shock M2 can still be supersonic or subsonic. Weak solutions often observed in flow geometric open to atmosphere. The Strong solution may found in the confined geometric. A Strong solution is required when the flow essential to match the downstream high-pressure condition. Discontinuous changes also occur in pressure, density, and temperature which all rise download of the oblique shock waves.

## Modelling of scramjet inlet in ansys

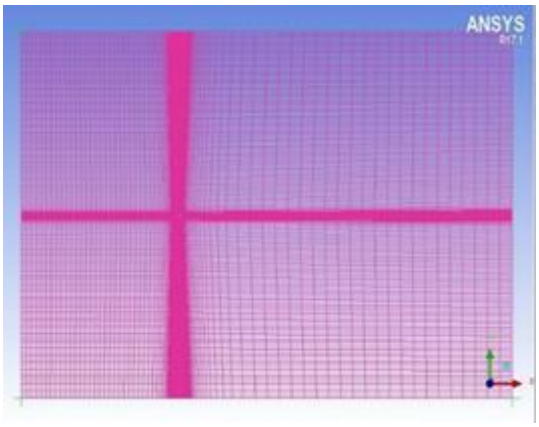
Geometry creation made by ANSYS with necessary commands from the geometry creation tool pad. The geometry creation tool pad contains a specification of scramjet inlet with leading edge, ramps, ramp angle, and length, without cowl deflection and Throat area (CR) to design a three ramp model of scramjet inlet with different Mach numbers.

## Create of inlet geometry

Geometry application




Grid generation

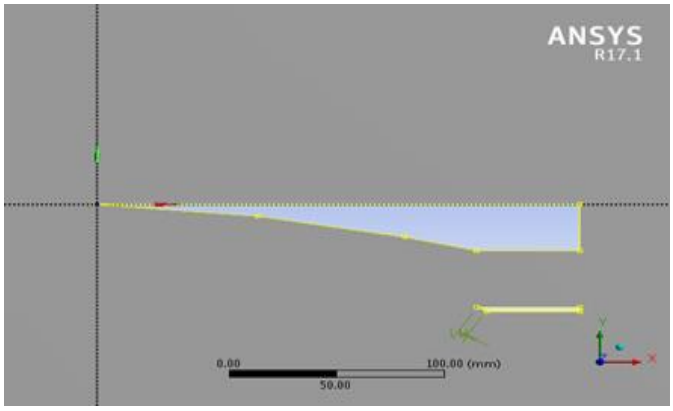



Meshing creation in ICEM done with the help of necessary commands from the meshing creation tool. The meshing creation tool contains control buttons that allow carrying out operations includes creating edge & face meshing.

Meshing creation in ICEM done with the help of necessary commands from the meshing creation tool. The meshing creation tool contains control buttons that allow carrying out operations includes creating edge & face meshing with necessary boundary conditions. For the numerical analyzing, inlet channel geometry parameters such as inlet ramps angles, length, the number of ramps, and contraction ratio are varied.

## ICEM Meshing

3 Ramp meshing Geometry model




Computational Domain

The 2D modeling scheme adopted in ICEM. The structured grids were generated using ANSYS Meshing tool.

- Meshing can be done in forms namely edge meshing, face meshing.
- Meshed edge & faces can be copied, moved, linked or disconnected from one another.
- Structured grid cells used for the entire domain. Cells are gathered in the region.
- Grading schemes include successive ratio. The interval count identified for the starting mesh based on the model. In face or 2D meshing, the resulting parameters were stated. Meshing patterns mesh node spacing and face meshing options.

| Leading edge | Sharp |
|---|---|
| No.of ramps | Three |
| Ramp angles | 5.5˚,10.8˚,14.1˚ |
| Ramps length (mm) | 75,69,35 |
| Cowl angle | 0˚ |
| Throat area (mm) | 35 |

The grid independence test was done which involves transforming the generated physical model into mesh with Number of node points depending on the refinement of the mesh. The various flow properties were assessed at these node points. The extent of accuracy of result depended on largely on the fact that how fine the real domain meshed. After a particular sanitizing limit, the results changes no more. At this point, it is said that grid independence was achieved. The result attained for this mesh is considered to be the best. This mesh formation is made with ICEM.

Boundary conditions

For two-dimensional computations over the model, structured grid consists of quadrilateral cells is made. The overall quadrangular domain formed of numerous iterations is selected for all models. Inlet departure was the part of the outlet boundary face whereas the design base located on the boundary which is reassigned as wall edge. The grid generation scheme is quad/tri type cells of volume meshing. Grid with approximately 3500 to 5000 cells generated for inlet model. The initialize boundary condition for three ramp scramjet inlet model after the meshing can be done.

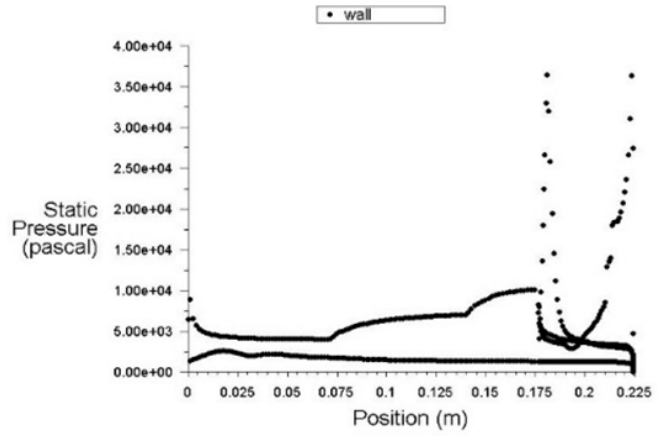
| Inlet | Velocity inlet |
|---|---|
| Outlet | Pressure outlet |
| Upper boundary | Wall |
| Lower boundary | Wall |
| Fore body | Wall |
| cowl | Wall |
| Fluid | Air |
| Surface | Interior |

## II. RESULTS AND ANALYSIS

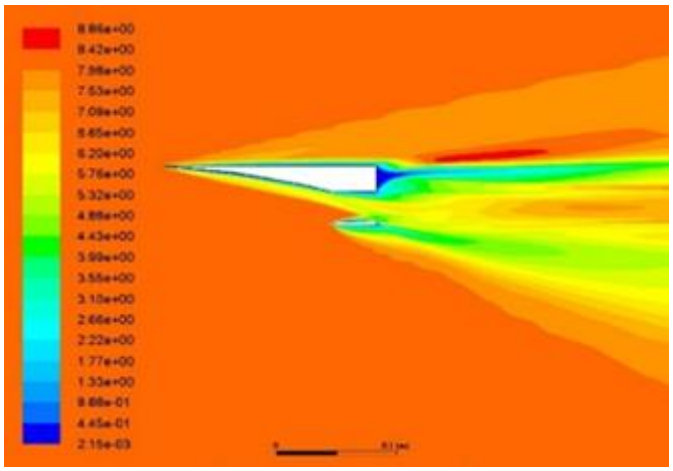
Two-dimensional simulations of the flow field using FLUENT to perform. Computations validated through a Simulation of the hypersonic inlet at desired Mach number. Boundary conditions and properties of the model defined as a reference to the literature

Analysis of scramjet inlet in fluent

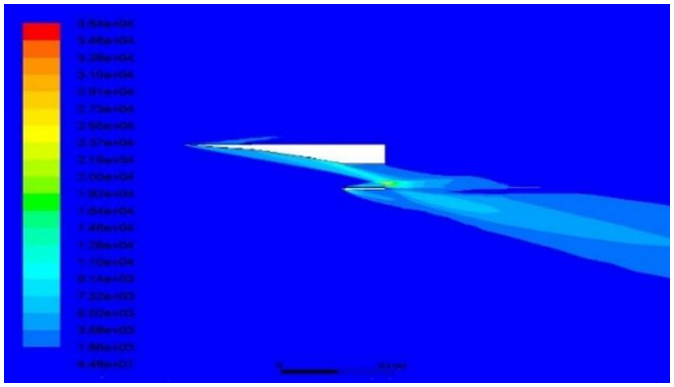
**For Mach 8**



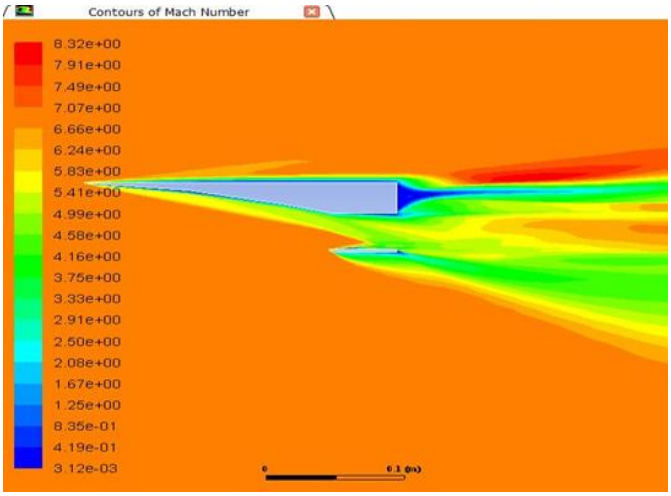

**Mach contour**

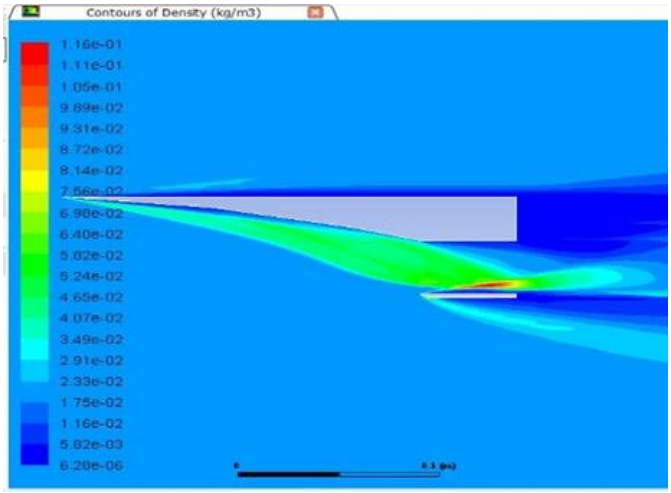


**Pressure contour**

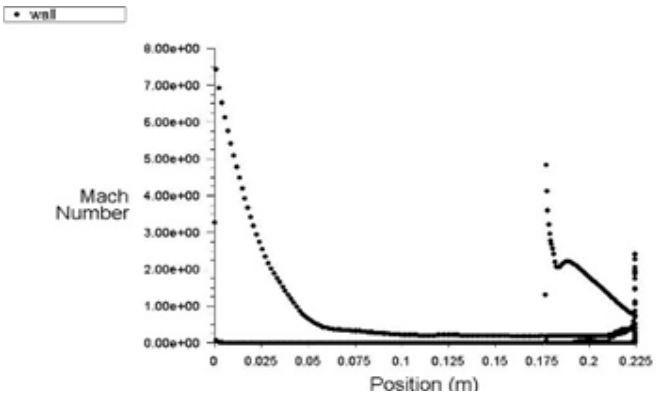


**Density contour**

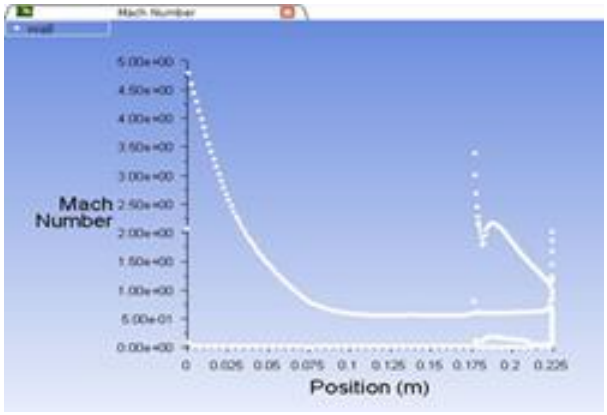


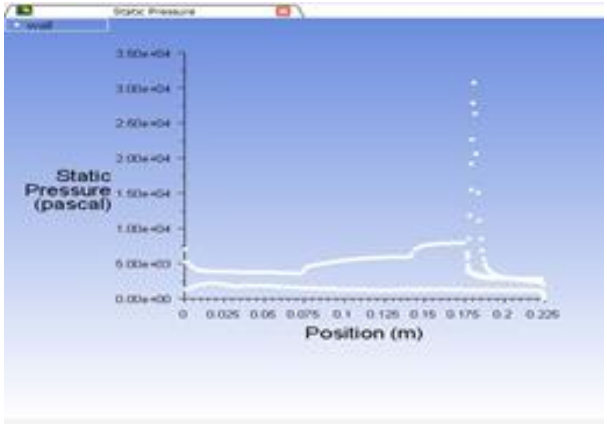

**For Mach 7**



Mach contour

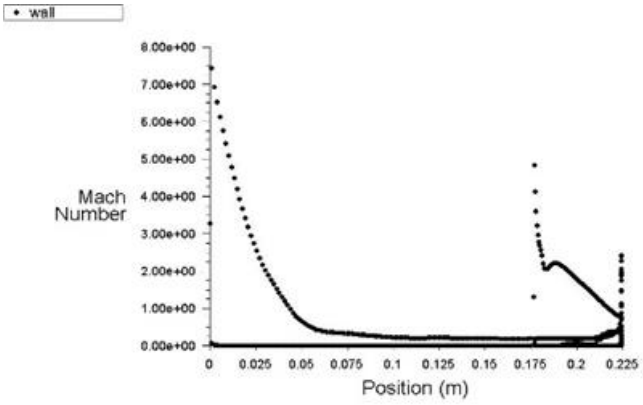



Density contour

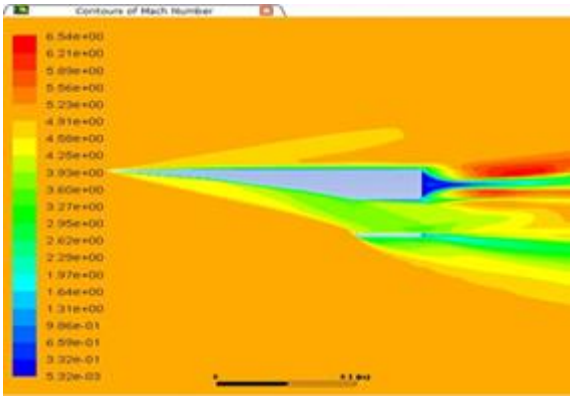


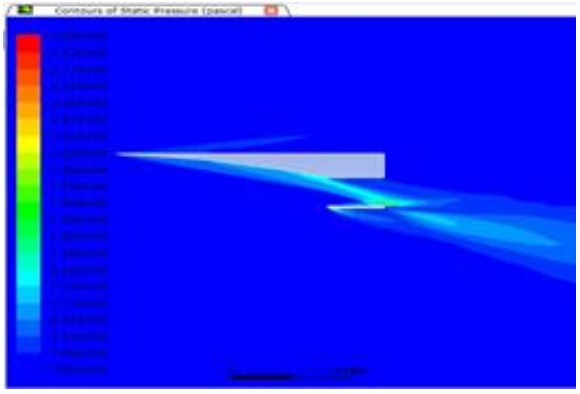

| | |
|---|---|
| Gauge Pressure | 1185 pa |
| Mach number | 7 |
| Reference temperature | 226.5 k |
| Turbulent Viscosity | 0.01 |
| Turbulent Ratio | 10 |
| Altitude | 30 km |

For Mach 6

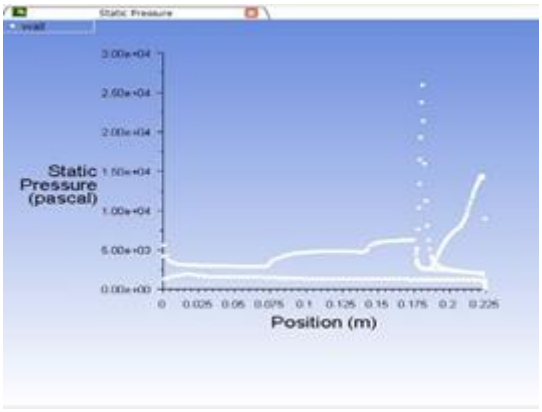



Density contour

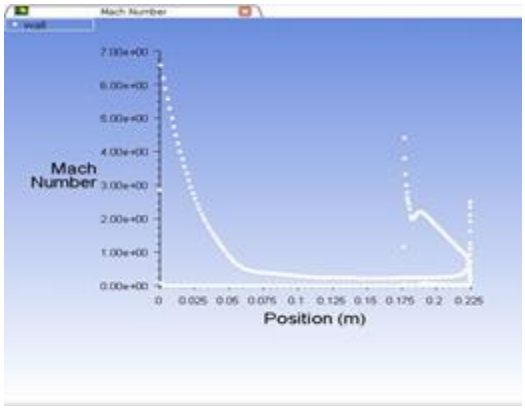




Mach contour

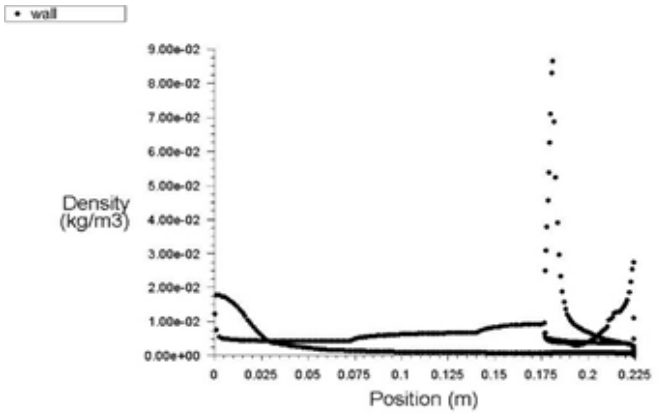


Pressure contour

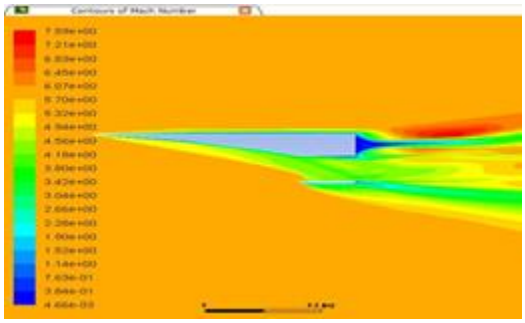


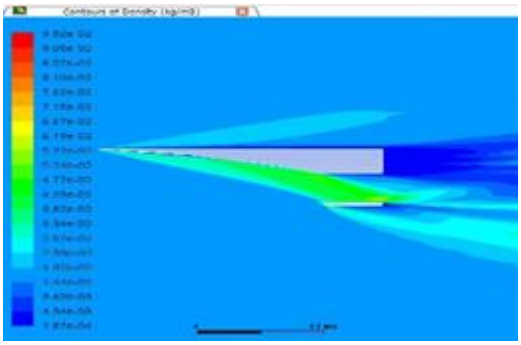

| | |
|---|---|
| Gauge Pressure | 1185 pa |
| Mach number | 7 |
| Reference temperature | 226.5 k |
| Turbulent Viscosity | 0.01 |
| Turbulent Ratio | 10 |
| Altitude | 30 km |

**For mach5**

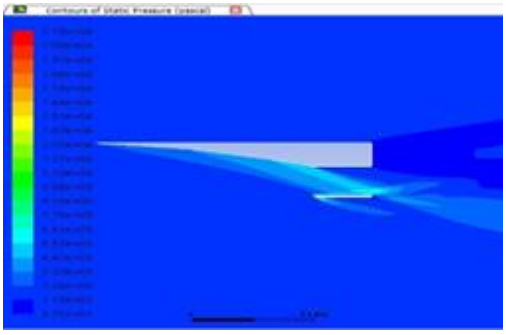



Density counter





Pressure counter



## III. RESULTS AND DISCUSSION

The simulation contours obey the flow pattern which analyzed here as plots to compare the performance of the model with respect Mach numbers. Here, is to compare the standard parameters such as Pressure, density, and Mach numbers. The primary objective of this research work is to predict the different Mach flow pattern in 3 ramp inlet model with ramp length and ramp angle.

The comparison of different Mach number in 3 ramp inlet model is given below

| Initial Mach no | Wedge angle | Shock angle | Mach no |
|---|---|---|---|
| 5 | 5.5 | 15.47 | 4.443 |
| | 10.8 | 21.557 | 3.543 |
| | 14.1 | 28.08 | 2.68 |

| Initial Mach no | Wedge angle | Shock angle | Mach no |
|---|---|---|---|
| 6 | 5.5 | 13.3566 | 5.24 |
| | 10.8 | 19.6333 | 4.07 |
| | 14.1 | 25.44 | 3.03 |

| Initial Mach no | Wedge angle | Shock angle | Mach no |
|---|---|---|---|
| 7 | 5.5 | 12.24 | 6.0188 |
| | 10.8 | 18.333 | 4.55 |
| | 14.1 | 24.44 | 3.33 |

## IV. CONCLUSION

The evaluation of performance parameters from the numerical simulation predicts that inlet geometry designed with isentropic compression ramp in lower hypersonic limits by providing favorable conditions for combustion as indicated by standard performance parameters. The specific goal is that the efficiency of the scramjet engine can be improved by decreasing the starting Mach number lowered to 3.50. Here the simulation Contours obeys the flow patterns analyzed contours are used to compare the performance of the model with respect to Mach numbers (M=8, 7, 6, 5) and also the standard parameters pressure, density and Mach number for 3 ramp model is also obtained. The purpose ofthis project was to predict the flow pattern for given free stream Mach numbers (M=8, 7, 6, 5) and its give better result for given condition like gauge Pressure, Temperature, Turbulent viscosity and Altitude. Thus the vital performance parameters obtained from FEM numerical simulation are compared and analyzed by parameterizing inlet ramp, Mach number and cowl deflection at low hypersonic limits.

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Journal URL : http://ijsrst.com/EBHAE020

3rd National Conference on Enhancement in Biomedical Engineering and Healthcare
Organised by Department of Biomedical Engineering,
Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India


# Computational Analysis of Neuro Muscular Rehabilitation Using Labview

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## ABSTRACT

Physical disabilities which caused by impairment due to muscle spasticity, osteoporosis, muscle atrophy affects the person's quality of life. As a result, physical rehabilitations are essential to be performed for the restoration of lost functions as a core treatment for such disabilities. On the other hand, the physical rehabilitations are too labour intensive due to the nature of one-to-one attention in healthcare sectors. To overcome the above mentioned problems, this paper presents the development of analysis of intelligent upper limb rehabilitation system to close the gap in shortage of therapists. The system is designed especially for user motivation to perform the exercise longer and be used with minimum therapist supervision at home. The physical rehabilitation aims to work out the increase in upper limb range of motion, and strengthen the associate muscles. The user's sEMG signals will be attained and the system detects the defined sEMG threshold level to display and analyse the active muscle's EMG signal in real time during performing exercises. These signals are extracted as live data and imported to LabVIEW platform. These live data were used as an input for real-time muscle activation module. Analysis and display of real-time muscle activation is performed in LabVIEW. The effectiveness of the proposed system is being evaluated by performing usability test. Since the system is user friendly the participants can interact with the rehabilitation exercises easily.

**Keywords :** sEMG , upper limb rehabilitation, analysis in LabVIEW.

## I. INTRODUCTION

Rehabilitation is the re-integration of an individual with disability into society by enhancing existing capabilities or by providing alternative or substitute. The principle of rehabilitation is to assist individuals with disabilities and aid the recovery of physical functions lost because of disease or injury. Rehabilitation engineering is the use of systematic application of engineering technological solutions to assist the individuals confronted with disabilities. Functional areas addressed through rehabilitation engineering may possibly comprise mobility, communications, hearing, vision and cognition activities related with employment living, education, and integration into the independent community. The goal of the rehabilitation engineering regarding clinical practice and education is to focus on the applications for different impairments and disabilities.

Electromyography (EMG) is a technique that deals with the detection, analysis and measurement of electrical signals obtained from the skeletal muscles.

The field of electromyography is studied in Biomedical Engineering and prosthesis that use electromyography comes under Biomechatronics. During the exchange of ions across the muscle membranes, an electric impulse is produced during the muscular activity. The surface electrodes which are used to acquire this signal is known as myoelectric signal. The instrument used to obtain the EMG signal is known as electromyograph and the resultant recorded form is called electromyogram. The movement of the human body is possible by coordination of muscles with the brain. Whenever the muscles get excited through the Central Nervous System (CNS), they are innervated in groups called 'Motor units'.

Electromyography is getting used as an assessment tool in applied research, physiotherapy, rehabilitation, medicine and training, biofeedback, ergonomics research, and biomechanical research. In the recent past, EMG has also being used in rehabilitation of patients with amputations in the form of robotic prosthesis. EMG has proved to be a valuable tool as it provides a natural way of sensing and classifying different body movements. Recent advances in electronics and microcontroller technology has improved control options for robotic mechanisms.

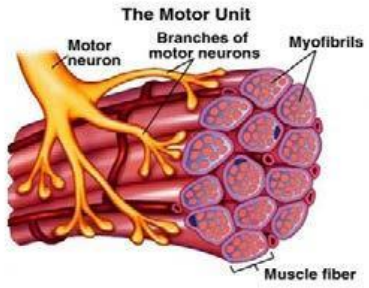
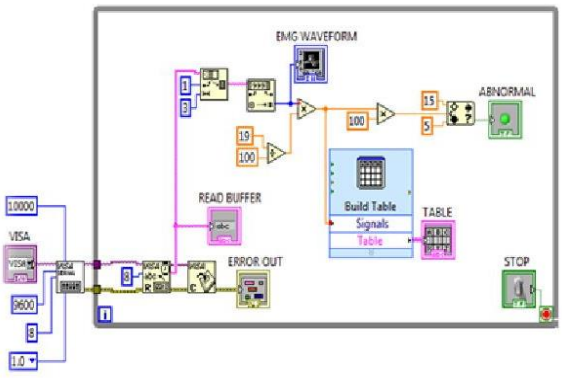



**Fig.1** Motor unit of the muscle

Electromyogram (EMG) is an electrical impulse produced by skeletal muscles during muscular activity. It can detect the abnormalities and activation levels of human movement through analyzing the shape are required for a certain activity, the brain sends size, and frequency of muscle activation. It gives very important information in many clinical and biomedical applications. There are numerous applications of EMG signals used for controlling of prosthesis or orthotic device movement, detection of user intended movement, controlling of virtual models, etc.

## II. Methodology

In this rehabilitation system, surface EMG electrodes are used to extract the signals. The real-time muscle simulation module in this system employs the sEMG signals to detect the activation level of muscle performance to trigger the muscle simulation. This module provides very useful information to user as a motivational tool and therapists to monitor and track the patient's muscle performance. The system consists of one main module and six sub modules in-built namely initialization, setups, read data, plot data, muscle animation and close connections in LabVIEW to exhibit as real-time muscle activation. The display of muscle activation is compared with the threshold value of sEMG live value with the predefined sEMG value.




The threshold value of sEMG signals is variable and can be defined by therapist according to the user performance. The sEMG signal is initially acquired by the needle and surface electrodes and amplified for

further process. Frequently more than one amplification stages are needed, it must be processed to eliminate low or high frequency noise, or any other factors that may affect the outcome of the data. The amplitude of the signal which is the point of interest can range between 0 to 10 millivolts (peak-to-peak) or 0 to 1.5 millivolts. The frequency of an EMG signal usually ranges between 0 to 500 Hz. However, the usable energy of EMG signal is dominant between 50-15 Hz.

The sEMG electrode will acquire some threshold value and gives to the amplifier unit. The amplifier then amplifies the sEMG signal and sent to the microcontroller ADC segment. This section converts the analog signal to digital signal. Controller sends the signal to LabVIEW platform PC. PC monitors and analyse the sEMG signal using LabVIEW.

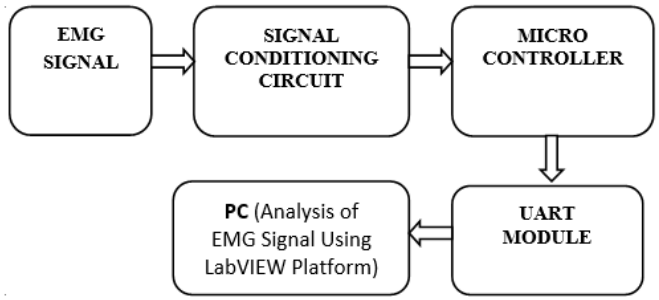



**Fig.2.1** Block diagram

*A. Hardware*

The hardware unit consists of power supply, signal conditioning unit and PC. The power supply circuit is built using filters, rectifier and voltage regulator, typically 230V rms, is connected to a transformer, which steps down the AC voltage to the level of 12V. A diode rectifier then provides a full wave rectified voltage and converts 12V AC to 12V DC. This resulting DC voltage usually has some ripple or AC voltage variation. Filter or smoothing capacitors are used to remove the ripples. A regulator is used to provide a DC voltage that has much less ripples and maintains the same DC value even if the DC input varies.

The most fundamental function of the signal conditioning unit is to filter the noise ripple signals. The spectrum includes some invalid signal frequency data too. There are several concerns regarding the appropriate acquisition of EMG signal. Once the electrode is properly placed, the signal is extracted. For the transmission of pure EMG, the high and low frequency noise should be deleted and only a specific band of frequency should be carried forward. In order to achieve this, a band pass filter can be used. A band pass filter can be designed by connecting a low pass and a high pass filter in series. A band pass filter response is shown in Fig 2.2

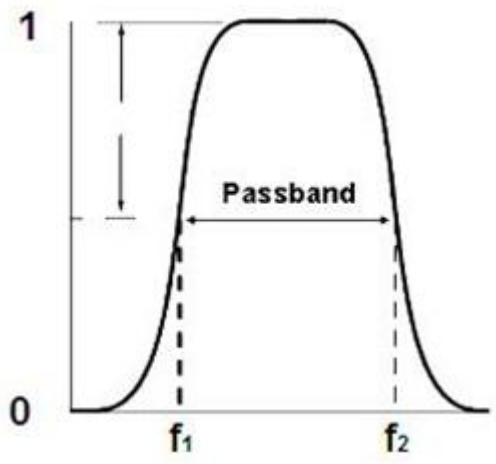



**Fig. 2.2.** Bandpass filter response

The frequency region where the response of the EMG signal is '1' is called the 'passband'.

## III. Software using labview platform

LabVIEW (Laboratory Virtual Instrumentation Engineering Workbench) is a platform and development tool for a visual programming language [2]. It contains a comprehensive set of tools for

analyzing, acquiring, storing data, displaying and to troubleshoot the code[2].

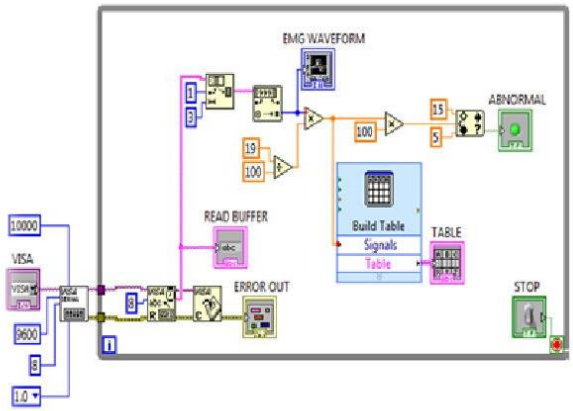



**Fig.3.1** LabVIEW Block diagram

It also includes built-in support for NI hardware platforms such as Virtual Instrument Software Architecture (VISA) toolsets, Measurement and Automation eXplorer (MAX), etc.

### *VISA Open*

Opens a session to the device specified by VISA resource name and returns a session identifier that can be used to call any other operations of that device.

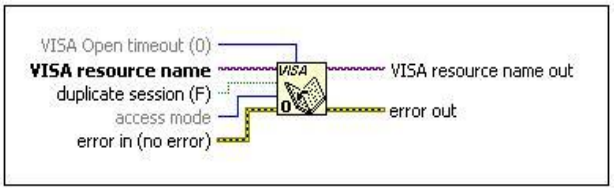



**Fig. 3.2** VISA Open

### *VISA Read*

This function might return less than the number of bytes requested if the function reaches the end of the buffer, reaches a termination character, or if a timeout occurs [3]. The output error cluster indicates if a timeout has occurred. Whether the data is read synchronously or asynchronously is platform-dependent[3].

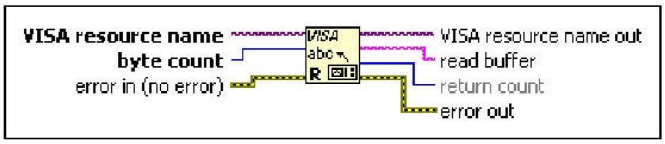



**Fig.3.3** VISA Read

C. VISA Close

Error I/O operates uniquely in this function. The function closes the device session regardless of whether an error occurred in a preceding operation [3]. For each VISA session that is opened, the session should be closed when it is completed. Depending on the speed of the transfer, this can hinder other processes that require the calling thread [3].

Fig.3.3 VISA Close

## IV. RESULTS AND DISCUSSION

The main objective of this research work is to rehabilitate patients with neuromuscular disorders like muscle spasticity, muscle atropy, osteoporosis, etc., EMG signal carries valuable information regarding the muscular system. The sEMG signals are usually not repeatable and contradictory in nature. Therfore to analyze such signal, LabVIEW platform is uesd. LabVIEW software serves as the valuable diagnostic and supportive tool for the analysis of sEMG signals obtained. The patients can interact with the system and they can monitor their trained muscle performance in real time.

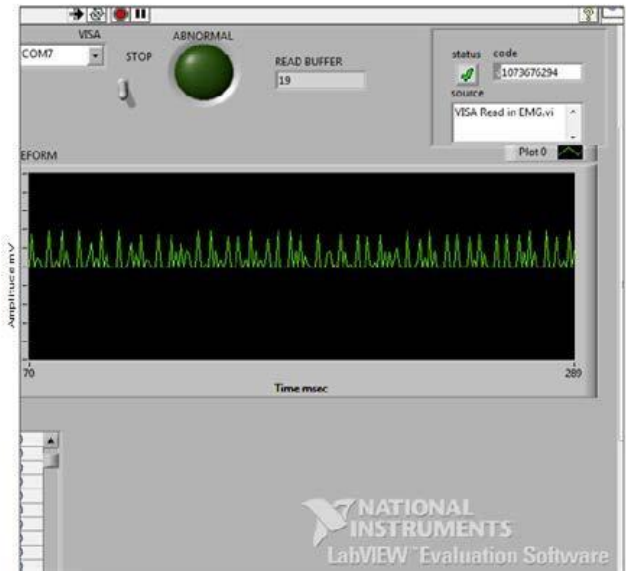



Fig.4.1 Output EMG signal

The test has been conducted with healthy subject in order to compare with the patients with neuromuscular disorders. Therefore the developed system is not only for adult rehabilitation but also for children with disabilities. In future, detailed information about sEMG signals can be obtained which can be used to rehabilitate patients with ease and the system can be made compact and portable.

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Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India


# Amputation Prevention in Diabetic Patients Using Electronic Orthotics Shoe

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## ABSTRACT

Most difficult challenges facing the healthcare industry is Diabetes. It is a primary affliction of diabetic patients due to peripheral neuropathy that means "loss of sensation in the foot". So this leads to ulcer increases which in many cases lead to the action of surgically cutting off the foot. We have constituting a new stage in a changing situation to introduce a wireless electronic orthotics shoes that composed of less weighted embedded systems with flexible and non-invasive sensors which can be used by diabetic patients. Thus the resulted in the escalations of weightless embedded systems through the continuous breakthrough in transistor technology by the development in processor performance. Thus the advancement of our system is composed of wireless and implanted technology that make it possible for remote healthcare sectors and telemedicine systems. It insisting of an real- time monitoring and continuous discretely analyze of how a patient's behavior affects his/her physiological states and if supplement symptoms suffering from numbness and pain in foot. Our suggested system monitors feet motion, foot temperature and pressure distribution beneath the feet in real-time actions and also it classier the state of the patient. It also detects the conditions that had abilities that causes foot sores. Continuous feedback mechanism enables was enabled for a instance in case of any consequence behavior or condition a serving message wirelessly to the patient and the patient'scaretakers.

**Keywords :** Arduino, Wi-Fi (ESP 8266), Load cell, Database System

## I. INTRODUCTION

As far as 25% of insulin impaired individuals will develop a foot sores during their lifespan and many of these patients finally must undergo the action of surgically cutting off a foot as a result of infection due to improper medical care foot sores. Any reduction in the rate of diabetic feet intricate would be significant to healthcare suppliers and more considerably, it improve the standard of life for many particulars. Diabetic individuals have difficulty with their feet mainly because of improper bloodflow, loss of sensation (diabetic neuropathy), reduced wound healing rate, and hardly fighting off infection caused by microbes. With diabetes, even a sores as tiny as a blister, e.g. due to a tight shoe, can cause considerable damage. In such individuals, the injuries heal to slow, because of improper blood flow. When a sore is not healing, it's a possibility for contaminations. The primary suggestion for preventing diabetic foot wounds are daily foot scrutiny, temperature monitoring, and pressure analysis by using this orthotic shoes. Educating patients to perform daily self inspectionsand properly care for their feet is not

costing a great deal and universally advised. An auspicious variant of this is daily assessments of feet temperature. Finding uplifted temperature in the foot is a significant early indicator of wound formations.


(a) High risk regions (b) Force readings (lbs) from two different subjects

## II. LITERATURESURVEY

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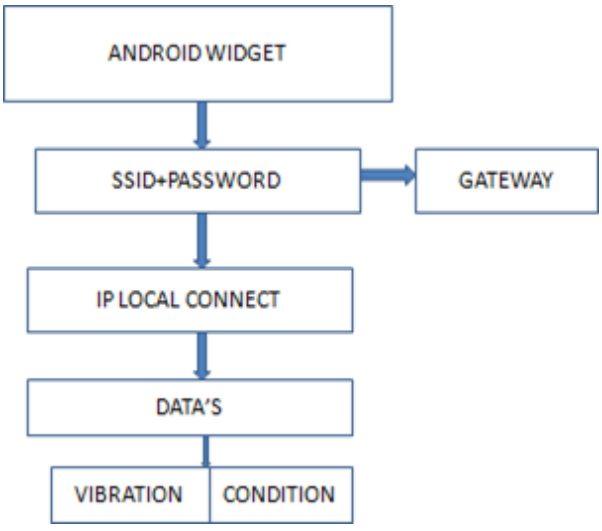
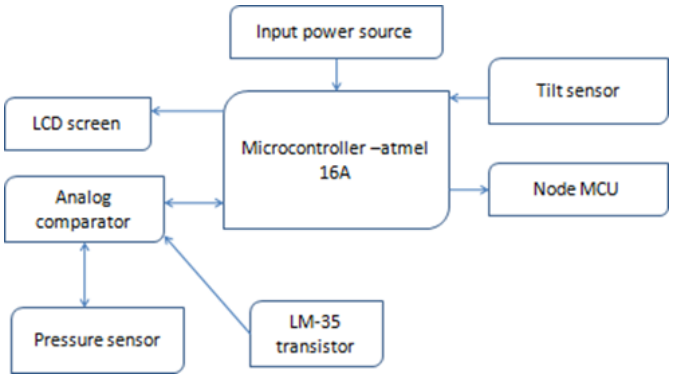
M. G. Mazumdc A Last Design with Uniform Foot Pressure Free Form Deformation, Planter foot pressure studies, in patients with diabetic neuropathy indicated relationship between excessive pressure and ulceration.

## III. RESULTS AND DISCUSSION

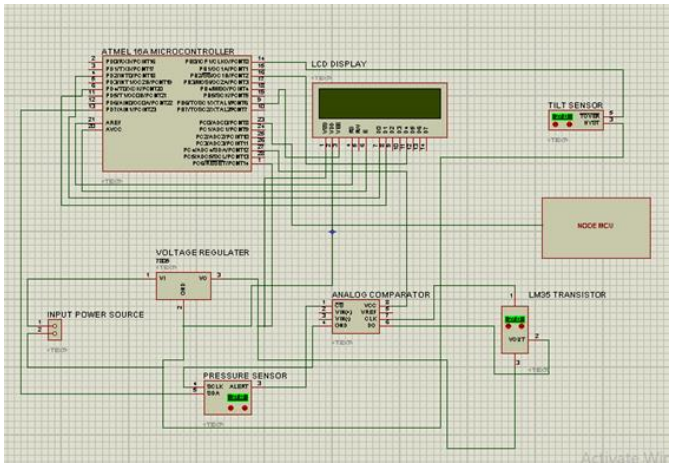
Android widget



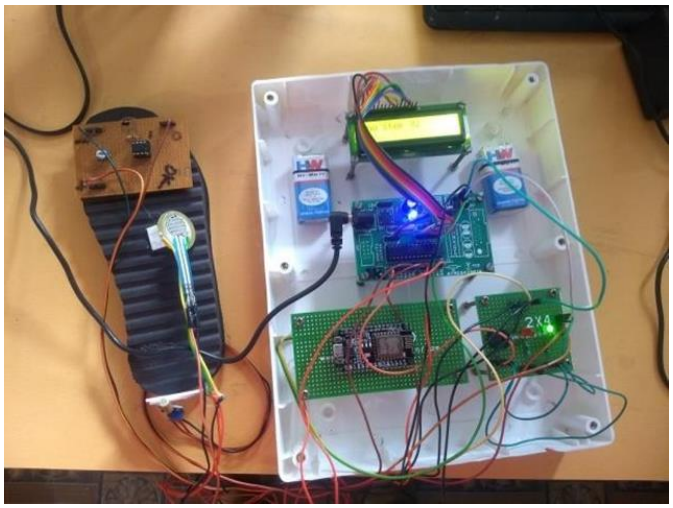
BLOCKDIAGRAM




CIRCUITDIAGRAM




DESCRIPTION



The Electronic Orthotics Shoe system is enforced with caliber, pervasive, diaphanous wireless implanting systems to establish the largest ramifications and probable for ratification. The upcoming segments evoked the hardware and software frameworks of the Electronic Orthotics Shoemodule.

A. Hardware framework: The high-level system architecture of Electronic Orthoticsshoe.

The main module of our establishmentincludes:

- ✓ Sensors for keep track of pressure dispensations, movement and step\walk inspections
- ✓ Med Node: implanting components for data acquisition, signal determinations and wireless dissemination
- ✓ On-Body Terminal which is idiosyncratic convenient gadgets for retention of retrievable data, categorization and depiction as well as providing assessments
- ✓ Central server which gathers patients' antiquity and several details for further examinations.

B. Softwareframework:

The software framework in our module subsists of two main constituents. First part is the imbedded software, which is managing on the processing unit implanted interior in the shoe. The second part is the software, which is getting effectuate on a personal device such as cell phone or PDA. The software running on the embedded processor is responsible for data acquisition, some preliminary data and signal processing, and transferring collected data to the empirical device. Software functioning on empirical device is responsible for supplemental computational and storage meticulous tasks such as data computing and signal processing in ancillary to the user enabling, then it lay out the collected ammunitions from various sensors and also the pressure's extremity under the patient's foot in the confirmed time during which a activity occurs.

## IV. CONCLUSION

The experimental study of foot pressure parameter for various class of diabetic patients and the mean value for both normal and abnormal foot pressure values are compared. The lag points are taken for pressure measurement; there will be an Increase in pressure if there is possibility for getting foot ulcer in a particular area .So any variation in Foot pressure which indicates of early detection of foot ulcer. This is very helpful to the Physician for The detection of foot ulcer in earlier stage and also reduces foot amputationpossibilities.

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Organised by Department of Biomedical Engineering,
Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India


# Central Unit for Multi-Patient Medication Register

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## ABSTRACT

In hospitals, there is a central nursing station for the simultaneous monitoring of the large count of the patients in ICU. But the medication provided to the patients is still in a tradition manner or with the help of the infusion and syringe pumps by the supervision of the nursing staffs. The automated register and medication time remainder (alerts when the time exceeds its offset) may be the next automation expectations to the hospitals. As its beginning our paper talks about the basic protocol of automated registering and remembering the time of medication to the nurse for the patient precaution and followed by the future analysis of the patient medication details.

**Keywords :** Medication Register, Hospitals, Medical Services, Reduced number of Nursing Staffs, Remainder for Medication.

## I. INTRODUCTION

As a beings of modern world, it's a day-to-day scenario of hearing about new diseases and disasters, which mainly opens full responsibility to hospitals on the case of admitting the victims. The victims may be large in count and it may be manageable for the hospitals of urban areas, but it is not possible to manage those patients by the reduced number of nursing employees in rural hospitals. Although it is the necessary job for the nurse to provide medicine for the patients at regular intervals, due to increased count of patients it seems little difficult to remember while providing medicines for all the patients. Hence we developed a hardware for monitoring of providing medication of those victims at regular interval of time with the use of reduced number of nursing staffs (almost a one or two staffs). At first, the beds of the ward are connected to the console through a Microcontroller. This hardware has an RFID to ensure that the patient has been medicated by the nurse using a unique RFID card for every beds. If medicine is not provided to the patient at the registered time it gives an alarm to the nurse through LED glow and buzzer. The data sheet of the medication and the time has been stored in the console for the doctor's reference. This may reduce the manualencryption of the medicine list, nurse inconvenience and mainly delayed medication of the patients.

## II. BLOCK DIAGRAM DESCRIPTION

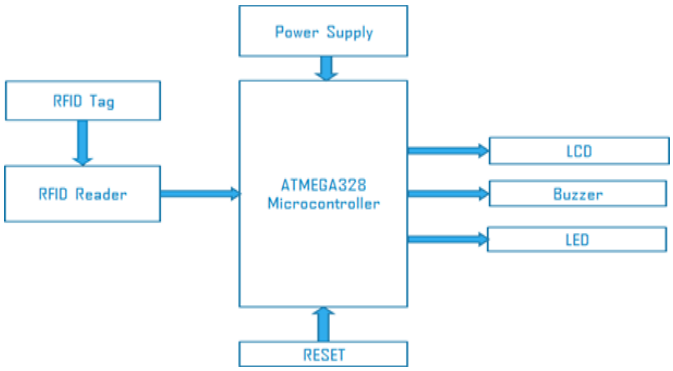


**Fig. 1** Block Diagram

The power supply to the microcontroller is accommodated with a step-down transformer to provide a 5V supply to the microcontroller. A unique RFID card is imparted for every bed with a centralised RFID decoder. When the card is tagged on the RFID it gives a TTL signal to the Microprocessor which can be seen in the LCD display the corresponding bed number, which ID has been tagged and it can be stored for the future analysis. It also has a timer for the medication to every bed, if the medicine is not provided at the given time, it will alert the nurse with the help of LED glowing and the buzzer.

## III. Circuit Diagram Explanation

The circuit diagram consists of the RFID reader. The RFID reader decodes the unique number in the RFID card and the output signal of the RFID reader is given tothe analog input terminal of the Microcontroller, which reflects to the LCD display connected to the output terminals of the Microcontroller. A reset button is associated with the microcontroller, so that the whole system can be easily reset (as we are not using a real time clock here). If the RFID is not providing any signal for the microcontroller in the given time, the LED glows and the buzzer alarm to indicate that the patient is not medicated within the given time. The Circuit board of the Microprocessor contains basic components namely, resistor, capacitors, regulator and crystal oscillator. We have used three resistors, ten capacitors (8 ceramics and 2 electrolytic), a voltage regulator and the crystal oscillator. The voltage regulator is to uphold the persistent voltage for the Microcontroller automatically.

