

Design and Analysis of IoT Based Intelligent Robot

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ABSTRACT

In the contemporary era, the automobiles are focused to be more automated to give personage a moderate driving. In this paper we are considering the most important aspects such as the cost, fuel consumption, and lots of accidents, strain while driving and the person with disabilities are depended on others for their journey and in order to constantly monitor for changes by deploying personnel near sensitive areas is achieved by human surveillance. To ease all this issues the paper aims to design and demonstrate a prototype of IOT-based intelligent Robot with simply automated features which works in two mode such as car mode and environment mode(surveillance) the car mode consist of features like obstacles avoiding to avoid accidents, line following robot which detects and follow lane and vision sensing feature for traffic sign detection, and the environment mode consist of temperature sensing, light intensity detecting features and overall system which is controlled by mobile device. This android application is designed in such a way that is speaks out what the robot is doing for example obstacle detected. This overall criteria is based on the ATmega48 microcontroller which is core for every embedded module for our project from Atmel corporations AVR microcontroller family was choosen because AVR deliver more performance in lesser power consumption. Our study releated that using wireless technological aspects to control the robot is more autonomous and automatic monitoring is done which helps the personages to travel strainlessly and cost effectively. Further advancement in our project can provide automatic location based robot which travel and reach destination according to the voice commands given by google maps.

Keywords : Intelligent Robot, Line Following, Obstacle Avoiding, Vision Sensing, Atmega48 Microcontroller.

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I. INTRODUCTION

Over years, remote control techniques have been implemented in many different fields for variety of different applications. We are having remote controlled televisions, audio systems and other

consumer electronic appliances. But all this devices have limitations that their area of operations is confined to certain range. This is because commonly used remote controls have power constraints so, in many cases it becomes necessary to have a control of the devices using advanced touch screen android

based devices. The technology as put forward many dynamic circumstances as a drastic change in automated fields which has impacts in all the areas. An autonomous Robot is an unmanned ground vehicle which covers the frontiers of research fields including intelligent decision, recognition, sensing, capturing and formulating tentative pre-requisites and then responding to environments perception. Comparing to last decades there is an enormous and tremendous increasing interest towards IOT has been recorded. This means the technological aspects is overwhelming structure for human needs and surviving. More curtain towards robots is being implemented to ease the stress barriers of people. For the coming stages of technology there is widely 80% of world will be filled with unmanned vehicles.

Among various research fields on unmanned vehicles for automation has several techniques that has been put forward for the robot to be more autonomous. In our project we move towards sensible navigation by taking lane reactance as an input the robot travel according to the lane and also by talking obstacle as input it avoids obstacle and navigates along the path given by input data.. Sensing capabilities has enriched various forms of sensors that will encapture the data from physical quantity and converts to a digital aspects in the robots which helps the robot to navigate tremendously.

Our project has two in one feature that is car mode as well as environment mode (surveillance) firstly the car mode focuses on three features of pre requisites such as obstacle avoiding, traffic sign detecting and lane following and other one is environment mode which enriches temperature sensing and light intensity sensing capabilities. All these features encapsulate the working flow of the Robot as prototype. In the first case which is car mode putting forward an obstacle avoidance we use IR sensor to detect obstacle. There are some highways with no obstacle areas which makes robot to navigate without

disturbance of the motion, but in critical cases the robot has to steer away the obstacle so that it has to take some step by moving at certain angles to make it accident free cases [1].

The next, comes up with autonomous navigation using the lane following technique here the robots have the capabilities to detect the dark or black lane present on the lighter surface via depends on their contrast. This enhances the reflectance of the surface beneath them by using an IR(Infrared) sensors here we use three IR sensors for lane detecting and mainly focused on straight forward navigations such as used for carrying heavy goods and services.[2]

The autonomous navigation using traffic sign detection system. Here there are traffic rules to be followed by all the people in the vast traffic zonal areas. People due to busy life time transparency they rush towards the urgencies by skipping the traffic signs. With the help of the traffic sign detection system the vehicle can be controlled by traffic rules and policy's.[3] all three cases we has been circuited with an open source ATmega48

The second mode that is environment mode one among this feature is light intensity sensing capability. This comes in to considerations during the military scenario under surveillance system where human can move into certain area in order to constantly monitor the changes of environment. Here we use photo sensor (light sensor) to detect light intensity [4].

The next comes under surveillance system is temperature detecting here we use temperature sensor (LM35) to constantly monitor the temperature changes [5]. All these factors taking into consideration the robot is controlled by ATmega48 microcontroller which is main controlling unit to completely monitor all the features as mentioned above .

