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.
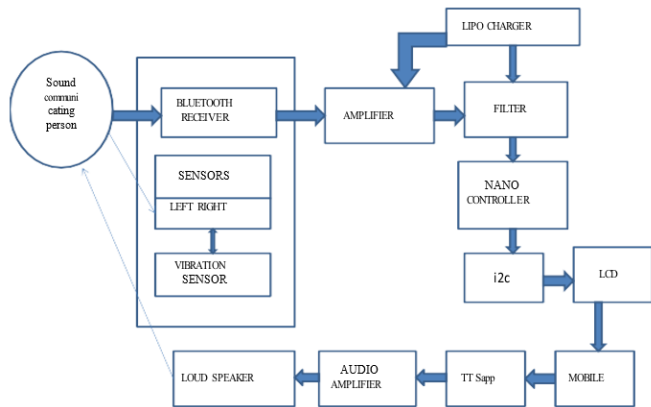
II. METHODS AND MATERIAL

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.
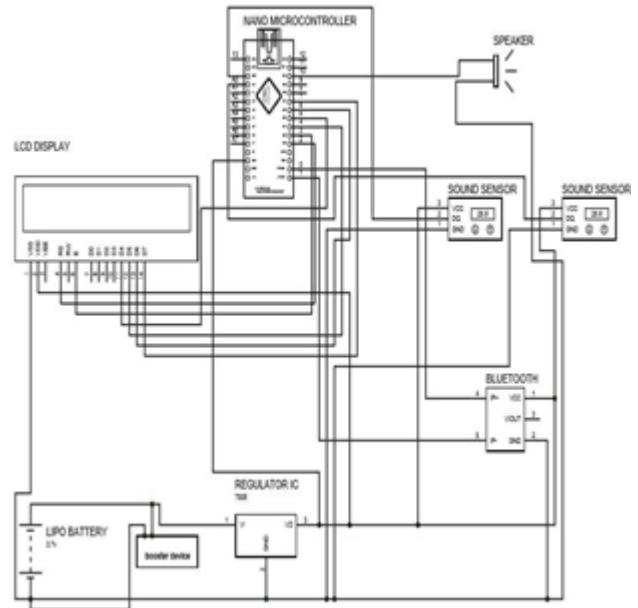
CIRCUIT DIAGRAM

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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2020.

Journal URL : http://ijsrst.com/EBHBM011