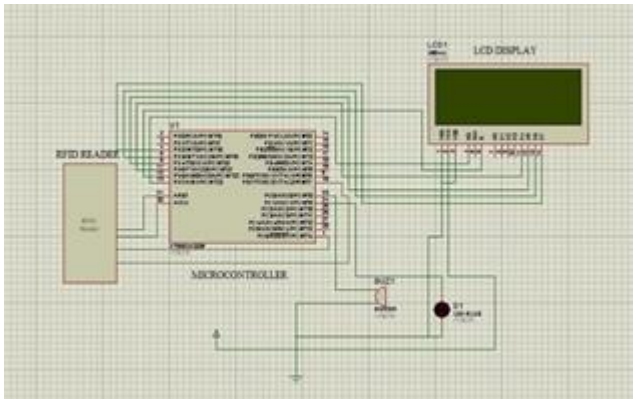

**Fig.2** Circuit Diagram

## IV. Materials Used

The microcontroller used is belonged to the family of AVR (RISC-based) named as ATMega328P-U manufactured by Atmel. It can be functioned with the minimum voltage of 4.5V and maximum of 5.5V. A Step down transformer is used to provide the required voltage for the circuit to be operated. An electromagnetic field operated RFID reader is used to read the specific RFID of each bed. A 20x4 LCD display is for showing the medicated and not medicated bed for nurse information. It can display up to 80 characters with 20 rows and 4 columns.

**Fig. 3** 20x4 LCD

A buzzer and an LED is provided for the alert signal to the nurse when the patient with certain bed number is not medicated.

## V. Results

As we predicted, we have shaped a model the we proposed above. This working model consists of a stepdown transformer, Microcontroller unit, RFID Reader, LCD Display, indicators circuit and a programmer interface.

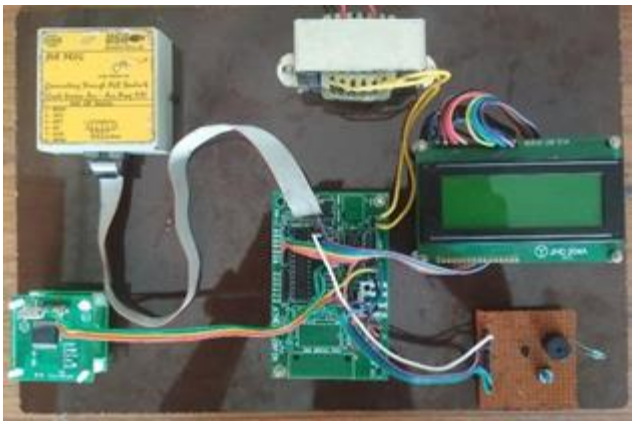

**Fig. 4** Project Kit


**Fig. 5** LCD output when bed 1 only treated


**Fig. 6** LCD output when all the beds are treated

On switching on the circuit, the LCD displays shows "Medicine check 1". We used three model beds with a unique RFID. Once the bed number 1 is medicated, the LCD shows "BED 1: MED TAKEN" and the other beds are still to be medicated, hence the alarm shouts for a particular time. If the three beds are medicated at the time, the buzzer shuts and the output in the LCD be as shown in the figure.

We have imparted a reset button, so that it can assist us to reset the microcontroller operation without switching off the device.

## VI. Conclusion

As the fragment of our project we had prospered in preparing a basic protocol for the Central Unit for Multi-Patient Medication Register using the Atmel produced ATMega328P-U Microcontroller deprived of RTC (Real Time Clock). This can help the nursing staffs in the hospitals especially in the rural hospitals with less technologies.

## VII. Future Scope

The Imminent of this project is applied with a help of the RTC (Real Time Clock) which can be useful in the real-time applications such as direct implementation over the hospitals for medication register with a use of a storage device such as cloud storage or some external storage devices to store the medication details of every patient for the imminent examination by the doctors. It can be an effective tool for the hospital staff for the register and retrieval of the patient medication database easier.

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Journal URL : http://ijsrst.com/EBHBM002

3rd National Conference on Enhancement in Biomedical Engineering and Healthcare
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# Automatic Tube Feeding System

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## ABSTRACT

According to the survey in hospitals, listed that 30% of patients suffer paralysis due to hypertension in our country. In hospitals the paralyzed patient needs to be feeded regularly which is major stress. The project is intended to replace the nurse with machine which gives feeding to the patient. By the use of automatic tube feeding system, the nurse can monitor the patient from distance. The advancement of tube feeding system helps hospitals to save time and man-power.

**Keywords :** Pre-Programmed, Peltier Plates, RTC, Atmel16A.

## I. INTRODUCTION

An infusion pump is an equipment which is commonly used in hospitals and to perfuse a liquid into the patient nostalgically. There are several types of infusion pumps which is semiautomatic and fully automatic [1]. Automatic tube feeding system is mainly used for body paralyzed patient who cannot able to perform any actions due to blood clots in brain. The flow control may be volumetric or non-volumetric [2]. A volumetric flow control gives the flow of liquid as desired amount, where the velocity and time, are programmed using embedded C. In a non-volumetric control, the pump controls the number of drops per seconds it is the small volume control unit [3]. The volume depends on the drop's size, varying with type of equipment, temperature, liquid viscosity and density. The advantages of controlled perfusion where the drop rate and flow rate can be controlled with respect to time, the automatic tube feeding system has advantage, where the flow and concentration of liquids can be changed when needed. In this paper Peltier Plate is proposed in automatic tube feeding system for sterilization. The centrifugal pump turns on and off the liquid, which has to be given to the patient. Real time clock is used to give feeding to the patient in real time. It is effectively used in body paralyzed patient which helps in feeding the patient continuously without man power.

## ATMEL16 MICROCONTROLLER

ATMEL16 microcontroller is common to ATMEGA16 microcontroller with certain differences. Atmel 16 is an 8-bit microcontroller of AVR family. ATMEL16 is based on RISC, architecture with 130 instruction.

ATMEL 16 has high flash memory and endurance when compared with ATMEGA microcontroller

### A. RELAY

A relay is an electrically operated switch. It acts as a switch to initiate the device. Current in the coil of

the relay produces magnetic field. The relay helps in converting the voltage from high to low as well as from low to high voltage.

## B. PELTIER EFFECT

The Peltier effect is a temperature difference which is created between two dissimilar metals. the heat as a source passing on one side of the plate where heat is generated and on other side of the metal cooling is generated. In this method the Peltier plates are used to sterilize the liquids by heating the liquid on rough surface of the plate and cooling the liquid on the smooth surface of the plate. Due to difference between these two metals the voltage is generated. This is similar to see beck effect and Thomson effect.

## C.PUMP

A centrifugal pump is a rotational device, it helps in diluting the medicine in water and after diluting the medicine is given to the patient through the centrifugal pump. The impeller acts as a tap for turning on the liquid and turning off the liquid flow from the pump. The casing in the centrifugal pump acts as a Centre tapped system to control the flow liquid given to the patient.

It has shaft in centrifugal pump which rotates in clockwise and in anticlockwise direction to assist the process of diluting the medicine in water.

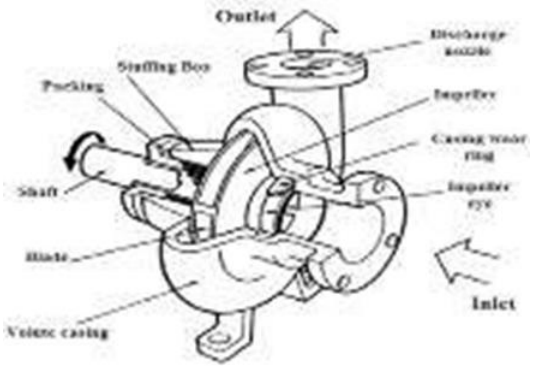


**Figure 1.** Centrifugal Pump

## BLOCK DIAGRAM

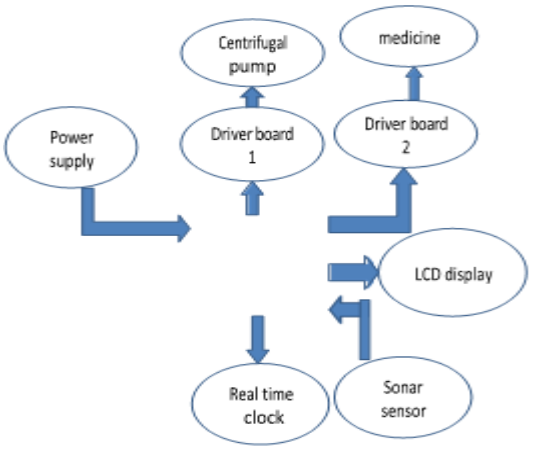


**Figure 2 :** Automatic Tube Feeding System

The block diagram mainly consists of three driver board, one driver board is connected to centrifugal pump, second driver board is connected to Peltier plate and the relay driver board is connected to medicine. Power supply is given to IC Atmel16A circuit. Due to the power supply, the driver boards are activated consecutively. when the food is to be given to the patient driver board 1 and relay driver are activated. Due to this, the Peltier plate heats and cools the sample and the centrifugal pump opens the required amount of flow to the patient and closes the pump after the delivery is given to the patient. Atmel 16A 3microcontroller has a RTC which performs RTC in real time. we can able to perform the operation, even when there is power failure. The sonar sensor indicates the level of liquid remaining in the container, which can visualize in LCD display.

## CIRCUIT DIAGRAM

The time, date and liquid supply mL/hour is pre-programmed in the Atmel16A micro-controller. The Peltier plates is being used to sterilize the milk, medicine and water. The RTC controller is a 24/7 format process the time accuracy is maintained by

Real Time Clock. The centrifugal pump acts as tap to turn on and off the flow of liquid.

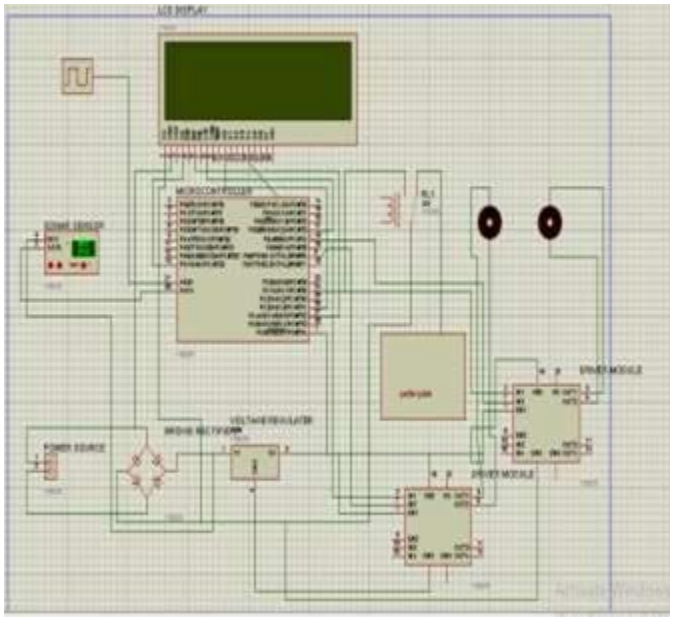

**Figure 3.** Circuit Diagram

## II. RESULT

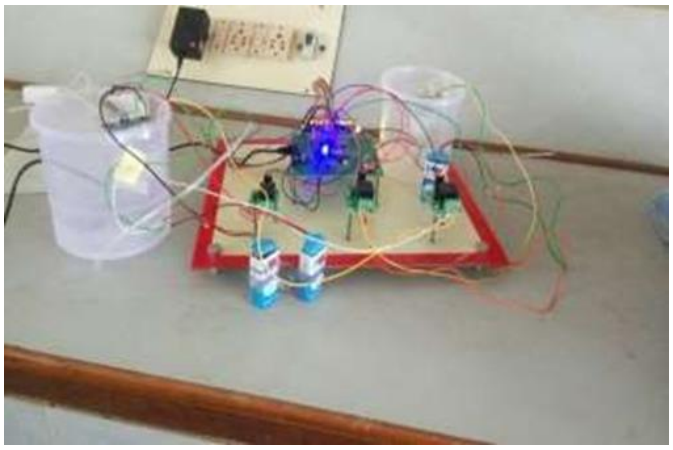

**Figure 4.** Result

The automatic tube feeding system is programmed and device carries the process of feeding to the patient continuously. The driver activates the centrifugal pump in the food container which gives feeding to the patient followed by the medicine in the other container. Thus, alternatively the medicine and food are given to the patient. The project gives solution to the hospital to reduce time consumption.

## V. CONCLUSION

Time consumption to feed the patients individually is highly increased in a multispecialty hospital. This could be overcome with the help of automatic tube feeding system. It gives feeding to the patient without any need of man power. It helps hospitals to save time and manual assessment. The feature of detecting clots in tube could be implemented. It would be able to detect the miscarriage of food in larynx and other artifacts with help of detector in future.

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# Wireless Wound Care System

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## ABSTRACT

Aim of the project is fast diagnosis of wound stages and bacterial infection for instant treatment using non-invasive technique. there are three functional hardware components and Zigbee module used in this system. RGB sensor detect the colour changes in the wound region and predict the stages of it. Gas sensor identify the volatile substances released by bacteria. Thus, the parameters are sensed and transmitted to monitoring system through Zigbee module. In FIR radiation therapy long wavelength (15micrometer to 1mm) and low energy infrared light is used which promotes reinnervation, remove pain in the injured section. Digital prescription depends on the wound status.

**Keywords :** RGB sensor, gas sensor, wound stages, volatile substances, bacterial infection, far infrared therapy.

## I. INTRODUCTION

There are 496,762 accidents per year in India. Major traffic collisions cause injuries which leads to septicemia. In India more than 62 million peoples are affected by diabetes. Most of the fatal cases of diabetes occur due to septicemia. 35% of the septicemia is fatal. The fast diagnosis and treatment are the best solution to this problem. Sepsis is the threatening complication of infection which spread bacterial toxic substance in the bloodstream if it is not treated earlier. The conventional technique for wound stages and bacterial infection instant diagnosis slow and time taken. we use RGB sensor to detect wound stages and gas sensor to identify bacterial infection by absorbing the volatile substances released by bacteria in wound region. The people in remote village can diagnosis quickly using this system and it is easy to handle. The doctor and nursing personnel can manage more patient at time by transmitting live parameters through Zigbee module

## II. Block Diagram

In these we have two separate kit transmitter and receiver. Transmitter-240V power supply is regulated to 5V which is supplied to Nano-microcontroller by using step down transformer. The RGB sensor pass white light on the wound and absorbs the reflected light from the target and depends on colour absorbed it sends signal to the LCD display and gas sensor change voltage according to concentration of gas in the targeted region the Zigbee module is used to transmit the parameter.

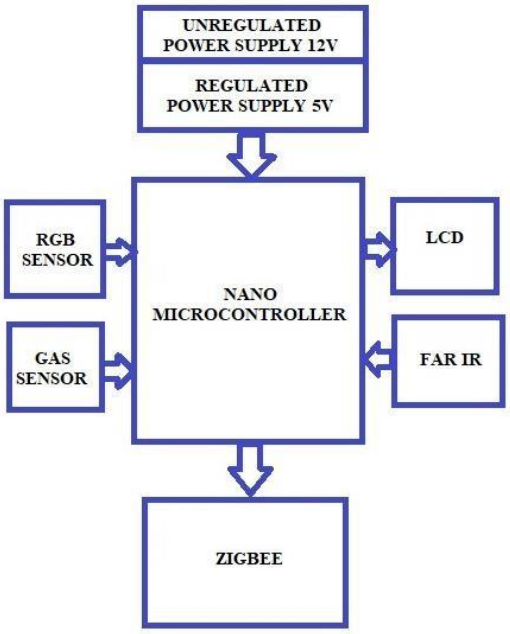



Fig.1 Transmitter Block Diagram

Receiver-transmitted parameters were received through zigbee module and monitored by interface with USB connection using driver terminal software. CP210XUSB Driver is used to drive the kit in the specified operating system of a personal computer

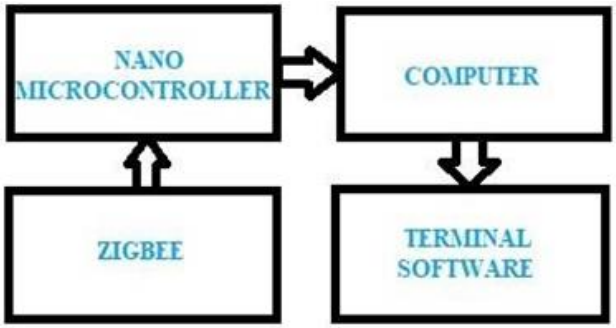
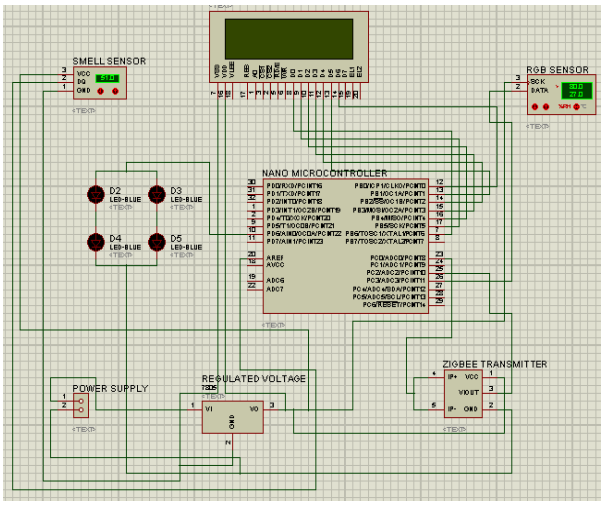



**Fig.2** Receiver Block Diagram

### III. Circuit Diagram

The two terminals from the power supply are connected to regulated voltage to step down input voltage. From there lined up with LCD display, Gas sensor, RGB sensor, Nano Microcontroller, Indicators and Zigbee transmitter. Microcontroller input pins are connected to RGB sensor, Gas sensor, and indicators. output pins are connected to LCD display and zigbee transmitter.




### IV. Components Used

Nano-Microcontroller has twenty-two i/p and o/p pins out of that 14 digital pins and 8 analogue pins. It has inbuilt USB port and reset switch. RGB sensor sends white light on the target and absorbs the reflected light. based on the wavelength of absorbed light it produces signal. Gas sensor has strontium oxide semiconductor sensing material. It detects gas concentration in the environment based on it generates potential difference by varying the resistance of sensing component. Far IR light is generated by LED operated in Far IR spectrum. We can detect different light and volatile substance released by bacteria through setting specific threshold value. Zigbee is a twoway communication tool for transmitting and receiving the live parameters. Interference with pc we can store the live stream data. LCD for temporary monitoring.

**Fig.4** Arduino Nano


**Fig.5** Gas Sensor MQ135

**Fig.6** RGB Sensor

## V. Result

We fabricated the main idea into a prototype kit which consist of RGB sensor, Gas sensor, Far IR LED and Zigbee. When switching the circuit RGB sensor pass white light on the wound region. If the reflected light has threshold score beyond 20 then it provides prescription. Gas sensor detect gas concentration on the wound if it exceeds threshold score of 500 then it indicates bacterial infection and provide prescription for it. The live parameters were monitored using computer through Zigbee.

**Fig. 7** Wireless Wound Care System

## VI. Conclusion

As the fragment of our project we had prospered in preparing a basic protocol for the Wireless wound care system will be more helpful for the doctor to manage more patient at a time. The digital prescription feature is beneficial to patient in remote area. Instant detection helps in immediate procedure.

## VII. Future Scope

With some advancement and combine with telecommunication link nursing personnel can do all the treatment and medication even though the doctor at long distance, live parameters are transmitting from one medical center to another for better analysis and treatment advice for severe/critical cases

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# Detection of Dry Eye In Human Using Humidity

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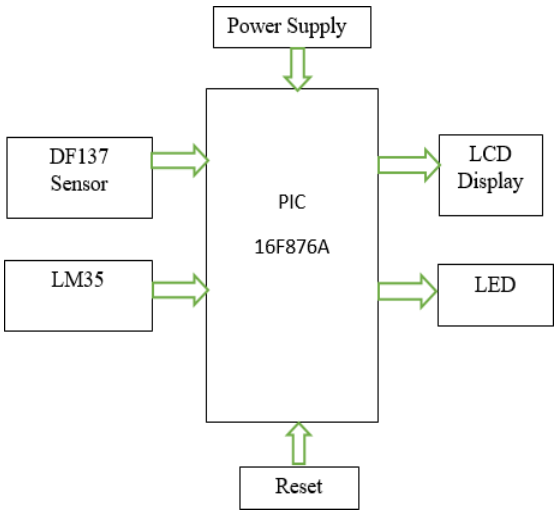
## ABSTRACT

Dry eye is one of the greatest public eye related difficulty that affect due to deficiency in tear production. There are many faces that contribute to this disease such as ocular area and deficiency in tear productivity, age and gender, innermost environments, and computer visualization syndrome (CVS). The elements deal with eye dryness in the electrical modules are humidity and temperature sensors, and a microcontroller. The design at this stage is aimed to prove the humidification level in human eye. In addition, the use of microcontroller was considered to offer programmability for clinical studies and personalized eye care.

**Keywords :** Dry Eye, Keratoconjunctivitis Sicca, Sensors, Humidity, Temperature, Microcontroller.

## I. INTRODUCTION

As we all know that human eye is very sensitive to the atmosphere that can attack bacteria and virus such that causes very dis-comfortness to the wellbeing. Major one of the common reason behind this is lack of tear in human eye that can be also called as keratoconjunctivitissicca. As that the quantity and quality of tear will need to be assigned and to be calculated. We were using water or other medicinal droplets over the past few decades. The main problem occurs which is the irritations that can irritate the wellbeing in the society during their work. The person should attain constant irritations that will attain a high pain too. The persons will feel a sandy and gritty sensation that will effects in worrying and ulceration of the cornea in the eye if it is left untreated for several period of time. The treatment for the dry eye is very less such that applying artificial tear by providing eye drop supplementary. By this humidifier analysis we can attain out the range of our level of dry eyeness such that evenly add the eye drops time to time.




Reducing the humidification which can reduce the dryness in the eye. By reducing that he or she can be able to work properly or more active in the society. Over stress which may also leads to this condition and strain over the display within a limited range of vision

which can be make dryness. The old peoples can be affected easily by which can affect the vision too. Sometimes hormonal imbalance also attacks these types of eye diseases. Such that vitamin A deficiency which would attacks the persons who have dry eye. The over usage of the computer can also form keratoconjunctivitis sicca such that the cooperate workers will affect this problem easily. The easy estimation of the dryness can achieve the less irritation and pain.

## II. BLOCK DIAGRAM

DESCRIPTION

Microcontroller is the main unit for controlling the sensing module. It reads the ambient temperature level and humidity level. The recognizing module is associated with the microcontroller. The sensor which may consists of a thermistor and a capacitive humidity sensor with itself that helps out to observe easily and provides a reset button to reset the values and the LED alert for if the dryness is too high. The sensitivity of the sensor to temperature is 0.1 degree Celsius and to humidity level 0.1%. For everytwo seconds both the temperature and humidity levels are measured if it's been connected out over the area of eye.

Using the pic microcontroller optimum humidity can be displayed out with the sensor and the thermistor. Normally a person has 24-degree humidification and 30-40 % should be balanced tear production. The PIC microcontroller is used in this circuit and the other modules are connected to it. The humidity (HR202L) sensor and temperature (LM35) sensor are connected to the main control unit which helps out easily placed in the area of eye and the temperature and humidity levels are measured. The power supply unit is also connected to the microcontroller which consists of Bridge rectifier, a filter capacitor and a regulator. For converting the AC voltage to DC voltage we use the rectifier which is full wave rectifier. To eliminate the ripples, we will use the capacitor filter. Regulator is used to convert the voltage to 5V from 230V supply. The temperature of the area of eye and humidity levels in the eye will be sensed and displayed in the LCD display which is also been connected to the microcontroller.

**Fig.2** LCD Display

Using mikroC software the PIC microcontroller which is been functioned out and shows the outputs which in the LCD display. The microC which helps in programming according to the user interfaces. It can develop complex applications into very simple. For smoothing purpose, we use out the electrolytic capacitor in which the range of 470 μF 35 V such that with of a charging and discharging input and output. So the varying DC will be reduced and the proper range of the humidity sense will be occurred easily. The regulator which is the range of 7805 such that which could get proper 5 V DC current and eliminate the ripple factor. For the easy conversion of AC to DC we use bridge rectifier that has 4 area of connections. The over dryness will affect the vision too such that can be reduced by making an alarm beep with the help of an LED indicator.

## III. CIRCUIT DIAGRAM

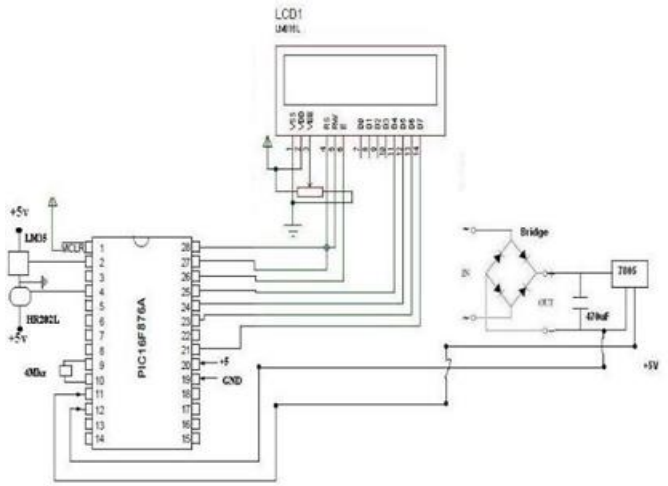



**Fig.3** Circuit Diagram

Using these measurements that can be makes out the power consumption by which providing the DC current. The supply can be works over battery and helps to be make it portable.

## IV. RESULTS

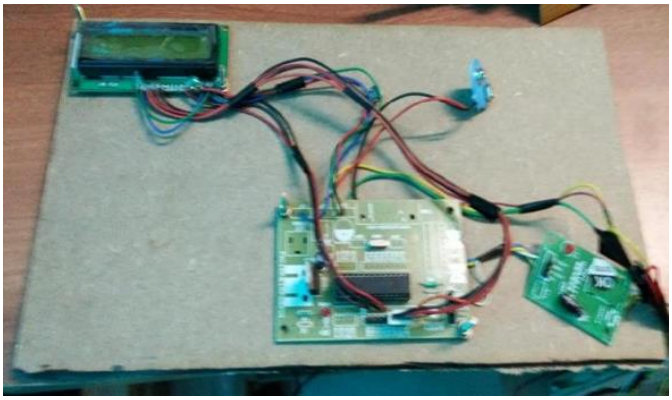


**Fig.4** Result (Model)

By using the 16F876A PIC microcontroller helps to find out the humidity level and the temperature is being sensed and been displayed out through the LCD display. This will help to reduce the time delay in the improper medicining in the dry eye diseases and other dry syndromes over region of the eye.

Time to time delay use can helps to achieve the normal tear by the proper medicines which as droplets. We can also reduce the medicine by using this detection method by which the alarm system that could be mentions at the time of looseness and make wash of the eyes over period of time.

## V. CONCLUSION

From the project, the development of active verification of the humidification and the temperature sensing over the range of accumulating dry eye in socio well-being or aged peoples. By using this we can reduce the usage of droplets and make ourselves a better treatment to keratoconjunctivitissicca.

## VI. FUTURE WORKS

In future these sensing can be within aligned in the pocket and measures out. The alarm sensing can be attached towards phone and make it feels or get reminded out the time of low or high teared/tearless eye.

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# Wireless Monitoring of Heart-Rate And Temperature Using Bluetooth Technology

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## ABSTRACT

Stethoscope is an important device to sense heartbeat and analyze pulmonary abnormalities. Moreover acoustic stethoscopes are used. It is difficult to analyze the heart sound and diagnose it. Also the chest piece and the connecting tubes are known to facilitate transmission of pathogens from patient to patient and from patient to user. Therefore, this idea was to develop a wireless transmission. Three different data are fed through pot specifying the following conditions: normal, below normal and above normal. These are visualized in the handheld device as digital data with certain indications.

**Keywords :** LM35 Temperature Sensor, Heart Rate Monitoring, Bluetooth Module For Wireless Transmission.

## I. INTRODUCTION

Stethoscope play an important role along with electronic stethoscope in healthcare unit to diagnose the internal organs like lungs, heart and bowel sounds, and also used to measure blood pressure. They are amplified by the body impulses. They convert acoustic sound waves into electrical signals and further amplified for maximal listening. In order to get an amplified sound output, ambient noise reduction and enhanced frequency range, wireless monitoring using Bluetooth technology is made. It enables them to connect with other Bluetooth devices. Subsequently, health care has become a challenge to many advancements and impairment.

## II. BLOCK DIAGRAM

Here the ATMEGA 328 microcontroller is given with the power supply of AC voltage typically 220V RMS through a transformer. The steps of AC voltage falls to

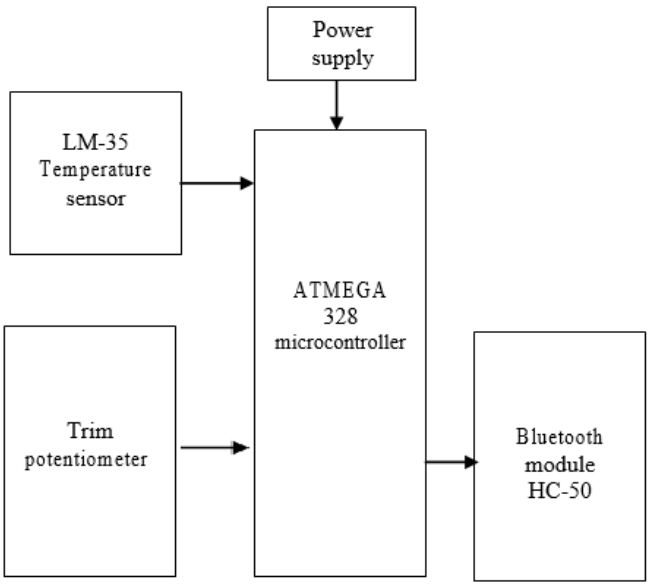


Fig 1.1 Block Diagram

the level of the attained DC output. A regulator circuit avoids ripples and even remains constant DC value if DC volume varies. Potentiometer is used to

feed the data with three different conditions with three different varying ranges. To detect the temperature here used is LM-35. Temperature varies directly as the electrical output and acts as an integrated circuit sensor which can measure temperature in °C.They are more accurate than thermistor. This circuitry temperature measures with a resolution of up to 0.5°C.

Microcontroller used here is ATMEGA 328microcontroller with the low power. Bluetooth is a special interest group which serves in computing, networking, consumer electronics and telecommunication. They interconnect with many other devices which synchronize the upcoming problems. Here used Bluetooth 4.0 of 2MHz spacing, which allows 40 channels. Hence it performs an excellent procedure in wireless transmission of heart rate and temperature to the device with high efficiency and transfer rate.

## III. CIRCUIT DIAGRAM

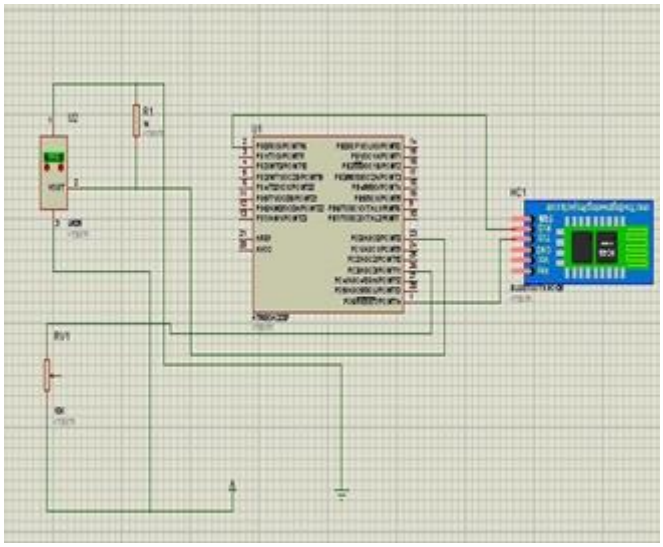

Fig 1.2 Circuit Diagram

The data is fed as an input to the microcontroller and it will process the digital data and waits at the transmitting end of the Bluetooth. This is viewed once the bluetooth application is interfaced with our mobile. This can be logged in by entering the security code which it had generated in the software. Once it matches it gets connected automatically. These parameters are viewed through the ASCII code. It can also process data through the added comments.

## IV. RESULT

Fig 1.3 Wireless monitoring of heart rate and temperature using bluetooth technology.

This idea has resulted into a proposed system detecting the heart rate and temperature through Bluetooth technology. It aids the physician to monitor the bodily conditions of an individual with an handheld device. Several diagnostic assessments could be performed. Also the transfer rate of data is so fast that it could yield result with higher efficiency.

## V. CONCLUSION

This system generally monitors the heart rate and temperature in real time environment and it can also be very much effective in the absence of connectivity tubing. This proposed system does not allow any type of pathogens that can affect the patient in any direct or indirect methods. All the data are continuously monitored and sent to physician or guardian in case of any issue or bad situation. The one who have

undergone heart surgery could make use of it so that they don't need to rush through hospital often.

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# Alcohol Consumption and Drowsiness Detection

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## ABSTRACT

According to the survey in recent years, road accidents are due to drowsiness or sleepiness of adriver. In order to avoid such accidents, many researches have been done to detect drowsiness. Their methodologies usually estimate either physiological or behavioral characteristics of the driver or the measures related to the vehicle being used. Sleepiness of the driver can be detected using eye blink sensors which trigger the alarm to conscious the driver and generate vibrations on steering, for the confirmation. It will also happen when driver's head fall due to sleepiness through head fall monitoring. In this process, the alert will be sent to the driver if the driver is Drowsy and this system is also designed with android app.

**Keywords :** Eye Blink Sensors, Alcohol Sensor,Head Fall Sensor, Bluetooth, Driver Board.

## I. INTRODUCTION

Frequently, the loss of driver's control over the vehicle results in the road accidents. Most of the times, even if the vehicles are flawless; the human errors may result in the fatal consequences. Usually sleepiness of driver or consumption of liquor leads to the loss of control over the vehicles. Loosing control for even a fraction of second leads to the major damage of both property and life. So, It is indispensable to avoid unexpected harmful effects of drowsiness on roads. Iris scan is most preferable to detect drowsiness of driver. Researches have been done in which a lot of prototypes and modules were developed for iris scanning. Innovations have been done in different technologies for gadgets designing it can detect drowsiness and consumption of alcohol by the driver. The drowsiness can also be detected by the use of eye blink sensor.

Frequency of opening and closing of eye rate is the main objective developed in this system. Drowsiness is the medial stage for sleep, it is the state of progressive awareness associate with the sleep. In case of driving, drowsiness increases the probability of accidents. Many traffic surveys shows that 22% of accidents are due to drowsiness and 33% of accidents are because of alcoholism. Many research have been trying to develop new drowsiness detectors. The drunk and drive detectors have also been developed to avoid accidents. But there are very few research works done for the combination of both sensors. It will be unique to create such a system can detect the drowsiness as well as alcohol consumed car driver and it intimate person on real time basis. Haar transform are used to detect the blinking rate of eyeanda breathalyser is used to measure alcohol content in blood from breath air content (BrAC). Along with the high speed Raspberian system, raspberry-pi board act as the heart of the system(CPU). The application of

raspberry pi CPU based sensing system to the detection of driver's lethargy and alcoholism in order to avoid the road accidents[1].

## II. OBJECTIVE

Driver drowsiness detection is a car safety technology which helps prevent accidents caused by the driver getting drowsy. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads.

## III. METHODOLOGY

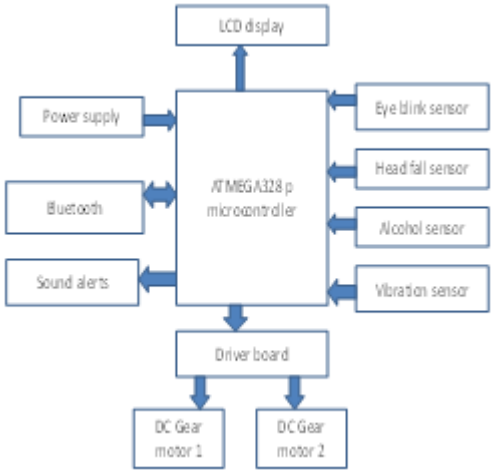


**Figure 1.** Drunk and drowsy system

ATMEGA32 is the 28 pin Microcontroller, it is based on low power AVR risk. As it contain 8KB programmable flash memory.The microcontroller is used to process the data from the availability sensors, all the sensors and components are connected with digital pins except alcohol sensor. The alcohol sensor (MQ3) works based up on the smell and concentration of the alcohol. Alcohol consumed data will be send to the microcontroller and it analyze the data andthe data is again send to the DC gear motors so the car could not starts. At the same time, buzzer vibrator and indicators tends to be "ON",the alcohol consumed get displayed on the LCD display. The drowsiness has detected by two sensors, Eye blink and head fall sensor. Eye blink sensor works depends upon IR radiation.If the human eye opens, it get observed so that frequency level of the eye decreased. The frequency level increases when the sensor detects the data. Head fall sensor contains a tilt, which is filled with mercury. The head fall movement of the driver has been detected depends up on the angular change of the tilt. Whenever the two sensors detects the data, it send the data to microcontroller, then the data is subjected to the DC gear motors, speed will be decreases step by step and then the car has been stopped. This information will be send through Bluetooth by a android application via SMS. At the same time the vibrator buzzer indicators tends to be "ON". The power supply is 5v for all circuits, and the DC gear motors has 12v power supply.

## IV. CIRCUIT DIAGRAM

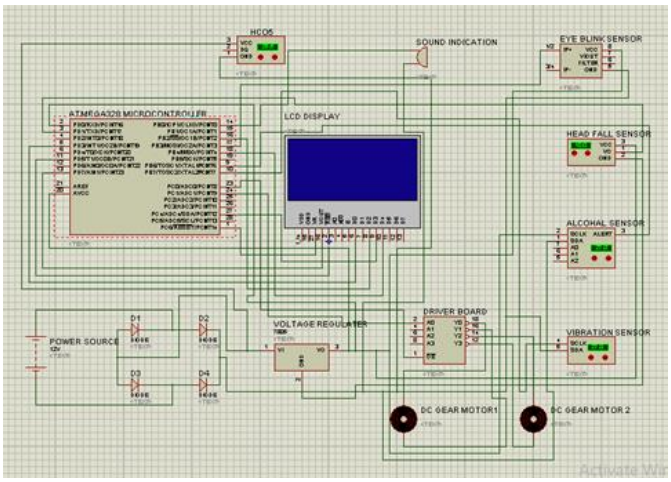


**Figure 2.** Circuit Diagram of Alcohol & Drowsiness Detection System

Microcontroller consist of 28 pins, 0-13 are called digital pins, except those are analog pins which is used to detect drowsiness while drunk & drive. Eye blink, head fall, vibrator sensor are connected to digital pins. Eye blink sensor consists of three pins digital Vcc, ground and output pin. Bluetooth consist

of four pins digital Vcc, ground, transmitter and receiver. LCD (16x2) consist of 16 pins, last two pins are used for LED connector. Driver board is used to change the positive and negative modes in order to move the car in front and back direction. All the circuit components works on five volts power supply. The motor, which works on twelve volts power supply.

## V. RESULTAND DISCUSSION

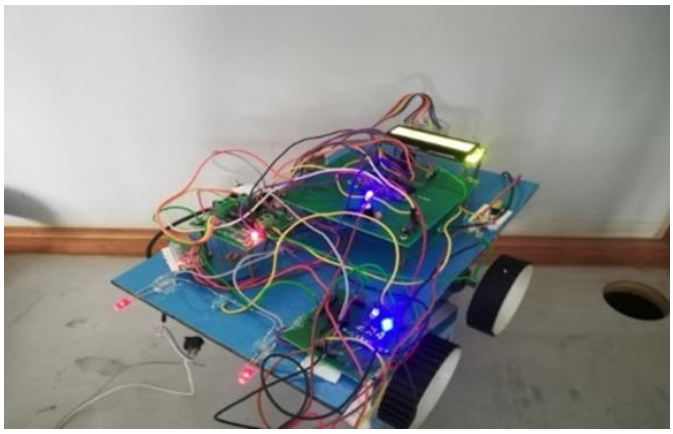

**Figure 3** Output of the system

The power supply is given to the system. The Bluetooth receives input data from all the sensors and makes the car to stop its motion step by step.

## VI. CONCLUSION

Recent survey showed that 20% of accidents is due to mind distraction of driver and 30% is due to fatigue (drunk and drive). We have followed different methodologies in a single prototype to monitor driver 's physical activities and to alert them in case of distraction. Thus the major cause for accident are drowsiness, fatigue, alcohol consumption, head fall. By using this system we can detect those parameters and it will be more helpful in minimising the percentage of road accidents of traffic survey.

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# Hearing Aid with Voice Recognition Alarm System

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## ABSTRACT

In modern world, the severe hearing loss undergoes surgery and based on the damage, hearing aid is used or prescribed. So far the advancement in hearing loss is amplification and recording system. Since the usage of hearing aid with recording system needs a manual operation, can have difficulties and leading to manual error. To overcome such difficulties the recording system with voice recognition board, alarm system is used to record the sound waves for particular distance and the alarm system is necessary to the person who leaves or forget to wear it in meantime. So the recording system records the required sound waves and gives alarm when it detects the sound waves which is not in use by the individual. Noise filters in voice recognition board discriminate the noise and used to detect the sound waves at a particular distance and alarm system is used to remind and show the location of the aid. So the ultimate aim is to achieve a hearing aid with voice recognition alarm system.

**Keywords :-** Hearing Loss, Voice Recognition Board, Impaired Patient, Losing the Aid, Alarm (Buzzer) system.

## I. INTRODUCTION

Hearing aid is a device used by the impaired patients with partial hearing loss and with surgery to the ear with the damage in the muscles such as stapes, malleus and incus. On severe hearing loss we go for surgery and based on the damage, hearing aid is used or prescribed. Impaired patients who have partial hearing loss will be prescribed with hearing aid by the response to the sound waves. So far the impaired patients with partial hearing loss used to lose or subconsciously fails to wear the hearing aid, Patients being old will lose the hearing aid often. Here losing the hearing aid under a particular distance can be found through voice recognition board since it is a recorded system of similar voice or familiar people. The statements or commands given and recorded in the voice recognition board will sense the voice of the people and gives a buzzer alarm to the patient. The buzzer alarm is given under a particular distance can be heard by the impaired patient.

## II. BLOCK DIAGRAM

### DESCRIPTION

The block diagram consists of power supply about 12V which is converted to 5V using step down transformer and fed to the microcontroller (ATMega 328). A voke board with analog input fed to the microcontroller as digital input. Buzzer and LCD display are the output from the microcontroller.

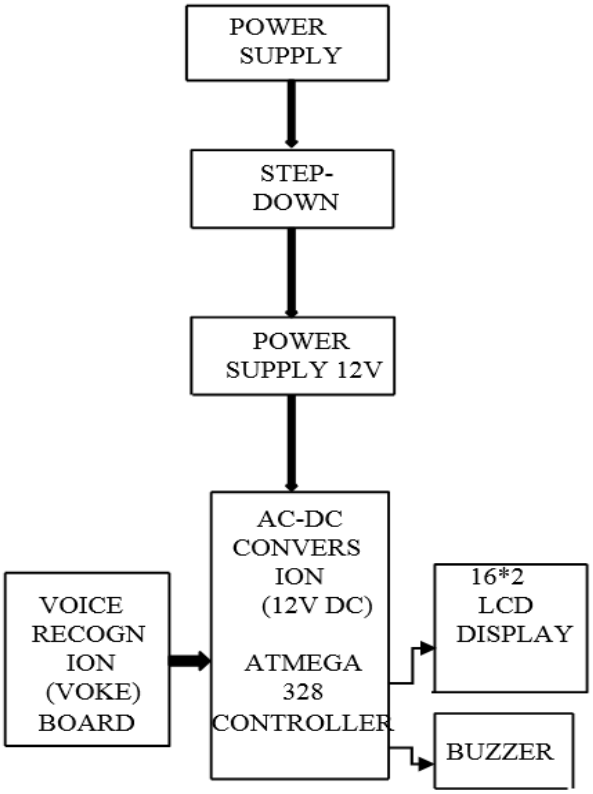


**Fig.1** Block Diagram

## III. MATERIALS USED

A microcontroller in this project is consists of AVR (RISC-based) named as ATMega 328P-U manufactured by Atmel.

Step down transformer is a device used to convert the high voltage or current to the secondary low voltage or current. Here it converts 230V to 12V-5V. Voice recognition board is a computer software programmed hardware device that decodes the human voice and gives the command to the controller. LCD display and buzzer are the outputs where the buzzer produces alarm system and LCD displays the command instruction.

## IV. CIRCUIT DIAGRAM

Liquid Crystal Display (LCD) is used to replace the LEDs. It can display numbers, characters and display and graphics. There are 14 pins marked with numbers. This comprises the required output. Using the measurements it can make out the required power consumption in which it provides the DC current supply easier.

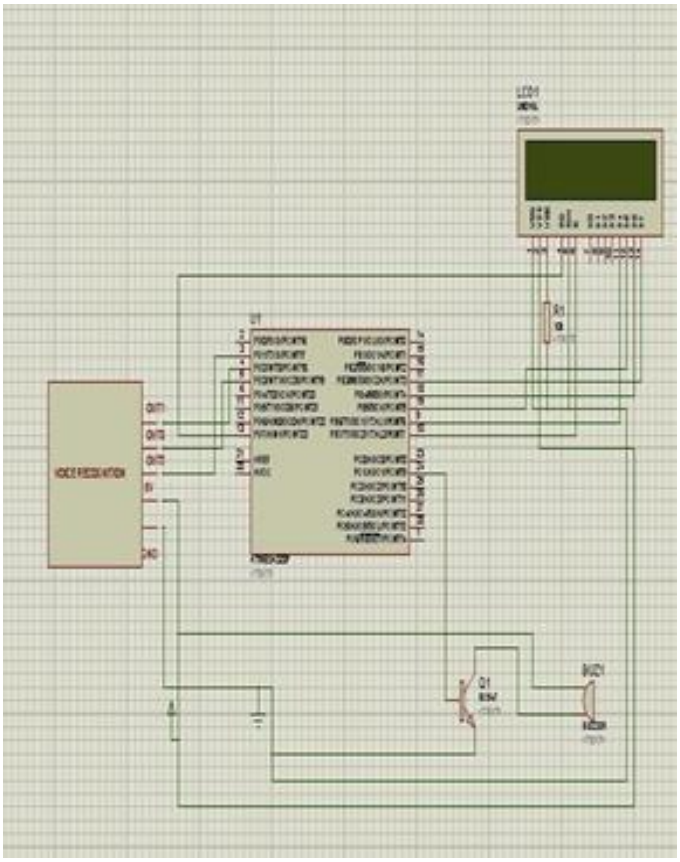

**Fig. 2** Circuit Diagram

## V. RESULT

By using the ATMega 348 microcontroller the PORT B is connected to the LCD display and PORT C connected to the voice recognition board to get the input from the person and it recognize will displayed on the LCD by identifying the loaded input.