The main motivation to build this project was there were many surveillance systems to be needed when a personage cannot travel in some areas so that the military people was facing drastic situation and also considering an aspects of autonomous car there were only two features in every papers in which some features were missing and was not updated to more to that extant. We got an idea of building all two application along with an advancement of traffic sign detection to make robot more autonomous along with that we designed robot as two in one mode to make more updated technology from the existing one by adding surveillance feature to the car so that the robot can work as car mode and also a surveillance mode.

II. THEORITICAL FRAMWORK

It includes the survey of place people and publications is context of research. Many books have provided valuable information that was useful for this project. One such book is “Design with microcontrollers” authored by John B. Peatman education PTE. Ltd. First Edition, 2001 [1]. This books aims that the active exoskeletons were the processors of contemporary high performance unmanned ground vehicles.

“Line follower and obstacle avoidance robot using Arduino” by Aadilansari (IJRET June 2018) [2]. This paper aims to create robot which routes the path as the user sets for it by detecting obstacles while the robot is navigating.

“Vision based traffic sign detection system” by C Liu, s Li, F Chang (sept.2019) [2]. This paper has accomplished the detection of traffics signs into five categories for classifying the traffics signs. We drawn this aspect from this paper and implemented with other two applications as mentioned previously for making it more efficient robot.

III. METHODOLOGY

A. Block diagram

Here is the simple block diagram of prototype of iot based intelligent robot which describes the actual structure of the project. The system make us of BLUETOOTH technology for the transmission of code pattern to control the devices which is based on microcontroller. To, switch left, right, back, front a robot uses appropriate code needs to be sent by Bluetooth through android phone. This code makes the robot to act accordingly and also by using Bluetooth technology any number of devices can be controlled.

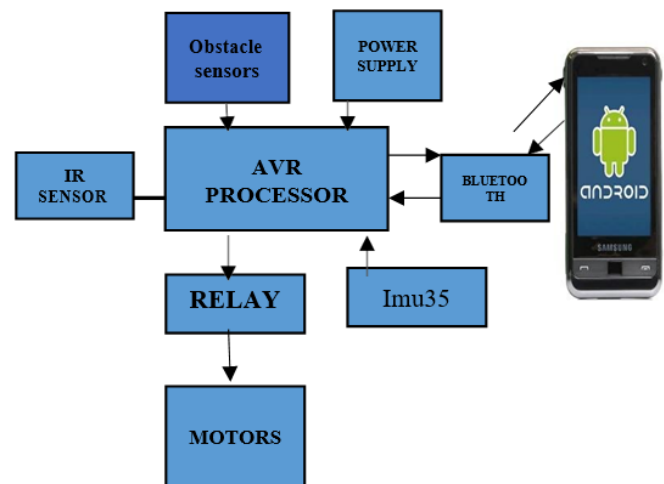


Fig 3.1 Block diagram of IOT based robot

IV. PROPOSED SYSTEM

Using existing system we can't have more updated autonomous car since it was having only two each features int either traffic sign detection and obstacle detection or lane detection and obstacle detection. Hence we need all three in one along with updated technology we can add environment mode (surveillance) to it. Which makes the robot more autonomous so, the proposed system is designed with all three features such as traffic sign detection, obstacle detection, and lane following system and also light sensing and temperature sensing features. This makes the people more comfortable to travel in driverless cars and also monitor the environment changes which makes easier navigations and more helpful in military systems.

The IoT based robot was not a simple system but a framework to immediately tackle the obstacles and traffic signs along with lane detection and also monitoring temperature and light intensity was more ambiguous. The architecture was designed in such a way that ATmega48 (AVR) as the main microcontroller which controls the circuit and by circuiting it with relay modules which controls the motors. The inputs were given through the Bluetooth through a high progressively designed Android system which has the capabilities of giving voice commands what the robot is being monitored. Most of the monitoring is done by using IR sensors. Three IR sensors for lane detecting, one IR sensor for obstacle detecting and last IR sensor for capturing traffic signals. Here we have also used Im35 for light sensing and temperature sensor for temperature sensing. All these devices are circuited to the main ATmega48 microcontroller to control the sequence of operations which is processed using embedded C language.

V. ARCHITECTURE OF ATMEGA48

By AVR enhanced RISC architectures feature the ATmega48 CMOS 8-bit microcontroller is designed. The ATmega48 microcontroller is much faster than conventional CISC because, the resulting architecture is dependent on embedded C coding aspects. A rich instruction set is combined along with general purpose registers. ATmega48 monitors the power resources and provides only a small amount of voltage throughout the implementation purpose. Which makes sufficient usage of power resources so that any default occurs the IC's won't burst.

As we see in Fig.5.1 AVR is a main processing unit which handles the services like flash SRAM and overall system

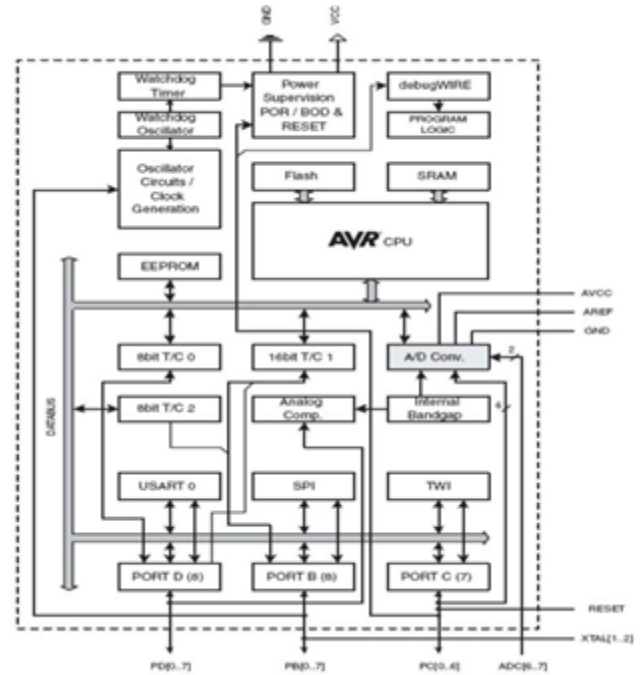


Fig 5.1 Architecture of ATmega48

In order to undergo any sequences of operations we must have a high performance ratio with high polarities and parallelisms. So, here also we must increase the performance of AVR. We get into an architecture called Harvard architecture which uses separate memories and buses for their functions and processing to maximize the performance ratio. Taking the pipelining concept which works as when one instruction is under process, the next instruction will be perfecting the instruction from the program memory. The overview of this process which will allow to execute instructions in every clock cycle.

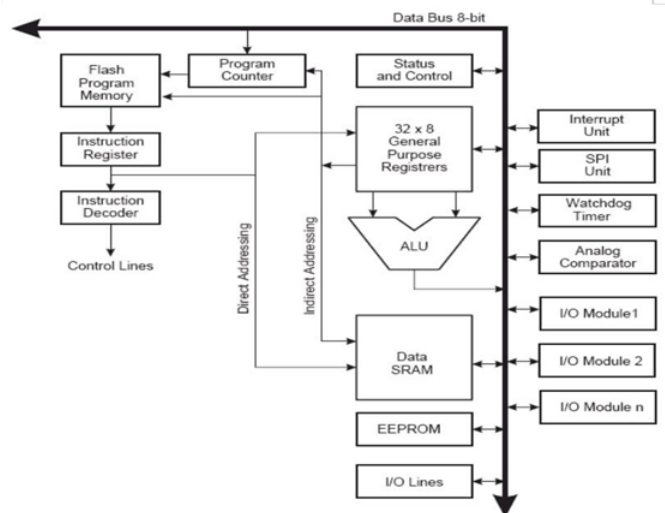


Fig 5.2. Block diagram of AVR

VI. TESTING

Most importantly testing plays a very important role before any product is coming into existence. Which detects any faults happened and securitizes the system which help users to take a step to make it correct and run systematically. The testing phase include unit, acceptance, integration and system testing's. .

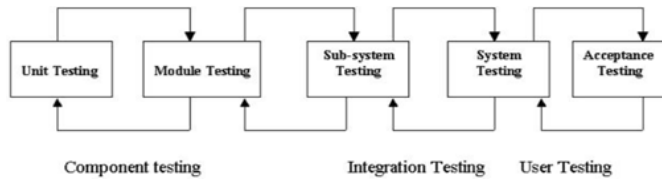


Fig 6.1 Testing process

6.1.1 Unit Testing:

This project is patriated to two separate modules. So that each an every module is tested.

6.1.2 Integration Testing:

This phase of testing describes how the each data and variables are being transferring from module to module. After compiling the program is done than the testing process is started. By giving various inputs the system is tested.

6.1.3 System Testing:

The modules which are tested in integration part are all combined together and should be tested sequentially. This phase is used to check weather all the given inputs are producing sequential outputs.

6.1.4 Acceptance Testing:

The testing is based on only the external aspects of the system and we are not going to bother about the internal logic. By installing the testing application we can proceed the testing process..