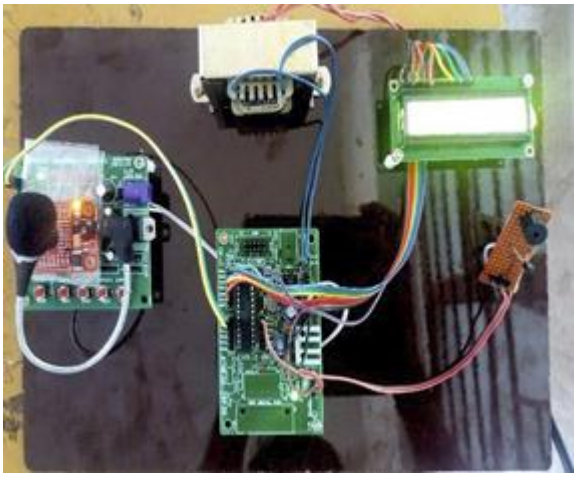

**Fig. 3** Result(model)

## VI. CONCLUSION

On hardware the voice recognition board is used to recognize the input voice given by different persons. The alarm system is followed by the voice recognition board which is fed with the input of two to seven persons voice command without any interference of noises and when the input is loaded the voice spoken will be read by the mike and LCD identifies and displays the specific person name given through the coding given by the c++ programming language to the microcontroller. The hearing aid with the simulated software using MATLAB and LABVIEW can overcome the issues on losing the aid device.

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3rd National Conference on Enhancement in Biomedical Engineering and Healthcare
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Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India


# Implementing A Smart Bed System for Patients With Impaired Mobility

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## ABSTRACT

Healthcare demand for hospital beds is a concern in both private and public institutions. The normal hospital beds are burdensome and do not consider both caregiver's health and patient's stress and discomfort that have consequences on the rehabilitation process. For these reasons, a Smart Bed system is proposed. Implementing the smart bed with a user- friendly interface empowers the patient and caregiver to move the bed into complex positions 45’ degree. This reduces the risk of death and also enhances the person’s quality of life. The arrangement in bed consists of a appropriate hole in the bed top & mattress which is normally covered by platform with mattress during idle position. This platform slides out by manually operated servo motor to clear the hole. Simultaneously, a downside bucket through the hole & is ready to use. A bucket arranged with level indicating sensor. When the sensor reaches it threshold level, the LED light indicates the current level. Vacuum motor turns on to clean the all wastages and connected to drainage pipeline. All controls are within patient’s reach. Conditions can be indicated on RGB LED lights and buzzer notifications. After use, arrangement is reversed and bed is brought back to its ordinary position.

**Keywords :** Health Care, Complex Positions, Level Indicator, Vacuum Motor, RGB LED.

## I. INTRODUCTION

In the hospital, care-givers need to transfer a immobile patient from medical bed to others places, such as x-ray laboratory, MRI laboratory, another ward etc. In general two nurses are needed to transfer the patient. The task becomes more exigent when shifting an overweight patient. The Musculoskeletal disorder (MSDS) including back injuries is the major risk in the long run. If the task is carried out repeatedly, most likely the nurses will experience a persistent back pain. Smart Transfer Patient Bed is designed to solve the nurse’s problems in transferring patient. Hospitalizing the bedridden patients is a vital issue with the clock assistance as many people are involved in it. Any reduction in the number of people involved and the amount of efforts required is going to benefit a large section of the society.

## II. LITERATURE SURVEY

[1] T. Yoshikawa, N. J. Livesley, andA. W.Chow, “Infected pressure ulcers in elderly individuals,” Clinical Infectious Diseases. If an elderly individual is in the same position for too long, whether in bed or a wheelchair, the friction between the skin and the surface may stop the blood flow, causing the pressure area to receive less oxygen and thus causing the cells

to die in that area. This is how bedsores will develop. Pressure ulcers in elderly individuals can cause significant morbidity and mortality and are a major economic burden to the healthcare system.

[2] "Mattress Sensing MAP System,"mattress- sensing-map-system-prevents-pressure-ulcershtml.MAP system involves a special electronic sheet placed over a mattress that has thousands of sensors that detect the pressure distribution of the patient's body over the bed. It is very similar to our proposed method. However, our proposed system uses 1/20 times fewer sensors than MAP. In addition, depending on the upper body and lower body, different types of sensors are deployed efficiently considering the incidence of bedsores. Notice that the incidences of bedsores are relatively low in the areas with frequent movements such as legs.

[3] Y. S. Delahoz and M. A. Labrador, "Survey on fall detection and fall prevention using wearable and external sensors," Sensors. The work in proposed a computer vision-based fall detection system for monitoring an elderly person in a home care application. It suffers from occlusion since subjects can sometimes be behind a sofa or furniture while being monitored.

## III. III. OBJECTIVE

In order to give support to caregivers in nursing and elderly patients who are not able to move freely, in this project, we propose a design and implementation of a smart bed. In this bed, ultrasound level sensors are fitted underneath the mattress. Our experimental results make obvious that a prototype smart bed works well for several human models of various heights and weights.

## IV. BLOCK DIAGRAM

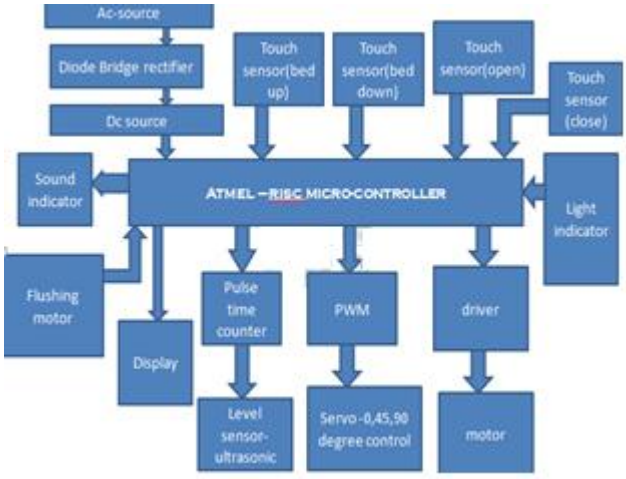


Fig 1. Block diagram

## V. BLOCK DIAGRAM DESCRIPTION

In this proposed system, the main power supply is the ac source. Since the ATMEL RISC microcontroller works on dc source, to convert ac to dc the Diode Bridge Rectifier is used. To achieve the objective of tilting the bed over a particular angle, the Servo Motor is used. The Servo motor is accompanied with Pulse Width Modulator (PWM) to control the amplitude of the digital signal in order to control the servo motor. The Ultrasonic Level Sensor is used to measure the range of the waste collected in the bucket which is fixed under the mattress. To achieve the clock assistance, Pulse Time Counter is assisted with the Level sensor. This is mainly used here to monitor the history of excretion of a patient. The removal of wastages collected in the bucket is done by the centrifugal action of the Flushing motor. The ATMEL RISC Microcontroller processes the signal from level sensor and make the decision either to ON or OFF the flushing motor through Relay Valve, it is also assisted with the display to notify the level of waste collected. The RGB LED indicates the current status of levels of waste collected. Sound Indicator

(buzzer) alerts the care-taker whenever the wastage level gets to maximum. The ATMAL RISC Microcontroller processes and controls all the signal fetched from the functional blocks. The Touch Sensors are used as Controls.

## VI. CIRCUIT DIAGRAM

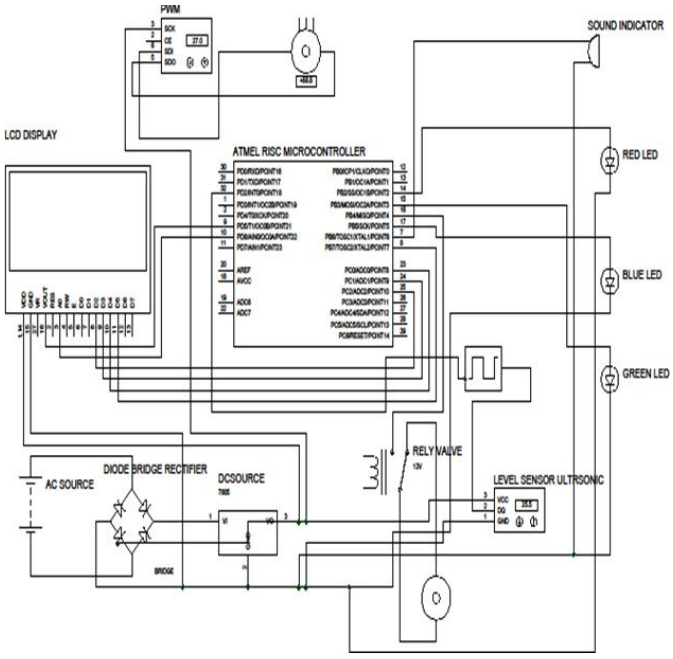


Fig 2. Circuit diagram

## VII.RESULT

## VIII. CONCLUSION

Smart medical beds are integrated solutions for patient care, assistance and monitoring, based on a inclusive, multidisciplinary design approach. Smart beds, flawlessly incorporated into the healthcare, have a exclusive prospect in enabling more efficient efforts for caregivers, and more approachable environments for patients.

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# Implementing an Emerging Technologies Based E-Saline Bottle Monitoring and Control System

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## ABSTRACT

Modern health care organization requires manual caretakers and their heavy duties become a social problem in the modern world which is an extremely time-consuming job. We are proposing a device wherein remote drip infusion monitoring and control framework has been produced for medical clinics. The device contains various Infusion checking gadgets, control framework, and a focal screen. The infusion monitoring device using an load cell which can detect or sense the drip infusion rate (drops per minute), remaining time, an empty infusion solution bag at particular critical set level and also show remaining infusion capacity displayed on central monitor and this information will be sent wirelessly to the crucial or central monitor located at the nurse's control room and also from central monitor. Here automatic controlling of reverse flow blood. Continues monitoring patient present in bed or absent, if they not present. The essential monitor receives the data from numerous infusion checking or administering devices and then displays. The projected system eradicates continuous on vision/sight monitoring of the patient by nurses.

**Keywords** :- Power supply, LCD, Load Cell, Relay, Microcontroller, Motion sensor, Buzzer, HX711, Wi-Fi device.

## I. INTRODUCTION

The current patient monitor schemes in hospitals permit continuous monitoring of patient vital signs, which need the sensors to be hardwired to neighbouring, bedside monitors or Personal Computers, and essentially restrain the patient to his hospital bed. Even after linking these systems to a specific patient, a paramedical associate need to endlessly monitor and note down all the vital parameters of a certain patient by keeping track of all of his/her records manually. Adopting such a method is error prone and may lead to disaster in the case of a human error. In the current planned system the patient health is continuously checked by the Mobile multi patient monitoring scheme and the attained data is transferred to a centralized controller. The patient monitor scheme that consumes very low power and is very small in size. These are specifically planned for low power consumption.

## II. BLOCK DIAGRAM

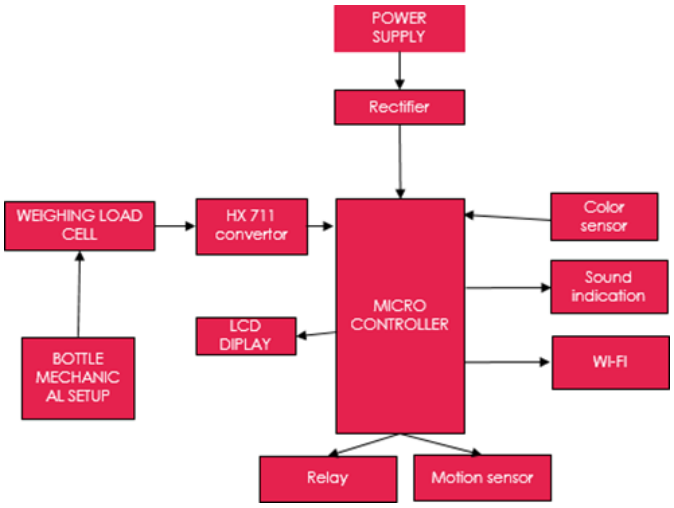



**Fig.1** Block Diagram

In our project we are proposing a new system of Infusion pump which will indicate the glucose level, back flow of blood, and the patient present or absent in bed which will be displayed in LCD and control system.

The system consist of power supply circuits built using filters, voltage regulators, and rectifiers. Starting with an AC voltage, a stable DC voltage is acquired by correcting the AC voltage, then riddling to a DC level, and finally, regulating to obtain a preferred fixed DC voltage.

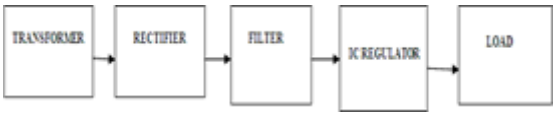



**Fig 2.** Block Diagram of Power Supply

The series of 78 regulators deliver fixed positive regulated voltages ranges from 5 to 24 volts. Similarly, the series of 79 regulators deliver fixed undesirable regulated voltages ranges from 5 to 24 volts.

- For IC's, Micro Controller, LCD - 5 volts
- For alarm circuit, op-amp, relay circuits -12 volts

The mechanical setup uses bottle and stand which connects to the load cell. The load cell which act as a force transducer is used to measure the weight of the saline bottle and load cell is connected to the HX711 which converts Analog data to digital data. That data is transferred to the PIC Microcontroller. PIC microcontrollers that can be programmed to carry out a massive range of tasks. The data from HX711 are transferred to the LCD display through PIC microcontroller. It displays the low level glucose rate and proper level glucose rate.

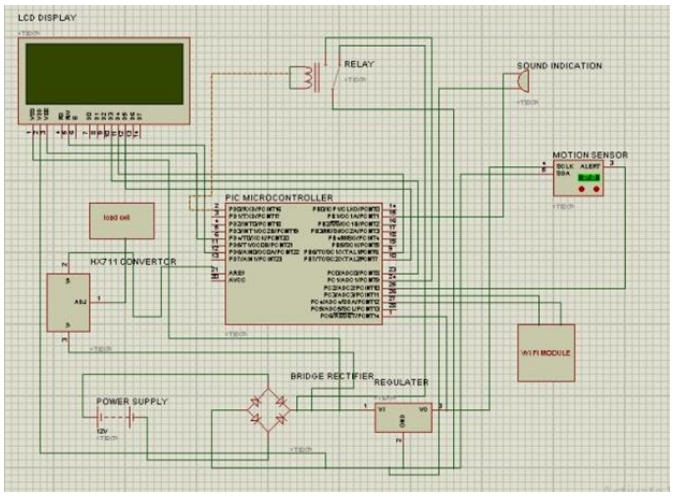
The Relay unit is used to controls (close and open) circuits electromechanically which controls the motion sensor and IR sensor. The Motion sensor checks either the patient is present or absent in bed. Socially the motion sensor alerts whenever there is change in patient position or when the child is missing.

**Fig 3** Single point load cells

The Relay unit is also connected with the IR sensor which sense the blood back flow in the tube. It connects with a buzzer that alerts whether blood is reverse to the saline bottle.

All those data's are transferred to the PIC microcontroller which connect with Wi-Fi module that transfers all the data's to the control system or central monitoring system. The transferred data's are viewed in the specific website page.

## III. CIRCUIT DIAGRAM




## IV. RESULTS

The load cell is designed to give the analog output to the HX711 then analog output is converted into digital output that is displayed in LCD. The LCD shows the command indications that is Low level glucose, Proper level glucose. The LCD is also displays the patient is present or absent in bed and blood back flow.


**Fig 5.** Patient absent Indication

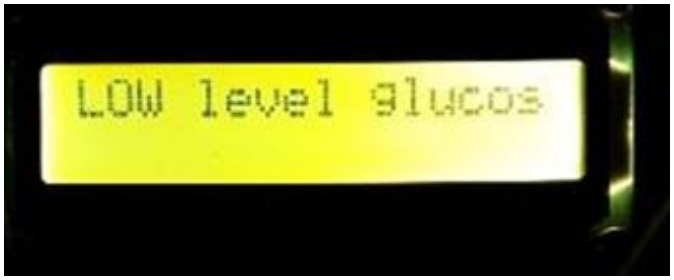



**Fig 6.** Low Level Glucose Indication


**Fig 7.** Blood Backflow Indication

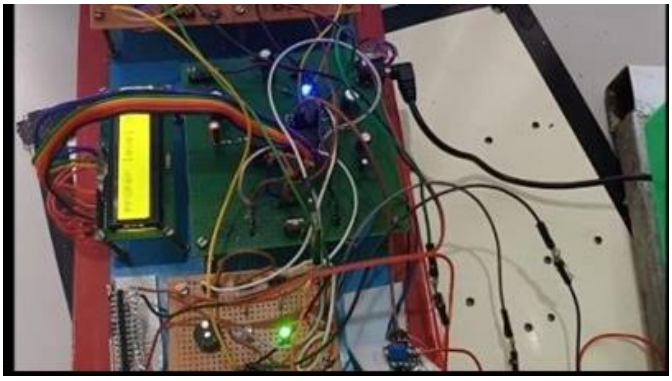


**Fig 8.** Proposed System

The Wi-Fi module is transfer the data to the connected device and it shows a threshold value and graphical representation of threshold levels and timings.

## V. CONCLUSION

This project describes the system in which the saline flow rate is automatically monitored using microcontroller. The results in the form of saline drop rate, number of drops coming from saline bottle, saline solution given to the patient and remaining time to empty the saline bottle with the help of serial port test software are wirelessly send to nurse's or doctor's computer and displayed. This system is cost effective, reliable, and useful for nurses. It can be re-claimed the next time with a different saline bottle. The rural hospitals make use of this system efficiently. It is mostly advantageous during night as there is no necessity for nurses toward go to patient's bed each time to check the level of saline in the bottle.

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# Detection of Sound and Direction of Arrival (DOA) To Assist Deaf And Dumb People By Converting Voice Data Into Text

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## ABSTRACT

The less-expensive, neck band wearable system is designed to help persons with hearing ailments by sensing alert sounds and analyzing the direction of arrival (DOA). The neck band kit contains two sound sensors which detect left 180 degree and right 180 degree. The prototype is composed of android app that will be connected to hardware kit through Bluetooth. Each sensor is connected to one of the analog inputs of the microcomputer. The power of the sensor signals is analyzed to detect alert sounds. Upon the detection of an alert sound, the user is notified about the detection of alert sound and it get shown on LCD screen. The developed smart application of android phones which can be connected to Bluetooth (HC-05), used to convert the voice data into text data and vice-versa by enhancing. A low cost programmed nano controller is used at the receiver to receive and display messages in the LCD display. The time required to sense and analyze the direction of an alert sound is around 35 msec.

**Keywords :** Nano controller, HC-025 Bluetooth, Smart app

## I. INTRODUCTION

Usually, deaf and dumb people have many complications in communication with other people. They are not involved with the social world because of their disabilities. They are treated in an unusual manner by the rest of the society. In 1960s and '70s, India have not even 10 schools for deaf and dumb in the whole country. Even though, there is no sufficient educational support for deaf and dumb children and adults, things are gradually improving. Nowadays, there are more number of deaf and dumb schools throughout the country with many places that have seen in the states of Tamil Nadu, Maharashtra, and Delhi. This prototype aids in their communication, in which the deaf people can be able to know others speech from text and they can also convey their message through texts which can be then converted into speech. All these functions are controlled and carried out by the use of nano controller. Neck Band consists of sound indication sensor, it indicates the persons and they need to connect with Bluetooth hardware, so the voice data gets converted to text data.

They can also communicate with others by the use of this system, there by the text data typed by them can be converted into voice data by using an android application.

## II. METHODS AND MATERIAL

### BLOCK DIAGRAM

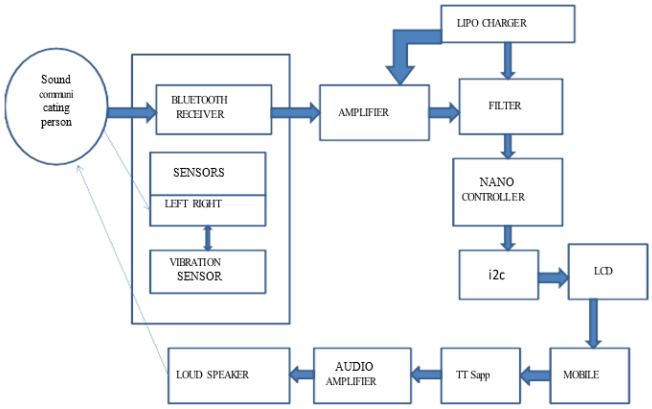


**Figure 1** Deaf and dumb system

The sound sensors are present in the left and right side of the neck band. It receives sound from the communicating person. The deaf and dumb people get indicated by the display LCD Screen (Side 1 or Side 2) to detect the direction of arrival of sound. The communicating person would connect to the system via Bluetooth HC-05 through the developed application and can send his/her voice. The received voice data is amplified and converted into text which is then sent to the nano controller in the system for processing. The controller then sends the signal to the LCD display which displays the converted text data that can read by the deaf and dumb person.

In response, the deaf and dumb person can also communicate with other person by texting in the developed application which can be then converted into speech.

The converted speech will be audible to the other person through the speaker which is connected to the mobile phone of the deaf dumb person. The nano controller performs the conversion process and it is responsible for the text display and in the LCD display. The deaf and dumb people convey their thoughts and messages through smart app.

### CIRCUIT DIAGRAM

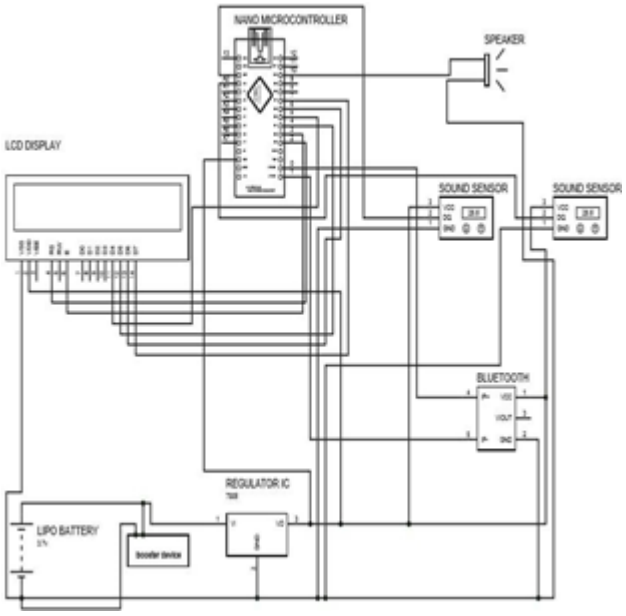


**Figure 2** Connection of components

The heart of the system is nano controller. It consists of 28 pins totally. Out of which, 2 pins are transmitter and receiver pin, 12 pins are digital pins and 6 pins are analog pins. Analog pins are to environmental sound changes and digital pins are to display digital data. The controller is connected to all the components in the system to perform control operations. Lipo battery is connected to the charging circuit for charging the battery. It is also connected to the booster which can boost upto 12V. Since the required voltage for all the components in the system is 5V, the booster is connected to the regulator IC (7805) which regulates the voltage into 5V and it consists of 3 pins such as input, output and ground pins. Here we are using analog sensors to sense the sound. The Bluetooth HC05 which consists of positive, ground, transmitter and receiver as 4 pins is used for the transfer of data/information wirelessly.

There are various kinds of embedded systems. Every system has some type of processor functioning in it, for example in mobile phones, washing machine etc.,

Embedded software is associated with each processor. The brain of embedded system is the processor and the soul of the system is the embedded software. The embedded software governs all the functions of embedded systems.

During early years, the programs were developed using assemblers and combined into the EPROMs using microprocessor. There was no mechanism to find what the program was running currently. To check the execution of the system, LED's, switches, etc., were used. After several years, the usage of microprocessor was replaced by C as the embedded programming language in embedded systems. Eventhough C is the most assemblers can also be used, but in order to increase high accuracy, embedded C was evolved. Kernighan and Ritchie developed the C language initially for fitting it into space 8K and for write(portable) UNIX OS. It can manipulate memory addresses. It allows the programmers to write compact codes, it will be redundant as the language of choice for hackers.

As assembly language programs are important to a processor, assembly language did not offer portability across systems. To overcome this, several high level languages, like C, have been developed. Some languages like PLM, Modula- 2, Pascal, etc. also developed but it couldn't find acceptance of world wide. Among those, C only got acceptance everywhere not only embedded systems, but also for desktop applications. Even though C have lost it as mainstream language for general purpose applications, it is still having a strong-hold in embedded programming.

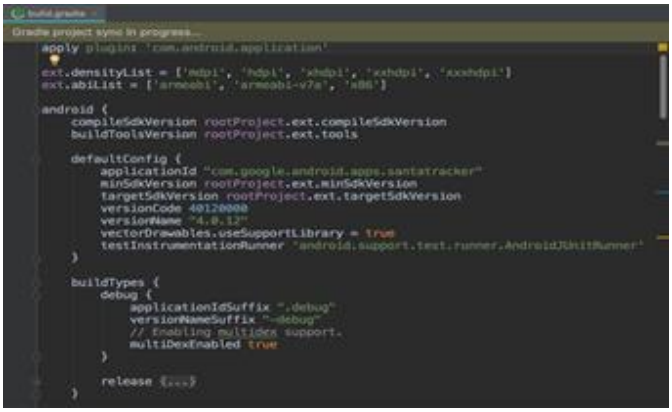


**Figure 3.** Coding in nanocontroller

Portability in systems is not possible in assembly language programs. To solve this, C language have introduced. PLM, Modula-2, Pascal, are the some other languages introduced, but that are not accepted by people. Among those languages, only C language got acceptance for desktop applications. C might have lost its mainstream language in general purpose applications; it plays a major role in embedded software.

## III. RESULTS AND DISCUSSIONS

In this paper, HC-05 Bluetooth and smart app has been implemented. By picking up voice signals, the nano controller performed the conversion process and displayed the data in the LCD display. Whenever the sensor receives the signal, it sends the response to the controller through Bluetooth. The controller processed the signal and displayed in LCD Display as sound sensed at sensor side 1 if it is from side 1 and as sound sensed at sensor side 2 if it is from side 2. Finally, the text typed in the smart app was converted into the voice signal and heard through the speaker which has been used.


**Figure 4.** Output display

## IV. CONCLUSION

The system aims to improve the communication between deaf people and normal world, as it facilitates two-way communications, text to speech and speech to text. This projected methodology interprets language into speech. This prototype overcomes the necessary difficulties of dumb people and greatly help them to improve their communication in a good manner. This system converts the language into text data that will be well explicable by them. Thus the DOA system plays a vital role in bridging communication gap among them.

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# Smart Incubator System for Baby Growth Monitoring

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## ABSTRACT

Significant progress in development of neonatal incubators are providing various advancement for baby monitoring. Babies in the gestation period of 32 to 37 weeks result in death due to lacking of essential care. However, the proposed device permits the early detection and consequent changes occurring in the neonates. Analysis of growth during the treatment period, detection of microbes in the incubator, humidity, temperature is done and measured parameters are stored in cloud. Immediate outputs are displayed in the LCD display itself. The proposed system assures the privacy of data.
Keywords : Microbial Detection, Growth Changes, Neonatal Monitoring, Cloud Storage, Data Privacy

## I. INTRODUCTION

Incubator is an apparatus used for monitoring and maintaining environmental conditions needed for a newborn baby who is unable to adapt the new environment immediately after delivery from the mother's womb. Normally incubators measure the weight, temperature and pressure levels present in the device. Normally, newborns are more prone to "Airborne Diseases" such as influenza, pertussis etc. The proposed smart incubator differs from the existing system by inclusion of micro dust sensor which detects and gives indications in case of dust particles entering the system and prevent the microorganisms to be transferred to babies. And using IoT data can be viewed and analysis can be made easily.

The proposed smart incubator we use sensors and the collected data will be stored in the online using cloud storage. The data obtained can be viewed using mobile phones and computers from places where we are and the actions can be taken. Incase of any problem with medical data and short circuit, and the alarm signals will be given to the cloud connected devices and mobile phones from the sensor.

## II. LITERATURE SURVEY

[1]Vetches Eng., Unnati Pensacon and Chan 'Start up incubators and the role of social capital',2005. The medical data can be viewed from mobile phones and computer systems from the place where they are and they can take actions. The design is based on Wi-Fi and infrared technologies that measure the essential parameters that must be controlled for pre mature babies. Variation occurred in this result immediately given alert message to given alert to the relevant hospital management and also the patient home.

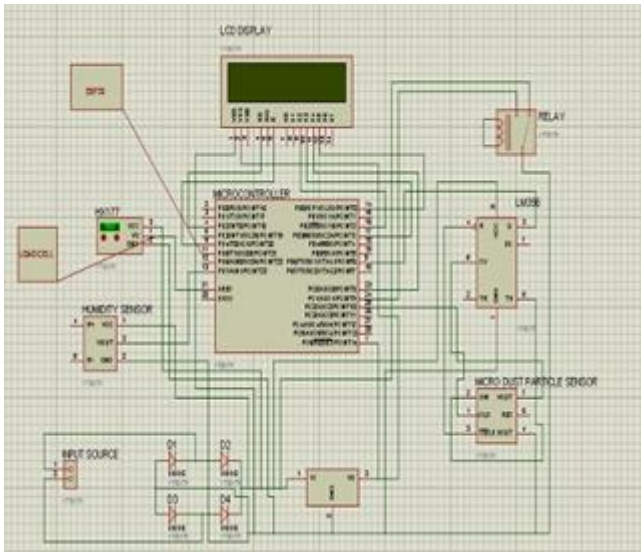
[2]Jignesh "Smart incubators Application using Arduino Controller",2009. An incubator is an apparatus used to monitor and maintain environmental conditions suitable for a newborn baby. It is used in preterm births or for some ill babies. The baby's health conditions are maintained properly. The incubator monitors oxygen supplementation and pressure levels. It also monitors temperature, radiation pulse activity and air humidity, gas around the environment.

[3]Dr.T.S.UdhayaSuriya "An Adaptive generalized predictive control for temperature and humidity inside an incubator",2015.

This smart incubator has developed an Adaptive decoupling strategy for controlling temperature and humidity inside a neonate incubator by using Adaptive noise cancellation technique. Several decoupling methods have been demonstrated but the RLS algorithm is more general and practical approach. It is capable of giving satisfactory performance than other systems by exploiting active humidification.

## III. METHODS AND MATERIAL

### CIRCUIT DIAGRAM

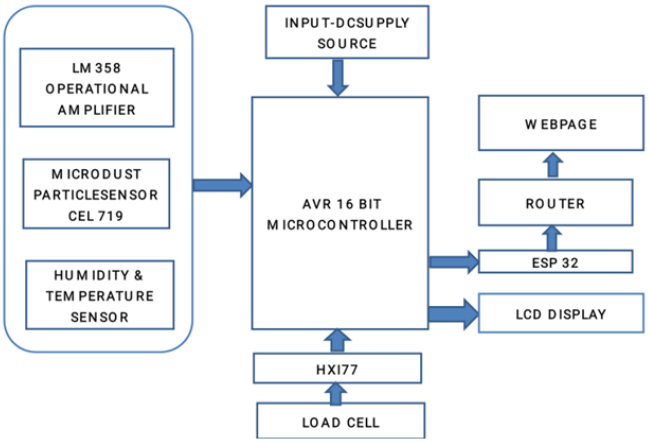


### SOFTWARE USED

For storing and analyzing of data, the software in our system are as follows

A.AVR STUDIO
a. AVR studio
b. Cloud computing

A. BLOCKDIAGRAM




B. BLOCK DIAGRAM DESCRIPTION

The block diagram for our proposed system is Shown in the fig-3.1. The proposed smart incubator uses the 16-bit microcontroller for processing the data. LM 358 is programmed to give two outputs from the device. DHT 11 sensor measure the incubator temperature and humidity. HX177 measure the baby weight and converts it into electrical signal. CEL 712 detects the microorganisms inside the device and gives indications using the buzzer circuit. The data is stored in cloud account of a user and data is sent to the signed user, when the AVR microcontroller is connected to the Wi-Fi network. The values can be checked for every second. It will give accurate values and that will be synced for every second. The data stored can be used as reference in future.

AVR Studio is a specially designed software for AVR microcontroller. It was developed Atmel studios. It is

embedded c program used for software applications. It is used for writing and debugging in integrated computers.

B. CLOUD COMPUTING

By means of using cloud storage we can store data in large numbers over online. Cloud computing allows us to analyse the previous and present medical data. By using this we are able to find out whether the baby have gained weight by using incubator. It allows doctors and nurses to get the medical data from the connected devices. Immediate alarms will also be given to the users by means of cloud and mobile phones in case of emergencies.

## IV. RESULTS

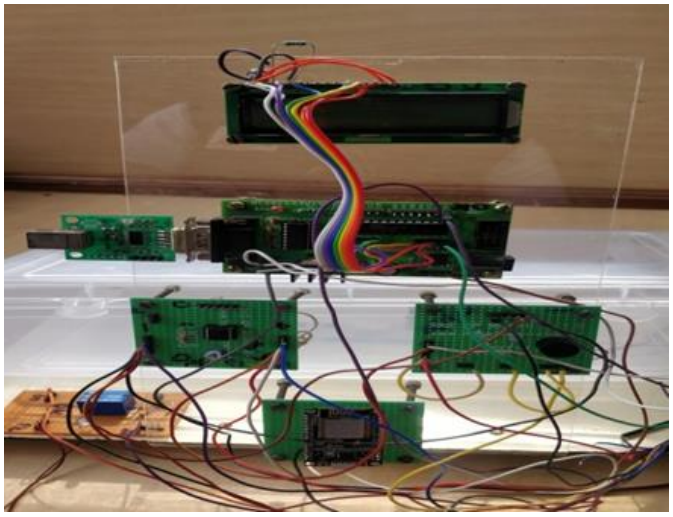


**Fig** Smart Incubator

In this project, by, using the CEL719,HX177,DHT11 we can detect the micro dust, weight ,humidity and temperature that can be stored in webpage using ESP32(Wi-Fi module)in order to make reference for future use.

## V. CONCLUSION

In hospitals after detecting the microbes from the device we can apply UV rays to destroy the pathogens. Immediate and accurate values are obtained. It also provides great secrecy of medical data. Proposed smart incubator will have a huge impact in medical society and allows to maintain the babies in proper conditions under the supervisions of doctors and nurses.

Arduino

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Organised by Department of Biomedical Engineering,
Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India


# Child Diaper Wet Detector Using Wireless System

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## ABSTRACT

In humans, Urinary tract infection (UTI) is a commonly found infection. UTI is easily treatable using antibiotics if identified in early stage. However, if it is not identified in early stages, UTI becomes a serious complication in elder patients, in particular, those suffering from neurodegenerative diseases. UTIleads to serious diseases in neonates because it leads to difficulty in describing their symptoms. In this project, we present a diaper-embedded wireless system. UTI at an early detection is possible by using an autonomous UTI monitoring sensor module with minimal effort. The sensor module consists of a wet sensor, smell sensor, a Bluetooth low energy module used for wireless transmission, a low-power sensor interface utilizing pulse width modulation and a boost dc– dc converter. Better results are produced experimentally when compared to conventional dipstick testing. By pressing the studs, detector unit is decoupled from the diaper and the soiled diaper is discarded. Our experimental setup show that the designed system perfectly produces the intended buzzer and light indication.

**Keywords :** Wet sensor, UTI monitoring sensor, Bluetooth low energy module for wireless transmission

## I. INTRODUCTION

In the past few decades, females are well employed in industrialized nations has greatly increased in present society. Subsequently, infant care has become a challenge to many families in their every possible cause of the baby. Nappies were excellent invention, controlling infants waste in a clean and healthy way daily life. Mother is always worrying about the well-being of her baby. As we can notice today that every parents of an infant are either employed or working in house so they have less or no time to look after their baby. Our system is smart enough to detect There are several types of diaper such as disposable diapers and cloth. As of now our smart system mainly targets two applications oriented. Primarily checks the diaper condition of the baby. Secondary gives the status of the baby's location. Our system is designed with stable output and no harmful components have been used in the process and design. There will be no effect on the baby in any case from our proposed system. Our system will generate output from the sensors. This project also uses sensors like wet sensor to detect moisture content and indicates whether the baby has passed urine or not. All the sensor outputs are sent to controller and the response is processed and sent to parents through wireless network platform.

## II. METHODS AND MATERIAL

BLOCK DIAGRAM

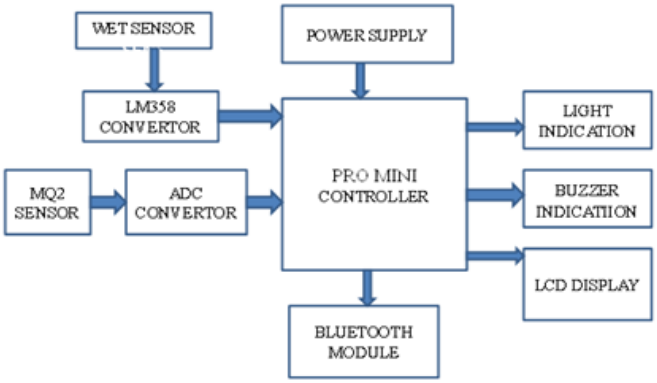


**Figure 1.** Block Diagram of wet detector

The block diagram consists of Pro mini controller, Power Supply, wet sensor, smell sensor (MQ2 Sensor), Bluetooth module, light, buzzer, ADC convertor and LM358 Convertor. The Wet sensor detects the wet in the diaper and then send the signal to the LM358 which reduces noise and fluctuation and then to the pro mini microcontroller. Likewise, theMQ2 sensor senses the smell of the baby's faces. Smell sensor is otherwise called as MQ2 sensor. The analogy signal from the MQ2 sensors converted into digital signal by using ADC convertor. The acquired output signal is fed to the pro mini microcontroller and then displays the output in the LCD screen. Diaper condition of the baby will also indicate by Light and Buzzer. Bluetooth modules sends the low energy output signal to the paired mobile to alert the mother via SMS to clean diaper. If the baby is out of mother's vision, the Bluetooth module indicates that the "baby is away" to paired mobile.

CIRCUIT DIAGRAM

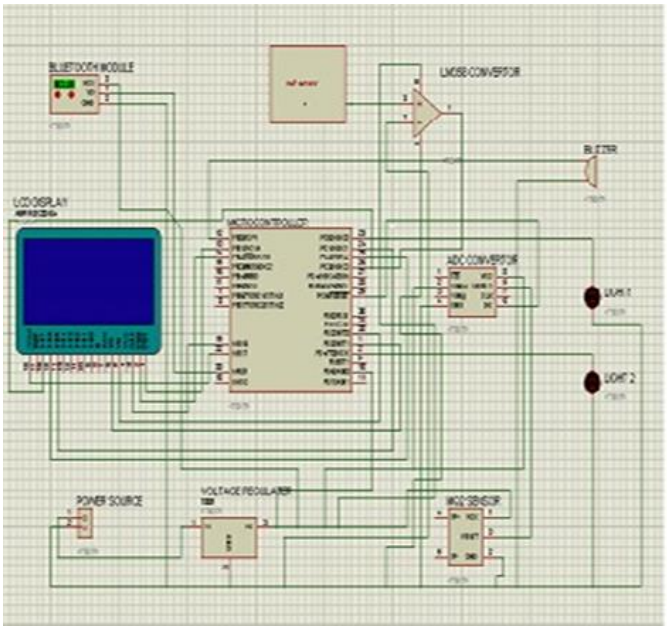

**Figure 2.** Circuit Diagram

The circuit diagram describes that pro mini Microcontroller has 32 pins i.e. (A0-A7)8 analog pins and (D0-D13)14 digital pins. In these 14 digital pins 0's and 1's are transmitter and receiver respectively. LCD Display has 16 pins. It is the output device. Second pin of the microcontroller is connected to the register select of the Liquid Crystal Display. Enable pin is connected to the third pin of the microcontroller. There are 8 digital pins in the LCD and out of these 8 pins any 4 pins are connected to the any 4 digital pins of the microcontroller. LED+ is connected to the VCC of the LCD and LED- is connected to the ground of the LCD. Bluetooth (HC05) has four pins. They are VCC, GND, transmitter and receiver. The transmitter (0) and receiver (1) pins of the microcontroller is given to the transmitter and receiver pins of the Bluetooth module respectively. The output signal from the wet sensor is fed to the LM358 convertor and the output signal from the LM358 convertor is then connected to the digital pin of the microcontroller. MQ2 sensor (smell sensor) is connected to the ADC convertor. Voltage

regulator is used to the regulates the voltage i.e. 3.3v and 5v based on the version of the board. In this circuit we need 12v so we use booster to boost the voltage from 5v to 12v.

## III. RESULTS AND DISCUSSION

In this method has digital wet detector sensor circuit detects the status of the diaper such as if the diaper is wet sent signal to LM358 convertor and signal transfer to Pro mini microcontroller. After that Bluetooth module sent the warning signal to the pair smart phone. MQ2 sensor is used for smell detection.MQ2 sensor has analog signal that is send to the ADC and transfer to the Pro mini microcontroller. The smart phone receiver and starts alarming sound using buzzer indicator as well as light indication. As this part consists of very small component as in it can be fabricated into smaller chip, to ensure diaper wearers comfortable and safety. The cost of the diaper is low, easy towear and compact. It should provide comparatively large detection range.

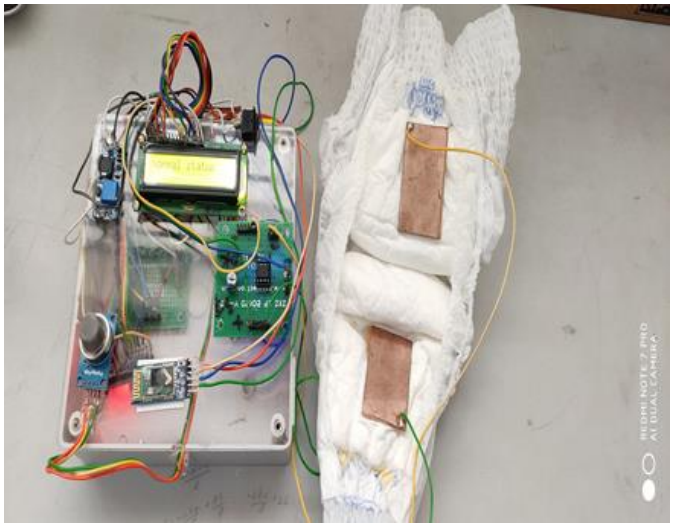

**Figure 3.** Child Diaper Wet Detector using wireless system

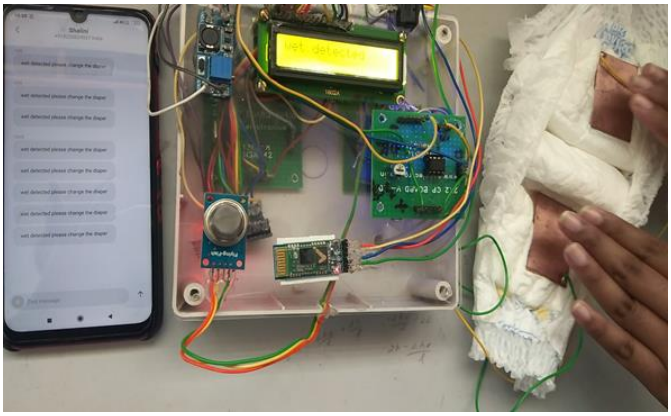

**Figure 4.** Wet Detected Display

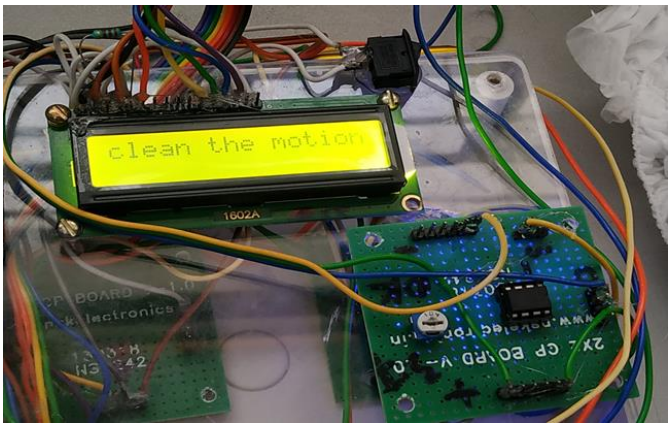


**Figure 5.** Motion Detected Display

## IV. CONCLUSION

Using this system, we can generally monitor the baby in real time environment and it can also be very much effective in the absence of the baby's mother. Our proposed system does not emit any type of harmful radiation that can affect the baby in any direct or indirect way. Our project focus on advanced baby care method. All the data are continuously monitored and sent to parents in case of any issue or bad situation. Bluetooth module works perfectly in sending notifications to the parents.

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Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India
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# Asthma Assessment by Using Sternocleidomastoid Muscle Contraction

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## ABSTRACT

Both exteriority of the neck is paired with the muscle called Sternocleidomastoid Muscle (SCM). The SCM muscle is attachment of inhalation. During asthma the SCM muscle contraction is abnormal. Monitoring of SCM muscle contraction has more importance in asthma assessment. We develop a wearable monitoring system based on an accelerometer sensor. Sensor detects the SCM muscle contraction in the form of analog signal and the signal is given to the input of the microcontroller and then output will be displayed by LCD display.

**Keywords** - Sternocleidomastoid muscle, Asthma, PIC microcontroller, Power supply.

## I. INTRODUCTION

Asthma is an provocative lung disease, which causes due to abnormal breathing, cold, wheezing, etc. The frequency and meticulous of the disease based on age group. In recent days most doctors prefers diagnose and monitoring of severe symptoms via spirometry and PEF tests. While performing these two measurements require continuous observation. This drawback is overcome by using this monitoring device. The SCM muscle starts with temporal bone at the cranial base and end in between the manubrium and inner portion of the clavicle. The SCM acts as unilaterally, causes lateral flexion, that rotates head to the conflicting side. In bilateral, elevation of the head, that support inspiration.