VII. IMPLIMENTATION AND RESULTS

The AVR board is connected to the relays to control the motion of motor's which in turn connected to the Bluetooth module in order to handle the robot functions all the IR sensors, light intensity sensors, temperature sensors are connected to the AT mega 48 microcontroller. The program is designed using embedded C language and loaded into the AVR board after all the sequence of connection are done and it is controlled by mobile application.

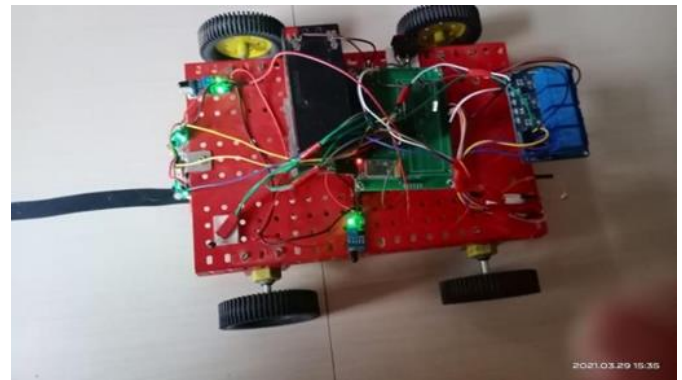


Fig 6.2 Iot based intelligent robot

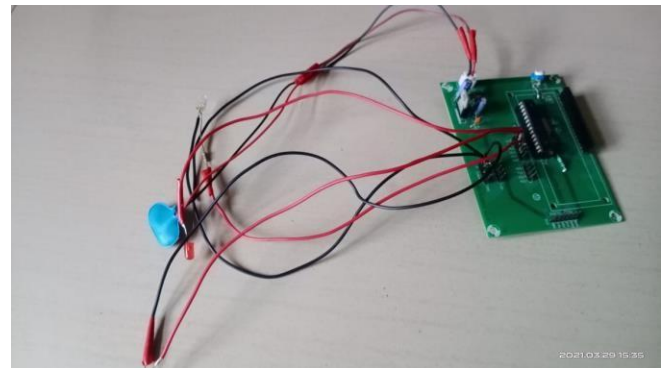


Fig 6.3 traffic light with 10 seconds delay

In order to detect traffic light we have used another AVR microcontroller to toggle LEDES so that the robot with detect using IR sensor and works autonomously.

VIII. CONCLUSION

By overview of this topic we can conclude it by assuming that in the modern era as the technological aspects is ongoing process were as we used the android designed programs to create an android app to control the device which gave the satisfactory

results and also the microcontroller is enough sufficient for the purpose of monitoring all the parameters. The two in one robot gives the virtual interface between the surveillance and normal autonomous car which makes the presence of technology used is much updated as compared to the existing one. Rather than using of raspberry pi for monitoring or capturing the signals and obstacles we have used an AVR board which is cost efficient than rest of microcontrollers or processors gave a good accuracy and performance ratio. The highly interactive module which was built on embedded systems perspectives made more comfortable to complete the process easier. For future purpose we try to combine all robotics features in one.

IX. REFERENCES

- [1]. "Design with microcontrollers" authored by John B. Peatman education PTE. Ltd. First Edition, 2001.
- [2]. "Line follower and obstacle avoidance robot using Arduino" by Aadilansari (IJRET June 2018).
- [3]. "Vision based traffic sign detection system" by C Liu, s Li, F Chang (sept. 2019).
- [4]. Elliot Williams, "AVR Programming", copy right 2014 Elliot Williams, 978-1-4493-5578-4".
- [5]. S. Kumar Reddy Mallidi, V. V. Vineela, "IOT based smart vehicle monitoring system", Vol. 9, No. 2, 2018, pp. 0976-5697.
- [6]. Hwang and Lin, "line follower Robot", v611105, June 2018.
- [7]. John-David Warren, Josh Adams, and Harld Molle,"Arduino Robotics", copy right 2011, illustrated, ISBN 978-1-4302-3184-4.
- [8]. Mobile Robot Monitoring System based on IOT, [http://www.researchgate.net/publication/341626062-](http://www.researchgate.net/publication/341626062)
- [9]. Nayantha KGHD, Obstacle avoiding Robot, <http://www.instructables.com/obstacle-Avoiding-Robot-Arduino-1/>
- [10]. <http://www.raspberrypi.org/> - the official website of raspberry pi.
- [11]. http://en.wikipedia.org/wiki/Wireless_modem
- [12]. <http://en.wikipedia.org/wiki/Microcontroller>

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WEB RESOURCES:

- [8]. Mobile Robot Monitoring System based on IOT, [http://www.researchgate.net/publication/341626062-](http://www.researchgate.net/publication/341626062)