## II. METHODS AND MATERIAL

BLOCK DIAGRAM

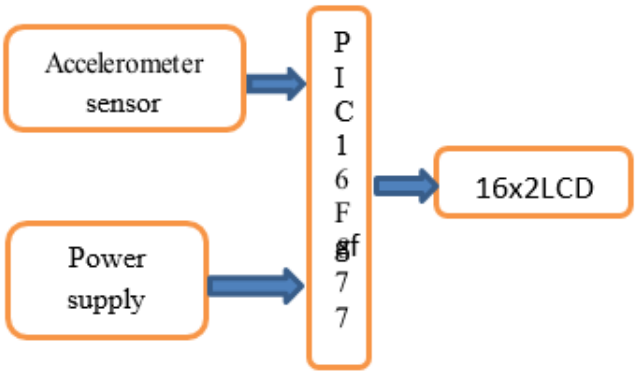


**Fig. 1** Block Diagram

CIRCUIT DIAGRAM

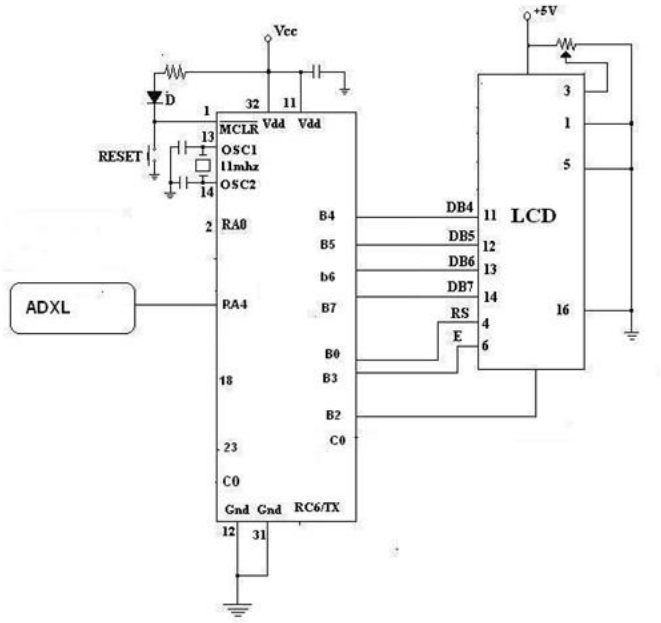


**Fig. 2** Circuit Diagram

POWER SUPPLY

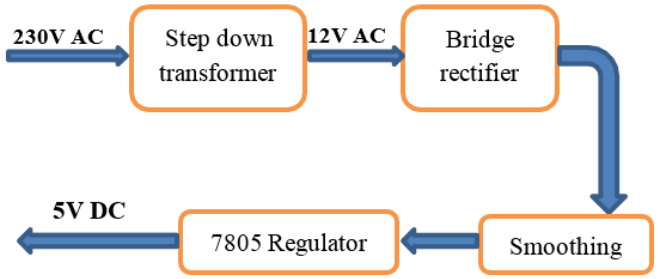


**Fig. 3** Power Supply

In this circuit we need 5V DC supply, so we can convert 230V AC to 5V DC by using transformer, rectifier, smoothing and regulator. Here, first we can reduce the voltage by the help of step-down transformer. It converts 230V AC into 12V AC. Then the output of the transformer is fed to the rectifier called as Bridge Rectifier, it converts 12V AC into 12V DC. Smoothing process wanted to make less ripple or noise and to increases the capacitance .Here, 470 micro farad filter capacitor is used for smoothing process. Then, the output of the capacitor is given to the 7805 regulator, it converts the current from 12V DC to 5V DC.

## III. RESULTS AND DISCUSSION

**Fig.4** Result (Model)

By using PIC16F877 microcontroller helps to find out the asthma intensity. It displayed throughout the LCD display. It requires low power.

## IV. CONCLUSION

From this work we develop a vesture monitoring system for asthma detection. It is a patient free device and takes less expensive.

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Journal URL : http://ijsrst.com/EBHBM014

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Adhiyamaan College of Engineering, Hosur, Tamil Nadu, India


# Design and Implementation of Prototype Helmet Model to Detect and Monitor Concussion

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## ABSTRACT

Concussion alters the brain functionality when occurred for a greater number of iterations in accidents. It happens when a sudden blow is introduced to the head during a fall, hit or could be worse in case of accidents. In this project, we design a prototype model helmet, to measure the impact of a hit when a player, a biker and a construction site labor's head comes across a hit. The impact sensor measures the intensity of the hit and gives an output in terms of "Gravity (g)" force based on the threshold set. The measured "Gravity (g)" will help for further diagnosis of the patient. This diagnosis helps in the situation where a person cannot move his body and is in critical condition. The advanced Micro controller gets data from sensor its resolution is 1024 sample data. This project detects neck injuries also from flex sensor. The process is also automated to indicate the information to guide people.

**Keywords :** Helmet, Concussion, Threshold Values.

## I. INTRODUCTION

When head is injured continuously the disease may cause is known as concussion. Symptoms may include loss of conscious, depression, head ache. Concussion also known as mild brain injury it affects brain function when continuous hit occurs. Concussion is cured by continuous care on the patient. This problem may also lead to brain cancer. It also occurs during sports injuries, accidents, or when the brain receives a hit. This concussion may be caused by impact forces, in which head strikes or is struck by something, in which the head moves without any preventive measures. Concussion is prevented by using helmet during playing, driving and working in construction site. Repeated head injury may also increase risk that leads to Parkinson's disease. To avoid these problems, use helmet during sports, driving which helps to protect the injury occurs to the brain. Sensors are used to detect the pressure occurred in the head. There are many different types of injury occurs in head but this concussion will be more harmful than others. Because it leads to coma in future if the person does not care about the head pain. In this proposed system, a helmet type model is designed to help the patient by detecting the injury for the treatment and to indicate the doctors, the occurred injury is major or minor. Buzzer is used to give the alarm sound to indicate the person wearing helmet or not.

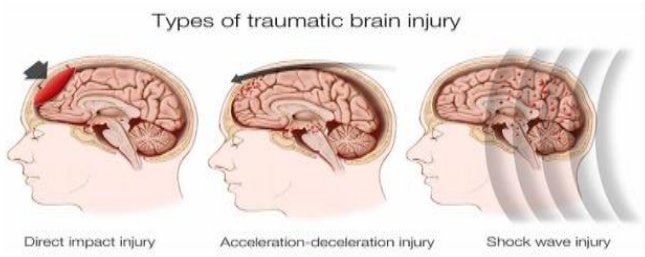


**Fig.1** Types of Traumatic Brain Injury

## II. METHODS AND MATERIAL

BLOCK DIAGRAM

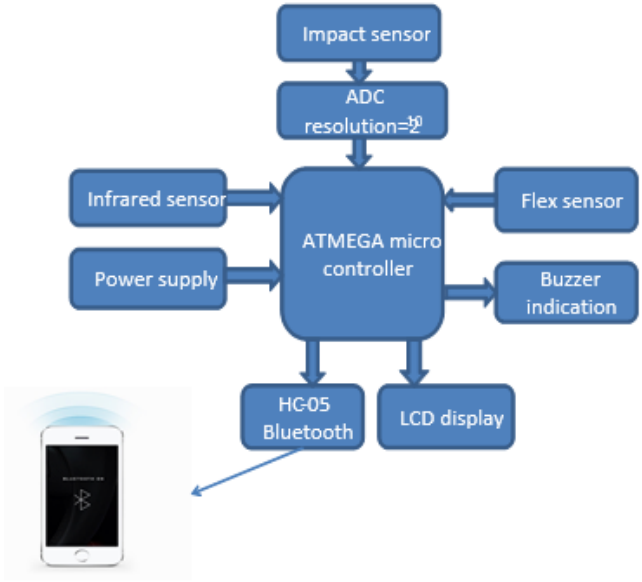


**Fig.2** Block Diagram for Concussion Detection using Helmet

BLOCK DIAGRAM DESCRIPTION

Piezoelectric sensor is placed on the helmet, to detect the pressure applied over the head. IR sensor is connected inside it to detect the patient wearing helmet and to give indications through the buffer. The pressure given on the head is received by the piezoelectric sensor and gives it to the ATMEGHA Microcontroller. The ADC resolution is inbuilt within the microcontroller to convert binary values to digital values. The output values given to the LCD display and transfer to the Android Application by Bluetooth. The Flex sensor also used to detect the neck injury. The output values will be changed depends on the force given by the user. It also indicates the injury becomes major or minor based on the threshold values.

CIRCUIT DIAGRAM

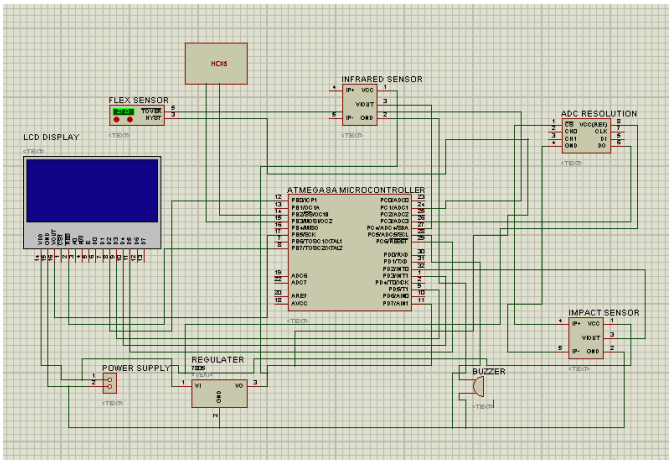


**Fig. 3** Circuit Diagram

CIRCUIT DIAGRAM DESCRIPTION

Power supply connected to the regulator to control the input power. The input power range is about 0-2 voltage, this current flows to the regulator to reduce the Voltage required to operating the circuit. This input is given to the ATMEGHA microcontroller by connecting it to the 11th pin. Regulator and power supply connected to the ground of impact sensor. The output of the impact sensor connected to the pin1 of ATMEGHA microcontroller. The impact pin 4 and 5 is connected to the ADC resolution. VCC is connected to the power supply. VCC of IR sensor connected to microcontroller and regulator. Then ground is connected to the buzzer for indication. Flex sensor is connected to the 5th pin of IR sensor. This also connected to the Buzzer for indication. The value from the ATMEGHA microcontroller is displayed on the LCD. Here VDD and ground are connected to the

power supply other pins connected to the microcontroller. The values are stored to the mobiles via the Bluetooth.

## III. RESULTS AND DISCUSSION

When the power supply is given to the circuit. IR sensor is used to indicate about the helmet and it is done by blowing red light. Then the force is applied on the piezo electric sensor it gives the value and also it indicates the injury is mild or major. The flex sensor also indicates if any neck injury occurred and gives the value based on pressure applied on the neck.The output values displayed in the mobile phone by turn on the bluetooth. Based on the values which is displayed in the Mobile phone is helpful in diagnosing and for the treatment.

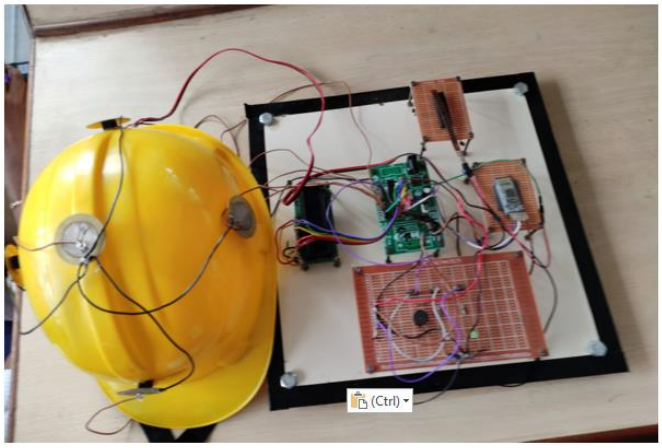

Fig.4 Result

## IV. CONCLUSION

The Values obtained by using the impact sensor gives the injury is mild or major for the diagnosis and the treatment of patient. This helmet is used in construction site for labors, players. This helmet gives the value based on the impact occurred and that value detects the impact of injury. The main use of this helmet is to avoid taking x-ray. Because continuous falling of radiation causes cancer to the patient. There is limited way to diagnose concussion so this helps to detect head injury immediately after the hit occurs.

## V. FUTURE SCOPE

This Helmet has a wide scope of development. In near future this helmet is mainly used in sports, Construction site labors, and also in normal helmets. It indicates the injury occur is mild or major. It gives the information directly to the person or guide or to the doctor. And also indicate the place of injury occurs to the patient.

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# Smart Glove

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## ABSTRACT

The Smart Glove is a feedback system designed for upper extremity rehabilitation after stroke. It includes a glove shaped exoskeleton as sensory hardware device and a software application. The sensor device tracks the movement and position of the user's distal limb and recognizes functional gesture, such as forearm pronation /supination, wrist flexion/extension, radial/ ulnar deviation, and finger flexion/extension. An accelerometer sensor in the device measures the 3-dimensional orientation of the hand, and 5 flex sensors estimate the angle of motion of the fingers. The acquired sensing data is transmitted and received via USB portal connected to the computer. According to the movement of the hand the data are sensed and transmitted to the software application which changes the visuals of the game. In addition, this device can analyze the active and passive range of motion for each functional gesture.

**Keywords :** Rehabilitation, Range of motion, visual feedback, Gaming, Exercise

## I. INTRODUCTION

Stroke accounts for high rates of mortality and disability. It imposes great Physical burden and mental stress on the affected subjects, their family and the society at large. Motor impairments after stroke mainly involve hemiplegic or hemiparesis in the upper and lower limbs. The recovery of the motor impairments is not consistent and does not follow a fixed pattern but it can be improved by repeating the motion of the affected area. Proper intensity of this movement repetition can retrieve the functioning of the impaired part. The therapy can be improved by assistive devices that can ease the recovery by repeating exercises bot at home and clinic. This thesis aims to develop a Smart Glove and a software that can retrieve the motor movements of the upper extremity by visual feedback to the patient on hand movements (wrist and finger gestures) performed during treatment. The design implements resistive flex sensors for detecting the extensions and scan the information using the Arduino Uno mounted on the wrist.

## II. METHODS AND MATERIAL

### BACKGROUND

The proper functional movements of the upper extremity are very much of importance since for leading a normal life involves the functioning of this part, but retrieving the functioning of this part is of much difficulty for the stroke survivors. The fingers

and wrist joint involves the most number of joints in the motor impairments of the stroke patients hence it took a long period and continuous repetition of exercises to regain the function. About half of the stroke survivors leads the life with impaired hand. Since it is the last part to recover after stroke the stroke patients often lose hope to continue exercises.

The function of upper extremity is very much essential for doing daily activities such as writing, eating, lifting objects, and it is also involved in doing most personal activities of daily living so it is of primary importance to enhance the upper limb functionality

## DESIGN OF GLOVE

The sensory device is a glove that is made of plastic on to which the sensors are placed. The glove is made of plastic to overcome the spasticity of the hand. Spasticity refers to the condition in which the muscles tend to contract continuously causing stiffness and restiveness to the movements of the muscles that is the result of the loss of control of the brain over the motor nerves in the hand due to stroke. The stroke patients also suffer from edema resulting after the hemiparesis which is swelling of the extremity due to fluid collection. This is result of improper fluid motion caused by nerve damage. This is often associated with pain stiffness and weak extremity in stroke patients. The plastic frame of the gloves provides support for extension of the muscles and positions the hand and wrist correctly. It provides support and protection for the swollen or weak joints in hand. This acts as splint and keeps the wrist in neutral position to eliminate muscle contracture and increases extensibility of the wrist and fingers.

## BLOCK DIAGRAM DESCRIPTION

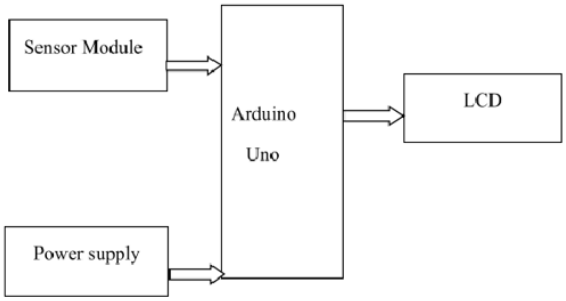


**Fig 1.** Block Diagram of Sensing Glove

Sensors are used for sensing each movement of hand during motion. Intended movements as follows:

- forearm pronation/ supination
- wrist flexion/extension,
- finger flexion / extension

The sensory module is fixed to the glove. The sensors used for recognizing the movements are the Bending sensors and the accelerometer. Bending sensors are used for sensing the vertical motion of the fingers and the accelerometer is used for sensing the orientation of the hand. the microcontroller board Arduino Uno is used for gathering the data from the sensory module process and transfer it to computer software. In addition, a voltage regulator is used to get a constant voltage of 5V. The power supply acquired from the computer to which the glove is connected for running software application.

## CIRCUIT DIAGRAM DESCRIPTION

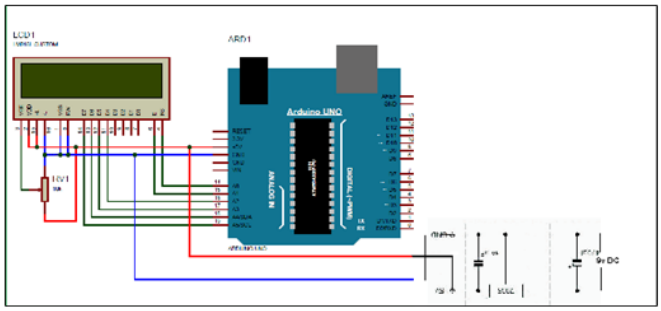

**Fig 2.** Circuit Diagram

Microcontroller

The Arduino Uno is the heart of the device. It used as a platform for creating the smart gloves. It consists of 14 digital input/output, 6 analog inputs pins for interfacing the board with various hardware of the glove and software gaming programs. The inputs are acquired from the various sensors connected to the microcontroller and the output of the board gives the compatible signal for running the software. Thus microcontroller board helps in the interfacing of the hardware and the software. The Arduino Uno is a microcontroller board based on ATmega328 microcontroller. It has Integrated Development Environment for programming software in computer. Both the power supply connection and data transmission can be done via the type 2 USB cable. Ceramic resonator in the board is the source of 16MHz Clock signal. It also contains an ICSP header which provides In-Circuit Serial Programming. The Atmega16U2 microcontroller present in the Arduino Uno acts as a USB-to-serial converter for speed transmission of data for visual feedback.

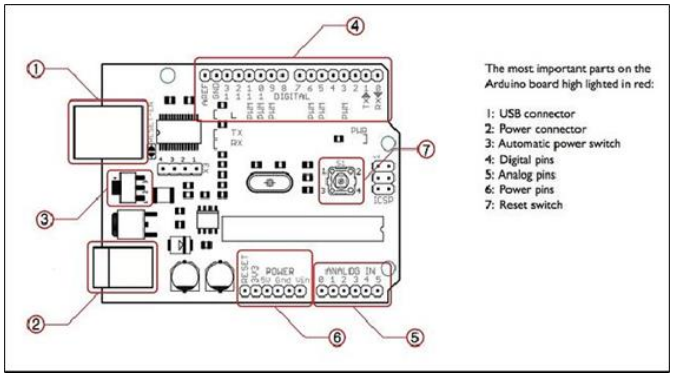


**Fig 3**. Pin Diagram of Arduino Uno

Voltage regulator

The LM7805 monolithic is a 3-terminal positive voltage regulators. It is used to get constant voltage. Regulator is used for stabilizing the voltage utilized by the processor and other modules of the system. It looks like a transistor and it contains three terminals, one input and one output and ground. Depends on the output voltage we choose regulators. The output required in this device is 5V, so 7805-5V regulator is used.

Bending sensor

Bending sensor or flex sensor is used for measuring the bending angle of the fingers. This sensor is basically a thin conducting layer whose resistance changes with change in dimensions of the conductive layer. Hence it can be called as variable resistor. It is applied on the device based on the principle that whenever the finger is bent the sensor is flexed, this decreases the width and increases the length of the sensor, thus the resistance increases. This change in resistance is measured and transmitted to device for predicting the movement of fingers.

Accelerometer

Accelerator is a device used to detect the orientation of the hand and to sense the movement. It basically measures the acceleration exerted upon the sensor. Acceleration is the measurement of the change in velocity, or speed divided by time. It is utilized for axis- based motion sensing of the glove.

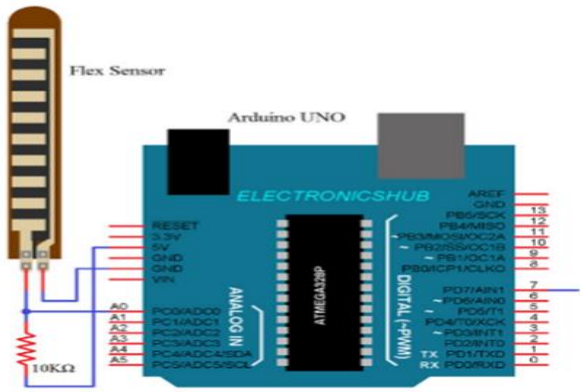


**Fig 4.** Circuit Diagram of Flex Sensor with Arduino Uno

Display

LCD display is used temporarily to display the data sensed by the sensor, it will be removed on further development of the device in which glove will be interfaced with the software.

SOFTWARE

Game is developed in which the user has to finish the task for continuous repetition of motion. Each game involves the task for the specific rehabilitation exercise movement. By successfully performing in each level the user can increase the repetition and range of motion of particular movement.

The orientation and motion of the hand is updated at immediately forming a visual feedback system. The performance of the user is determined based on the range of motion but it can also be determined by the speed of motion for some tasks. Based on adequate repetition of a movement and on the performance the difficulty level is increased. The motion of each joint is analyzed. The improvement and the percentage of motor function recovered is shown at each level. This helps the user to see the progress visually and continue gaming.

## III.RESULTS AND DISCUSSION

The sensors are interfaced with the microcontroller. The wrist and finger extension and flexion are sensed. During the hand movement, the data from the sensor is displayed on LCD. The smart glove and PC software have to be designed further.

## IV.CONCLUSION

Smart glove can bring rehabilitation to home in a comfortable environment and at low cost. It is novel rehabilitation device that helps to increase the repetition of the exercise movements of the upper extremity to improve the functioning of the wrist and fingers. It will be great solution after stroke to help stroke patients to stay motivated by engaging exercises in fun games. It can be used as a home rehabilitation device. It eliminates the stiffness of the hand and increases the functional capability.

## V. FUTURE SCOPE

Future scope of this work can be the further effective rehabilitation by creating more effective exercises, more accurate data analysis on movement and designing even more interesting games.

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# Smart Inhaler System Based on GSM Communication System

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## ABSTRACT

The acquisition of accurate and effective feedback from patients on routine adherence becomes difficult when treating asthma and chronic obstructive pulmonary disorders (COPD). The current methods followed like the face-to-face and oral reporting methods are not satisfactory. A handy electronic device that is attached to the inhaler uses a flow measure and contact sensors to detect users' buffer count, calculate and an embedded digital pro mini microcontroller to capture while the inhaler is in use. The activity, air pressure and corresponding volatile gases around the asthmatics is monitored using a hardware module included in the developed system. The radio frequency device consists of a transmitter and receiver. Here transmitter send the signal to receiver transfer data from the hardware are sent to the patient's doctor by a GSM module. The doctor examines the sensed values and desired action is performed on the asthmatic's treatment and medications. The established system is reliable, cost efficient and easy to use device which aids in finding out the asthma symptoms exhibited by the asthmatics.

**Keywords :** Buffer count, signal transmission, GSM communication.

## I. INTRODUCTION

The acquisition of accurate and effective feedback from patients on routine adherence becomes difficult when treating asthma and chronic obstructive pulmonary disorders (COPD). The current methods followed like the face-to-face and oral reporting methods are not satisfactory. A portable electronic device that attaches to the inhaler uses an buff flow measure and contact sensors to detect users' buff count calculate and an embedded digital pro mini microcontroller to capture while the inhaler is in use. The developed system inbuilt with a hardware module which monitors the air pressure, activity and amount of volatile gases surrounding the asthmatics. The radio frequency device has transmitter and receiver. Here transmitter send the signal to receiver transfer data from the hardware are sent to the patient's doctor by a GSM module. The sensed values allow the doctors to take necessary actions. The developed system is reliable, cost efficient and comfortable nature allows to find out the asthma symptoms in asthmatics.

In this project, to measure the rates of accurate inhaler use, the system is designed to monitor daily inhaler use and analyze the collected data. It provides valuations that show whether patients are in compliance with the usage as per the recommendations. Proposed system has contact sensors to detect users' buffer count calculate and an embedded digital pro mini microcontroller to capture

while the inhaler is in use. If dose is over taken without knowledge of doctors, controller detects its buffer count and RF transmitter transfer the signal to RF receiver if emergency means communicate to doctors and relations through sms notification.

## II. METHODS AND MATERIAL

BLOCK DIAGRAM

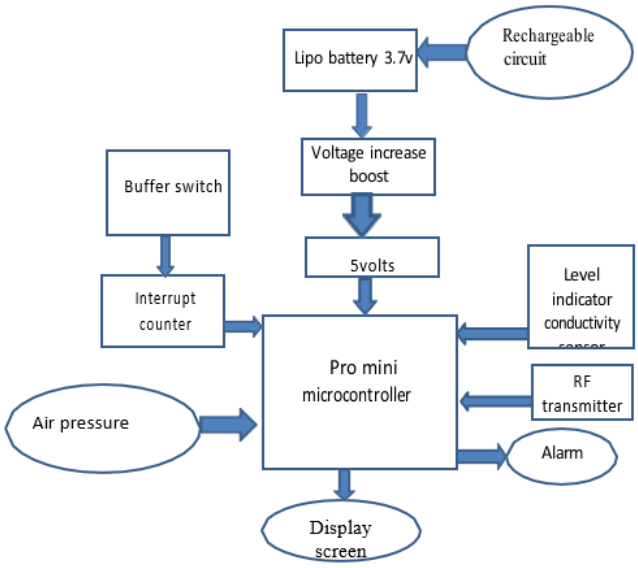


**Figure.1** Transmitter Unit

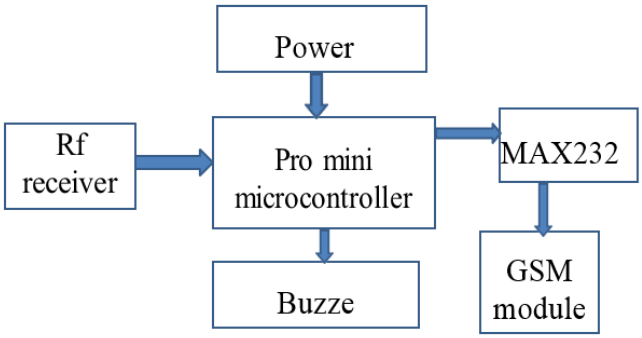


**Figure.2** Receiver Unit

The asthmatic patients are generally advised to use inhalers to overcome the problems like breathlessness and wheezing. The smart inhalers also assist in an enhanced way of inhaling medication with alert signals. When the patient is suddenly short of breath, he/she is advised to use an inhaler.

The patient places his/her fingertip on the buffer switch which calculates the number of times the medication is entering through the airways. The LCD display is set to display the number of counts, the charge in the system is indicated. The pressure of the medication is also indicated on the display. The maximum limit of the counts will be preset in the system. If the count outdoes the preset value, an alarm signal indicates caution. The buzzer attached to the system produces an alerting sound. While charging, an LED light glows and another LED light is the one showing the alarm signal.

The conductivity sensor indicates the decreasing levels of medicine in the inhaler. The charge in the system is provided by a 3.7 Volts Lipo battery which is further boosted up by a voltage booster. A USB port allows the charging of the system. The signals from the system are picked up the RF transmitter. These are the elements of the first part of the project.

The signals from the transmitter end are collected by the receiver. It is then send to the microcontroller to process the fetched signal. A GSM module is attached to this part which helps in transmitting the messages. A sim card placed in it has certain important contacts like those of the doctor the patient usually consults and close family members. Any chances of over dosage will be immediately informed to those members. At the same time, the patient will also be alerted that the dosage levels taken has increased. Buzzers placed on both the transceiver parts gives alert signals.

The previous usage results will be stored in the system itself so that it can be viewed by the doctor when the patient visits the doctor the next time.

If the doctor finds improvements in the patients' health condition, then the buff count can be reduced.

The system is liable to changes and the preset number of counts can be altered.

CIRCUIT DIAGRAM

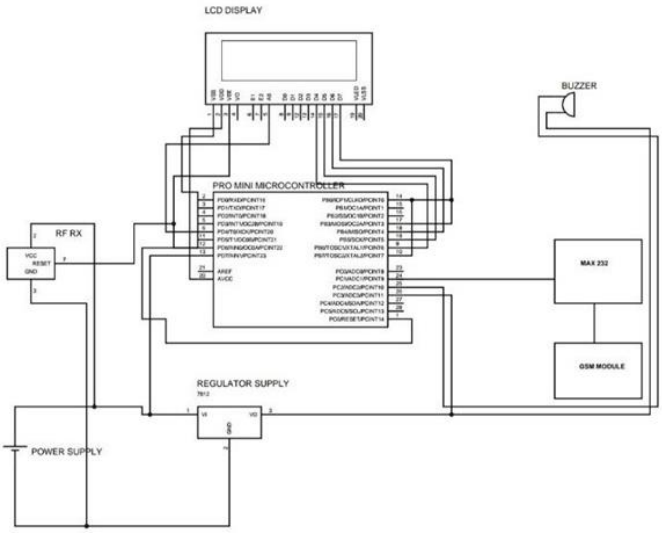


**Figure. 3** Circuit for Transmitter

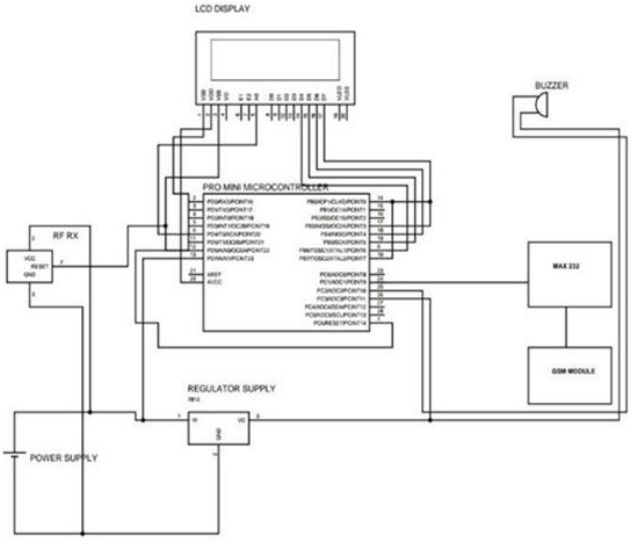


**Figure. 4** Circuit for Receiver

## III. SIMULATION RESULT

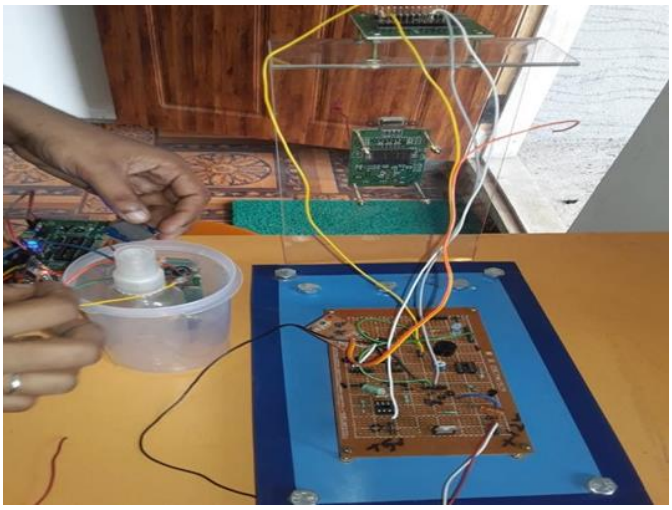

**Figure. 5** Working of the Smart Inhaler

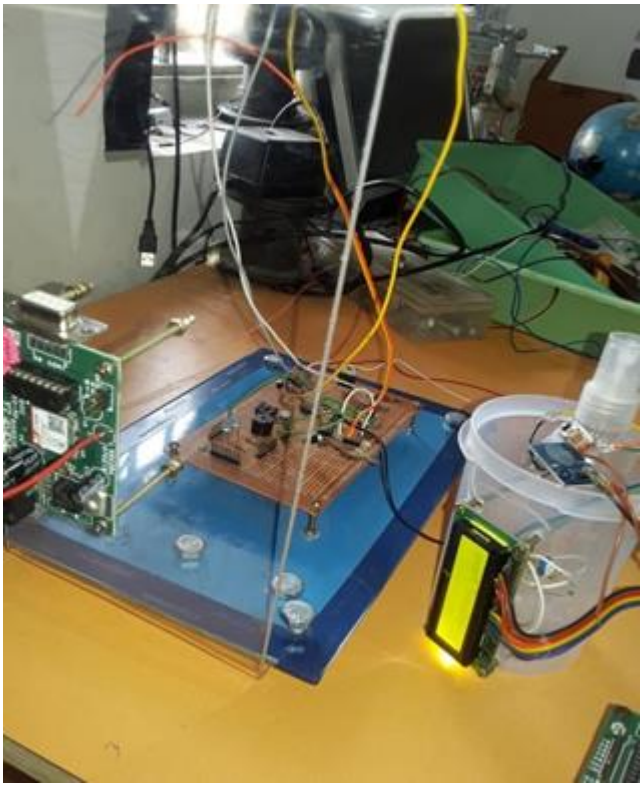

**Figure. 6** Entire View of the System

## IV. CONCLUSION

The use of smart inhalers will enhance the treatment methodologies of the patients. It supports the issues arising between the patients and clinicians. The patients using these inhalers will be conscious about

the consequences and will be able to manage the situation. It has increased the patient participation and cooperation toward the treatment. This system will have a better impact on the life of the patients and will help them overcome their difficulties by themselves.

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# Wireless Brain Implant

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## ABSTRACT

The wireless brain implant project aims at developing and embedding into the head, a three-dimensional intracortical electrode array with all electronics required for signal acquisition, processing, and wireless communication.

**Keywords :** Brain-machine interfaces, Brain Implant

## I. INTRODUCTION

People with locked-in syndrome, a condition where a healthy mind is unable to express itself due to brain damage, are slowly being opened up through direct contact with their motor neurons in the brain.The electrodes were designed to measure activity in the speech centers of the brain through implanted electrodes. These electrodes can then relay the information to a sub-dermal amplifier and then to a computer via wireless FM transmission. Through this system a patient has demonstrated the ability to form rudimentary vowel sounds on a synthesizer using just his thoughts.

## II. II.SPEECH MECHANISM

Electrodes on the brain have been used to translate brainwaves into words spoken by a computer – which could be useful in the future to help people who have lost the ability to speak.

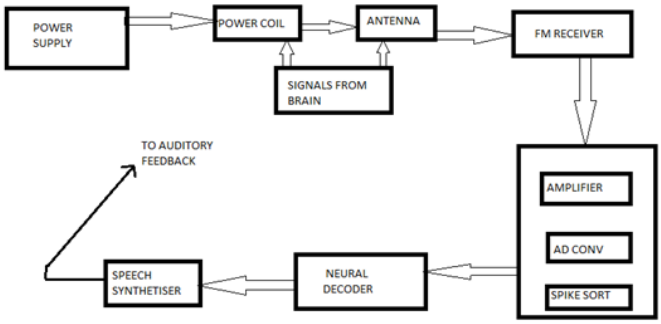
When you speak, your brain sends signals from the motor cortex to the muscles in your jaw, lips and larynx to coordinate their movement and produce a sound.

## III. BRAIN MACHINE INTERFACE (BMI)

Brain-machine interfaces (BMIs), aka brain-computer interfaces (BCIs), are in development by several different teams across the globe. The project uses similar wireless transmission technology to connect electrodes in the brain to cursors on a computer, or even the controls of an electric wheelchair. This project uses motor neurons to control movement. The Speech Lab/Neural Signals BMI is somewhat rarer because it is translating those signals which might inform mouth/tongue/vocal chord movement and directly interpreting them as sounds. This layer of interpretation is difficult to perfect but its pursuit gives us hope that one day we could see devices that actually “read” our thoughts and translate them into images, sounds, and other sensations. Once we

achieved that level of "mind-reading", there could be a direct conduit between our mental and digital worlds. Totally immersive virtual reality, surrogate bodies…the possibilities really expand at that point.

## IV. WORKING




Implanted electrodes in the speech center of the brain can communicate wirelessy via FM transmission with a computer. This allows a computer to inteprete brain activity into sounds using a speech synthesizer.

For now, research into turning thoughts into sounds is still at a rudimentary level. Neural Signal designed the hardware (electrodes, amp, receiver) and implanted it, but the Speech Lab had to develop the software routines to interpret the information into sounds. A synthesized voice produced on a computer gave the patient auditory feedback so that he could hear how his "thoughts" were being translated and could focus on correcting them as needed. That feedback was remarkably fast, about 50ms, on par with the normal speed of talking. After practice, the patient's ability to listen to vowel sounds and then repeat them improved from 45% to 70% (and beyond).

## V. CONCLUSION

A short overview of wireless brain implant has been provided. This System of whole is implanted within the brain to facilitate the patients. This system also provides a connection between human brain signals and digital signals. The other fabrication techniques are required for the improvement of the system.

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# Fuzzy Based Irrigation Control using Wireless Sensor Network in Tomato Farming

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## ABSTRACT

Fuzzy logic systems are used to check the degrees of truth in real life system. New advancement has been seen in the field of agriculture due to the advancement in wireless technology. The proposed system will describes about the uses of fuzzy logic systems with help of wireless sensor network in efficient farming of tomato crop which is an important crop and commonly suggested by many farmers. It leads more profit but, it has to be taken care properly. Because it gets affected to disease easily. The proposed system also explain the irrigation system as well as fertigation (fertilisers given through irrigation) and controlling the pesticides. Fertigation technique is established with wireless sensor network that will collect a data, monitoring to the crops to allow for higher yields and lower cost, with less impact to the environment. Each area receives only what is required for its particular space, and at the appropriate time and duration. Required information is collected which is scientifically accurate with the help of wireless sensors. And the fuzzy based irrigation controller will accept the data which is sent to by WSN from the farm. Based upon the condition the machine will sprinkle the fertilizer and drip the water. The main use of advanced technologies will leads to proper and efficient use of resources in tomato farming.

**Keywords :** WSN, Tomato Farming, Irrigation, Fuzzy Logic Systems

## I. INTRODUCTION

Farmers now-a-days are trying to use modern ways for farming. By implementing more new effective technologies and automation in the farming will ultimately be efficient and time saver.One of the main reason of big loss in the field of agriculture is, crops are not properly taken care off. There is one term which is used often in recent days is “Precision agriculture” which means all the works related to agriculture should be done precisely. Everything which are lifeline to any farm like water, fertilizer etc., has to be given precisely and on time to time fashion.Now a days, farmers use many techniques for irrigation and disease control in crops manually. By doing manually, so the delays can occur and can affect the crop.For that reason, automation is required in irrigation and disease control system which is completely based on sensing device. Which reduce the man power and manual work take appropriate decision which makes more money. Tomato is a common crop which grows in Kharif season (July to October), Rabbi (October to March) and also in summer season. India is in 2nd place in world for cultivating tomatoes. It leads more profit but, it has to be taken care properly. Because it gets affected to disease easily.

The required wireless technology is widely used in many areas and are easily available in the markets in reasonable prices. It gives features like high speed data transfers, safe and reliable, flexibility, low cost etc. By using this technology will require less man power and has to be handled automatically. Fuzzy logic controller, it makes the decision whether to irrigate water through farm or not. The proposed system only specifies about the irrigation system of the farm. The crop needs many more resources than just water. The whole system was powered by photovoltaic cells and communication link for monitoring the states of the crops.A drip irrigation system was proposed for farming with the use of wireless sensors and fuzzy logic controller.The system will decides when and for how much time the values should be opened for dripping of water.The system will decides when and for how much time the values should be opened for dripping of water.It is helpful and efficiently use both water and fertilizers.

## II. LITERATURE SURVEY

In the existing system work was done in the area of irrigation control systems using fuzzy logic controllers and wireless sensors. The existing system says about the various types oftechniques for irrigation to be done in the farm.Wireless sensors used in this particular technology are mainly used for collection of the information about the soil in the farm, collected information consists of the above all information is provided to the proposed system only specifies about the irrigation system of the farm.The system will decides when and for how much time the values should be opened for dripping of water.

- ✓ The soil depth from which a mature crop extracts most of the water needed for evapotranspiration.
- ✓ Available Water Storage Capacity (AWSC) is the range of available water that can be stored in soil and be available for growing crops.
- ✓ Plant water usage capabilities
- ✓ Soil moisture content, etc.

The water storage capacity can be measured by ES100 watermark sensor, which is a soil moisture and temperature sensor. It is possible to rate in which the soil gets It is possible to rate in which the soil gets dried.

| S.NO | TITLE | AUTHOR | ABSTRACT | METHODOLOGY |
|---|---|---|---|---|
| 1 | Design and development of precision agriculture wireless sensor networks. | R.Nandurkar,V .R. Thool | The system is particularly useful for agriculture applications in sparsely populated semi- arid areas since human involvement and intervention is not needed for irrigation purposes. | The main intension of the system is going on to increase the efficiency of the moisture sensors so as to minimize the effects of fertilizers on the value of soil moisture. system is very useful for small farmer as the initial cost is very low. |

| | | | | |
|---|---|---|---|---|
| **2** | Advances in greenhouse automation and controlled environment agriculture | Ramin Shamshiri, Fatemeh Kalantari, K. C. Ting, Kelly R. Thorp, Ibrahim A. | Smart greenhouse fuzzy logic based control system enhanced with wireless data monitoring. | Greenhouse cultivation has evolved from simple covered rows of open-fields crops to highly sophisticated controlled environment agriculture (CEA) facilities that projected the image of plant factories for urban agriculture. The advances and improvements in CEA have promoted the scientific solutions for the efficient production of plants in populated cities and multi-story Buildings |
| **3** | A fuzzy logic based irrigation system enhanced with wireless data logging applied to the state of Qatar | Farid Touati Mohammed Al-Hitmi Kamel Benhmed Rohan Tabish | The system specifies about the fuzzy logic controller acquires data From these sensors and then applies well-devised fuzzy rules to produce appropriate time and duration for irrigation. | The system consists of a feedback fuzzy logic controller that logs key field parameters through specific sensors and a Zigbee- GPRS remote monitoring and database platform. The system is easy to deploy in existing drip irrigation systems without any physical modification. |
| **4** | Automated early plant disease detection and grading system | Rizk, Hashem | As the agriculture industry grows, many attempts have been made to ensure high quality of produce. | Hence, many techniques and technologies have been developed to help solving or reducing the impact of plant diseases. Imagining analysis tools, and gas sensors are becoming more frequently integrated into smart systems for plant disease detection. |

| | | | | |
|---|---|---|---|---|
| 5 | Combining Multi-Agent Systems and Wireless Sensor Networks for Monitoring Crop Irrigation | Gabriel Villarrubia Juan F.De Paz,Daniel H.De La lglesia and Javier Bajo | The system will describes about tool that allows us to monitor the condition of crops on a TV screen using a low cost device. | This work presented the development of an intelligent system based on WSN that monitors and automates crop irrigation in an easy and economical way. |
| 6 | A Survey on usage of Soft Computing Techniques in Crop Production | Silky Narwal Vijay Nehra | This survey table is very useful to understand problems and corresponding problem solving technique. | Soft computing techniques shows great ability in solving problems like crop selection, crop planning, irrigation planning, water resources management, vegetable production, water resource management etc has been discussed in the present paper. |
| 7 | Fuzzy logic based irrigation control system using wireless sensor network for precision agriculture | Prakashgoud Patil, Umakant Kulkarni, B.L. Desai ,V.I. Benagi and V.B. Naragund | The irrigation controller regulates the desired moisture level in agricultural soil by making the irrigation pump on,off basedon sensor readings. | This work has been carried out using MATLAB simulation tool. The developed software for the proposed work was tested under different input condition and provided good results in terms of accuracy and has a wide scope of being established in near future. |
| 3 | A fuzzy logic based irrigation system enhanced with wireless data logging applied to the state of Qatar | Farid Touati Mohammed Al-Hitmi Kamel Benhmed Rohan Tabish | The system specifies about the fuzzy logic controller acquires data From these sensors and then applies well-devised fuzzy rules to produce appropriate time and duration for irrigation. | The system consists of a feedback fuzzy logic controller that logs key field parameters through specific sensors and a Zigbee- GPRS remote monitoring and database platform. The system is easy to deploy in existing drip irrigation systems without any physical modification. |

## III. Creating Ideal Conditions

### Available Water Storage Capacity (AWSC) guide

**Table 1:** Soil texture with Available Water Storage Capacity

| Soil Texture | AWSC[Inch of water per foot of soil] | Linguistic variable |
|---|---|---|
| Sand | 0 to 1 | Sandy |
| Loamy sand | 1 to 1.2 | Sandy |
| Sandy loam | 1.3 to 1.5 | Sandy |
| Fine sandy loam | 1.6 to 1.7 | Loamy |
| Loam | 1.8 to 2.1 | Loamy |
| Slit loam | 2.2 to 2.5 | Loamy |
| Clay loam | 2.4 | Clay |
| Clay | 2.4 | Clay |
| Organic soil | 3 | Clay |

Loam: Is considered ideal for gardening and agricultural uses because it retains nutrients well and retains water while still allowing excess water to drain away A soil dominated by one or two of the three particle size groups can behave like loam if it has a strong granular structure, promoted by a high content of organic matter.

Sandy loam: Is a type of soil used for gardening. This soil type is normally made up of sand along with varying amounts of silt and clay.

Split loam: Loam is soil composed mostly of sand (particle size > 63 μm), silt (particle size > 2 μm), and a smaller amount of clay (particle size < 2 μm).In the USDA textural classification triangle, the only soil that is not predominantly sand, silt, or clay is called "loam".

Available water storage capacity: Is the maximum amount of plant available water a soil can provide. It is an indicator of a soil's ability to retain water and make it sufficiently available

Organic Soil: And Amendments. Organic soils contain organic matter that is rich in many nutrients and minerals. The scientific definition of organic soil is "Of, relating to, or derived from living matter." Organic soil consists of decaying plant material, microorganisms, worms, and many other things.

Clay loam: is a soil mixture that contains more clay than other types of rock or minerals. A loam is a soil mixtures that is named for the type of soil that is present in the greatest amount. The particles of clay are very small, which is one of its most important characteristics.

Clay: Is a finely-grained natural rock or soil material that combines one or more clay minerals with traces of metal oxides and organic matter.for plant use. Available water capacity is the water held in soil between its field capacity and permanent wilting point. capacity ( $\theta$ fc) and permanent wilting point ( $\theta$ pwp): $\theta a \equiv \theta fc - \theta pwp$.

### Temperature

Ideal temperature is 18 c to 30 c for tomato crop to grow, and it can be measured by a sensor which is used for analysing

**Table 2 :** Temperature classification

| Sensor reading | Level | Linguistic variable | Range |
|---|---|---|---|
| Temperature obtained by a sensor | 10 | Very cold | [0 5 10 15] |
| | 20 | Cold | [10 15 20 25] |
| | 30 | Normal | [20 25 30 35] |
| | 40 | Hot | [30 35 40 45] |
| | 45 | Very Hot | [40 45 50 50] |

**Smoke detection**

As tomato crop is susceptible to the smoke generated through any source, which badly affects the growth of the crop. To detect smoke there is a need of smoke detectors.

Fig 1: pH Scale [7]

**pH of soil**

pH 6.0 to 6.8 of the soil is the best for the tomato to grow. It requires slightly acidic to grow. The pH of the soil can be tested by many applications available in the marke.

## IV. BUILDING A SYSTEM

Fig 2: Structure of system

## V. ARCHITECTURE OF SYSTEM

From the image of the architecture of the system

- ✓ Farm- Wireless sensors for all the parameters are distributed evenly for getting all the relevant data to send to the fuzzy controller.
- ✓ Gateway sink node - The data sensed by the wireless sensors will be sent to the gateway, which will a router like a device. The gateway node is directly connected to the fuzzy controller.
- ✓ Fuzzy based irrigation controller- It will accept the data which is sent to by all the sensors from the farm. It will analyse it and according to rules specified in the system and will send the signal to respective machine (pump, sprinkler etc.).
- ✓ Machine (water pump) - It will act according to the signals received from the fuzzy logic controller. The pump pipelines are distributed in the farms.

## VI. SENSORS IN THE SYSTEM

MESMIC eKo Pro – A wireless agriculture and sensing system used for crop monitoring.
ES100 WATERMARK SENSOR – A soil moisture and soil temperature sensor.
ES1201 – A temperature/humidity sensor that measures the relative humidity and air temperature

## VII. ACTION TAKEN IF THE CONDITION ARE NOT IDEAL

The system starts right after checking for the ideal conditions of soil. If the conditions are not proper then the following measures are taken the controller.

- ✓ pH –Specifically soil pH is very important because it has such a strong influence on how well your crops will grow. The pH sensor senses the pH of the soil, if the pH is more acidic than required level then it can be raised by adding base into that which can be through the automated irrigation system by using mixture of water and lime stones.
- ✓ Measuring plant leaf sap pH
- ✓ Measuring foliar and hydroponic fertilizers
- ✓ Measuring pH of rain and irrigation water

Water the sensor gets the information about pH being too acidic then it tries to control that, at the same time it will set the controller for giving water regularly in the farm after particular amount of time period. If the pH is more alkaline then, it can be made acidic by using compost manure and can control the soil pH.

Soil temperature – In affects plant growth directly, that is all crops practically slow down their growth below the soil temperature of about 90C and above the soil temperature of above 50 0C.If the soil temperature is more than required then the sensor

sends signals to the controller and then the timer is set into the controller for watering the soil regularly until the temperature is maintained. If the soil temperature is lower than nitrogen should be provided to the crop.

- ✓ Formaldehyde – If all the conditions are proper sensed by the sensors then a signals is send to the controller for sprinkling formaldehyde into the farm field. This will be automated when all other factors are appropriate.
- ✓ Water logging – The wetness sensors will sense the soil and if it is wet for more amount of time then the water irrigation should be stopped.

After Planting

- ✓ NPK – Nitrogen, phosphorous and potassium are useful for increasing the durability, attractiveness and shine of the tomato fruit.

If all the conditions are proper then Nitrogen. Phosphorous and Potassium should be circulated at proper time period throughout the tomato farming. All the conditions should be checked daily.

NPK requirements –

o 120 kg/hector
o 60 kg/hector
o 120 kg/hector

It can be mixed with water and then can be circulated in the farm through the distribution system.

- ✓ Water irrigation – If all the conditions are proper then the water should be irrigated to farm after each 10th day. If the water is logged in the farm then the irrigation should be stopped. If the temperature drops to the ideal conditions then the irrigation should be stopped till the ideal conditions are maintained.
- ✓ Zinc and Boron – These two elements are essential for making fruit attractive
- ✓ Theses elements are given as a mixture with water. At the time of 2nd or 3rd irrigation, these should be circulated in farm.
- ✓ Damping off – Tomato crop gets affected by the disease called as 'Damping off' This happens because of humid temperature and wet and cold soil. To control this sensors keep watch the conditions of soil and climate for particular amount of time.

## VIII. ALGORITHM FOR SYSTEM TO MAINTAIN PROPER CONDITION

t>=19 && t<=21 the >3
Conditions are good.
Else
Send Information to farmer with a message
When a t humidity>requirement then >1
Irrigate H2O2 solution by water. Humidity Count++;
If humidity> 2 then >2
Inform farmer through message. Sprinkle planofix on the crops.

Increase the dailyCount by 1

If (dailyCount/15) =0 then >1
Sprinkle CH2O on the farm (on every 15th day)
Check for (dayCount%10=0) till 120 days (Each 10th day till 120 days)
With proper amount the water should be irrigated
Check for minuteCount till 60 minutes
If dayCount=3 then >2
A mixture of zinc and boron should be given by the water.
If dayCount%2 equals to 0 then >3
Sprinkle Dimethoate in the farm.
Increase minutesCount by 1; Until minuteCount less than equals to 60;

dayCount++;
Until dayCount less than equals to 120;

## IX. CONCLUSION

Crop irrigation and fustigation are the most important factors in the farming. It is very necessary to find out the proper requirements for the crop and take measures according to that. In the case of tomato crop, it is quite hard to maintain because it gets affected to disease easily. As it is very susceptible for the environmental factors. So, if proper care is not taken for the crop then the profit making crop can turn into a disaster.

The problems which farmers face regularly are, water shortage and adequate amount of fertilizers. If the proper scientific measures are taken and analysed, on the basis of temperature, soil humidity, soil moisture, environmental conditions, a way higher field can be achieved.

In the points which are discussed above, there are still some limitations regarding the solid materials which are required to be discussed with the farmers because at present there is no mechanism present for it. The materials which are liquid and the materials which are soluble in water can be flown very easily in the farm and certainly there are some factors in which a machine actually can't do anything but just inform farmers. Thus, the proposed work concludes that by using the proposed ideas following advantages can be achieved - Increasing Irrigation Efficiency, reducing the labour cost, saving water and electricity.

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# Early Stage Prediction of Caesarean Vs Normal Vaginal Delivery Using Artificial Intelligence

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## ABSTRACT

Machine learning techniques provide learning mechanism that can be used to induce knowledge from data. A few studies exist on the use of machine learning techniques for medical diagnosis, prediction and treatment. In this study we evaluate different machine learning techniques for birth classification (cesarean or normal). Data on cesarean section is collected and different medical factors are identified that result in cesarean births. A birth classification model is built using decision tree and artificial neural networks. In this paper, we provide method of classifying caesarean section and normal vaginal deliveries using fetal heart rate signals and uterine contractions using Artificial intelligence. Here we predict the status of fetal using machine learning technique "Decision tree Algorithm" which classifies the delivery of women. This gives the prediction results as Normal, Suspicious, Pathologic as accuracy above 95% with the given dataset. It can classify the births into normal and cesarean with an average accuracy, precision and recall of 98% respectively.

**Keywords :** Early Prediction of Delivery, CTG (Cardio Toco Graphy)

## I. INTRODUCTION

Worldwide, over 130 million babies are born each year. 3.6 million will die due to perinatal complication and 1 million of these will be intrapartum still births . In the USA, the number of deliveries in 2017 was 3952,841; one in every 164 of these resulted in stillbirth.1 In the UK, in the same year, there were 671,255 with one in every 200 being stillbirth2 and 300 that died in the first four weeks of life . Cardiotocography (CTG) is the most common method used to monitor the fetus during the early stages of delivery and clinical decisions are made using the visual inspection of CTG traces. However, the main weakness with this approach is poor human interpretation which leads to high inter- and intra-observer variability.

Problem identification: Cardiotocography (CTG) is used to monitor the foetus during the early stages of delivery.

clinical decisions - visual inspection of CTG traces. weakness -poor human interpretation which leads to high inter- and intra-observer variability

Inter and intra-observer variability and low positive prediction is accountable for the 3.6 million babies that die each year.

## II. METHODOLOGY

(A) Dataset preparation
(B) Data preprocessing
(C) Training and Testing
(D) Decision tree Algorithm
(E) Training and Testing Accuracy

In this proposed model, we are using Machine learning Technique to predict the fetal status using fetal heart rate signal and uterine contraction. Knowledge engineering and machine learning are used to extract disease patterns from the available medical data. The extracted patterns can be used for medical diagnosis, prediction and treatment. This paper has covered three goals: First, it has identified the significant factors that influence the type of birth. Second, it has presented a prediction model for the type of birth that can help doctors and patients We provide "Decision tree Classifier Algorithm" to classify fetal state based on statistical measures applicable to them, such as standard deviation and kurtosis.[5]

The values may be numbers, such as real numbers or integers, for example representing a person's height in centimeters, but may also be nominal data (i.e., not consisting of numerical values), for example representing a person's ethnicity. More generally, values may be of any of the kinds described as a level of measurement. For each variable, the values are normally all of the same kind. However, there may also be missing values, which must be indicated in some way.

In statistics, data sets usually come from actual observations obtained by sampling a statistical population, and each row corresponds to the observations on one element of that population. Data sets may further be generated by algorithms for the purpose of testing certain kinds of software. Some modern statistical analysis software such as SPSS still present their data in the classical data set fashion. If data is missing or suspicious an imputation method may be used to complete a data set.

Based on 2126 fetal cardiotocographs were automatically processed and respective diagnostic features are measured. Using this dataset we train the machine using Decision tree classifier and predicting the result with best accuracy.

### (A) DATASET PREPARATION

A data set (or dataset) is a collection of data. In the case of tabular data, a data set corresponds to one or more database tables, where every column of a table represents a particular variable, and each row corresponds to a given record of the data set in question.

In the open data discipline, data set is the unit to measure the information released in a public open data repository. The European Open Data portal aggregates more than half a million data sets. In this field other definitions have been proposed, but currently there is not an official one. Some other issues (real-time data sources, non-relational data sets, etc.) increases the difficulty to reach a consensus about it.

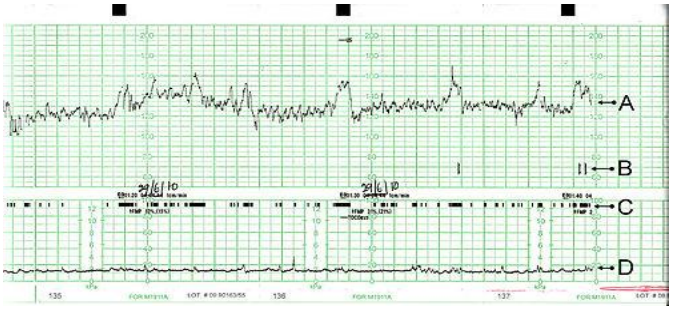


**Fig.1** Cardiotocography output

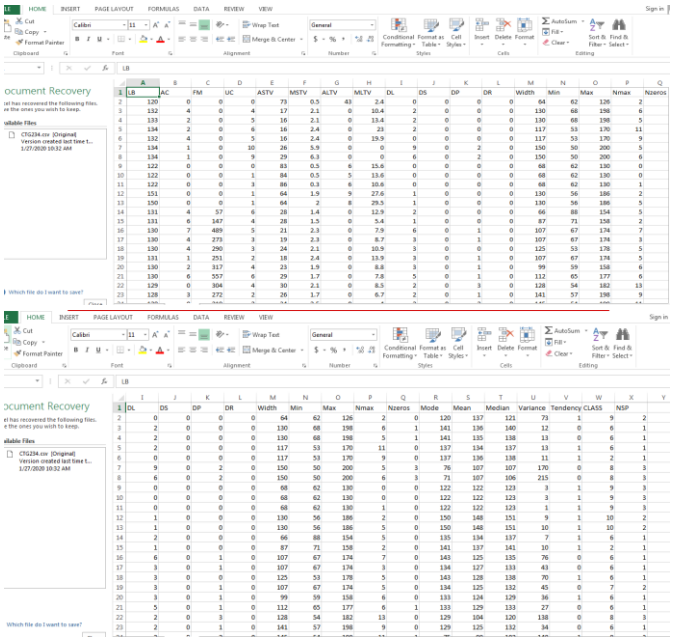

**Fig.2** Dataset calculation

## (B) DATA PREPROCESSING

### IMPORT LIBRARIES

First step is usually importing the libraries that will be needed in the program. A library is essentially a collection of modules that can be called and used. A lot of the things in the programming world do not need to be written explicitly ever time they are required. There are functions for them, which can simply be invoked. This is a list for most popular Python libraries for Data Science. Here's a snippet of

me importing the pandas library and assigning a shortcut "pd".

```
Import pandas as pd
Import numpy as np
```

### IMPORT THE DATASET

A lot of datasets come in CSV formats. We will need to locate the directory of the CSV file at first (it's more efficient to keep the dataset in the same directory as your program) and read it using a method called read_csv which can be found in the library called pandas.

```
import pandas as pd dataset = pd .read_csv('Medium.csv')
```

After inspecting our dataset carefully, we are going to create a matrix of features in our dataset (X) and

create a dependent vector (Y) with their respective observations. To read the columns, we will use iloc of pandas (used to fix the indexes for selection) which takes two parameters — [row selection, column selection].

```
X = dataset.iloc[:, :-1].values
```

as a parameter selects all. So the above piece of code selects all the rows. For columns we have :-1, which means all the columns except the last one.

### TAKING CARE OF MISSING DATA IN DATASET

Sometimes you may find some data are missing in the dataset. We need to be equipped to handle the problem when we come across them. Obviously you could remove the entire line of data but what if you are unknowingly removing crucial information? Of course we would not want to do that. One of the most common idea to handle the problem is to take a mean of all the values of the same column and have it to replace the missing data.

The library that we are going to use for the task is called Scikit Learn preprocessing. It contains a class called Imputer which will help us take care of the missing data.

```
fromsklearn.preprocessing import Imputer
```

A lot of the times the next step, as you will also see later on in the article, is to create an object of the same class to call the functions that are in that class. We will call our object imputer. The Imputer class can take a few parameters —

i. missing_values — We can either give it an integer or "NaN" for it to find the missing values.
ii. strategy — we will find the average so we will set it to mean. We can also set it to median or most_frequent (for mode) as necessary.
iii. axis — we can either assign it 0 or 1, 0 to impute along columns and 1 to impute along rows.

imputer = Imputer(missing_values = "NaN", strategy = "mean", axis = 0)

Now we will fit the imputer object to our data. Fit is basically training, or in other words, imposing the model to our data.

## ENCODING CATEGORICAL DATA

Sometimes our data is in qualitative form , that is we have texts as our data. We can find categories in text form. Now it gets complicated for machines to understand texts and process them, rather than numbers, since the models are based on mathematical equations and calculations. Therefore, we have to encode the categorical data.

This is an example of categorical data. In the first column, the data is in text form. We can see that there are five categories — Very, Somewhat, Not very, Not at all, Not sure — and hence the name categorical data.

So the way we do it, we will import the scikit library that we previously used. There's a class in the library called LabelEncoder which we will use for the task.

**Fromsklearn. preprocessing import Label Encoder**

As I have mentioned before, the next step is usually to create an object of that class. We will call our object label encoder_ X.

**Label encoder _X = Label Encoder()**

## (C) SPLITTING THE DATASET INTO TRAINING SET AND TEST SET

Now we need to split our dataset into two sets — a Training set and a Test set. We will train our machine learning models on our training set, i.e our machine learning models will try to understand any correlations in our training set and then we will test the models on our test set to check how accurately it can predict. A general rule of the thumb is to allocate 80 % of the dataset to training set and the remaining 20% to test set. For this task, we will import test_train_split from model_selection library of scikit.

**fromsklearn.model_selection import**

**train_test_split**

Now to build our training and test sets, we will create 4 sets— X_train (training part of the matrix of features), X_test (test part of the matrix of features), Y_train (training part of the dependent variables associated with the X train sets, and therefore also the same indices) ,Y_test (test part of the dependent variables associated with the X test sets, and therefore also the same indices). We will assign to them the test_train_split, which takes the parameters — arrays (X and Y), test_size (if we give it the value 0.5, meaning 50%, it would split the dataset into half. Since an ideal choice is to allocate 20% of the dataset to test set, it is usually assigned as 0.2. 0.25 would mean 25%, just saying).

X_train, X_test, Y_train ,Y_test = train_test_split(X,Y, test_size=0.2)

**Feature Scaling**

The final step of data preprocessing is to apply the very important feature scaling.

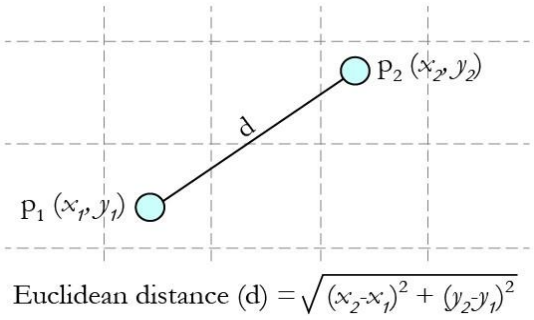


**Fig.3** Feature scaling

It is a method used to standardize the range of independent variables or features of data. But why is it necessary? A lot of machine learning models are based on Euclidean distance. If, for example, the values in one column (x) is much higher than the value in another column (y), (x2-x1) squared will give a far greater value than (y2-y1) squared. So clearly, one square difference dominates over the other square difference. In the machine learning equations, the square difference with the lower value in comparison to the far greater value will almost be treated as if it does not exist. We do not want that to happen. That is why it is necessary to transform all our variables into the same scale. There are several ways of scaling the data. One way is called Standardization which may be used. For every observation of the selected column, our program will apply the formula of standardization and fit it to a s

```
fromsklearn.preprocessing import StandardScaler
sc_X = StandardScaler()
 X_train=sc_X.fit_transform(X_train)
 X_test = sc_X.transform(X_test)
```

Now we will fit and transform our X_train set (It is important to note that when applying the Standard Scalar object on our training and test sets, we can simply transform our test set but for our training set we have to at first fit it and then transform the set). That will transform all the data to a same standardized scale.

## (D)DECISION TREE ALGORITHM

Decision trees are a non-parametric supervised learning method used for both classification and regression tasks. The goal is to create a model thet predicts the value of a target variable by learning simple desion rules inferred from the data features.

**Decision Tree consists of:**

1. **Nodes**: Test for the value of a certain attribute.
2. **Edges/ Branch**: Correspond to the outcome of a test and connect to the next node or leaf.
3. **Leaf nodes**: Terminal nodes that predict the outcome (represent class labels or class distribution).

**Classification trees** (Yes/No types) :

What we've seen above is an example of classification tree, where the outcome was a variable like 'fit' or 'unfit'. Here the decision variable is **Categorical/ discrete**.Such a tree is built through a process known as **binary recursive partitioning**. This is an iterative process of **splitting the data into partitions**, and then splitting it up further on each of the branches.

**Creation of Decision Tree:**

In this method a set of training examples is broken down into smaller and smaller subsets while at the same time an associated decision tree get incrementally developed. At the end of the learning process, a decision tree covering the training set is returned.The key idea is to use a decision tree to partition the data space into cluster (or dense) regions and empty (or sparse) regions.

In Decision Tree Classification a new example is classified by submitting it to a series of tests that determine the class label of the example. These tests are organized in a hierarchical structure called a decision tree. Decision Trees follow Divide-and-Conquer Algorithm.

**Decision Tree Classifier**

- Using the decision algorithm, we start at the tree root and split the data on the feature that results in the **largest information gain (IG)** (reduction in uncertainty towards the final decision).
- In an iterative process, we can then repeat this splitting procedure at each child node **until the leaves are pure**. This means that the samples at each leaf node all belong to the same class.
- In practice, we may set a **limit on the depth of the tree to prevent over fitting**. We compromise on purity here somewhat as the final leaves may still have some impurity.

**Advantages of Classification with Decision Trees:**

1. Inexpensive to construct.
2. Extremely fast at classifying unknown records.
3. Easy to interpret for small-sized trees
4. Accuracy comparable to other classification techniques for many simple data sets.
5. Excludes unimportant features.

## (E)CONFUSION MATRIX

A confusion matrix is a technique for summarizing the performance of a classification algorithm. Classification accuracy alone can be misleading if you have an unequal number of observations in each class or if you have more than two classes in your dataset..

Calculating a confusion matrix can give you a better idea of what your classification model is getting right and what types of errors it is making.

How to calculate a confusion matrix for a 2-class classification problem from scratch.

A confusion matrix is a summary of prediction results on a classification problem.

The number of correct and incorrect predictions are summarized with count values and broken down by each class. This is the key to the confusion matrix.

The confusion matrix shows the ways in which your classification model is confused when it makes predictions. It is this breakdown that overcomes the limitation of using classification accuracy alone. our need a test dataset or a validation dataset with expected outcome values. Make a prediction for each row in your test dataset. From the expected outcomes and predictions count: The number of correct predictions for each class. The number of incorrect predictions for each class, organized by the class that was predicted.

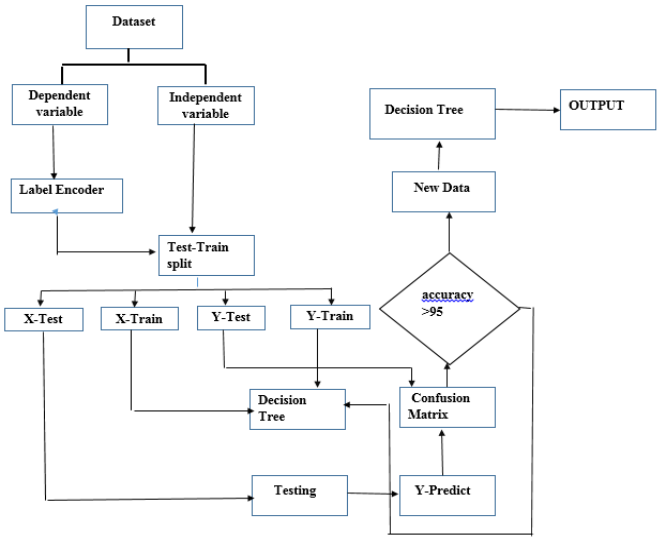


**Fig.4** Flow Diagram

Parameters

FHR parameters for classification

| Parameters | Baseline (bpm) | Variability (bpm) | Deceleration | Acceleration |
|---|---|---|---|---|
| Normal | 110-160 | ≥5 | None | Present |
| Suspicious | 100-110<br>150-170 | <5 for 40-90 min | Typical variable decelerations for over 90 min | - |
| Abnormal | < 100<br>> 180<br>Sinusoidal pattern | - | Either atypical variable decelerations with over 50% of contractions or late decelerations, both for over 30 min Single prolonged deceleration for more than 3 min | - |

**Fig.5** CTG

## III.CONCLUSION

This paper, presented a proof-of-concept using machine learning and FHR signals and uterine contraction as an ambulatory decision support to antenatal care.

The results indicate that it is possible to provide high predictive capacity when separating normal vaginal deliveries and caesarean section deliveries and in many cases produce much better results than those reported in previous studies.

An active machine learning “Decision tree Algorithm” approach is proposed for caesarian with greater automation and better performance.

The developed approach was evaluated with actual datasets collected from the features of fetal heart rate and uterine contraction.

The evaluation process is conducted with manually labeled data and the proposed active machine learning shows a favorable performance.

The accuracy of outcome prediction is to be 98% using Decision tree algorithm . From this we can get better performance analysis

## IV. FUTURE WORK

We have obtained quite satisfactory results for classification of births. However these results can be further improved by identification of additional factors that influence the type of birth. We will investigate these factors in the future. In this work three machine learning techniques have been used. We want to evaluate other techniques on the medical data. The prediction models will be more useful if available online. We will make these models online so that they can be further trained on the new data available. We want to increase the area surveyed because there may be certain geographical factors that can influence the type of birth

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# Smart Irrigation System Based on Arduino UNO Board

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## ABSTRACT

In this paper, Smart Irrigation System [SIS] is designed using arduino UNO along with GSM module and sun tracking solar system. This system is very comfortable and cost effective for the people in rural areas. This system is used to deal with the demand of economical irrigation system. In this smart irrigation system, the status of the submersible pump can be monitored with the help of cell phone. The design of smart irrigation system [SIS] mainly depends on arduino UNO board. Here, the communication between arduino UNO board and the cell phone is wireless. The smart irrigation system is flexible. Since, the minimum changes in its core can allow the variety of devices to be controlled. The smart irrigation system plays a major role for the people in rural areas.

**Keywords :** Arduino UNO, GSM Module, Soil Moisture Sensor, Submersible pump, Liquid crystal display (LCD), Polycrystalline type Solar Panel, Light Dependent Resistor (LDR), PWM charger controller, Single Pole Double Throw (SPDT) relay.

## I. INTRODUCTION

In this Modern World, everything relay on smart technology, because of increase in efficiency, maximum capability, minimum cost and decrease in waste. The Smart irrigation system [SIS] is the advanced form of traditional irrigation system. The waste produced from smart irrigation system is very low due to minimum consumption of resources. Here, the water supply is based on seasonal variations, soil characteristics, weather conditions and plant to reduce the excess flow of water. The major problem of agriculture is lack of water. To overcome this problem, SIS is used, with the help of smart irrigation system, almost 80% of water can be saved when compared to traditional irrigation. In addition to the wastage of water, another disadvantage of traditional irrigation is introducing the water directly to the plants, because of this the soil undergoes high stress from the variation in soil moisture. SIS is already implemented in some countries like America, China, Egypt, Portugal and Sweden. Recently, India has been started to implement SIS by using various methods.

## II. LITERATURE SURVEY

### A. Irrigation system using RF module:

In India, agriculture plays an important role for development in food production. In our country, agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in

agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. In this method, automatic irrigation system based on ARMs and RF module. All the system will be setup using ARM and RF module. The most important factor of this system is RF module which is used to send and receiving the message to the controller. This system used three nodes which communicate each other and irrigate paddy field automatically. The aim of this project is to modernizing agriculture technology by programming components and built the necessary component for the system. The system is real time based and extracts the exact condition of paddy field. There is one central node used which to control other node. The main function of RF module is to pass the message to the node and operate the system.

### B. Irrigation system using solar photovoltaic water pump

Irrigation is a well-established procedure on many farms and is practiced on various levels around the world. It allows diversification of crops, while increasing crop yields. However, typical irrigation systems consume a great amount of conventional energy through the use of electric motors and generators powered by fuel. Photovoltaic energy can find many applications in agriculture, providing electrical energy in various cases, particularly in areas without an electric grid. In this method the description of photovoltaic irrigation system, is presented. Photovoltaic water pumping system is one of the best alternative methods for irrigation. The variation of spatial and temporal distribution of available water for irrigation makes significant demand on water conservation techniques. Hence solar powered Automated Irrigation System provides a sustainable solution to enhance water use efficiency in the agricultural fields using renewable energy system removes workmanship that is needed for flooding irrigation. The use of this photo-irrigation system will be able to contribute to the socio-economic development. It is the proposed solution for the energy crisis for the Indian farmers. This system conserves electricity by reducing the usage of grid power and easy to implement and environment friendly solution for irrigating fields.

### C. Irrigation system using humidity sensor

The main aim of this method is to provide information about automatic irrigation to the plants which helps in saving money and water. The entire system is controlled using ATMEGA 328 microcontroller which is giving the interrupt signal to the motor. Temperature sensor and humidity sensor are connected to internal ports of micro controller via comparator, whenever there is a fluctuation in temperature and humidity of the environment these sensors senses the change in temperature and humidity and gives an interrupt signal to the micro-controller and thus the motor is activated, along with this buzzer is used to indicate that pump is on.

## III. Methodology

### A. System architecture

In smart irrigation system, Arduino is used for controlling the SIS. Here, soil moisture sensor is used to monitor the moisture level of the soil continuously and arduino is used to send SMS if the moisture level of the soil is low.

Here, Submersible pump is controlled by using relay and GSM Module TTL SIM 800L is used with Liquid Crystal Display (LCD). The probe which is connected to the soil moisture sensor is used to sense the moisture level of the soil. The soil sensor circuit is connected to the digital pin D7 of arduino and an LED.

i. LED ON= Presence of moisture in soil
ii. LED OFF= Absence of moisture in soil

Transistor BC547 is used to operate the relay and it is connected to the digital pin D11 of arduino. GSM module is used to transmit the messages via SMS to the users. In addition to the GSM module, the LCD display is used to display the status and messages of the system. LCD data pins of D4 to D7 are directly connected to the arduino pins of 16-19. The 4-bit mode in LCD is operated by using the LCD and library which is inbuilt in arduino.

**B. Solar tracking system:**

This system consists of arduino UNO broad, 2 resistors, 2 LDR and one servomotor. A servomotor is used to rotate the solar panel towards the source of light.

The purpose of the solar tracking system is to consume the maximum energy from the sun and it is more efficient.

This system contains servomotor which can rotate approximately 180 degrees and it is controlled by using servo library in arduino's PWM outputs. Depending upon the intensity of light, the resistance of 2 LDR is changed and it is connected to the arduino board.

**C. Charger Controller**

The conduction of power is the major role of solar charger controller the charging process of the battery is managed by solar charger controller. The commonly used solar charger controller is pulse with modulation (PWM) and maximum power point tracking (MPPT) there performance depends upon the use of the system. PWM charger controller is used in this system. When compared to MPPT charger controller PWM charger controller is cost efficient. Here, direct connection from the solar array to the battery bank is controlled by PWM solar charger controller in this way PWM charger controller is used in the system. At the time of bulk charging the array output voltage is "PULLED DOWN" to the battery voltage. Since, there is continuous connection from the array to the battery bank. During day time the deep cycle batteries cannot be overcharged because the reverse flow of the power is not possible to the solar panels overnight. Lighting and load control are the additional capabilities in few charger controllers.

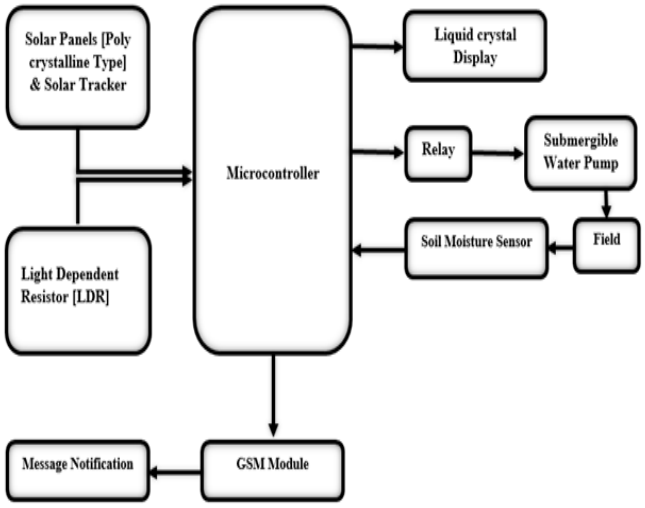


**Fig 1 :** Block diagram

In smart irrigation system, the AC submersible pump is driven with the use of inverter. The main parts of the oscillator are R3, R4, C1, C2, T2 and T3 are used along with MOSFET each trproduces inverting square waves. The values of R1, R2, R3, R4, C1 and C2 determine the frequency range. T1 and T4 act has power MOSFET's and they used to enhance the inverting signal from the oscillator. The amplified signal is increased by step-up transformer with its center tap connected to12V DC.

**Comparison of smart irrigation system with traditional irrigation system:**

| Traditional system | | | Smart irrigation system | | |
|---|---|---|---|---|---|
| Fixed cost | Diesel engine price | 45000 TK | Fixed cost | Smart irrigation system | 3000 TK |
| | Pump Price | 5000 TK | | Submersible Single phase AC Pump Price | 150000 TK |
| | Engine Oil | 1000 TK | | Solar Panel | 240000 TK |
| | Installation cost | 500Tk | | Battery | 15000 TK |
| Variable Cost | Maintenance Cost ( daily Basis) Fuel cost per Cost | 500 TK 80 TK | Variable Cost | Fuel cost & Maintenance Cost | 0 TK |

Traditional irrigation means, supply of water to the plant zone by pumped water surface like pond, rivers, channels and underground water through earth and channels or pipes with gravitational force.

The smart irrigation system means, supply of water through sub surface or surface pipes directly to the roots zone of a plant based on requirement without wasting the water resources.

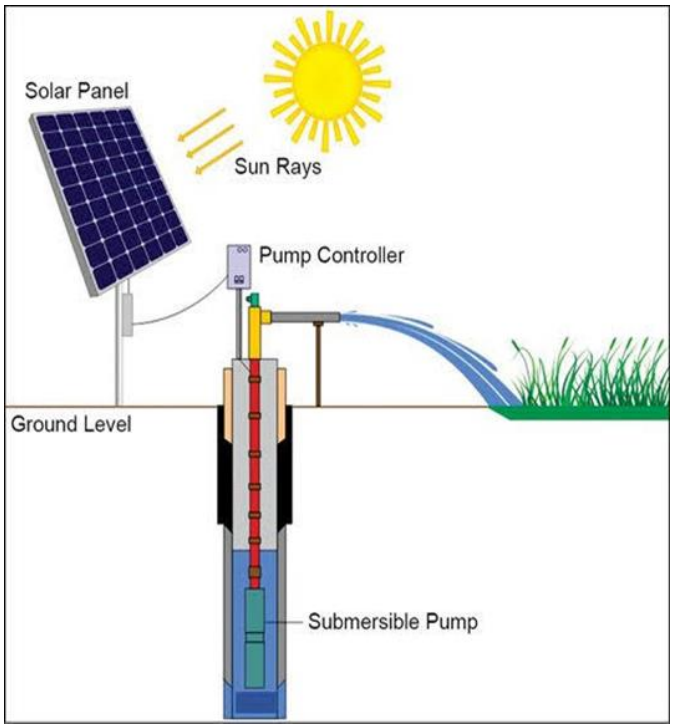


**Fig 2** : Solar tracking system

## IV. RESULTS AND DISCUSSION

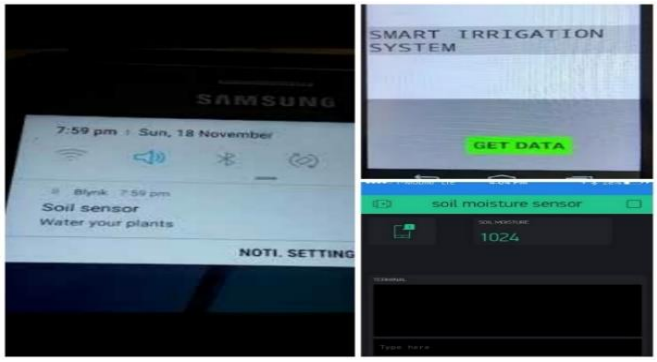


**Fig 3 :** SMS notification

In traditional irrigation the need of water is more when compared to smart irrigation system, traditional irrigation method fails in area like mountains and hilly regions but in smart irrigation it is easy to serve water in all corners, over flooding and over irrigation in traditional method can be neglected in modern methods. Crops like cotton needs minimum water for normal growth if we provide excess water to the plant it can be highly affected or leads to damage.

Smart irrigation method is very useful in high or low elevation there is no need of maintenance for a long period of time, this system does not need the support of power grid due to usage of solar panel. The proposed system ensures the optimized use of water and electricity, the smart irrigation system keeps the farmer updated about the pump through phone via SMS regularly. Since, the system sufficiently utilizes the water resource it is most suitable for dry areas, where there is inadequate rainfall.

Hence, this smart irrigation system is predicted to be more helpful to modern agriculture.

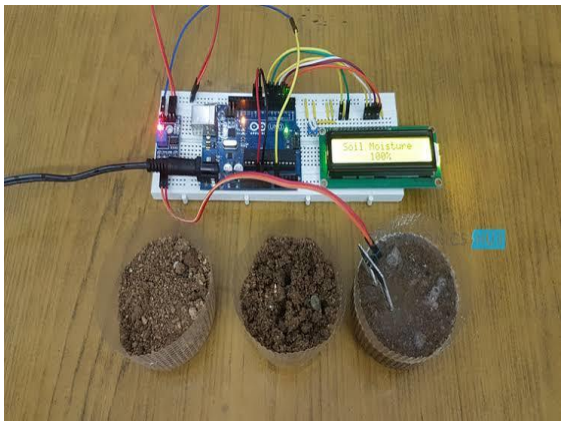


**Fig 4 :** Soil moisture testing

## V. CONCLUSION

The SIS system is used to maintain the sustainability of water resource the system is economical and versatile. Smart irrigation increases annual income and reduces the likelihood of poverty significantly. Household using concrete canal river diversion had higher cropping income per household than those using other irrigation method. It minimizes leaching of nutrients. The microcontroller based SIS monitors and controls all the activities efficiently. This SIS model is used to modernize the agriculture industry at a mass scale with optimum expenditure. Using this system one can save man power, water to improve production and ultimately profit.

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# A Modular Infant Screening Isolate with Anti-Intrusion Buzzer System

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## ABSTRACT

Preterm infants birth rate are especially high in the developing countries. Nearly 20 million premature and low birth rate infants are born each year in developing countries. A combination of poor after-birth, poor facilities care have lead to infant mortality. In India due to rodents attacks and temperature increment infant death in incubator seems to be abundant. In this project we proposed a new feature for an incubator (isolette) that is an anti-intrusion system to prevent immature baby from rodents attack and also we include portable (modular) approach with multi parameters measurement include temperature, weight, head circumference by using temperature sensors (DHT 11), load cell and two ultrasound sensor respectively based on IOT using Node MCU 8266 processor. It is low cost, transportable, energy saving useful in ambulance services and rural areas.

**Keywords :** Portable (modular), incubator (isolette), anti- intrusion system, multi parameters, IOT.

## I. INTRODUCTION

In developed and developing countries, many infants die in the first week of birth. Problems that are often encountered include hyperthermia, asphyxia and also infants born prematurely. WHO records the classification for hyperthermia which cold stress or mild hypothermia: 36.0 to 36.41C (96.8 to97.51 F);

1. moderate hypothermia: 32.0 to 35.91C (89.6 to 96.61 F);
2. severe hypothermia: below 321C (<89.61 F).

So here the incubator plays a big role where the incubator temperature must be set to maintain the infant's temperature between 95F and 98F or 99F. The infant can live well with temperatures that are slightly below normal.

Infants born prematurely have a high risk of controlling the exchange of heat between the surface of the skin with the conditions of the surrounding environment, even the heat dissipation that occurs can exceed the heat production of the infant's own metabolism. So, infants born prematurely are more likely to suffer from illness or death than infants born normal. One of the procedures to make premature infants still alive is put them into the incubator, the period premature infants in the incubator according to soundness, durability, and system of organs of them. The incubator is one of the tools to help premature infants to adjust with the outside world because the condition in the womb is very different with the outside world, especially condition of temperature. The temperature in the womb is approximately 36- 37°C but in the outside world is approximately 27°C–28°C.

The incubator discovered in 1880 triggered dramatic, popular and professional excitement about the prospect of reducing premature infant mortality. But, technology in the incubator develops slowly, which illustrates that the history of technology involves more than discovery.

The invention of the incubator itself is less significant than the development of a system to support the devices that . are in it. In this way, a new type of infant incubator must be studied that can independently adapt the environment based on a series of sensors and monitor in real time vital signs for the infant.

Advances in technology today following increases in the use of electromagnetic waves in everyday life. One example is the infant incubator. Monitoring the infant incubator is essential to keep the infant has a temperature corresponding to the environment at the newly born.

Not many parents realize that the size of the head circumference that also reflects the brain volume is also an important thing that should always be monitored growth to see whether the infant's brain grow and develop normally or not. Generally, doctors or midwives use a separate measuring instrument. The use of separate measuring instruments requires considerable time and a partially manual and part digital measuring instrument. This research aims to make a tool in one system that there are three measurement parameters including weight, temperature and head circumference that can record automatically. Facilitate the performance of paramedics to automatically measure the infant's weight, temperature, and head circumference to determine the condition of the infant. The tool is operated through IOT (internet of things) which can facilitate paramedic to monitor the infant's situation wherever and whenever using internet network that can be accessed via web or Android. The three parameters are controlled directly with the NodeMCU ESP8266 module using two ultrasonic sensors to determine the circumference of the infant's head, the weight sensor using load cell, while the temperature sensor uses an DHT11 temperature sensor.

Head circumference measurements use two ultrasonic sensors. The data will be processed directly with NodeMCU module ESP8266 displayed through web and Android with internet network. So that the instrument will get three measurements automatically in one system. Making this instrumentation through three stages including, making hardware, software manufacture, and testing instrumentation system. Test results infant incubator is a tool used to monitor the circumference of the infant's head circumference, the infant's weight and the temperature in the infant.

## II. EXISTING METHODS

A neonatal incubator is a rigid box-like enclosure in which an infant can be kept in a controlled environment for observation and care. The device may include a heater, a fan, a container for water to add humidity, a control valve through which oxygen may be added, and access ports for nursing care. These neonatal incubator are provided with ventilator, oxygen hood and blood pressure monitor. In older techniques they used hot water to provide warmer condition for babies in incubator . Due to some technology developments several adaptable sensors were used to measure the temperature and humidity range of a baby. Recent study showed that there is possible for portable incubator which can be compacted and used and there is also various parameter measured incubator too.

## III. LITERATURE SURVEY

Automation is not a new idea in our modern life due to advanced technological development. Large businesses and wealthy homeowners were implementing this technology for years now. In recent years this concept getting more accessible to many user due to cheaper cost, easier to setup and used modular concept and also higher internet penetration rate. However this automation are used in elderly monitoring too now a days so that doctors or physicians can easily access them.

Web based temperature monitoring also used that allows the user to continuously monitor the temperature condition of a room. Microcontrolled based parameters monitoring also plays vital role in incubator setup. an enhanced noise cancelling system that monitors the baby and reduces sound pollution has been suggested. The main function of the system is to reduce the noise that might disturb the baby by playing relaxing songs. This system can also adjust the room's light intensity with the aid of a light sensor. Even though there is lot of technology features mentioned above used in infant incubators still problem of infant in incubator seems to be major issues. Many articles and papers related to infant production in incubator are there but it is still in obligation to bring in real world due to cost and production availability.

Thus we setup a system of incubators that will be featured with advanced technology affordable cost and portable too.

## IV. PROPOSED METHODOLOGY AND IMPLEMENTATION

In proposed system, we have designed one box as an Incubator section, hardware section and PC or Mobile as the monitoring section. Both will be communicate using HTTP using Node MCU. In an Incubator Section, we fixed temperature and humidity (DHT11) sensor, Ultrasonic sensor and the load cell. These devices are used to monitor internal temperature, humidity level of an Incubator. Ultrasonic sensors are used to find the baby's head circumstance. Load cell is used for measuring the baby's weight. Once the baby has placed in an Incubator, the weight of the baby is monitored by load cell. If the weight of the baby is increases or decreases from the baby's normal weight, an alert is sent to doctor immediately so that the doctor can take the necessary precautions.

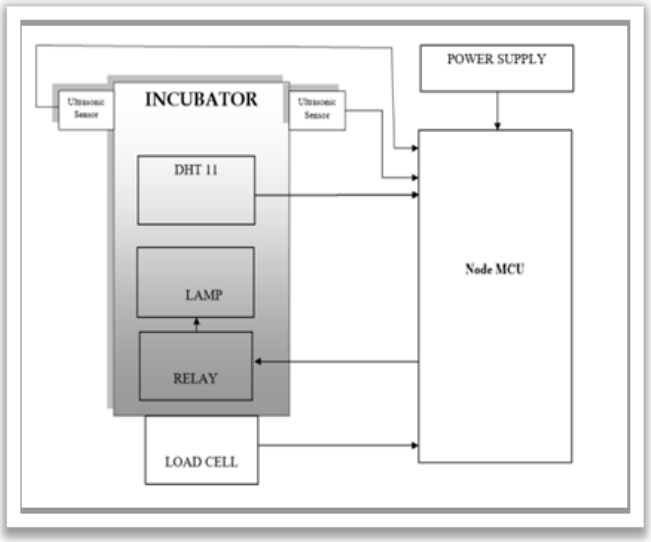


Fig.1. Block diagram of Incubator prototype

The incubator has a certain temperature range to keep the babies warm. In some cases, if the temperature becomes more than normal then the lamp will be turn on to maintain the same temperature. The doctors can monitor the

incubator's parameters remotely by using Ubidots cloud platform. The fig

1. explains the block diagram of incubator prototype.

A. Incubator Section

The prototype setup is designed by acrylic component that keeps infant incubator in warm. The setup will have six holes for necessary care and feeding. There is a mattress to have infant and a tray that hold mattress. The incubator is kept in folded table so it can be portable and also taken in ambulance also.

B. Hardware Section

The electronic component we used here are DHT 11, Load cell, ultrasound sensor, relay system, step down transformer (if portable mode not needed) and anti-intrusion buzzer system.

The Step down Transformer is used to step down the main supply voltage from 230V AC to lower value. This 230 AC voltage cannot be used directly, thus it is stepped down. The step down voltage is consists of 12V.The Transformer consists of primary and secondary coils. To reduce or step down the voltage, the transformer is designed to contain less number of turns in its secondary core. The output from the secondary coil is also AC waveform. Thus the conversion from AC to DC is essential. This conversion is achieved by using the Rectifier Circuit/Unit.

The Rectifier circuit is used to convert the AC voltage into its corresponding DC voltage. Rectifier having three types,

- Half wave rectifier
- Full wave rectifier
- Bridge rectifier

The most important and simple device used in Rectifier circuit is the diode. We used bridge rectifier. A bridge rectifier makes use of four diodes in a bridge arrangement to achieve full-wave rectification.

If portable mode is not required the battery can be used for power sources. The fig 2 shows step down transformer and fig 3 shows bridge rectifier.

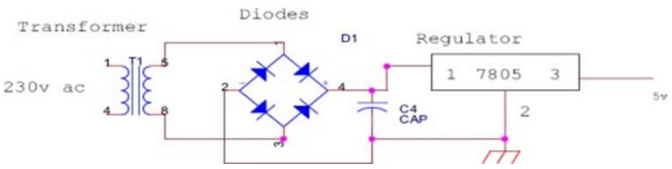


**Fig 2.** Bridge rectifier

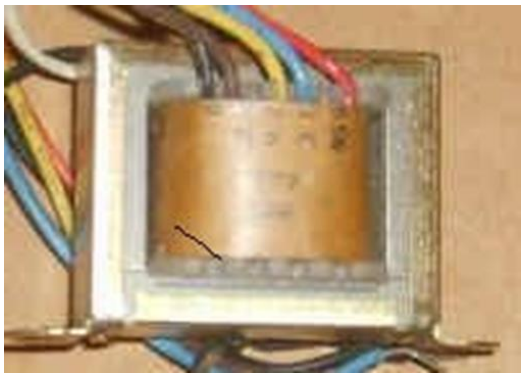

**Fig 3.** Step down transformer

The simple function of the diode is to conduct when forward biased and not to conduct in reverse bias. The Forward Bias is achieved by connecting the diode's positive with positive of the battery and negative with battery's negative. The efficient circuit used is the Full wave Bridge rectifier circuit. The output voltage of the rectifier is in rippled form, the ripples from the obtained DC voltage are removed using other circuits available. The circuit used for removing the ripples is called Filter circuit.

The simple capacitor filter is the most basic type of power supply filter. The application of the simple capacitor filter is very limited. It is sometimes used

on extremely high-voltage, low-current power supplies for cathode-ray and similar electron tubes, which require very little load current from the supply. The capacitor filter is also used where the power-supply ripple frequency is not critical; this frequency can be relatively high.

Capacitors are used as filter. The ripples from the DC voltage are removed and pure DC voltage is obtained. And also these capacitors are used to reduce the harmonics of the input voltage. The primary action performed by capacitor is charging and discharging. It charges in positive half cycle of the AC voltage and it will discharge in negative half cycle. Here we used 1000μF capacitor. So it allows only AC voltage and does not allow the DC voltage. This filter is fixed before the regulator. Thus the output is free from ripples.

Regulator regulates the output voltage to be always constant. Regulator having two types.

- Positive regulator (78XX)
- Negative regulator (79XX)

The output voltage is maintained irrespective of the fluctuations in the input AC voltage. As and then the AC voltage changes, the DC voltage also changes. Thus to avoid this Regulators are used. Also when the internal resistance of the power supply is greater than 30 ohms, the output gets affected. Thus this can be successfully reduced here. The regulators are mainly classified for low voltage and for high voltage. Here we used 7805 positive regulator. It reduces the 12V dc voltage to 5V dc.

The Filter circuit is often fixed after the Regulator circuit. Capacitor is most often used as filter. The principle of the capacitor is to charge and discharge. It charges during the positive half cycle of the AC voltage and discharges during the negative half cycle. So it allows only AC voltage and does not allow the DC voltage. This filter is fixed after the Regulator circuit to filter any of the possibly found ripples in the output received finally. Here we used 0.1μF capacitor. The output at this stage is 5V and is given to the Microcontroller In the power supply circuit two regulators are used. 7805 regulator is used to produce positive 5V dc. Microcontroller and sensors are operated at 5V dc voltage. The output of the 7805 regulator is connected to NODE MCU.

A Relay shown fig. 4 is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. It was invented by Joseph Henry in 1835. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

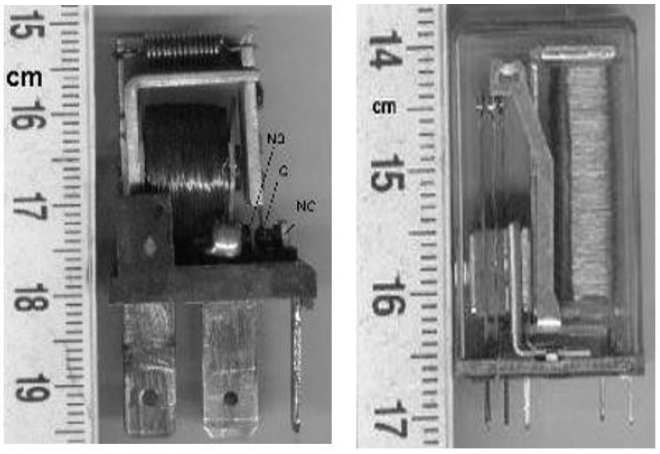


**Fig 4.** Relay circuit

The ultrasonic sensor used find distance from the object. The ultrasonic receiver is used to receive the reflected wave. Depends upon the distance of the object the received wave strength is varied. The received signal is given to amplifier unit. The amplifier unit is constructed with the operational amplifier which acts as power amplifier. The

received signal wave is in the form of AC wave form so the amplified signal is given to signal conditioning unit. Thus head circumference of a baby is found. The fig.5 shows ultrasound sensor.

**Fig 5(a)** Ultrasound sensor

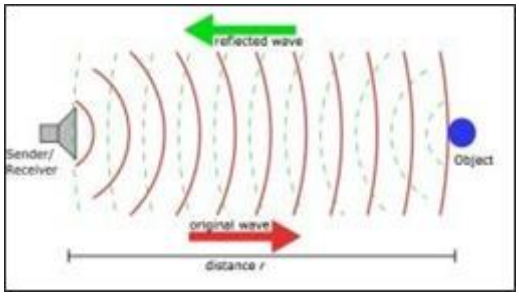


**Fig 5(b)** Ultrasound transmission

A load cell is a transducer which converts force into a measurable electrical output. Although there are many varieties of force sensors, strain gauge load cells are the most commonly used incubator and baby which is connected with anti-intrusion system.The load cell will be setup with threshold values if there is changes in weight of the incubator there comes the role of anti-intrusion buzzer alarm to notify that there is rodents interference or some issues. The fig 6 shows load cell that is used in this prototype

**Fig 6.** Load cell

This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor complex. Its technology ensures the high reliability and excellent long-term stability. A high- performance 8-bit microcontroller is connected. This sensor includes a resistive element and a sense of wet NTC temperature measuring devices. It has excellent quality, fast response, anti-interference ability and high cost performance advantages. The table I shown below explain about DHT 11 specifications and fig 7

Table I. DHT 11 specifications

| | |
|---|---|
| Sensor | DHT 11 (Temperature and humidity sensor) |
| Operating voltage | 3.3 V-5.5 V |
| Humidity measuring range | 20 %-95% ($0^0$-$5^0$ C) |
| Humidity measuring error | +_ 5 |
| Temperature measuring range | $0^0$-$5^0$ C |
| Temperature measuring error | +_$2^0$ C |
| Dimensions | 29.00 mm *18.00 mm |
| Fixing hole size | 2.00 mm |

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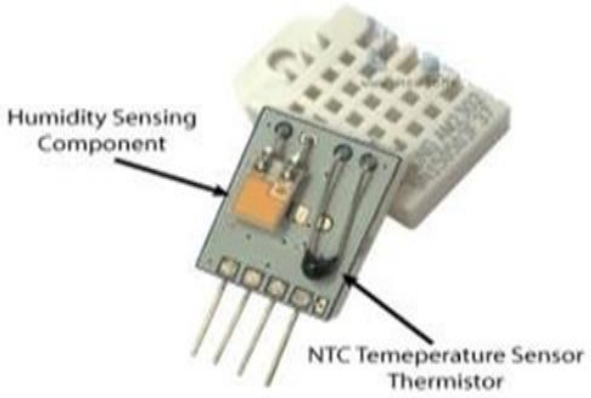


**Fig 7.** DHT 11 temperature sensor

**Fig 8.** Node MCU

**Fig 9**. Proposed model

The output of all parameters will be shown in monitoring sections like PC or mobile phones and these complete setup is controlled by Node MCU 8266 processor shown in fig 8which is a IOT plat form shown in fig. NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi- Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

This proposed model shown in fig 9 .will avoid much man power and gives accurate care to neonatals.

## V. RESULTS AND DISCUSSION

The prototype will provide successful results with good outcomes and avoid death rates in all places. This type of incubator model will also avoid need of more incubator populations and can also be used in primary health cares in rural areas. This setup can also used in homes under the surveillance of physicians and doctors with advanced IOT technology.

## VI. CONCLUSION

The result obtained from research data is concluded that in this system each sensor are working properly in accordance with the calibration tool namely ruler, thermometer and multi tester. Based on sensor data obtained at the time of testing, monitoring the Internet-based system is to run well. Based on the experimental results of monitoring, the results of sensor data displayed is the Internet of things cloud platform thinger.io website and look at the monitor serial Arduino software. The device (infant incubator or infant isolette) is to put the ultrasonic sensor on all sides of the box incubator, to measure the head circumference infant and then DHT11 sensors and Load cell sensor to monitoring the weight , temperature of infant and also these prototype can be used as portable (modular) mode that may helpful in urban especially in primary care center of rural areas.

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# Artificial Intelligence on Humanoid Robots

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## ABSTRACT

"Artificial intelligence will be the future scope and in all the field Artificial Intelligence will be the developed one. It will reduce the Work Force but all the works will be completed quickly. Various tasks and various works in all the fields will be performed by single Humanoid Robot. Less work and Higher Efficiency - efficient bureaucracy – AI has the power to change public administration, but the governments are ready. This technology comes with both risks and opportunities that need to be understood deeply & evaluated. Researchers study the human body and their structure and behavior (biomechanics) to build humanoid robots. Besides the research, humanoid robots are developed to perform human tasks like personal assistance, through which they can solve any problem statement, and dangerous jobs.

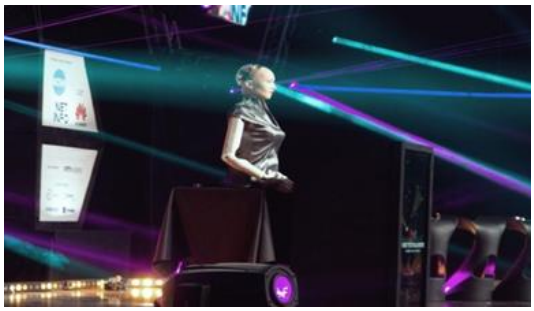
**Keywords :** Artificial Intelligence, Humanoid Robots, Biomechanics, Machine Learning, Natural Language Processing

## I. INTRODUCTION

Artificial intelligence (AI)

AI makes it possible for machines to learn from various experiences, adjust to new upcoming inputs and perform as human-like tasks. Most examples that you hear about today starting from chess-playing computers to self-driving cars heavily on deep learning and also natural language processing (NLP). By taking above two methods/technologies, computers can be trained to perform tasks by processing huge amounts of data and recognization patterns in the data.

Machine learning is one of the method of data analysis which runs analytical model building of the data. It is a branch of artificial intelligence based on that the systems can learn from data and also identifies patterns then makes decisions with the minimal human intervention. Deep learning is a type of machine learning (ML) that trains a computer to perform and do human-like tasks, such as recognizing the speech, identifying the images or making predictions with the given data sets. Instead of organizing data to run through existing equations, deep learning sets up the basic parameters about all the data and trains the computer to learn on its own by recognizing those patterns using many layers of processing in it.



Natural language processing (NLP) is one which is a branch of artificial intelligence (AI) that helps the computers understand, interpret and manipulate the human languages. NLP is came from many disciplines, which includes computer science and computational linguistics, in its pursuit to fill the gap between human communication through different languages and computer understanding of it.

Computer vision is a type of artificial intelligence which trains computers to interpret and understand the external visual world. Using digital images from the cameras and videos and deep learning (DL) models, machines can accurately identify the patterns and classify all the objects and then it will react to what they “see.”

## II. METHODS AND MATERIAL

### AI in Humanoid:

Sophia has made to start working from February 14, 2016. The Humanoid robot (Sophia) was modeled after the ancient Egypt Queen Nefertiti for human-like appearance and its behavior when compared to previous robotic variants. Inventor of Sophia, David Hanson Sophia uses artificial intelligence, visual data processing and facial recognition technologies in it. Sophia also recognizes human gestures and facial expressions of all and is capable to answer all the questions and can make simple conversations on the topics predefined in it. Sophia the Humanoid Robot that uses voice recognition (speech-to-the text) technology from Alphabetical order and designed to get the smarter time over. Sophia speech-synthesis ability is provided by Cereproc's (Text-to-Speech engine and also allows Sophia to sing all type of songs). Sophia's intelligent software is designed by the Hanson Robotics. The Artificial Intelligence program checks analysis conversations and the extracts data which allows it to improve more responses in the future scope.

Sophia is similar to the computer program called ELIZA, which is one of the initial attempts at simulating human conversations. This software has been programmed to give responses to specific questions or phrases which is pre-written, like a chatbot in computers. The responses from it are used to create illusion which makes the robot to understand the conversation, which includes stock answers to the questions like "Is the window open or shut. This information is shared via the Cloud Network which stores data as input and responses and analyzed to block chain technology.

According to the Quartz, the experts who have been checked the source code of Sophia state that Sophia is considered as a best chatbot with face. Moreover all the experts in Artificial Intelligent field disapproved Sophia’s over stated presentation. Ben Goertzel, the main chief scientist of the company which made Sophia, acknowledged that the Sophia is "not ideal" that some of the members think that Sophia has humans equivalent intelligence, but also argues Sophia's presentation that was given, which clearly explains that something that is unique to the audiences: "If we show the beautiful smiling face on an Robot, then they get the feeling of 'AGI' (Artificial General Intelligence) which may be indeed by them.

But none of this which we call AGI is not easier in Working.

Goertzel said that the Sophia could utilize AI methods that include the face tracking, the emotion of human recognition, and also robotic movements which are generated by deep neural networks. Sophia's speech is generated via decision tree, but it is integrated with the output uniquely.

If Sophia gets first switched on, the world couldn't get enough knowledge. It has a personality, it says many jokes late night hosts, has facial recoganization which is observed by all. Thus finally a robot came straight out of the current science fiction, the closest and unique AI technology we have ever seen.
Currently, AI is not having free will and certainly is not that the conscious of two persons which tend to make if it is faced with advanced or over-hyped technologies, Mousavi states that the most advanced AI systems out there are mostly products which would follow the processes defined by the smart people. Only they can't make decisions by their own.

In Machine Learning (ML), that includes Deep Learning (DL) and neural networks, the algorithm is presented with the loads of training data – example whatever the algorithm may be it will make it to learn data, which is instructed by people -until it is completing the task by its own. For the facial recognition software, it means that more number like thousands of photos and videos are stored in system and it should identify the undefined sample from it. The best machine learning algorithms are generally just memorizing the data given to it and running the statistical models in the system. To call as "learning" is to anthropomorphize machines which operate on a very different and undefined wavelength from our human brains. Artificial intelligence is one of the big catch now-all the information given to computer if it does automatically then it is referred as AI.
"From the view of software point we can say Sophia is the big platform, like a laptops and computers is a platform for something for task performing," Sophia control system is of three different types, 1) Timeline Editor, 2) Sophisticated Chat System and 3) Open Cog. Timeline Editor is one of the straight scripting software. The Sophisticated Chat System that allows Sophia to pick up and respond to all the keyword and also the phrases. And finally the Open Cog grounds Sophia's answers the questions with the experience and reasoning. This is the only system they are hoping to grow one day into AGI. "It happened that is the young adult female robot became very popular," The entire team at Hanson Robotics said they didn't expect Sophia can do this much then they expected. The physical appearance of Sophia is another example of what someone sees as a traditional representation of attractive and, submissive that designed as female robots.

According to the point of Hanson, Sophia has simulations of every major muscle in the human face now, which allows her to generate expressions of joy, grief, curiosity, confusion, contemplation, sorrow, frustration, among other feelings too.

"In case of the some of the work we're doing, Sophia will see our expressions and sort of match a little bit to us and also tries to understand that expression in her own way, what it is we might be feeling,"

## Universal Appeal

Hanson began sculpting Sophia first; he wanted her form to reverberating sound with all people from all around the world. Till that end, he was looking against old statues of Nefertiti, and ancient Chinese paintings, Audrey Hepburn and his wife also got

inspiration. But an important thing is to he also wanted to maintain the sensitivity of the robot too."That is very important that she represent the intersection of humanity and also the technology, with the initiative idea that the technology can enhance the humanity, which helps us to actualize to the higher states of human beings," said by the Hanson.

"Again the question provokes: What does the human mean it? What is the real, what isn't the real? And what is the reality of our future which has not yet existed?"

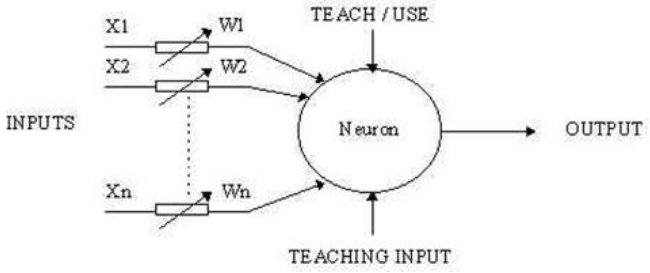
Besides modeling, she has been made appeared on the talk shows and spoken at the conferences about the role of AI in the robots. Controversially, Sophia was even granted for live in the Saudi Arabian citizenship that is becoming the first robot to have a nationality for her.

"Sophia is one robot amongst the more number of robots they have designed, which has become really internationally very famous".

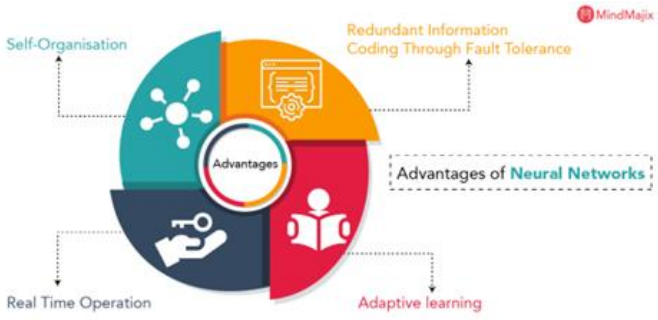
Role of Neural Networks in Artificial Intelligence:
Artificial neural networks (ANN) are the important tool of machine learning. ANN systems are developed by the inspiration of neuron functionality in the normal human brain, which will make the way how the humans learn. Neural networks (NN) consist of both input & output layer, as well as a hidden layer units that changes input into output so that output layer can take and use the value. These are the tools which are used for finding the patterns which are numerous & complex for the programmers because it is impossible to retrieve the data and train the machine to recognize the patterns given in input units.

**Structure:**

ANN working is similar to that of the human-brain. Doing the necessary connections, it is possible to duplicate the working of brain by using silicon and wires which is just similar to the dendrites and neurons in human brain. The stimuli from external environment are accepted by dendrites in the same way mentioned, and then the input creates electric impulses that travel through the neural network. ANN has several nodes which behave as same as neurons. Each node is connected by links (wires) for the purpose of communication with one another. The Nodes which take input data to perform small operations on trained data and the resultant of such operations are passed to other nodes (neurons). The output at this node is called its node value. The image for neuron structure is shown below.




Neural networks have a special ability to retrieve all the meaningful data from imprecise data, which is used in detecting the trends and also to extract the patterns which are difficult to understand by either computer or by the humans. A fully trained NN can be made as an “expert" in the information that has been given to analyze and that can be used for provide projections.



**How do Neural Networks learn from trained Data:**

Initially, neural networks (NN) are fed with huge number of data. Training of the NN is generally done by providing input and educating the network as what should be the output. Example, facial recognition is the latest and trending technology implemented by all the Mobile phone companies. All the input is gathered by the identification of similar matching data, like image of the person's face, emotion, various facial expressions, and all these inputs have to be trained. The proper answers will allow accommodating its internal data to check how better the NN can learn.

Rules should be defined in such a way that, each node decides what to be sent to next layer considering its own inputs from the previous layer. It can be done by considering many things like, genetic algorithms, fuzzy logic, and gradient-based training Bayesian method. ANNs are given some set of rules related to object relationships. Correct decisions must be taken in building the rules.

## III. RESULTS AND DISCUSSION

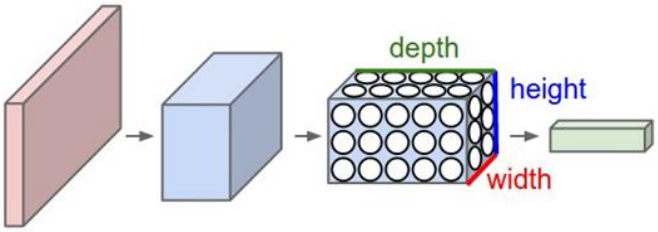
**Training:**

**Supervised Training:**

The supervised training has both the inputs and the outputs that are provided. The neural network then processes each of the inputs and compares its resulting outputs against the desired outputs. The Errors are then propagated back through the system, causing the system to adjust the weights which can be able to control the network. These processes occurred over and over as the weights gets continuously tweaked. The set of data which enables the training is called the "training set." During the training of a network the same set of data is processed over many times as the connection weights are ever refined.

**Unsupervised or Adaptive Training:**

As now presently, unsupervised learning is not well understood. The adaption to the environment is one of the promise which would enable science fiction types of robots to continually learn on their own as they encounter new situations and new environments. Life is fully filled with situations where exact training sets do not exist. Some of these situations involve strict action where new techniques and new weapons might be encountered. Because of this unexpected aspect to life and the human desire to be prepared, there continues to be research into, and hope for, this field. Yet, at the present time, the vast bulk of neural network work is in systems with supervised learning. Supervised learning is achieving results.




Applications:

- ✓ Health Care
- ✓ Agriculture
- ✓ Finance
- ✓ Gaming etc


## IV. CONCLUSION

In a highly competitive world, we have a lot to gain from neural networks. ANN capability to learn through better example makes them powerful and flexible. Moreover, we need not devise any algorithm to perform a particular task. We don't require internal mechanisms of that task. These are well suited for real time systems as they respond fast with best computational times because of their parallel architecture. Neural Network is also contributing to other areas of research like psychology and neurology. In neurology, it is used to investigate the internal mechanisms of the brain and model parts of living organisms. The most exciting aspect of neural networks is that there is a possibility that one-day 'conscious' networks might arise. Some scientists are arguing that consciousness is a "mechanical property" and conscious neural networks are realistic and are possible. Neural networks have a huge potential and we can get the best from them by collaborating with fuzzy logic, computing, AI and ML.

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# GSM Aided Women Safety Device

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## ABSTRACT

Personal safety is one of the most important concerns for women, as offence against women has not decreased. Now a days, various devices are available in markets which claim to protect women in many ways. Still there arises the need of a safeguarding device which acts as a guardian at time of an attack. This increases a new thought of a GPS/GSM Aided Safety device for Women. In such situation, the aid of a safety device that will inform victims family members or the authorities may help women feel safer confident a reduces the chances of harassment. It may not be possible for victim to reach for her phone in some situations without the knowledge of perpetrator. In this approach they focuses on a security system that is designed merely to same the purpose of providing security to women so that they never feel helpless while facing such social challenges. It is a simple and easy to carry device with generous functionality. The basic approach is to intimidate rapid location and a distress message to the cops and registered number, so that unfortunate incidents would be averted and to provide real time evidence for immediate action against the perpetrators of crime against women. The ADXL sensor is activated when the victim fall down and the impact sensor get activated when an external force beyond the threshold value is enforced on the victim.

**Keywords :** GPS, GSM, ADXL

## I. INTRODUCTION

In today's world, women safety has become a major issue in our country as women can't step out of their house at any time, particularly during night. It is primarily due to fear of violence against them or being physically. The fear of harassment opposed to women is not only the condition at outside but it may also happen at homes[1]. Even in the 21st century where the technology is quickly growing and new gadgets are being developed but still women and girls are facing problems. They often work across ethnic, religious, political, and cultural divides to help liberty. Our society is all aware of importance of women safety, there is a need of a simpler safety solution that can be activated automatically and can instantly send alerts to the near one of the victim[2]. This projects focuses on a security system that is designed uniquely to serve the purpose of providing security and safety to women.

## II. OBJECTIVES

The objectives of this work is

- To create a portable safety device for women that provides the facilities like alert family and friends

by sending emergency messages, and exact locations

- To provide safety to the women from dangerous zone. This project provides facilities to secure women by providing this safety kit.
- To provide an SMS containing the location of the victim will be sent to preferred mobile numbers informing them of danger.
- The received coordinates can be viewed on Google maps to discover the location of the woman and appropriate help can be provided.

## III. BLOCK DIAGRAM

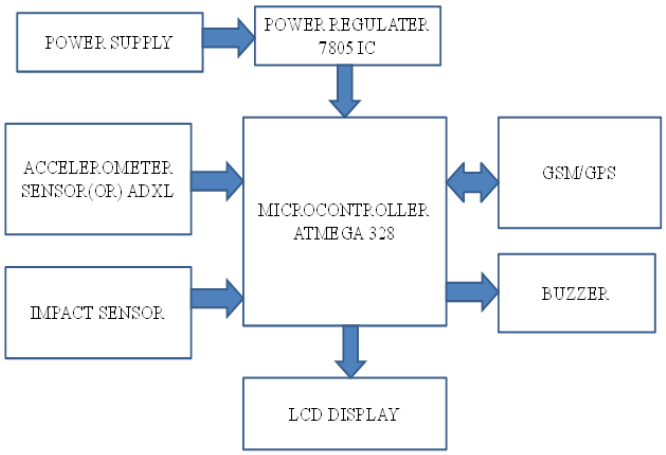


**Fig. 1** Block Diagram

The block diagram shows the women safety device and it provide the current location of the women upon receiving of the message from the user. The ADXL sensor activated when the victim fall down and the impact sensor get activated when an external force beyond the threshold value is enforced on the victim[3]. The GSM in the device provide the current location of the victim and sent alert message to the registered numbers.

## IV. HARDWARE DESCRIPTION

A. ATMEGA328
MICROCONTROLLER

It is embedded based device that carry throughput of 16 MIPS at 16 MHz and operates between 2.7-5.5 volts. High-performance, Low-power Atmel AVR 8-bit Microcontroller. It employed to develop the arduino mega platform.

B. POWER SUPPLY

The present chapter introduces the operation of power supply circuits constructed using filters, rectifiers, and then voltage regulators. Starting with an AC voltage, a steady DC voltage is get by correct the AC voltage, then clarify to a DC level, and finally, regulating to obtain a desired fixed DC voltage. The regulation is generally get from an IC voltage regulator unit, which takes a DC voltage and gives a somewhat lower DC voltage, which remains the same even if the input DC voltage range , or the output load connected to the DC voltage changes.

C. LCD

An LCD is a small low cost display. it is uncomplicated to interface with a micro-controller because of an embedded controller (the black blob on the back of the board). This controller is merit over the more displays (hd 44780), which means numerous micro-controllers have libraries that make displaying messages is easy to a single line of code.

D. AXIS SENSOR

3 Axis Acceleration Sensor Board form on ADXL from Anolog devices. It is a first creation of 3 axis acceleration sensor. User could receive acceleration value of X, Y, and Z axis. And it is generally used in shock, slope, and moving detection. Output sensitivity could be select by directly set voltage level on few pins. The output of MMA7260Q is analog mode, so you demand a A/D converter to read the acceleration value

E. IMPACT SENSOR

An impact sensor is a device that utilize the piezoelectric effect, to calculate variation in pressure, acceleration, temperature, strain, or force by changing them to an electrical charge. The affix piezo- is Greek for 'press' or 'squeeze'.

F. GPS/GSM MODULE

SIM800C is a quad-band GSM/GPRS module that operates on various frequencies. With a small-scale configuration of 17.6*15.7*2.3mm, SIM800C can meet all the extent demand in customers' applications, such as smart phone, PDA and other mobile devices. SIM800C is designed with power saving mode so that the present consumption is as low as 0.6mA in sleep mode.

G. BUZZER

A buzzer is a tiny and efficient component to add sound features to our project/system. It is very small and compact 2-pin structure. we are using simple buzzer which when powered will make a Continuous Beeeeeeppp.... it can be customised with help of other circuits to fit easily in our application. This buzzer power supply ranging from 4v to 9v and to regulated +5V or +6V DC supply. The buzzer is generally working to turn ON or turn OFF.

## V. SOFTWARE DESCRIPTION

The Keil C51 C Compiler for the 8051 microcontroller is the most agree to 8051 C compiler in the world. It provides more features than any other 8051 C compiler accessible today[4]. The C51 Compiler permits you to write 8051 microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language supplement in the C51 Compiler permit you full approach to all resources of the 8051[5].The C51 Compiler translates C source files into reloadable object modules which contain full symbolic details for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler create a listing file which may optionally include symbol table and cross reference information.

## VI. CIRCUIT DIAGRAM

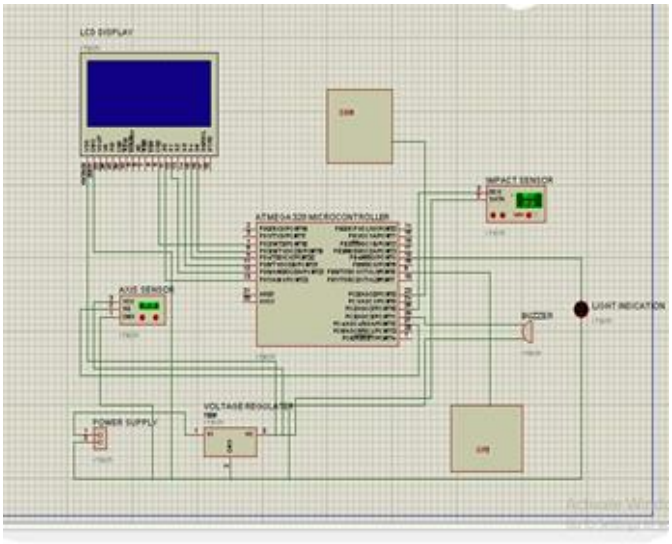


**Fig.2** Circuit Diagram

## VII. RESULTS

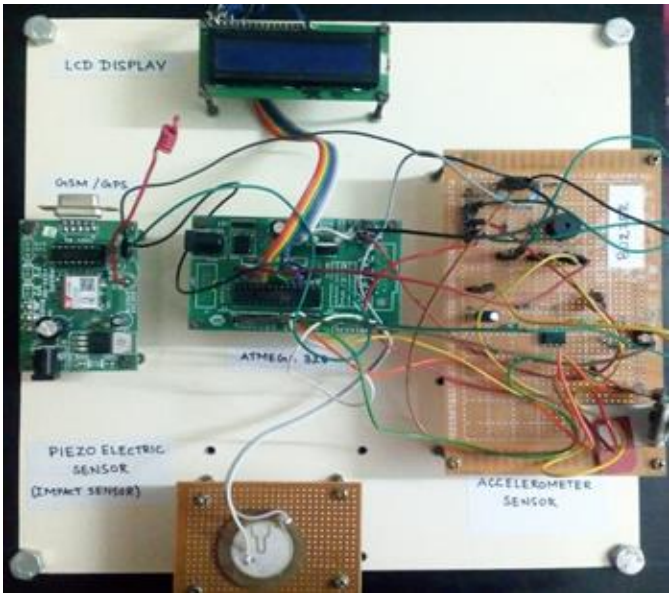


**Fig.3** Result (Model)


External force beyond a value is applied


Women fall unconscious


An SMS is sent to registered the mobile numbers along with these information.

The system continuously monitor the safety of women. When the victim fall down, the ADXL sensor is activated and sent message "fall down" [6]. When an external force beyond a threshold value is enforced on the victim the impact sensor get activated and sent message as "impact on women". GSM sent alert message to the registered mobile number and GPS provide the exact location of victim [7].

## VIII. CONCLUSION

Being safe and secure is the insistence of the day. Our effort behind this project is to design and fabricate a gadget which is so dense in itself that give advantage of personal security system[8]. This design will deal with most of the dangerous issues faced by women and will help them to be secure. Existing systems provide the mechanisms to track the vehicle but no other emergency mechanism is proposed[9]. The proposed mechanism provides viewing the exact location and current state of the victim within short time period. This systems helps to decrease the crime rate against women. Women's security is a critical issue in present situation. These crimes can be brought to an end with the help of real time implementation of our proposed system[10].

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# Upgradation of Milling Machine Using Servo Drive

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## ABSTRACT

This project is about Servo drive upgradation from Rexroth DKC01.3-FW to Mitsubishi MR-J4-700B4 in H-series cylinder head LA8290 milling machine bay-1 in shop 5. Milling machine is used in the line for milling inlet manifold of Cylinder head. This machine contains Component fixing fixture, Hydraulic power pack, controlled by servo rapid. These elements are in-turn controlled by servo drive of Mitsubishi make, of model: MR-J4. This up gradation is done because of obsolescence of Rexroth DKC01.3 Servo drive. Mitsubishi Servo drive of model: MR-J4-700B4 is more populated in the shop for various machines, this Servo drive is wiser and user friendly than Rexroth DKC01.3, so we have planned to upgrade to model Mitsubishi MR-J4-700B4. This Servo drive is having more advantages than Rexroth DKC01.3, some of the advantages are it is highly reliable, extremely user and maintenance friendly, modularized Input units. It combines high performance to meet complex requirement, versatile communication facility to integrate intelligent device.

**Keywords** : Milling Machine, Servo Drive

## I. INTRODUCTION

A servo drive could be a special electronic amplifier used to power electric servomechanisms. A servo drive monitors the feedback signal from the servomechanism and continually adjusts the servo rapid . A servo drive receives a command and feed back signal from an effect system, amplifies the signal, and transmits current to a servo motor so as to provide motion proportional to the command signal.2-axis and 3-axis servo drives are available for operating two and three servo motors, respectively. These servo drive enable energy-conservative, compact machine at low cost. differing kinds of servo motors including rotary servo motors, linear servo motors, and direct drive servo motors are freely combined as long because the servo motors are compatible with the servo drive.

The servo drives are communicates with the plc using RS232 communication cable. The servo drives control the speed of the servo motors in line with the required speed within the plc programmed memory. MR-J4 servo drive manufactured by the mitsubishi company is used in this project.

Drives used in an automatic system or in milling system are differing types like electrical, hydraulic or pneumatic. Electrical drives These are Direct current or Alternating current servo motors. they're small in size and easy to manage. Hydraulic drives These drives have large power to size ratio and supply

stepless motion with great accuracy. But these are difficult to keep up and are bulky. Generally they employ petroleum based hydraulic oil which can have fire hazards at upper level of working temperatures. Also hydraulic elements need special treatment to shield them against corrosion. Pneumatic drives This drives use air as working medium which is out there in abundant and is fire proof. they're simple in construction and are cheaper. However these drives generate low power, have less positioning accuracy and are noisy.

In this servo drive, usually AC, DC, servo and stepper electrical drives are used. the varied drives employed in milling machines will be classified as Spindle drives to supply the most spindle power for cutting action

## II. BLOCK DIAGRAM

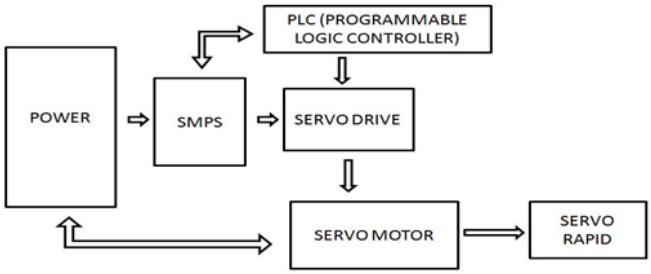


**Fig. 1** Block Diagram

## III. DESCRIPTION

Milling is the machining process of using rotary cutters to remove material from a H-series cylinder head in inlet manifold for cylinder head by advancing the cutter into the work-piece at a certain direction. The cutter may also be held at an angle relative to the x axis of the tool. Milling covers a wide variety of different operations and machines, on scales from large individual parts , heavy-duty gang milling operations. It is one of the most commonly used processes for milling machining custom parts to precise tolerances. Typical milling operations are:

Plain milling is the milling of a flat surface with the axis of the milling cutter parallel to the machining surface.

End Milling is the milling of a flat surface with the axis of the milling cutter perpendicular to the machining surface Gang milling is a vertical milling operation that utilizes three or more milling cutters grouped together for the milling machin of a complex surface in one pass Straddle milling a group of spacers is mounted in between one side and face side of milling cutters on the spindle motor.

The objectives of the design are i) obtain a complete automated milling machine. ii) Design the control panel considering all the possible constraints using PLC and servo drive. iii) Achieve sequential flow of servo rapid. iv) For easy back up support for maintenance and cost effective.

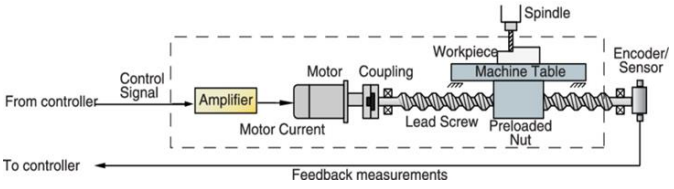


**Fig.2** Typical milling machine

From this block diagram it is explained as, three phase supply is given transformers for the required voltage level then it is given to MCB's, contactors and AC line filter for protection, then it is given to power supply module. PSM is connected in series with spindle and servo drive for power maintenance.

MR-J4-B Servo Motors are connected to servo drives for the controlling; feedback is taken from motor to sevo drive for its actual speed and position of the servo rapid, depending upon the inputs given to PLC MITSUBISHI FX5U, Motor speed and position will control according to the inputs given and actual

measurements. Along with this sensors and limit switches signals will also control the milling machine movements.

Major components required for automation are PLC( Programmable logic controller) MITSUBISHI FX5U, Servo Motor Drive MITSUBISHI MR-J4-700B4, Proximity sensors, solenoids, Computer Numeric Control, and Limit switches. Four servomotors are connected to the Servo drives for the axis movements X axis. One spindle motor is connected to the spindle drive for the milling cutter rotation. Power Supply Module (PSM) is required to proper maintaining the power to the servo and spindle drives. PSM is connected in series with the spindle drive and servo drives. Working of Drives and motors is based on the signal obtained from Programmable logic controller. The inputs to PLC are signals from sensors. Push buttons are for start and stop operation. In Milling machin is for the communication of the machine with outside world. HMI has LCD screen which helps to display the ongoing operation and to even give input for different operations. The sequence to run the machine is done in two ways manual mode and auto mode. In manual mode all the movements take place one after the other in an order second method is based on the auto mode given by the operator. One or more movements take place according to the choice of operator which can also be called as conditional flow of movements.

The milling machine controlling is done by using the PLC part programming starts from analysis of the applications, distance has to move from initial homing position to final end point. Along with that depth of cutting, speed of the spindle (milling cutter) and type of the milling head. Final point of control is by checking the completed job. Below is the controlling methodology of the whole system. The following are the steps of controlling process Control panel is designed for the milling process mainly consists of Programmable Logic Controller, Servo drives , Spindle drive, Power Supply Module.

Servo drive, relay boards, SMPS (switched mode power supply), MCB's, Contactors and MPCB's etc. These components are assembled and wired and are further connected to the Milling machine. the connection between the control Panel and milling machine.

The milling machine and the control panel that is to be designed. The proximity sensors and limitswitches are inputs to PLC. The position of different movements whether at home position or at end position is given to programmable logic controller through these sensors. As per the programming done, actuating output signals are given to servo drive feed to servo motors and Spindle motors, which results in the movement of the x axis in the direction given by the operator. Here the servo drives are operating on constant v/f ratio. So here Power Supply Module controlling the power given to the drives intern controls the speed of the motors. i.e., on actuation of axis drives. Here X axis is for movement of vertical direction, for the rotation of the work-piece on the work table and Spindle drive for controlling the speed of the milling cutter according to the depth of the cutting. The interfacing between the PLC makes it easy to operate the machine in required directions manual mode or in auto mode.

## IV. CIRCUIT DIAGRAM

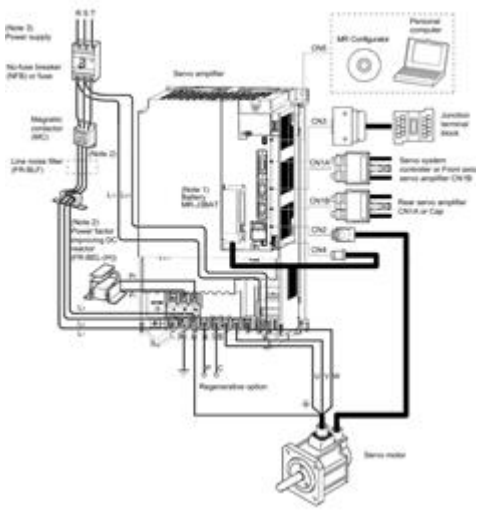

**Fig 3.** Circuit Diagram

Using this servo drive the run time of the servo rapid can be reduced and high reliability of the machine can be ensured.

## V. RESULTS

**Fig 4.** Result

By using the MITSUBISHI MR-J4-700B4 servo drive.used to reduce power consumption and we can connect number of servo drive than Rexroth servo drive. We can also implement the reliability of the machine.

## VI. CONCLUSION

Our project is about servo drive upgradation from REXROTH DKC01.3-100-7-FW to MITSUBISHI MR-J4-700B4 in LA8290 milling Machine. This project is taken because of obsolescence REXROTH DKC01.3-100-7-FW, So we have gone for replacing MITSUBISHI MR-J4-700B4. These have various advantage of REXROTH DKC01.3 Over MR-J4-700B4. Some of advantages are isolated power supply, CPU Module, Input Module, Output Module. Individual modules can be diagnosed and replace. By this project we are Aspiring MTTR (Mean Time To Repair) From 12hours to 1hour. MTBF (Mean Time Between Failure) from 36 hours to 480 hours and reliable machine.

## VII. FUTURE WORKS

In future manual work done in machin can be reduce by fully automated control assembly line and increase the production rate of machine.

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# IoT Tracking Device

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## ABSTRACT

The tracking system is technology that is used by many companies and individuals for several tracking purposes like vehicle tracking, child safety, women's safety etc. In our project we track a vehicle based on IOT using GPS and that operates using satellites and ground-based stations or by using our approach which depends on the cellular mobile towers. It is a fleet management solution and total security, the internet of things (IoT) may provide satisfactory and good results in our work by relying on a mixture of software and hardware. The data from the IoT tracking device are constantly uploaded to the cloud platform and making access to its information from anywhere at any time. The aim of using IoT for tracking and monitoring is due to the great advantage that provides when working with its components and platforms.

**Keywords :** Tracking Device, GPS, Internet of Things

## I. INTRODUCTION

Geographic position tracking techniques are evolving day by day. Those techniques are using for numerous things nowadays. Factories, industries, and other huge economical enterprises are getting rapidly developed over a decade. By this security is playing a main role in their environment. In this situation, GPS asset tracking systems are very helpful for the industries and other business vendors to track their assets in many ways. One of the main needs is to track their goods vehicle to make confirm that their product reaches a particular place safely. By combining IoT and cloud techniques with these we can store and retrieve the GPS data whenever we want. GPS provides highly interactive maps. These help users to find their tracking products even more precisely. In this way, IoT combined geographic positioning system is improving asset tracking need.

Tracking systems have brought GPS technology day-to-day lifetime of the person. These days GPS fitted cars, police vehicles, fleets and ambulance are common sights on the roads of developed countries. Familiar by several names like Automatic Vehicle Locating System, Vehicle tracking and Information System, Mobile quality Management System, these systems provide an efficient tool for rising the operational potency and utilization of vehicles. GPS is employed in vehicles for each tracking and navigation. Tracking systems enable a base station to stay track of the vehicles and navigate the driver to achieve the destination. The all existing technology can offer solely tracking the vehicle and additionally navigations. The planned technology is integration of

GPS systems, Wi-Fi systems. All mentioned systems are integrated along and transfer the info to cloud server that is stored and maintained in their infrastructure. The GPS technology integration for vehicle tracking the most advantage of planned technology is sensors primarily based watching the vehicle activity.

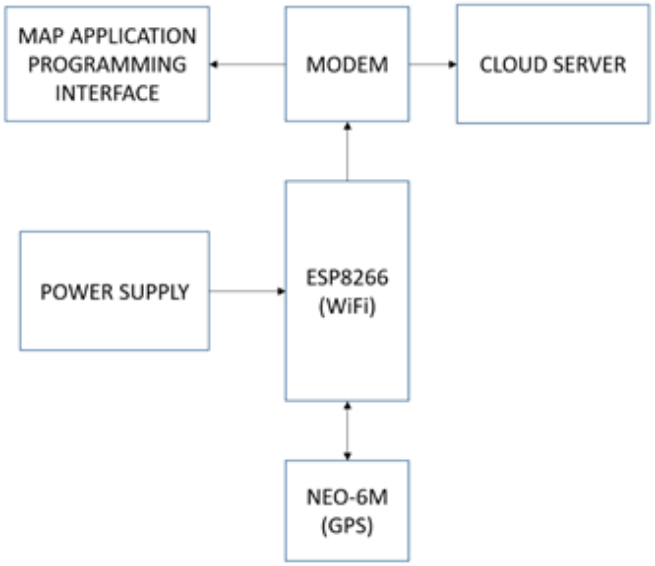


**Fig. 1** Block Diagram

## II. DESCRIPTION

The ESP8266 Wi-Fi module is the main unit for transferring the GPS data to the cloud server. ESP8266 is a compatible wifi module which is mainly developed for the IoT application. ESP8266 is also called as NodeMCU. Which node is referred for a firmware developed for ESP8266 chip and MCU stands for microcontroller unit. ESP8266 has tensile xtensa 32-bit reduced instruction set computer microprocessor. Which contains 80 to 160 MHz clock frequency. Which possess 128kB of random access memory. 4MB of an external flash. 802.11 b/g/n Wi-Fi transceiver. Wi-Fi module can accept power supply through its built-in USB port. Usually, the USB port delivers 5V supply to the ESP8266 but it only works with 3V to 3.3V. For this purpose, there is a built-in voltage regulator on its board. Which coverts high voltage to system capable voltage.

**Fig.2** ESP8266(wifi)

The Geographic position system module is used to gather the location co-ordinates and sent it to the ESP8266 wifi module. The Wi-Fi module is connected to a local area network whether that local area network is linked to cloud servers. GPS module is connected with the ESP8266 Wi-Fi module. The GPS module contains four pins which are Vcc, Tx, Rx, and ground. The Vcc pin is for power supply. GPS module intakes a standard power supply of 3.3V which is provided by 3.3V pin from the wifi module. Transmitter(Tx) pin of GPS is connected to the receiver(Rx) pin of the wifi module and the receiver(Rx) pin of GPS is connected to the Transmitter(Tx) pin of the wifi module. These connections are responsible for the data interchange between the wifi module and the geographic positioning system.

Cloud server and Wi-Fi module is must connect in the same local area network. Local area network connection is provided by a external modem. Programming is needed to connect those cloud server and Wi-Fi module with the modem. After the connection is made the data is automatically upload to the clouds database and the data are represented by graph. Map application programming interface is use to display the location in a real map layout. For this purpose we want to create a Google map application programming interface. Then the data's are display in the map.

## III. CIRCUIT DIAGRAM

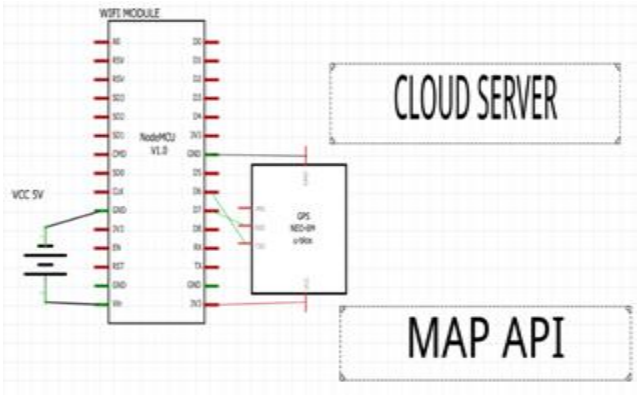


**Fig.3** Circuit Diagram

Above diagram shows the circuit of the tracking system.

## IV. RESULTS

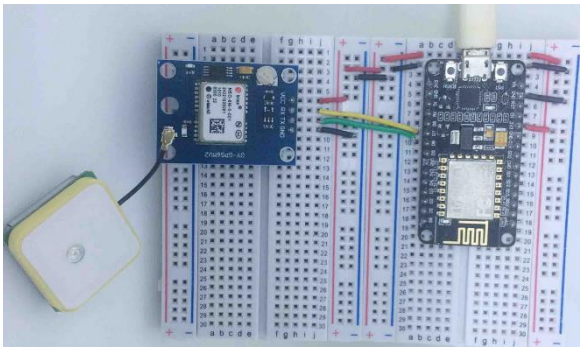

**Fig.4** Result (Model)

We tested and implemented the IoT tracking device. The result was shown in Fig.4. The system was tested with vehicle and the GPS data are successfully uploaded to the cloud server and shown in map application programming interface

## V. CONCLUSION

In this paper, we express the development of IoT tracking device. The proposed tracking system is made with Wi-Fi system and GPS system which provide great efficiency and precision in location tracking. And this module so small in size thus it easily fit everywhere.

## VI. FUTURE WORKS

In future these tracking system can be redesign as more efficient and provide more precision in tracking location. And the cloud server infrastructure is improved well to store and retrieve data.

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# Detection and Classification of Kidney Stone in CT Images

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## ABSTRACT

Kidney stone disease is one of the risks for life throughout the world and the majority of people with the stone formation in the kidney at the initial stage do not notice it as disease and it damages the organ slowly. The current estimation is that 30 million people are suffering from this disease. The currently available widely used imaging techniques for diagnosing kidney diseases include X-ray imaging and Ultrasound imaging. The proposed work is used to detect and classify the kidney stone using CT images. The Bilinear Interpolation and the median filter is used for image resizing and noise removal in preprocessing. Level set segmentation (Fuzzy C means clustering) is proposed for kidney stone segmentation. A novel approach for the classification of different types of Kidney stones using Random Forest and gray level co-occurrence matrix (GLCM). Different types of Kidney stones namely Cystine stones, Staghorn stones, and Renal Calculi stones were analyzed. MATLAB R2013A tool is used for this project.

**Keywords :** Bilinear Interpolation, clustering, co-occurrence, Staghorn, Calculi

## I. INTRODUCTION

Current estimates are that 30 million (1 in 11) Americans will experience a kidney stone within their lifetime, and up to 50% of new stone formers will have a recurrence, within as early as 5 years. The increasing number of patients with kidney diseases leads to high demand for early detection and prevention of kidney diseases. A kidney stone may not cause symptoms until they move within the kidney or until it passes into the urethra (the tube connecting the kidney and bladder). The most common symptom of kidney stones is a pain in the upper back. When the pain is severe there is the possibility of getting nausea as well. There can be blood in the urine and also a urinary tract infection. Stones are diagnosed with CT scans, X-rays, or ultrasound. The proposed method gives preference to CT images because CT gives more information compare to Ultrasound images. These images can be used as an initial evaluation to estimate kidney size and position, and help to diagnose structural abnormalities as well as the presence of cysts and stones. To enhance the quality of these images, some image processing techniques are usually applied for a better understanding of hidden information as well as for extracting some parameters or features that will be useful for kidney stone classification. This proposed method classified three types of stones. When there is too much Cystine in the urine the cystine stone

formed in the kidney. Staghorn stone is most frequently composed of mixtures of magnesium ammonium phosphate (struvite) and calcium carbonate apatite. Urine contains more crystal-forming substances such as calcium, oxalate and uric acid means the Renal Calculi stones are formed.

## II. METHODOLOGY

In proposed work, a novel scheme for efficient detection and classification of kidney stones with minimal processing time. The proposed scheme utilizes Bilinear Interpolation for image resizing and Median Filter for noise removal in preprocessing. Fuzzy c-means clustering and level set segmentation technique is used in the segmentation process for segmenting kidney stones alone. From segmented images, several texture features are extracted. The features are namely contrast, correlation, energy, and homogeneity. The Random Forest machine learning techniques are used to perform stone classification in CT images of the kidney. The kidney stone CT is collected from the Bharath scan center. The methods of work represented in workflow diagram Fig:1

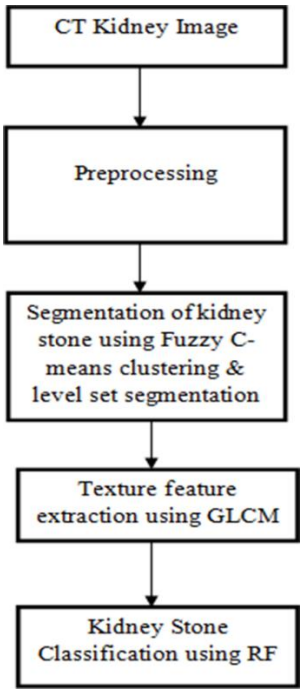


**Fig:1** Workflow diagram

### A. IMAGE ENHANCEMENT

The objective of the preprocessing phase is to apply possible image enhancement techniques to obtain the required visual quality of the image. Initially, the CT kidney stone images are converted into a grayscale image for further processing. Image resizing is an important role in image processing technique, to enlarge and reduce the given image size in pixel format. It is done by using a bilinear interpolation method. The median filter is used to remove the noise in the CT images.

### B. FUZZY C-MEANS CLUSTERING ALGORITHM

This algorithm works by assigning membership to each data point corresponding to each cluster center based on the distance between the cluster center and the data point. More the data is near to the cluster center means its membership towards the particular cluster center. The summation of membership of each data point should be equal to one. After each iteration membership and the cluster centers are updated

$$\mu_{ij} = 1 / \sum_{k=1}^{c} (d_{ij} / d_{ik})^{(2/m-1)}$$

$$v_j = (\sum_{i=1}^{n} (\mu_{ij})^m x_i) / (\sum_{i=1}^{n} (\mu_{ij})^m), \forall j = 1, 2, \ldots . c$$

according to the formula:

'n' is the number of data points. 'vj' represents the jth cluster center. 'm' is the fuzziness index m ∈ [1, ∞]. 'c' represents the number of cluster center. ' μ ij' represents the membership of ith data to jth cluster center. 'dij' represents the Euclidean distance between ith data and jth cluster center. The main objective of the fuzzy c-means algorithm is to minimize:

$$J(U,V) = \sum_{i=1}^{N} \sum_{j=1}^{C} (\mu_{ij})^m \left\| x_i - v_j \right\|^2$$

### C. RANDOM FOREST CLASSIFIER

Random forests are a way of averaging multiple deep decision trees, trained on different parts of the same training set, to overcome the over-fitting problem of the individual decision tree. In other words, random forests are an ensemble learning method for classification and regression that operate by constructing a lot of decision trees at training time and outputting the class that is the mode of the classes output by individual trees. The test image is passed down each random tree until it reaches a leaf node. All the posterior probabilities are then averaged and the maximum is taken as the classification of the input image.

## III. RESULT AND DISCUSSIONS

### A. PREPROCESSING

Totally 30 kidney stone images were collected and processed. In the preprocessing phase the test image shown in Fig:2. The resize is done by the bilinear interpolation method. This is shown in Fig:3. The noise is removed by using a median filter it is shown by Fig:4.

### B. SEGMENTATION

After the preprocessing stage, segmentation of kidney stone is performed by fuzzy c- means and level set segmentation it is shown in Fig:5 and Fig:6. The goal of a fuzzy c means clustering analysis is to divide a given set of data or objects into a cluster, which represents subsets or a group. The partition should have two properties homogeneity and heterogeneity. This algorithm based on fuzzy optimization of the quadratic criterion of classification where each class is represented by its center of gravity. The algorithm requires knowing the number of classes in advance and generates classes through an iterative process minimizing an objective function. Thus, it provides a fuzzy partition of the image by giving each pixel a degree of belonging to a given region. Finally, the level set is used to only detect the stone region in the clustered image.

### C. FEATURE EXTRACTION

In the feature extraction stage, texture features are extracted from the segmented kidney stone image. Features are computed from the statistical distribution of observed combinations of intensities at specified positions relative to each other in the image. According to the number of intensity points (pixels) in each combination, statistics are classified into first-order, second-order and higher-order statistics. The Gray Level Co- occurrence Matrix (GLCM) method is a way of extracting second-order statistical texture features. The approach has been used in several applications, Third and higher-order textures consider the relationships among three or more pixels. Gray Level Co- Occurrence Matrix (GLCM) has proved to be a popular statistical method of extracting a textural feature from images. In this project Energy, Contrast, Correlation, and Homogeneity texture features are extracted.

### D. CLASSIFICATION

The classification process is done over the segmented images. RF classifier is applied over the segmented images and the classification is done. It is shown in Fig:7 and The performance analysis of this proposed method shown in Fig:8

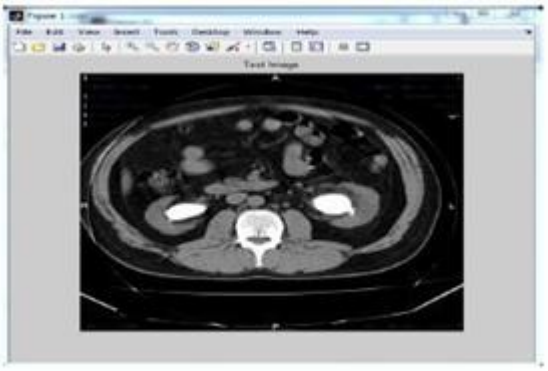

**Fig:2** Test image

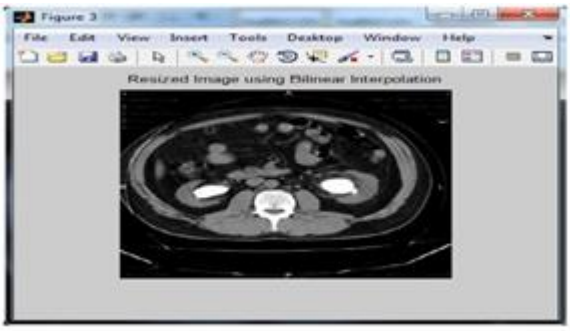


**Fig:3** Resized image


**Fig:4** Filtered image

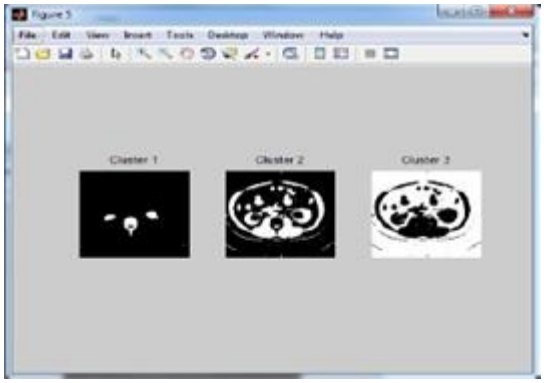

**Fig:5** Clustered image

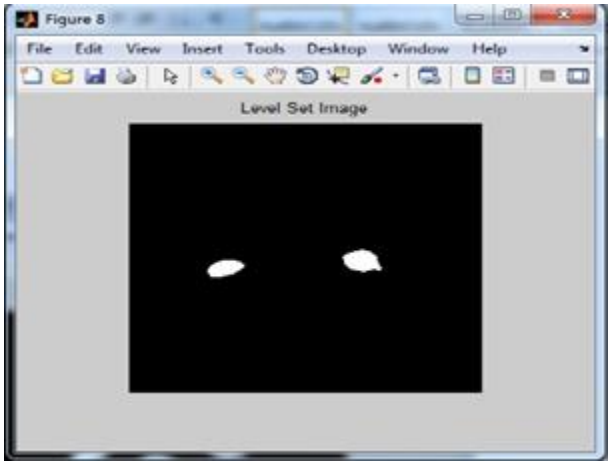


**Fig:6** Level set segmented image

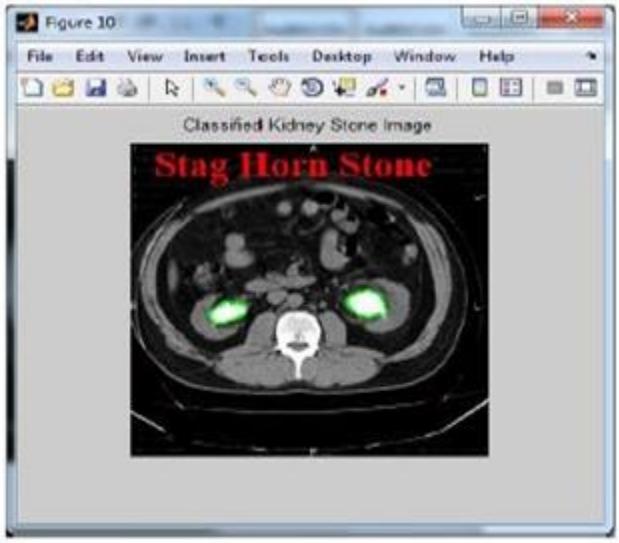


**Fig:7** Classified kidney stone image

**Table 1.** Performance Analysis

| | Proposed method |
|---|---|
| Accuracy | 93.33% |
| Sensitivity | 87.50 % |
| Execution Time | 31.64 s |

## IV. CONCLUSION

This work describes a method for the detection and classification of the kidney's stone using fuzzy c-means clustering and random forest. Preprocessing

involves image resizing and noise removal. A kidney stone is effectively detected from the segmented image. Finally, three types of classification are performed. This proposed method is efficient and time taken to process the image is lower.

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# Contactless Biometric Fingerprint and Signature Identification and Verification

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## ABSTRACT

To query the biometric and fingerprint and signature identification, the database communicates with a single secure server as if the entire database is stored in it. In CSP, outsourced encrypted biometric and fingerprint and signature identification are stored in a distributed manner, whereas the secure server manages the query processing on such a distributed database. The desired data will be distributed and stored in secure servers which increases the verification of accessing data. It stores data in a particular cloud server from which the server distributes them based on availability and performance. It increases the security of the verification process by comparing the details stored. Study on signature and finger knuckle patterns has attracted increasing attention for the automated biometric signature identification. Signature and finger knuckle pattern is essentially a biometric identifier and the usage or availability of 2D knuckles and key limitations to avail biometric identifiers. So the proposal since proposes 2D signature and finger knuckle collection of data, which was gathered from various sources using a photometric imaging stereo approach. This paper investigates on 2D information from signature and finger knuckle patterns and introduces a new feature descriptor to extract discriminative features for accurate signature and finger knuckle matching. An individuality model for the proposed feature descriptor is also presented. Expected experimental analysis by consuming state of the art technology on the signature and finger pattern executes and validates the efficiency of the proposal. This process is verified from the obtained results, using the state of the art technique, signature and fingerprint collection patterns on available datasets that are distributed.

**Keywords :** Service Oriented Architecture (SOA), State-of- the-Art, Support Vector Machine (SVM), Deep Neural Network (DNN), Knuckle Patterns.

## I. INTRODUCTION

Biometric technologies offer enormous potential to meet a range of security requirements for the automated and efficient recognition of humans. Among various biometric identifiers, the fingerprint is probably the most widely deployed biometrics for e-governance, e-business and a range of law-enforcement applications. Other biometric identifiers such as the face, iris, palm print, or vascular pattern shave also established their usefulness for a range of applications. The usefulness of biometric identifiers depends on the nature of application requirements including the accuracy, efficiency and importantly

the user convenience. Several challenges have emerged with the biometric recognition deployments using fingerprints. The degradation in finger-print matching accuracy due to frequent skin deformations, residual dirt, sweat, moisture and/or scars, is well-known while a large number of manual laborers and elderly population also suffer from fingerprints with less than acceptable quality for the identification. The NIST report submitted for the US Congress stated that about 2% of the population does not have usable fingerprints. Similar conclusions have also been reported in a large-scale proof of concept study from UIDAI which stated that about 1.9% of subjects cannot be reliably authenticated by using their fingerprints. The finger knuckle patterns can be simultaneously imaged during the fingerprint identification and are less susceptible to damages during daily life activities. The finger knuckle patterns can be more conveniently imaged from a distance, unlike fingerprints, as the major creases and curved patterns are easily visible with naked eyes. In summary, there are reasonable arguments to indicate that the addition of finger knuckle patterns for biometric recognition could address some of the limitations with the usage of only fingerprints. Therefore, many more enterprises and individuals have moved their data, such as personal data and large archive system, into the cloud every day. The cloud has become a necessity for many of us for individual, enterprise, and government use. The cloud aims to reduce costs and helps the users focus on their core business instead of being impeded by IT obstacles. The major available technique in cloud computing is data virtualization. Cloud computing holds the proposals from Service Oriented Architecture (SOA) which help users to overcome issues into various processes that were combined to intimate an optimized result.

## II. RELATED WORK

K. Getgen: An approach to probabilistic risk assessment of electrical system grounding is proposed. The method uses all significant factors that affect the risk of electrocution at substations and takes into account their probabilistic nature. The approach implements an accurate statistical description of IEC479-1 fibrillation and body impedance data, and it uses detailed computer simulations of the modeled grounding system to provide safety level distributions that take into account the individual's presence at a site as a random variable. Variation in the power system fault level is accounted for, and extensive data of actual system fault clearance time are included. It is proposed that the probabilistic risk assessment is utilized as a second stage of the grounding system assessment when the first-stage deterministic analysis requires expensive or impractical mitigation. Implementation of the second stage probabilistic risk assessment yields a measure of individual risk. This is then benchmarked against industry-accepted "as low as reasonably practicable" values to determine whether an investment in mitigation is required. To illustrate the applicability of the proposed approach, the probabilistic risk assessment is applied to a practical case study of a transmission substation.

C. Gentry: In this paper, a new architecture for accelerating homomorphic function evaluation on FPGA is proposed. The architecture is based on a parallel cached NTT algorithm with an overall time complexity O ( √ N log √ N). The architecture has been implemented on Xilinx Virtex 7 XC7V1140T FPGA that achieves a 60% utilization ratio. The implementation performs a 32-bit 2 16 -point NTT algorithm in 23.8 μ s which is a 2x speedup over the state of the art architectures. The architecture has been evaluated by computing a block of each of the AES and SIMON-64/128 on the LTV and YASHE schemes. The proposed architecture can evaluate the AES circuit using the LTV scheme in 4 minutes while processing 2048 blocks in parallel. This

leads to an amortized performance of 117 ms/block, which is the fastest performance reported to the best of our knowledge.

R. A. Popa: OpenEHR is an open standard specification for developing a flexible electronic health record (EHR) management system. It defines the standard service models and APIs and offers a whole lifetime data storage method to the patient's record. As an important OpenEHR system component, EHRServer plays the role of back-end services repository for data storage and query. It complies with the OpenEHR specifications and adopts the MySQL database. However, level EHRServer has many limitations. For example, its official requirement stresses that one organization cannot access the EHR owned by other organizations. The original EHRServer database is in plaintext format. It can lead to the risk of electronic record leakage. Encryption is one common protection method, but the level EHRServer APIs do not support encrypted data queries. That restricts building EHRServer on the cloud. What's more, the inconvenience of information sharing among different organizations may also hinder the extension of OpenEHR coverage to more domains and countries. To solve the above open problems, in this paper, we explore two approaches that guarantee the security and flexibility of sharing EHR on the cloud and thus propose a new architecture called Crypt-EHRServer. Firstly, we use attribute-based encryption to realize flexible EHR access authority for different authorized organizations. Secondly, we learn from an efficient ciphertext query model, CryptDB, and adopt their onion encryption approach to support standard SQL queries on the encrypted EHR. The result of our work could provide a flexible, scalable and secure EHR system. Crypt-EHRServer will benefit OpenEHR's widespread adoption in the world, and will also arouse people's awareness about incorporating security criteria into the design of electronic health records management systems.

M. F. Kaashoek: Data mining is a powerful new technique to discover knowledge within a large amount of data. A number of theoretical and practical clarifications to query processing have been proposed under various scenarios. With the recent popularity of cloud computing, data owners now have the opportunity to outsource not only their data but also data processing functionalities to the cloud. Because of data security and personal privacy concerns, sensitive data (e.g., medical records) should be encrypted before being outsourced to a cloud, and the cloud should perform query processing tasks on the encrypted data only. These tasks are termed as Privacy-Preserving Query Processing (PPQP) over encrypted data. These protocols protect the confidentiality of the stored data, user queries, and data access patterns from cloud service providers and other unauthorized users. Several queries were considered in an attempt to create a well-defined scope. These queries included the k-Nearest Neighbor (kNN) query, advanced analytical query, and correlated range query. This paper presents protocols utilize additive cryptography-based privacy-preserving data mining technique at different stages of query processing to achieve the best performance all computations can be done on the encrypted data.

N. Zeldovich: With the rapid increase of Internet users, network security becomes very essential. Cryptography plays a major role in network security. However, cryptographic systems consume considerable amounts of resources, like memory, CPU time, encryption and decryption time. In this paper, we compared the most common block cipher modes of operation on AES according to the recommendations of the National Institute of Standards and Technology (NIST). The comparison is done in terms of encryption time, decryption time,

and throughput with variable data packet sizes. The results of the comparison are summarized and our observations are highlighted to help to make an informative decision when choosing the mode of operations for different applications with symmetric-key ciphers.

## III. PROBLEM AND MODEL DESCRIPTION

To address this security problem, there have been many proposed solutions: using homomorphic linear regression to analyze the fingerprint and as well as the signature verification of a trusted coprocessor. However, they are either incomplete or infeasible (with low efficiency). In this paper, we propose a novel system architecture called RPA Region Proposal Algorithm, which is based on re-designing the processor architecture to support arbitrary computation. Our design tightly couples the original data with the collection of information that has been stored in the database or in the dataset that has been proposed architecture. With our method, the comparison can be attained with better accuracy and the compared result has been optimized with accuracy. Our main contributions are as follows: To the best of our knowledge, it is the first to use processor architectural design to successfully protect remote operation on signature as well as the fingerprint knuckle patterns database against any honest-but-curious administrator.

This paper addresses the key limitations of levelly available finger knuckle identification technologies by developing a 2D finger knuckle feature extraction and matching model that can simultaneously recover extended finger knuckle features from finger knuckle images reconstructed from a single 2D imaging sensor. Simultaneous availability of information from the finger knuckle images not only offers significantly improved matching accuracy but can also ensure automated detection of sensor-level spoof attacks using printed knuckle images. Any direct application of known or popular feature descriptors, e.g. those designed for other biometric identifiers such as palm or fingerprint, is expected to offer limited performance. Instead, specialized feature extractors should be designed to recover the most discriminative information from the 2D finger knuckle patterns which is largely embedded in curves and creases with varying thickness. Some of the successful attempts in recovering fingerprints using photometric stereo require reconstruction or the integration of source information,

i.e. surface normal. The reconstruction process is generally complex, e.g. popular method used in requires FFT and IFFT which are known for their complexity, and are known to introduce errors in the reconstructed depth images. These errors are introduced as it is difficult to

find closed-form solutions for the integration, i.e., inerrability problem and mainly results from the discontinuities around irregular ridge valley boundaries during the re-construction. Therefore, any direct usage of source information from the surface normal vector scan not only enhances matching accuracy for knuckle images but can also help to reduce the complexity and is therefore highly desirable. The introduction of new finger knuckle modality also raises a fundamental question on the (theoretical) upper limit on the performance from this biometric modality. Therefore, the uniqueness of knuckle patterns needs to be established to answer some of such fundamental questions relating to finger knuckle patterns.

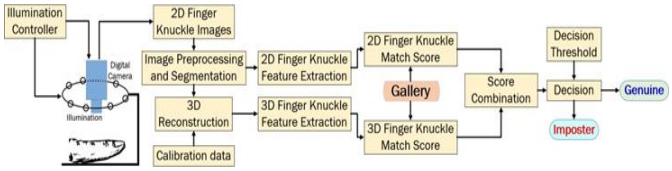
## IV. SYSTEM IMPLEMENTATION

Finger Print Acquisition:

The concerned person's fingerprints have been stored and analyzed with the matching patterns and have been moved on to the storage for verification. To access that storage, the proper authentication policies have been needed. After acquiring the details, several fingerprint information can be gathered and manipulated to match and analyze the sequential patterns that have been already stored.

Upload and View File Details:

Each user who can access the cloud storage can upload their desired data to the cloud storage server. The entire data will be in an encrypted format in the cloud server. The admin i.e.: the cloud owner can view the file details such as size, location and as well as user can retrieve their data from the cloud server.




Verify Secret Key:

The cloud owner verifies the secret key provided by the user to access the data. The user maintains data privacy by using the honey encryption algorithm. Hence incase of an attack of data the breacher can't access the user data.

Verify Trapdoor and Unlinkability:

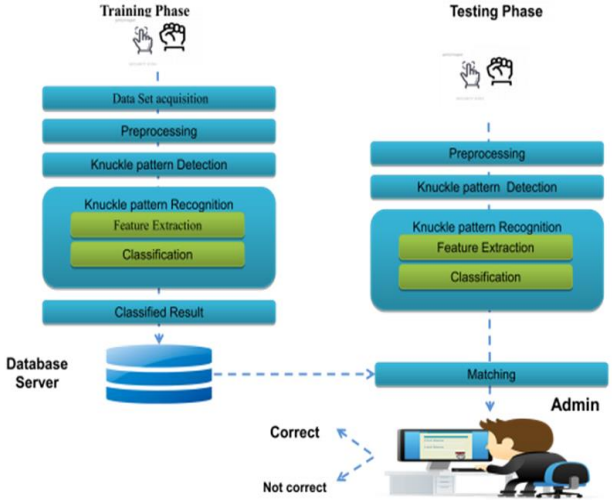
It has been done by the cloud owner i.e.: the server to gain knowledge about the tracker or the attacker. After knowing the attacker details the cloud owner can block or make unavailable status to the attacker for accessing the data of the user. The data of the user has been stored with a quiet higher security level.

View Request and Send Response:

The cloud server transfers the user data into secure nodes to make the security of the user data. The data has been stored in multiple secure nodes so that the gain zero knowledge about the user data. If the user sends the request to the server to retrieve the stored data, the server accesses the secure node and provides the data to the user.

View Attacker:

The cloud owner can view and block the attacker who tries to breach the data that has been stored in the secure node. The tracking of the attacker can be done based on identifying the IP or MAC address of the attacker. So that the data breacher can't access the data that has been stored in the secure node.




## V. EXPERIMENTAL RESULT AND EXPECTED OUTCOMES

In the comparative work naive Bayes, the SVM algorithm is used to classify and the data set, and it also used the K-means clustering algorithm for prediction of air quality. Thus Air quality prediction system successfully diagnoses the data and predicts the Air quality. The results thus obtained shows that the K- Means clustering algorithm provides 86.58% of accuracy with minimum time.

Dataset Description

This data is a cleaner version of both 2D finger knuckle patterns and signature which provides a perfect asset. Datasets are gathered, stored and compared with the collection of datasets and matches the fingerprint knuckle patterns and signatures that are currently provided. Each data pacifies various stages of signature and fingerprint pattern information.

The dataset contains the following features:

1. ptn_code: Pattern code. A code is given to each pattern that recorded the data.
2. sampling date: The date when the data was recorded.
3. state: It represents the states whose fingerprint and fingerprint knuckle pattern quality of data is measured.
4. type: The type of pattern which specifies the measurement of each pattern.
5. SVM: Comparison done by support vector machine.
6. DNN: Patterns are deeply analyzed and processed.

*Precision*

In the field of information retrieval, precision is the fraction of retrieved patterns that are relevant to the query: For example, for a signature search on a set of patterns, precision is the number of correct results divided by the number of all returned results. Precision takes all retrieved fingerprint patterns or signature patterns into account, but it can also be evaluated at a given cut-off rank, considering only the topmost results returned by the system. This measure is called precision at n or P@n.

Precision is used with recall, the percent of all relevant patterns that are returned by the search. The two measures are sometimes used together in the process to provide a single measurement for a system.

Note that the meaning and usage of "precision" in the field of information retrieval differs from the definition of accuracy and precision within other branches of science and technology.

*Recall*

In information retrieval, recall is the fraction of the relevant patterns that are successfully retrieved. For example, for a fingerprint search on a set of datasets, recall is the number of correct results divided by the number of results that should have been returned.

In binary classification, recall is called sensitivity. It can be viewed as the probability that a relevant pattern is retrieved by the query.

It is trivial to achieve a recall of 100% by returning all patterns in response to any query. Therefore, recall alone is not enough but one needs to measure the number of non- relevant knuckle patterns also, for example by also computing the Precision.

Precision recall and F-Measure are then defined as

$$Preceision = tp/(tp + fp)$$

$$Recall = tp/(tp + fn)$$

$$Recall = 2*[(Precision*Recall)/ (Precision + Recall)]$$

**Accuracy Rate**

The below figure shows the Accuracy rate having value 96 % with the SVM (Support Vector Machine) Algorithm and DNN.

$$Accuracy = tp + tn/(tp + tn + fp + fn)$$

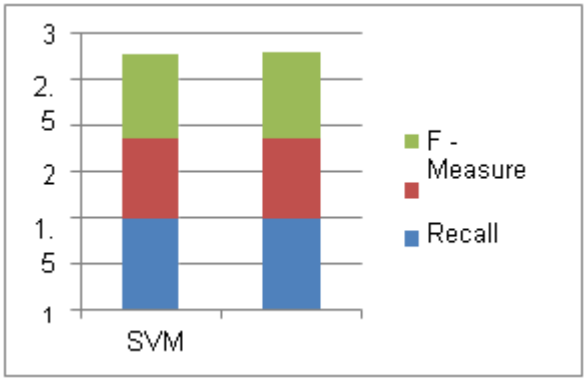
Whereas,
**P – Precision R- Recall**

**F- (F-Measure) A - Accuracy**

The below table represents the results of SVM and DNN in the signature pattern and fingerprint knuckle pattern and the accuracy obtained.

| Methods | P | R | F | ACCURACY |
|---|---|---|---|---|
| SVM | 0.98 | 0.895 | 0.92 | 92.98%, |
| DNN | 0.95 | 0.896 | 0.94 | 92.66%, |

The below graph provides the accuracy levels that have been obtained by considering precision, recall, and f-measure values, which concludes the accuracy in predicting the 2D signature verification and fingerprint knuckle patterns.




## VI. CONCLUSION AND FUTURE WORK

Levelly available online finger knuckle identification systems only incorporate discriminative 2D information for user identification. This paper has investigated the development of a 2D finger knuckle identification system and also introduced a 2D finger knuckle image database, for the first time in the literature, for further research. Any direct application of existing 2D feature descriptors, like those developed for the 2D palmprint or 2D fingerprint identification, is not expected to recover most discriminative features from the 2D finger knuckle patterns. Therefore, the development of specialized feature descriptors is critical to realize the full potential from 2D finger knuckle biometrics. The feature descriptor introduced in this proposal addresses such objective and has shown to offer outperforming results. One of the fundamental questions relating to any new bio-metric modality relates to its uniqueness, or individuality of the finger knuckle biometrics, which has not yet been studied in the literature. This paper has attempted to address this problem by developing the individuality model for 2D finger knuckle patterns using the best performing feature descriptor.

Despite the advantages of the 2D finger knuckle identification, the deployment of a 2D finger knuckle identification system is more complex than that of a 2D finger knuckle identification system. Such an increase in complexity, over 2D systems, is largely due to the reconstruction or acquisition of 2D finger knuckle images. Among the existing 2D imaging technologies such as laser scanning, multi-view stereo, and structured lighting, our proposed new system adopted the photometric stereo approach due to its low cost, high-quality imaging, and simple deployment. This approach only requires a single fixed camera with at least three light sources, while more light sources may enhance the reconstruction accuracy. The key limitation of such an approach lies in its sensitivity towards the ambient illumination. Therefore, efforts are required to appropriately position the camera, select and fix the illuminators, which reduce the adverse influence from ambient illumination during the imaging. Such shortcomings are however worthy of the tradeoff of more accurate recognition and anti-spoofing performance, as also indicated from our results in the paper.

Our work or attempt to systematically evaluate the potential from 2D finger knuckle patterns for the biometric identification has achieved promising results. A lot more work, however, needs to be done to realize the full potential of this biometric identifier. Recovery of non-pixel-wise features or those based on the singularity of patterns, such as the minutiae features employed for matching fingerprints, is expected to be more effective (for higher accuracy and efficiency) than pixel-wise features and should be pursued in further extension of this work. Our attempts to achieve further performance improvement by incorporating popular deep learning-based methods were not effective and their performance is limited by the size of training data which is the key challenge for 2D finger knuckle data employed in this work. The individuality model presented in this paper has made assumptions on the mutual independence of match scores and has been justified as such a model can provide a theoretical upper limit on the performance expected from the 2D finger knuckle pat-terns. Incorporating interdependence of features, or the scores during the feature extraction process can provide more realistic estimates on the individuality and is suggested in the further extension of this work.

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# A Novel Approach On Medication Dispency

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## ABSTRACT

Robotics for medical applications started fifteen years ago while for biological applications it is rather new (about five years old). Robotic surgery can accomplish what doctors cannot because of precision and repeatability of robotic systems. Besides, robots are able to operate in a contained space inside the human body. All these make robots especially suitable for non-invasive or minimally invasive surgery and for better outcomes of surgery. Today, robots have been demonstrated or routinely used for heart, brain, and spinal cord, throat, and knee surgeries Robots in medicine deserve enhanced attention, being a field where their instrumental ids enable exacting options. In the world of pharmaceuticals, there is a vital role for robotics to play in the complicated processes of research and development, production, and packaging. With a rapidly aging population that urgently requires sophisticated medical devices and newer drugs, robotics systems are increasingly adopted for improved productivity and efficiency to meet this growing demand. The Dispency of medications with help of robots by using cloud computing and card reader is our newer proposal to the field of Medicine.

**Keywords :** Pharmaceutical field, Robotics, Automated dispensing mechanisms, Card reader, Cloud computing.

## I. INTRODUCTION

Medical robotics is causing a paradigm shift in therapy. The most widespread surgical robot, Intuitive Surgical's da Vinci system, has been discussed in over 4,000 peer-reviewed pub-lications, was cleared by the United States' Food and Drug Administration (FDA) for multiple categories of operations, and was used in 80% of radical prostatectomies performed in the U.S. for 2008, just nine years after the system went on the market [1–3]. The rapid growth in medical robotics is driven by a combination of technological improvements (motors, materials, and control theory), advances in medical imaging (higher resolutions, magnetic resonance imaging, and 3D ultrasound), and an increase in surgeon/patient acceptance of both laparoscopic procedures and robotic assistance. New uses for medical robots are created regularly, as in the initial stages of any technology-driven revolution.

In 1979, the Robot Institute of America, an industrial trade group, defined a robot as "a reprogrammable, multi-functional manipulator designed to move materials, parts, tools, or other specialized devices through various pro-grammed motions for the performance of a variety of tasks." Such a definition leaves out tools with a single task (e.g., stapler), anything that cannot move (e.g., image analysis algorithms), and nonprogrammable mechanisms (e.g., purely manual laparoscopic tools). As a result, robots are generally indicated for tasks requiring programmable

motions, particularly where those motions should be quick, strong, precise, accurate, untiring, and/or via complex articulations. The downsides generally include high expense, space needs, and extensive user training requirements. The greatest impact of medical robots has been in surgeries, both radiosurgery and tissue manipulation in the operating room, which are improved by precise and accurate motions of the necessary tools. Through robot assistance, surgical outcomes can be improved, patient trauma can be reduced, and hospital stays can be shortened, though the effects of robot assistance on long-term results are still under investigation.Medical robots have been reviewed in various papers since the 1990s. Many such reviews are domain-specific, for example, focusing on surgical robots, urological robots, spine robots, and so forth . For an overview of the basic science behind medical robots (e.g., kinematics, degrees of Automated Drug Dispensing Systems Today automation in drug dispensing includes solutions that range from computer-assisted physician order entry, to robotic handling, packaging and sorting of drugs in the Pharmacy. This paper provides an overview of the impact of robots in multiple medical domains especially. in the field of pharmacy. Robotic dispensing can fill 40-75% of your daily prescription volume. It does this work with extreme accuracy and safety .The robot actually drives the workflow and eliminates chaos in both high and low volume practice settings

2. Neurological

Brain surgery involves accessing a buried target surrounded by delicate tissue, a task that benefits from the ability for robots to make precise and accurate motions based on medical images. Thus, the first published account investigating the use of a robot in human surgery was in 1985 for brain biopsy using a computed tomography (CT) image and a stereotactic frame . In that work, an industrial robot defined the trajectory for a biopsy by keeping the probe oriented toward the biopsy target even as the surgeon manipulated the approach. This orientation was determined by registering a preoperative CT with the robot via fiducials on a stereotactic frame attached to the patient's skull. That project was discontinued after the robot company was bought out, due to safety concerns of the new owning company, which specified that the robot arm (54 kg and capable of making 0.5 m/s movements) was only designed to operate when separated by a barrier from people. Then in 1991, the Minerva robot (University of Lausanne, Switzerland) was designed to direct tools into the brain under real-time CT guidance. Real-time image guidance allows tracking of targets even as the brain tissue swells, sags, or shifts due to the operation. Minerva was discontinued in 1993 due to the limitation of single-dimensional incursions and its need for real-time CT .

The currently available neurosurgery robots exhibit a purpose similar to historical systems, namely, image-guided positioning/orientation of cannulae or other tools (Figure 1). The NeuroMate (by Renishaw, previously by Integrated Surgical Systems, previously by Innovative Medical Machines International) has a Conformite´ Europeenne´ (CE) mark and is currently used in the process for FDA clearance (the previous generation was granted FDA clearance in 1997)

In addition to biopsy, the system is marketed for deep brain stimulation, stereotactic electroencephalography, transcranial magnetic stimulation, radiosurgery, and neu-roendoscopy. Li et al. report in-use accuracy as submillimeter for a frame-based configuration, the same level of application accuracy as bone-screw markers with infrared tracking, and an accuracy of 1.95 mm for the frameless configuration .

Another robotic system, Pathfinder (Prosurgics, formerly Armstrong Healthcare Ltd.), has been cleared by the FDA.

For neurosurgery (2004) . Using the system, the surgeon specifies a target and trajectory on a pre-operative medical image, and the robot guides the instrument into position with submillimeter accuracy. Reported uses of the system include guiding needles for biopsy and guiding drills to make burr holes .

Renaissance (Mazor Robotics, the first generation system was named SpineAssist) has FDA clearance (2011) and CE mark for spinal surgery, and a CE mark for brain operations (2011) . The device consists of a robot the size of a soda can that mounts directly onto the spine and provides tool guidance based on planning software for various procedures including deformity corrections, biopsies, minimally inva-sive surgeries, and electrode placement procedures. Renais-sance includes an add-on for existing fluoroscopy C-arms that provides 3D images for intraoperative verification of implant placement. Studies show increased implant accuracy and provide evidence that the Renaissance/SpineAssist may allow significantly more implants to be placed percuta-neously .

3. Orthopedics

The expected benefit of robot assistance in orthopedics is accurate and precise bone resection. Through good bone resection, robotic systems (Figure 2) can improve alignment of implant with bone and increase the contact area between implant and bone, both of which may improve functional outcomes and implant longevity . Orthopedic robots have so far targeted the hip and knee for replacements or resurfacing (the exception being the Renaissance system in Section 2 and its use on the spine). Initial systems required the bones to be fixed in place, and all systems use bone screws or pins to localize the surgical site.

The initial robot assistance for orthopedics came via Robodoc (Curexo Technology Corp, originally by Integrated Surgical Systems), first used in 1992 for total hip replacement. Robodoc has received a CE mark (1996), and FDA clearance for total hip replacement (1998) and total knee replacement (2009) [34]. The robot is used in conjunction with OrthoDoc, a surgical planner, with which the surgeon plans bone milling is based on preoperative CT. During the procedure, the patient's leg is clamped to the robot's pedestal, and a second clamp locates the femoral head to automatically halt the robot if the leg moves. The Robodoc then performs the milling automatically based on the surgical plan. Many initial attempts in surgical robotics involved such autonomous motions, which generated con-cerns about patient and doctor safety. To address those concerns, Robodoc has force sensing on all axes, as well as a six-axis force sensor at the wrist [35]. The force sensing is used for safety monitoring, to allow the surgeon to manually direct the robot arm and to vary the velocity of tool motion as a function of the forces experienced during the milling operation.

Though no longer for sale, CASPAR (Computer Assisted Surgical Planning and Robotics) was another robotic system for knee and hip surgery, introduced in 1997 by OrtoMaquet surgical site. The arm is designed to be low friction and low inertia, so that the surgeon can easily move the tool, backdriving the arm's joint motors in the process [19]. The arm's purpose is to act as a haptic device during the milling procedure, resisting motions outside of the planned cutting envelope by pushing back on the surgeon's hand. Unlike other orthopedic systems, the RIO does not require the bone to be fixed in place, instead

relying on a camera system to track bone pins and tools intraoperatively and instantaneously registering the planned cutting envelope to the patient in the operating room. With this configuration, the system has promise for use as a surgical training tool.

Further reducing robotic influence on the cutting tool, the iBlock (Praxim Inc., an Orthopaedic Synergy Inc. company, previous generation the Praxiteles, FDA clearance 2010) is an automated cutting guide for total knee replace-ment [38]. The iBlock is mounted directly to the bone, preventing any relative motion between the robot and the bone and aligns a cutting guide that the surgeon uses to manually perform planar cuts based on a preoperative plan. Koulalis et al. report reduced surgical time and increased cut accuracy compared with freehand navigation of cutting blocks [39].

The Navio PFS (Blue Belt Technologies, CE mark 2012) does not require a CT scan for unicondylar knee replace-ment, instead it uses intraoperative planning [40, 41]. The drill tool is tracked during the procedure, and the drill bit is retracted when it would leave the planned cutting volume. Limited information is available on the system due to its recent development.

The Stanmore Sculptor (Stanmore Implants, previous generation the Acrobot Sculptor by Acrobot Company Ltd.) is a synergistic system similar to the RIO, with active con-straints to keep the surgeon in the planned workspace [42]. The company's "Savile Row" system tailors a personalized unicondylar knee implant to the patient, incorporates the 3D model of that implant into the surgical planning interface, and uses active constraints with the Stanmore Sculptor to ensure proper preparation of the bone surface. The system does not currently have FDA clearance, but has been in use in Europe since 2004.

4. General Laparoscopy

Prior to the 1980s, surgical procedures were performed through sizable incisions through which the surgeon could directly access the surgical site. In the late 1980s, camera technology had improved sufficiently for laparoscopy (a.k.a. minimally invasive surgery), in which one or more small incisions are used to access the surgical site with tools and camera [43]. Laparoscopy significantly reduces patient trauma in comparison with traditional "open" procedures, thereby reducing morbidity and length of hospital stay, but at the cost of increased complexity of the surgical task. Compared with open surgery, in laparoscopy the surgeon's feedback from the surgical site is impaired (reduced visibility and cannot manually palpate the tissue) and tool control is reduced ("mirror-image" motions due to fulcrum effect and loss of degrees of freedom in tool orientation)

Robot assistance for soft-tissue surgery was first done in 1988 using an industrial robot to actively remove soft tissue during transurethral resection of the prostate [5]. As with neurosurgery, the researchers deemed use of an industrial robot in the operating room to be unsafe. The experience provided the impetus for a research system, Probot, with the same purpose [46].

4.1. Zeus. Commercial robotic systems for laparoscopy started with Computer Motion's Aesop (discontinued, FDA clearance 1993) for holding endoscopes [47]. Aesop was clamped to the surgical table or to a cart, and either moved the endoscope under voice control or allowed the endoscope to be manually positioned. In 1995, Computer Motion combined two tool-holding robot arms with Aesop to create the Zeus system (discontinued, FDA clearance 2001) [48]. The Zeus's tool arms were teleoperated, following motions

the surgeon made with instrument controls (a.k.a. “master” arms or joysticks) at the surgeon console. Technically, the Zeus is not a robot because it does not follow programmable motions, but rather is a remote computer-assisted telemanip-ulator with interactive robotic arms. To improve precision in tool motion, the Zeus filters out hand tremor, and can scale large hand motions by the surgeon down to short and precise motions by the tool. As described by Marescaux et al., the Zeus was used in the Lindbergh Operation, the first surgery was (cholecystectomy) performed with the surgeon and patient being separated by a distance of several thousand kilometers [49]. 4.2. da Vinci. Meanwhile, Intuitive Surgical Inc. was devel-oping the da Vinci (initial FDA clearance 1995, Figure 3(a)). Like the Zeus, the da Vinci is a teleoperated system, wherein the surgeon manipulates instrument controls at a console and the robot arms follow those motions with motion scaling and tremor reduction. Also like the Zeus, the da Vinci was initially offered with three arms to hold two tools and an endoscope, which are mounted to a single bedside cart.

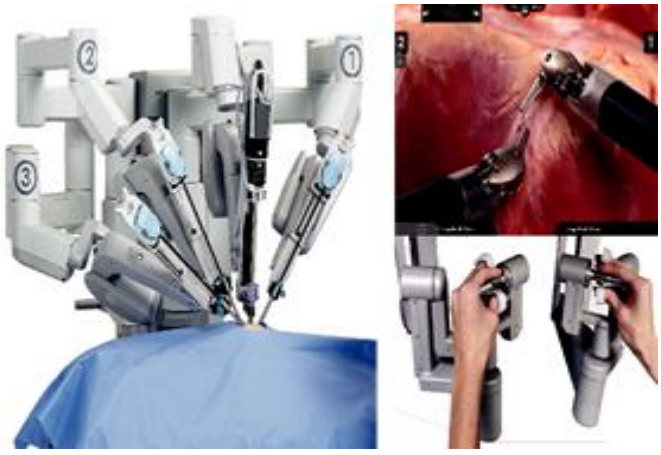
The da Vinci system provides several technical enhance-ments over the Zeus. The grasper tools have two degrees of freedom inside the patient, the EndoWrist (Figure 3(b)), an enhanced articulation that increases the ease of suturing and other complex manipulations. The console puts increased emphasis on surgeon ergonomics and incorporates a sepa-rate video screen for each eye to display 3D video from the 3D endoscope. The motions of the surgeon’s hands are mapped to motions of the operational ends of the tools, providing a more intuitive control than the “mirror-image” laparoscopic mapping. In 2003, Intuitive Surgical began selling a fourth arm for the da Vinci, and Intuitive Surgical and Computer Motion were merged (discontinuing the Zeus).

The da Vinci system is the only surgical robot with over a thousand systems installed worldwide and has been sold in four models so far: Standard (1999), S (2006), Si (2009), and Si-e (2010). The S model increased the image resolution, redesigned the patient-side manipulators to enable multiquadrant access, and shortened setup time. The Si model further improved the visual resolution, refined the instrument controllers, and increased the ergonomics and ease for the surgeon to provide input to the system. The Si-e model is a 3-arm system that is fully upgradeable to the Si model. Continuing the da Vinci focus on improved visu-alization, the Firefly Fluorescence Imaging add-on product combines fluorescent dye and a special endoscope to identify vasculature beneath the tissue surface.

The da Vinci was initially cleared for general laparoscopy, became commonly used for radical prostatectomy, and is now cleared by the FDA for various procedures [52, 53]. Even so, as with most or even all robotic systems, long-term benefits continue to be uncertain [15, 54]. The enhanced endoscopic visualization and increased tool articulation are commonly considered improvements, but detractors point out the system’s expense (between $1 M and $2.3 M), the reduced patient access due to the amount of space the arms take over/around the patient, and the significant amount of training necessary for the best outcomes [55, 56]. To address this last point, the Si model also allows dual console use for training and collaboration, in which both consoles get the same images and can cooperatively control the instruments

[57]. Additionally, the da Vinci Skills Simulator is an add-on case that can be used with an Si or Si-e console to practice operations in a virtual environment [58].

In an attempt to further reduce patient trauma, surgeons are exploring Single-Port Access (SPA), LaparoEndoscopic Single-Site surgery (LESS), and Natural Orifice Transluminal Endoscopic Surgery (NOTES) [59, 60]. To meet this need, Intuitive Surgical has recently developed the Single-Site platform for the da Vinci Si model. The Single-Site platform passes two semirigid tools and the endoscope through a single multichannel port, reducing the number of incisions but preventing EndoWrist articulation [61]. same images and can cooperatively control the instruments[58]. Additionally, the da Vinci Skills Simulator is an add-on case that can be used with an Si or Si-e console to practice operations in a virtual environment [58].



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number of incisions but preventing EndoWrist articulation [61]. 4.4. Telelap ALF-X. SOFAR S.p.A has developed Telelap ALF-X (CE mark 2011, Figure 3(d)), a four-armed surgical robotic system, to compete with the da Vinci . The system uses eyetracking to control the endoscopic view and to enable activation of the various instruments. Compared to the da Vinci, the system moves the base of the manipulators away from the bed (about 80 cm) and has a realistic tactile-sensing capability due to a patented approach to measure tip/tissue forces from outside the patient, with a sensitivity of 35 grams. The system has been used in animal trials demonstrating a significant reduction in the time for cholecystectomy compared with a “conventional telesurgical system

5. Percutaneous

Noncatheter percutaneous procedures employ needles, can-nulae, and probes for biopsy, drainage, drug delivery, and tumor destruction. During the procedure, accurate targeting can be reduced by soft tissue displacements that occur due to patient breathing, changes in posture, or tissue forces exerted during the insertion. Two options to guide a needle to its target are tissue modeling for needle steering and three-dimensional intraoperative imaging . Unfortunately, tissue modeling is excessively complex . So following the latter approach, InnoMotion (Synthes Inc., previously by Innomedic GmbH, CE mark 2005) is a robot arm designed to operate within a CT or magnetic resonance imaging (MRI) machine. For MRI-compatibility, the arm (Figure 4(a)) is pneumatically actuated and joint sensing is via MRI-compatible encoders.

6. Steerable Catheters

Vascular catheterization is used to diagnose and treat various cardiac and vasculature diseases, including direct pres-sure measurements, biopsy, ablation for atrial fibrillation, and angioplasty for obstructed blood vessels [68–70]. The catheter is inserted into a blood vessel and the portion external to the patient is manipulated to move the catheter tip to the surgical site, while fluoroscopy provides image guidance. Due to the supporting tissue, catheters only require three degrees of freedom, typically: tip flexion, tip rotation, and insertion depth. Possible benefits of robot-steered catheters are shorter procedures, reduced forces exerted on the vasculature by the catheter tip, increased accuracy in catheter positioning, and teleoperation (reducing exposure of the physician to radiation).

The Sensei X (Hansen Medical, FDA clearance and CE mark 2007, previous generation the Sensei, Figure 4(c)) uses two steerable sheaths, one inside the other, to create a tight bend radius . The sheaths are steered via a remotely operated system of pulleys. IntelliSense force sensing allows constant estimation of the contact forces by gently pulsing the catheter a short distance in and out of the steerable inner sheath and measuring forces at the proximal end of the catheter. These forces are communicated visually as well as through a vibratory feedback to the surgeon's hand on the "3D joystick". Corindus's CorPath 200 is a direct competitor with the Sensei X, but is not yet commercially available. a magnetic field is used to guide the catheter tip. The magnetic field is generated by two permanent magnets contained in housings on either side of a fluoroscopy table (Figure 4(b)). The surgeon manipulates a joystick to specify the desired orientation of the catheter tip, causing the orientations of the magnets to vary under computer-control, and thereby controlling the magnetic field. A second joystick controls advancement/retraction of the catheter. Chun et al. report significant improvements in surgical outcomes due to advances in the design of magnetically guided catheters

7. Radiosurgery

Radiosurgery is a treatment (not a surgery), in which focused beams of ionizing radiation are directed at the patient, primarily to treat tumors By directing the beam through the tumor at various orientations, high-dose radiation is delivered to the tumor while the surrounding tissue receives significantly less radiation. Prior to real-time tissue tracking, radiosurgery was practically limited to treating the brain using stereotactic frames mounted to the skull with bone screws. Now that real-time tissue tracking is feasible, systems are commercially available.

The CyberKnife (Accuray Inc., FDA cleared 1999, Fig-ure 5(a)) is a frameless radiosurgery system consisting of a robotic arm holding a linear accelerator, a six degree of freedom robotic patient table called the RoboCouch, and an X-ray imaging system that can take real-time images in two orthogonal orientations simultaneously. The two simultaneous, intraoperative X-ray images are not sufficient to provide good definition of the tumor, but are used to register a high-definition preoperative CT image. The robotic arm can then provide the

preplanned radiation dosage with a wide range of orientations. For targets that move during treatment (e.g., due to breathing), the optional synchrony system can optically track the tissue surface, correlate the motion of the tissue surface to the motion of radio-opaque fiducials inserted near the target, and thus continuously predict target motion . The intraoperative tracking obviates the need for a stereotactic frame, reducing patient trauma and making it practical to fractionate the dosage over longer time periods.

The Novalis with TrueBeam STx (BrainLab Inc. and Varian Medical Systems, previously Novalis and Trilogy, initial FDA clearance 2000, Figure 5(b)) is also a frameless system with a linear accelerator, but with micro-multileaf collimators for beam shaping. Similar to CyberKnife, intraoperative X-rays are compared with a CT, and skin-mounted fiducials are optically tracked in real-time. The delivery system also includes cone beam CT. The patient is moved into position on top of a six degree of freedom robotic couch. The major differences between Cyberknife and Novalis are that the Cyberknife radiation source has more degrees of freedom to be oriented around the patient while the Novalis can shape the radiation beam and claim reduced out-of-field dosage .

8. Emergency Response

Few medical robot systems are suitable for use outside of the operating room, despite significant research funding on medical devices for disaster response and battlefield medicine. Typical goals for such research include improved extraction of patients from dangerous environments, rapid diagnosis of injuries, and semiautonomous delivery of life-saving interventions. Current Emergency Response robots are little more than single-motor systems, but those systems can be controlled by health monitors to minimize the nec-essary attention by Emergency Responders. Such a feedback control makes it more likely that such systems will be autonomous, for example, automated external defibrillators.


TheAutoPulse Plus (ZOLL Medical Corp., previously by Revivant) is an automated, portable device that combines the functions of the AutoPulse (FDA clearance 2008, Figure 6(a)) cardiopulmonary resuscitation device and the E Series moni-tor/defibrillator (FDA clearance 2010) . Consisting of a half-backboard containing a battery-powered motor that actuates a chest bThe LS-1 “suitcase intensive care unit” (Integrated Medical Systems Inc., previous generation called MedEx 1000, previous generation called LSTAT, FDA clearance 2008, Figure 6(b)) takes an inclusive approach to portable life support [89]. The system contains a ventilator with oxygen and carbon dioxide monitoring, electrocardiogram, invasive and noninvasive blood pressure monitoring, fluid/drug infusion pumps, temperature sensing, and blood oxygen level measurement. The LS-1 is battery powered and can be powered by facility or vehicular electrical sources. The system is FDA-cleared for remote control of its diagnostic and therapeutic capabilitiesand, the AutoPulse rhythmicallytighten the band to perform chest compressions. The tightness of the band during compressions is a function of the patient’s resting chest size, to adjust for interpatient variability. Meanwhile, the E Series monitor/defibrillator measures the rate and depth of

chest compressions in real time and filters cardiopulmonary resuscitation artifacts from the electrocar-diogram signal. If combined with an automatic battery-powered ventilator, for example, the SAVe (AutoMedx Inc., FDA clearance 2007), basic cardiopulmonary emergency response treatments could be automated while on battery power.

The LS-1 "suitcase intensive care unit" (Integrated Medical Systems Inc., previous generation called MedEx 1000, previous generation called LSTAT, FDA clearance 2008, Figure 6(b)) takes an inclusive approach to portable life support . The system contains a ventilator with oxygen and carbon dioxide monitoring, electrocardiogram, invasive and noninvasive blood pressure monitoring, fluid/drug infusion pumps, temperature sensing, and blood oxygen level measurement. The LS-1 is battery powered and can be powered by facility or vehicular electrical sources. The system is FDA-cleared for remote control of its diagnostic and therapeutic capabilities.

10. Assistive and Rehabilitation Systems

Assistive robotic systems are designed to allow people with disabilities more autonomy, and they cover a wide range of everyday tasks. In 1992, Handy 1 (Rehab Robotics, Ltd.) became the first commercial assistive robot ]; it interacts with different trays for tasks such as eating, shaving, and painting, and it is controlled by a single switch input to select the desired action. One task-specific system is the Neater Eater (Neater Solutions Ltd.), a modular device that scoops food from a plate to a person's mouth, and can be controlled manually or via head or foot switches. More general systems rely on arms with many degrees of freedom, such as Exact Dynamics' iARM, a robotic arm with a two-fingered grasper, that attaches to electric wheelchairs and can be controlled via keypad, joystick, or single button.

Rehabilitation systems can be similar to assistive systems, but are designed to facilitate recovery by delivering therapy and measuring the patient's progress, often following a stroke.The Mobility System (Myomo, Inc.) is a wearable robotic device that moves the patient's arm in response to his/her muscle signals, thus creating feedback to facilitate muscle reeducation. The InMotion (Interactive Motion Technologies, based on the MIT-MANUS research platform) is a robotic arm that moves, guides, or perturbs the patient's arm within a planar workspace, while recording motions,

12. Proposed Methodologies

In the field of medicine pharmacy is playing a major role . Drugs dispency is the major process to safeguard the life of a person . Internet of things is become a life breath in every field of science .

Drug dispencies with the help of robot with the technology of cloud computing its possible. The information of drugs can be decoded in the card and it can be read through the Barcode Reader and it can be stored in the system then through the technology of cloud computing it can be interpreted in the server then the information are passed to the robots for the detection of position of the Rack and through the

process of image processing the tablets are counted and verified by the pharmasist. Then its been passed to the user after verification.

12. Discussion

In surgical robotics, there has been a trend away from autonomous or even semiautonomous motions, and toward synergistic manipulation and virtual fixtures. Thus, the robot acts as a guidance tool, providing information (and possibly a physical nudge) to keep the surgeon on target. Such use requires accurate localization of the tissues in the surgical site, even as the tissues are manipulated during surgery. Improved imaging systems (e.g., Explorer, an intraoperative soft tissue tracker by Pathfinder Therapeutics or robot compatibility with MRI or CT will provide that localization. In particular, MRI-guided robots will benefit from intraoperative 3D images with excellent soft tissue contrast and accurate registration between the tool and the tissue, thus allowing precise virtual fixtures, “snap-to” and “stand-off” behaviors. Further, such imaging will allow modeling and rapid prototyping of patient-specific templates/jigs/implants.

The physical designs for medical robots will continue to improve, reducing expense and size, while minimizing or compensating for nonidealities such as flexion, for example, the CRIGOS robot . With better physical designs, semiautonomous behavior will likely become more useful. “Macros” may become commonplace, wherein the surgeon presses a button and the robot performs a preprogrammed motion, such as passing a suture needle between graspers, or the Sensei’s autoretract feature.

The major dependency of the use of medi robots in the Pharmacy is the Efficiency, accuracy , reduction of man power , Tierdless work. This can be further implemented in all pharmacy in large area and large amount of medications.

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# Personal Lung Function Monitoring Devices for Asthma Patients

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## ABSTRACT

Asthmatics experience difficulty in breathing and airflow obstruction caused by inflammation and constriction of the airways. Portable peak flow meters are available but are inconvenient to use. We have created a user-friendly, accurate, and portable external mobile device accessory that collects spirometry, peak expiratory flow, exhaled nitric oxide, carbon monoxide, and oxygen concentration information from patients after two breath manoeuvres. We have also developed a software application that records and stores the gathered test information and mail the results to a physician. Telemetric capabilities help physicians to track asthma symptoms and lung function over time, which allows physicians the opportunity to make appropriate changes in a patient's medication regimen more quickly. Here we use a remote monitoring device that measures asthma levels as well as environmental level using gas sensor. Here the values of the sensors continuity flow to the doctor if there is any emergency condition occurs doctor will press alert key, it will automatically play the message to the nearby hospital using GSM and Bluetooth module.

**Keywords :** physician, GSM, Bluetooth Module

## I. INTRODUCTION

Asthma is a chronic disease and a growing health problem worldwide. The objective of this pilot study was to test the feasibility and utilization of tracking asthma symptoms through an innovative mobile phone application providing health care. It is therefore important to develop accurate devices to monitor the disease symptoms so doctors can take appropriate steps to treat the patient with proper medication. One effective way to track asthma symptoms is to monitor a patient's peak expiratory flow (PEF). Many current PEF meters are inaccurate, inconvenient to use, bulky, expensive, and rarely include real-time data plotting capabilities. We have created a user-friendly, accurate, and moderately inexpensive external mobile device accessory that records and stores the user's PEF. Traditional methods of monitoring, such as manual asthma diaries, have not been very successful largely because these methods require more effort and commitment than most patients can easily devote. The efficacy of an asthma monitoring plan using PEF decreases, however, when patients deviate from their prescribed medical action plan or fail to follow the plan entirely. Here the values of the sensors continuity flow to the doctor if there is any emergency condition occur doctor will press alert key, it will automatically play the message to the nearby hospital using GSM module and we also use a camera to monitor the patient.

## II. TRANSMITTER SECTION

CO2 Sensor: This instrument used for measuring carbon dioxide gas. Measuring CO2 is the important monitoring for asthma patients. Sends an analog signal that increases as the concentration of CO2 increases. This module also includes a digital output pin with TTL output. It has high sensitivity & stability. Operating voltage is 6v dc.

- Pressure Sensor: Pressure sensor can be classified in terms of pressure ranges they measure.
- Bluetooth Module: HC-O5 module is an easy to use Bluetooth SPP(serial port protocol).

It designed for transparent wireless serial communication. The HC-05 modules are very clever pieces of hardware, as they translate incoming bluetooth communication to serial data. So once configured this gives the tinkerer the possibility to achieve serial communication over Bluetooth.

The transmitter section is used as a mask in patient body. Aurdino, CO2 sensor, pressure sensor is fixed as mask. This Bluetooth module will be transmitter section which is HC-05. In transmitter section AVR is used as aurdino which has an 328 bit. Input of the aurdino will contain the value of the CO2 sensor and the pressure sensor. AVR will convert the values into a digitalized value. This digitalized value will be send to the Bluetooth module in the transmitter section. This Bluetooth module will give the values to the receiver section.

## III. CONFIGURE AND PAIR TWO HC-05 BLUETOOTH MODULES AS MASTER AND SLAVE COMMANDS

In this Arduino Tutorial we will learn how to configure and pair two HC-05 Bluetooth Modules as Master and Slave devices. You can watch the following video or read the written tutorial below. In my previous two tutorials we already learned how to connect the HC-05 Bluetooth Module to the Arduino and make a communication between an Android smart phone and the Arduino. In those tutorials we used the HC-05 Bluetooth module with its default configuration, as a slave device.

### A. Configuring the HC-05 Bluetooth Module at Command

For this tutorial we need to configure both modules. In order to do that we need to switch to AT Command Mode and here's how we will do that. First we need connect the Bluetooth module to the Arduino as the circuit schematics explained in the previous tutorials. What we need to do additionally is to connect the "EN" pin of the Bluetooth module to 5 volts and also switch the TX and RX pins at the ArduinoBoard.So the RX pin of the Arduino needs to be connected to the RX pin of the Bluetooth module, through the voltage divider, and the TX pin of the Arduino to the TX pin of the Bluetooth module.

Now while holding the small button over the "EN" pin we need to power the module and that's how we will enter the command mode. If the Bluetooth module led is flashing every 2 seconds that means that we have successfully entered in the AT command mode. After this we need to upload an empty sketch to the Arduino but don't forget to disconnect the RX and TX lines while uploading. Then we need to run the Serial Monitor and there select "Both NL and CR", as well as, "38400 baud" rate which is the default baud rate of the Bluetooth module. Now we are ready to send commands and their format is as following. All commands start with "AT", followed by the "+" sign, then a <Parameter Name> and they end either with the "?" sign which returns the current value of the parameter or the "=" sign when we want to enter a new value for that parameter.

### B. Slave Configuration

So for example, if we type just "AT" which is a test command we should get back the message "OK". Then if we type "AT+UART?" we should get back the massage that shows the default baud rate which is 38400. Then if we type "AT+ROLE?" we will get back a massage "+ROLE=0" which means that the Bluetooth device is in slave mode. If we type "AT+ADDR?" we will get back the address of the Bluetooth module and it should looks something like this: 98d3:34:905d3f.Now we need to write down this address as we will need it when configuring the master device. Actually that's all we need when configuring the slave device, to get its address, although we can change many different parameters like its name, baud rate, pairing password and so on, but we won't do that for this example.

### C. Master Configuration

Now let's move on and configure the other Bluetooth module as a master device. First we will check the baud rate to make sure it's the same 38400 as the slave device. Then by typing "AT+ROLE=1" we will set the Bluetooth module as a master device. After this using the "AT+CMODE=0" we will set the connect mode to "fixed address" and using the "AT+BIND=" command we will set the address of the slave device that we previously wrote down.Note here that when writing the address we need to use commas instead of colons. Also note that we could have skipped the previous step if we entered "1" instead of "0" at the "AT+CMODE" command, which makes the master to connect to any device in its transmission range but that's less secure configuration. Here you can find a complete list of commands and parameters: HC-05 AT Commands List. Nevertheless, that's all we need for a basic configuration of the Bluetooth modules to work as a master and slave devices and now if we reconnect them in normal, data mode, and re-power the modules, in a matter of seconds the master will connect to the slave. Both modules will start flashing every 2 seconds indicating a successful connection.

## IV. ADVANTAGES

Continuous monitoring is possible. Useful in emergency conditions.Relatively easy and quite easy to coordinate. Network failure affects the entire system.

## V. FUTURE SCOPE

In the future work Technological advances in miniaturization together with progress in wireless communication allow for the development of miniaturized devices, integrated with clothes. Self-monitoring makes it feasible in almost all situations and locations.

## VI. VI. CONCLUSION

The architecture of Arduino UNO based monitoring system for asthma patients. This project outlines the sensor development and instrumentation steps required to enables real-time collection of PEF data from patients onto computer, mobile phones etc.

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# Li-Fi Communication for Transmitting Data, Audio and Image Information

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## ABSTRACT

LI-FI communication is one of the advanced technologies for communication purpose. The efficiency, durability, and lifetime of light-emitting diodes (LEDs) have led to their use in a variety of applications, including audio transmission, text transmission and image transmission. LI-FI communication is also called as the Visible Light Communication (VLC) here we use the visible light for transmitting the data, audio, text and image. It is the one of the fastest communication which compared to the WI-FI communication and also due to the VLC we can use different wave length for different speed of transmission. We have designed a prototype LI-FI system to transfer audio as well as text and image . Our idea is to send audio, text and image as serial datas using UART serial communication from one PC to another PC using VLC.

**Keywords :** LiFi (Light Fidelity), WiFi (WirelessFidelity), VLC (Visible Light Communication), LED (Light Emitting Diode)

## I. INTRODUCTION

There are over 5 billion mobile phones which can use 1.4 million mast cellular radio waves base station. LI-FI stands for Light-Fidelity which is invented by Harald Hass. LI-FI is transmission of data using visible light by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. A communication system can classified into two types i.e Wired communication and Wireless communication. Presently wireless communication uses radio waves. Spectrum is the one of the most essential requirement for wireless communication. With the advancement in technology and the number of users, the existing radio wave spectrum fails to cater to this need. To resolve this problem we use the LI-FI communication in this information can be transmits through the LED's which is much faster and flexibility than the radio wave communication.

Visible light communication (VLC) is a new way of wireless communication using visible light. Typical transmitters used for visible light communication are visible light LEDs and receivers are photodiodes and image sensors. Here we use the different software for transmission of text, audio, image and data. Using Terminal software we can transmits the text messages and using MATLAB we can transmits the images and by using simple audio transreciever circuit we can transmits the audio also Design and implementation.

## II. OVERVIEW OF LI-FI

LI-FI stands for LIGHT FIDELITY. LI-FI is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that varies in intensity faster than the human eye can follow. LI-FI is the term some have

used to label the fast and cheap wireless-communication system, which is the optical version of Wi-Fi. Light reaches nearly everywhere so communication can also go along with light easily. Light Fidelity is a branch of optical wireless communication which is an emerging technology.


**Fig.1** Basic LI-FI overview

By The professor of mobile communications at the University of Edinburgh, UK, first time publically displayed the proof of Light Fidelity(Li-Fi), a method of Visible Light communication(VLC). Li-Fi is the transfer of data through light by taking fiber out of fiber optics and sending data through LED light. LI-FI technology provides transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. Wi-Fi is great for general wireless coverage within buildings, whereas LI-FI is ideal for high density wireless data coverage in confined area and for relieving radio interference issues. LI-FI provides better bandwidth, efficiency, availability and security than Wi-Fi and has already achieved blisteringly high speed in the lab. By leveraging the low-cost nature of LEDs and lighting units there are many opportunities to exploit this medium, from public internet access through street lamps to auto-piloted cars that communicate through their headlights. Haas envisions a future where data for laptops, smart phones, and tablets will be transmitted through the light in a room

UART

The UART is defined as Universal Asynchronous Receiver/Transmitter. The control operation of UART can be control by clock which runs multiple data. In UART mostly 8 times the bit rate is used. Start bit is high initially and when the start bit goes low, the UART starts its process. The stop bit is high after receiving the 8 bits. The fig 3 shows the wave form of UART.

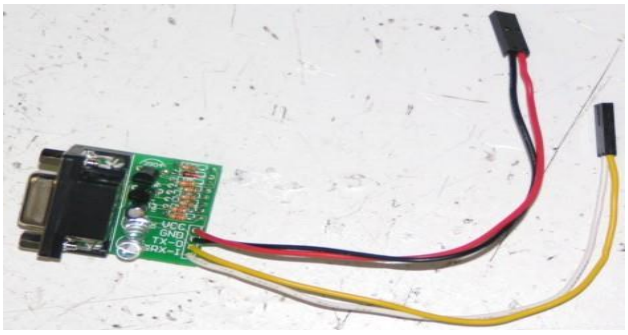

**Fig.2** UART

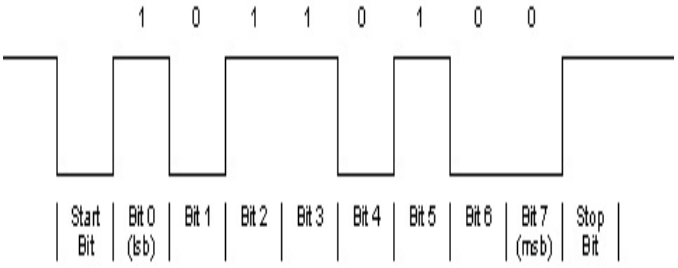


**Fig. 3** Wave form of UART

Block Diagram of Li-Fi Communication System

Fig.4 Shows The Block Diagram Of Li-Fi Communication System.

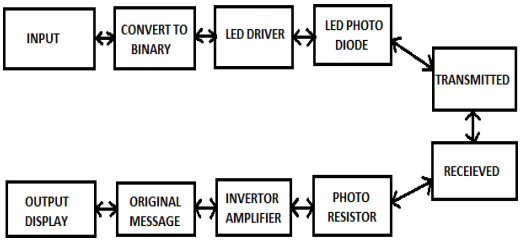


**Fig.4** LI-FI communication system

The LI-FI communication system consists of Binary converter, LED driver, LED photo diode, Transmitter, Receiver, Photo resistor, Inverter Amplifier. When the input is given to system which is in the form of analog, so it has been convert to digital. The binary convertor will convert the analog signal to binary signal which helps to communicate very easily. Then these binary signals are drive through the LED Driver, this Driver will convert the binary to high illumination light through a LED which can blink continuously hence the data can transmitted through transmitter.

In other side the receiver can receive the transmitted signal, this receiver consists Photo resistor which can detect the light source consisting of information. This information again converts to analog with help of Inverter Amplifier and finally the original analog information can display at output.

HARDWARE REQUIREMENTS

- Arm 7 lpc2148
- Max 232
- LM386(audio amp)
- Transistor Bc337
- Inverting Buffer Amplifier
- Photo transistor ST1kl38
- High wattage LED
- Power supply LM317 5V
- MATLAB (image)
- Keil (arm programming)
- Solar cell
- Terminal software (text)
- Transformer 6-0-6 500mA

## III. AUDIO TRANSMISSION

The LI-FI is transfer data through visible light. Since the bandwidth of visible light is 10,000 times more than Radio waves, more data can be transferred through light at short period of time with continuously blinking the LED in which the data can transmits. Let coming to the part of audio transmission, transmitter consisting the audio signal from the mobile phone as a input which connect through the audio jack and this audio signal will converted to digital and transmitting through the LED, at the receiver which consists photo resistor which detects the LED information and converts to analog which can processes through the basic audio amplifier with high gain can boost audio signal and finally the audio can transmitted through the speaker .

Image and Text message transmission

Here the MATLAB is used to transmission the images between the two PC's. Initially the transmitter has input images are in the form of analog image components, by using MATLAB code the image can be converted to digital. This digital image process for objective checks for transmission quality and then it will serially transmitted through a LED. At the receiver these digital image can be received and convert to analog which can be process for objective transmission checks and finally the original image will display on the PC's . In the same way as Image, the Text messages also transmits between the two PC's in this we will use the Terminal Software. Here in the transmitter consists text as a input and by using Terminal Software the text what we are type that will be converted to ASCII information and by setting the baud rates range we can vary the transmission speed. This ASCII information will transmit through the LED. At the receiver the ASCII information will again convert to analog and display at the output

Here we use the buffer inverter IC for fast transmission.

## IV. RESULT AND DISCUSSIONS

The Li-Fi system proposed in this paper is capable of transmitting data such as text, image, audio between

two devices at the speed of a few kbps. The working model and output of the LI-FI communication for transmitting audio, text and image as shown in the fig.5

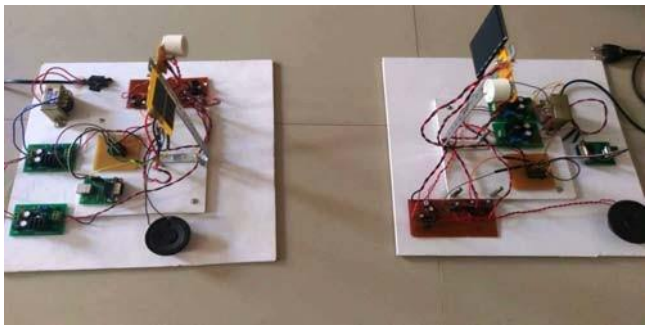

Fig. 5 Working model of the LI-FI communication

The main requirement is line of sight between the sender and the receiver and hence it can be used to transmit data within a room. Li-Fi technology is based on (Visible Light Communication) VLC technology. VLC is one of the advanced optical wireless communication technologies in which light in the visible region is used as a medium for data transmission. It is more secure and achieves high data rates as compared to conventional wireless technologies like Wi-Fi, Bluetooth, etc.

The data can transmits serially through an LED using UART, here the text can be converted into ASCII and then it transmitted and we can adjust the baud rate with the range of 19200 which helps to transmits at faster rates. The fig.6, 7.a, 7.b, 8.a, 8.b shows the data, Text and Image transmission and reception respectively.

**Fig.6** Data transmitted serially

**Fig.7.a** Text transmitted serially

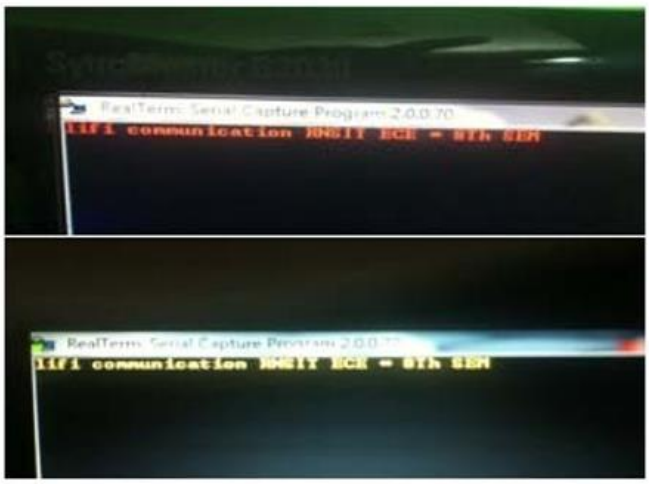

**Fig.7.b** Output of Text Transmission and Reception

**Fig.8.a** Transmitted image

**Fig.8.b** Reconstructed image

## V. CONCLUSION

Through a wireless communication by using VLC we can tra nsmit the data,audio,image and Text message. Here in this paper reports thecommunication between the two PC's by implementing the LI-FI

communication. LI-FI technology can be implemented to obtain high speed data transfer thus this technology provides numerous benefits by using this technology we can proceed towards greater,safer and cleaner future.

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# Head Display Stethoscope with Temperature Sensor

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## ABSTRACT

A stethoscope is a medical device for listening to the sound of heart and breathing in our body. The commonly used stethoscope is an acoustic stethoscope. The disadvantage of acoustic stethoscope is that the sound level is very low and this stethoscope is not very suitable to use in noisy environment as well as to detect internal sounds of babies as they are very low. However, acoustic stethoscope is commonly used because it is cheaper than electronic stethoscope. Electronic stethoscope electronically amplifies body sounds. As the sound signals are transmitted electronically, it can be wireless and can provide noise reduction. The primary aim of this paper is to develop and construct an electronic stethoscope using filters and based on wireless Bluetooth using Arduino Microcontroller that will make it easier to detect heart sound. In this paper we have discussed design and simulation of an electronic stethoscope which will not only provide us with a better signal but can also be wireless and interfaced with computers so that it can be further analyzed and stored for further uses.

**Keywords :-** Arduino , Amplifies Interface, Microcontroller, Stethoscope, Wireless.

## I. INTRODUCTION

Stethoscopes are used regularly by medical personnel to listen to acoustic signals picked from the internal parts of the human body during diagnosis and treatment of patients. Typically, signals that are picked from the body for diagnosis include that of the heart, lungs, and bowels. The proposed wireless design, the signal captured from a patient can be broadcast to multiple users of the device within operational range with restricted access. In this work, we focus on the design reconfiguration and development of the electronic stethoscope by introducing wireless transmission between the chest-piece and the head-piece. The proposed design aims to enable different users in a team to select different examination modes from the broadcast data without interference, minimize the mobility issues during examinations, and also reduce some of the inherent problems associated with connecting cable of the modern electronic stethoscope.

## II. LITERATURE REVIEW

Stethoscopes are used to listen to acoustic signals from the internal organs of the human body. Although stethoscopes play a very important role in the diagnosis process, the chest piece and the connecting cable are known to facilitate transmission of pathogens from patient to patient and from patient to

the user. Replacing the connecting cable with a wireless system may help reduce the potential risk and further allow broadcasting of the signals to multi-users for examination. This work reports on the design of a two-piece Bluetooth- based wireless system that eliminates the connecting cables in electronic stethoscopes. The design consists of a Bluetooth based integrated chest-piece module for captured acoustic sound transmission and a microcontroller- based (MSP430) head-piece receiver module for decoding the data for the three operational modes of the stethoscope. The design was first tested using a chirp signal source with frequency of 10 Hz – 5 kHz. Results obtained for the three operational frequency bands of the stethoscope were consistent with the expected behavior of the stethoscope.

## III. PROPOSED METHODOLOGY

Heart sound stethoscope is primary stage to access diseases. In this paper design of an electronic stethoscope with the functions of wireless transmission is discussed. This electronic stethoscope based on embedded processor. The data can be transmitted through wireless transmission using Zigbee module. A microphone is used to pick up the sound of the heartbeat. Acoustic stethoscope can be changed into a digital stethoscope by inserting an electric capacity microphone into its head. The signal is processed and amplified to play with or without earphone. Heart sounds are processed, sampled and sent wirelessly using Zigbee module so that multiple doctors can do auscultation.

**Fig 3.1**. Head Display Stethoscope with Temperature Sensor

## IV. RESULTS AND DISCUSSION FUTURE SCOPE

Available in adult and pediatric sizes, these probes offer accurate, continuous measurement of core vital sign. The esophageal stethoscope is obtainable with a soft, thin cuff that gives outstanding clarity of heart and lung sounds. The male luer fitting conveniently attaches to straightforward acoustical earpieces. Depth markings aid in proper placement. The long lead wire keeps the connector off from the surgical field. The probe quickly and accurately reflects changes in core vital sign. The merchandise offers single- • - patient use convenience and infection control. The merchandise is compatible with most multifunction patient monitors.

## V. CONCLUSION

Nearly all medical personnel actively involved in the treatment and diagnosis of patients use stethoscopes on a daily basis. Stethoscopes are used for pulse measuring, blood pressure monitoring, and diagnosis of cardiovascular, respiratory, and digestive diseases. The majority of stethoscopes currently on the market

are acoustic devices that use purely passive mechanical parts to isolate and focus sound generated by the body. Though these methods have been used for years, the simplicity of such devices is overshadowed by poor sound quality, discomfort, and high cost. These devices are also difficult to interface with modern technologies such as computers to record and analyze body sounds. Therefore efficient electronic stethoscopes need to be designed that are comparable in cost, has better acoustic response, and can interface with modern technologies better than the current acoustic stethoscope.

Electronic stethoscopes have been used for the last couple of decades, although it is only recently that they have gained any acceptance in everyday medical practice. This is because historical electronic stethoscopes were typically bulky and non-portable, requiring large separate cases to house the electronics. Because of this, electronic stethoscopes were only used in research and advanced diagnostic settings. Recent advances in microelectronics have led to smaller, more portable devices, and a subsequent rise in electronic stethoscope usage in everyday medicine. This project is our effort towards designing such an electronic stethoscope which not only interfaces with computers and other display devices easily but is also cost effective and easy to use. we have used the simplest of components known so that the designing of this stethoscope can be universal and have simulated it through multisiom software which is rather simple software to work on. So considering the widespread use of stethoscopes for diagnostic purposes we hope the stethoscope we have designed to be a success keeping in mind its advantages over the acoustic and other bulky stethoscopes now being used.

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On the (Real Time) Accident Information & Insurance Dispute Resolution

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## ABSTRACT

Initially it took a long time to claim insurance whenever an accident took place for the victim. To overcome this we introduced a web portal for the easy use of insurance. There should be a system/portal for gathering of on the spot information during road accidents. This information should include photos of the site, interviews with eyewitnesses, information on injuries and fatalities, reason, speed, road condition on a relative basis, etc. The responsibility for collecting the data could be given either to police, transport authority, ambulance or even ordinary citizens who volunteer for the same. In the same system, there should also be a provision to submit/exchange insurance numbers/ details in order to settle the dispute if any arising out of the accident. It reduces delay of accident reporting and makes even more easy to claim insurance.

**Keywords :** Insurance, Accident report, Eyewitnesses, Police.

## I. INTRODUCTION

Road accidents are undoubtedly the most frequent and, overall, the cause of the most damage. The reasons for this are the extremely dense road traffic and the relatively great freedom of movement given to drivers. Accidents involving heavy goods vehicles (especially coaches and lorries with trailers) occur all too frequently despite calls for responsible behavior, for respect of the loading regulations and the highway code, as well as the obligation for drivers to adapt their speed, which affects stopping distances, to the traffic and weather conditions (rain, ice, fog, etc.). The prevention of road accidents is also extremely important and will be ensured by strict laws, by technical and police controls, ongoing training for drivers (especially those involved in the transport of dangerous substances) and, if need be, by legal and administrative penalties for those responsible. The control of all accidents is, in the first instance, the responsibility of the commander (chief) and personnel of the affected means of transport. It is up to them to limit the resulting damage as much as possible.

Passengers must obey the directives of the personnel on board (protective and rescue measures) and behave as they are instructed by the regulations on disaster situations, especially air, rail or maritime disasters. As far as search, rescue and assistance operations are concerned, the means or system of transport involved and the area (country) where it occurs will determine who is the person in charge at the disaster site.

## II. RELATED WORKS

[1] "Methods Of Pre-Generating Insurance Claims", by TM Potter, ME Clauss, DR Carter, DA Graff - US Patent App. 10 Volume: 072018

A system used for pre-generating insurance claims, accident data associated with a vehicle accident involving a driver may be collected. The accident data

may be analyzed, and a likely severity of the vehicle accident may be determined based upon the analysis of the accident data. An estimated insurance claim may be generated based upon the determined likely severity of the vehicle accident, and transmitted, via wireless communication, from one or more remote servers to a mobile device associated with the driver to facilitate presenting all, or a portion of, the estimated insurance claim to the driver or the insured.

## III. PROBLEM IDENTIFICATION

A lot of efforts have been earlier done on web based information systems in case of road accidents, traffic information management, analysis and reporting etc. Also, the system is prone to increase the false positives because there is no filter in place to verify if an accident detected is a real accident or just false. Difficult in retrieving the report back for analysing purpose and time consuming. The accident reporting form must be completed by handy and often leads to delays in report submission

## IV. PROBLEM SOLUTION

In the proposed system, all the information about accidents can be directly reported to the emergency system. In this we are going to maintain a web portal where we can gather all the information during road accidents and the information includes photos of the site, information about injuries and fatalities and reason for accidents. The centralized server or database is maintained to store all the information. The benefits include reduce delays, report submission to various departments simultaneously, easier means of reporting.


**Fig 1:** Architecture Diagram

## V. SOFTWARE USED

NetBeans is an integrated development environment (IDE) for Java. NetBeans allows applications to be developed from a set of modular software components called modules. NetBeans runs on Windows, macOS, Linux and Solaris The NetBeans Platform is a framework for simplifying the development of Java Swing desktop applications. The NetBeans IDE bundle for Java SE contains what is needed to start developing NetBeans plugins and NetBeans Platform based applications; no additional SDK is required. NetBeans 10.0 was released on 27 December 2018. It brings support for Java 11 and improved
support for PHP


**Fig 2:** NetBeans

## VI. PROGRAM OUTCOME

MODULE 1- Accident Data From Concerning Organization The accident data will be collected from the different organizations by the police department. The information can include a photos of the site

where accident has been occurred, interviews with the eyewitnesses the person who was physically present at the place where accident has happened, and also can be the information about the injuries and fatalities, reason for accident may be over speeding, drunken driving, distractions to driver, red light jumping, avoiding safety gears like seat belts and helmets etc.,

MODULE 2- Accident Medical Report

The doctor will update the accident medical report such as movement of client on impact, immediate symptoms, current symptoms and treatment, loss consequential to injury and at last the reviews of the medical. The victims or users can also view the medical report which is updated from the doctor.

MODULE 3- Individual Accident Casualty Report Matching

In this project, the police and hospital records from the road accident casualties were collected to determine their matching and reporting records of the particular victim. The police department will update the road accident information and also along with the vehicle information. The police department also updates the location based on death updates, it is all maintained and stored in the secured database.

MODULE 4- Insurance Claim For Accident Compensation

The claim is the first step toward being compensated for medical expenses, lost wages, or other damages resulting from the accident. The insurance company will then open an investigation of the claim and victims may be asked to submit the accident report or independent medical examination by a doctor.

## VII. CONCLUSION

In this project, it is concluded that the system is to provide emergency service to get the accident information and reach in time, it significantly improves the timeliness of accident reporting as it encourages prompt reporting and investigation for quick action and ultimately contribute to injury prevention. Application consists of important detail, which is sufficient for summary of accident reporting.

## VIII. FUTURE ENHANCEMENT

For future work we would like to explore AUC optimization techniques as well as online learning methods to predict traffic accidents in real-time. We also plan to investigate approaches to predict the precise number of accidents.

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# Development of Nano Biosensor for Cholesterol Detection

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## ABSTRACT

The aim of this study is to develop cholesterol biosensor using synthesized reduced Graphene Oxide (rGO) by modified Hummer's method and reduced Graphene Oxide-Silver (rGO-Ag) nanocomposite had prepared by a simple chemical method. The rGO-Ag nanocomposite was synthesized in the presence of Silver Nitrate (AgNo3) and Sodium borohydride (NaBH4). The synthesized reduced Graphene Oxide (rGO) and reduced Graphene Oxide–silver rGO-Ag nanocomposite were characterized by Ultraviolet-Visible Spectroscopy (UV-Vis), Fourier Transform Infrared Spectroscopy (FTIR) and Dynamic Light Scattering (DLS). Then the Cholesterol Oxidase (ChOx) enzyme is to be immobilized on rGO-Ag poly-pyrrole network. The rGO-Ag poly-pyrrole/ChOx enzyme is coated on electrode and its electrochemical studies are to be accomplished. The bioenzyme integrated nanostructure platform is very sensitive toward cholesterol and it has a fast response time.

**Keywords :** Cholesterol, Enzyme, Silver Nanoparticles, rGO.

## I. INTRODUCTION

A biosensor is an analytical device, used for the detection of a chemical substance, that combines a biological component with a physicochemical detector. The transducer or the detector element, which transforms one signal into another resulting from the interaction of the analyte with the biological element, to easily measure and quantify the substance [1].

Graphene is a two-dimensional honeycomb crystalline single layer of carbon lattice [2]. It has extraordinary electrical and thermal conductivities [3][4], high mechanical stiffness [5], good biocompatibility [6] and low cost [7].

Silver is extremely soft, ductile and malleable transition metal, though it is slightly less malleable than gold. It has very high electrical and thermal conductivity. The interaction of silver with other material takes place with lower electron mobility. The electrical conductivity of silver is the greatest of all metals [8].

Cholesterol is an essential structural component of nerve cells and plasma membrane. Cholesterol is an organic molecule. It is a sterol type of lipid. Cholesterol is carried in the blood by lipoproteins. Cholesterol serves as a precursor for the biosynthesis of steroid hormones, bile acid and vitamin D [9].
Nowadays cardiovascular disease and cardiac arrest are the most important cause of death due to the increased concentration of cholesterol level in blood

(hypercholesterolemia). It is important to develop the existing cholesterol biosensor by improving its sensitivity. Detection and determination of biomolecules are clinically highly significant for diagnosis and treatment of various diseases.

Enzymatic biosensor is a very well accepted system for sensing biomolecules based on their electrochemical reaction (oxidation or reduction) with the enzyme, which is immobilized on the electrode surface. The electrochemical output signal corresponds to the concentration of the analyte molecule. The analytical performance of a biosensor depends on the electron transfer between the metal active site of the enzyme and the electrode surface.

Enzyme can be directly immobilized on the electrode surface to achieve direct electron transfer between the electrode and the enzyme. However, it might result in the denaturation of the enzyme and hence affect the biosensor response. In order to improve enzyme adsorption, improve stability and enhance the direct electron transfer, nanomaterials have been widely used as immobilization matrix, a mediator between the enzyme and the electrode. The biosensor selectively detects cholesterol even in the presence of interfering agents found in clinical serum samples. It is to be designed for rapid and sensitive detection of cholesterol.

## II. EXPERIMENTAL METHOD

### A. Materials

The chemicals such as Graphite and Hydrogen peroxide ($H_2O_2$) were purchased from LOBA CHEMIE PVT LTD, Sodium nitrate ($NaNo_3$) and Potassium permanganate ($KMnO_4$) were purchased from SRL chem, Conc. Sulphuric acid ($H_2SO_4$) was purchased from Isochem Laboratories, Silver nitrate ($AgNO_3$) was purchased from HIMEDIA, Sodium dodecyl sulphate ($C_{12}H_{25}NaO_4S$) and Sodium borohydride ($NaBH_4$) were purchased from MERCK. Double distilled (DD) water was used for all the solution preparation.

### B. Preparation of reduced Graphene Oxide (rGO)

The rGO was synthesized by modified Hummer's method. The Graphite powder and $NaNO_3$ mixture were added to 100 ml of DD. The mixture was subjected to magnetic stirring for 15 mins. 115 ml of Conc. $H_2SO_4$ was added slowly to the solution placed in an Ice bath. Then the solution was stirred for 15 min. 15 gm of $KMnO_4$ was added to the solution and stirred for 15 mins. 250 ml of DD water was added to the solution and stirred for 15 mins. 10 ml of $H_2O_2$ was added to the solution for the completion of the reaction. The above solution was added with distilled water to make up the solution as 400 ml. The solution was subjected to stir for 7 days. Then the prepared solution was dried in hot plate in order to obtain powder form.

### C. Instrumentation

The UV analysis were carried out in Agilent Technologies Cary 8454 UV-Vis Spectrophotometer. The Functional group measurements were performed with a Perkin-Elmer FTIR spectrophotometer. The particle size distribution of the prepared powder was analysed in NANOPHOX.

## III. RESULTS AND DISCUSSION

Thus the rGO prepared by modified Hummer's method was obtained in black colour. The Characterization of rGO such as UV, FTIR, DLS are discussed below.

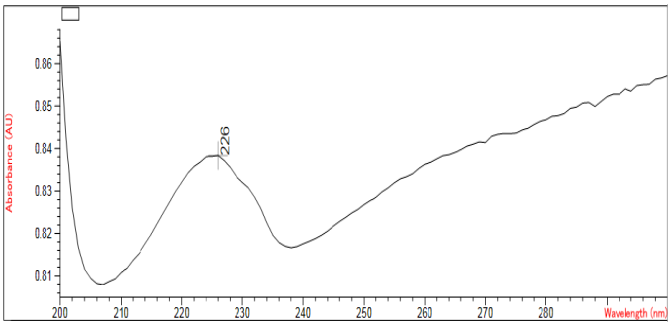


**Fig. 1** UV-Visible (A) spectra of rGO.

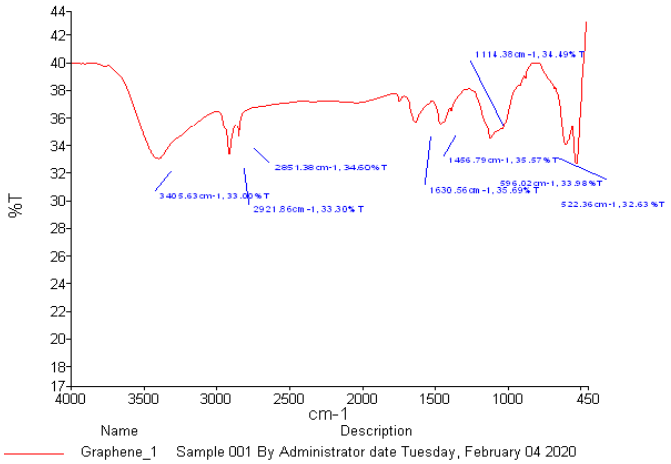


**Fig. 2** FTIR (B) spectra of rGO

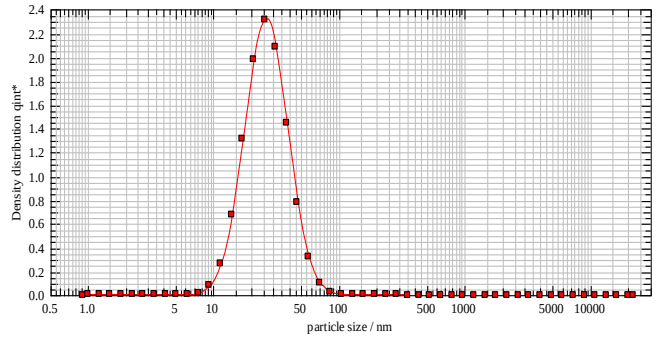


**Fig. 3** DLS (C) of rGO

UV spectra analysis as shown in Figure 1 (A) is a quantitative technique used to measure how much a chemical substance absorbs light. It measures the intensity of light that passes through sample with respect to the intensity of light through a reference sample. The UV-visible absorption spectrum of rGO shows a main band at 226 nm corresponding to the π-π* transition of aromatic C-C and carboxyl C-O bonds respectively.

FTIR spectra analysis was performed to investigate the different types of functional groups of the nanoparticles, as shown in Figure 1 (B). Firstly, the broad peak at 3405 $cm^{-1}$ originates from stretching vibrations of hydroxyl (-OH) group, then an aromatic (C=C) peak appears at 1630 $cm^{-1}$ and carboxyl peak (C-O) appears at 1114 $cm^{-1}$.

Dynamic Light Scattering (DLS) of rGO as shown in Figure 1 (C) measures the Brownian motion of molecules and particles to determine size and size distributions. The average particle size distribution rGO was obtained as 13 nm ($D_{90}$).

## IV. CONCLUSION

In this way the reduced Graphene oxide was successfully synthesized by modified Hummers method. The particle size was obtained as 13 nm in DLS. Then the Graphene Oxide functional groups were analysed using FTIR. The UV absorption spectrum of rGO was obtained in a successful manner. The prepared rGO is used as sensing platform for biological applications.

## V. ACKNOWLEDGMENT

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## VI. FUTURE WORK

Further characterization such as SEM and XRD analysis for rGO will be carried out. The rGO - Ag nanocomposite will be synthesised and their characterization will be done. The above composite will be used as sensing platform for detecting cholesterol.

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