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Semi Autonomous Smart Car

Alisha Shaikh

Priyanka Jadhav

Radhika Kulkarni

Students, Electronics and Telecommunication Engineering, RMDSSOE, Pune, India

Prof. Snehal Bhosale

Head of Department, Electronics and Telecommunication Engineering, RMDSSOE, Pune, India

Abstract: ***The aim of the project is to design & develop multipurpose semi autonomous smart car which can control the speed & direction automatically in cities & restricted areas like school, hospitals & speed limit areas etc. In today's fast moving world the people not have self control. Nowadays people drive vehicle very fast, accidents occurs frequently & there is loss of life as well as property. This paper provides a way for how we can control the vehicle speed without causing harm to anyone. Driver does not control the vehicle at such places & controls are automatically taken by electronic system. The main objective is to design adaptive cruise control unit, obstacle detection & avoidance unit, zonal speed control unit and traffic signal detection unit.***

Index Terms: Semi Autonomous Smart Car, adaptive cruise control, zonal speed control.

I. INTRODUCTION

Road facilities are a major concern in the developed world. Recent studies show that in most cases accidents occurs due to excessive or in appropriate speed. Most of the vehicles get accident because no proper safety measures are taken especially at curves or any obstacles in front of the vehicle. Reduction of the number of accidents and mitigation of their consequences are a big concern for traffic authorities the auto motive industry and transport research groups. Important line of action consists in the use of advanced driver assistance systems (ADAS) [1], In order to avoid such kind of accidents, to alert the drivers and to control their vehicle speed which is acoustic, hectic or visual signals produced by the vehicle itself to communicate to the driver the possibility of a collision. The objective of this work is to design and develop a multipurpose semi-autonomous smart car

Semi-Autonomous Smart car is a very huge concept consisting of developing a vehicle which will be almost man less/unman vehicle. Total determined concept of self driven vehicle is suppose to control a vehicle which normally keeps the car moving at a set speed but intervenes if necessary to avoid getting too close to the vehicle in front of it. This Concept is known as adaptive cruise control. Traffic signals play very important roles in accordance with the control & management of the traffic. Once the information is received from the zones, the vehicle's embedded unit automatically alerts the driver, to reduce the speed according to zones, it waits for few seconds, and otherwise vehicle's SDC unit automatically reduces the speed. Semi-Autonomous Smart Car should be able to recognize the traffic signals and should work accordingly .This is a Traffic signal acquisition & control. The car should be able to control its speed in a definite zone consisting of schools, hospitals etc. This concept is zonal speed detection & control. Semi-Autonomous Smart Car will decrease in percentage of road accidents by increase in traffic rules followers by reducing human efforts and an additional man can be accommodate in a car as it will be Semi-Autonomous Smart Car. This system will be less costly than present day systems.

OBJECTIVE

- ✓ To identify the distance between two vehicles & detecting obstacle according to the speed reduction & controlling the speed of PWM motor by using Speed control sensor

L293D.

- ✓ To make wireless transmission of Zonal unit signal by using ZigBee Module.
- ✓ To make traffic signal scanning & its sensing by using color sensor SUNROM1185.
- ✓ To save predetermined path in a memory of ARM controller to built location tracking system.

II. SEMI-AUTONOMOUS SMART CAR STRUCTURE

The Semi-Autonomous Smart Car structure consist of 4 units

- ✓ Adaptive cruise control unit
- ✓ Obstacle detection and avoidance unit
- ✓ Zonal speed control unit
- ✓ Signal detection unit

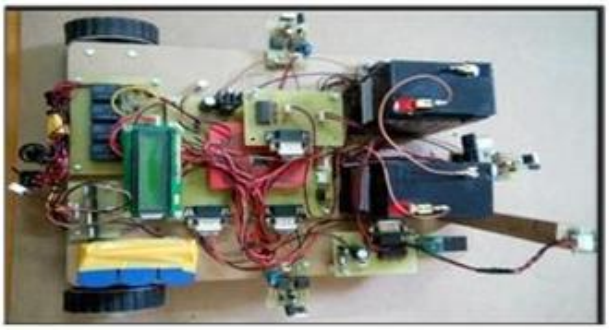

Figure 1: Semi-Autonomous Smart Car

III. SYSTEM APPROACH

In our proposed project we are used transmitter & receiver to communicate the signals. Transmitter part section includes the PIC16F877A which transmits signal through wireless communication using RF Zigbee. Receiver section includes ARM LPC2138 which receives the signal transmitted from the PIC controller, decodes it and accordingly speeds & direction of vehicle will change.

A. TRANSMITTER

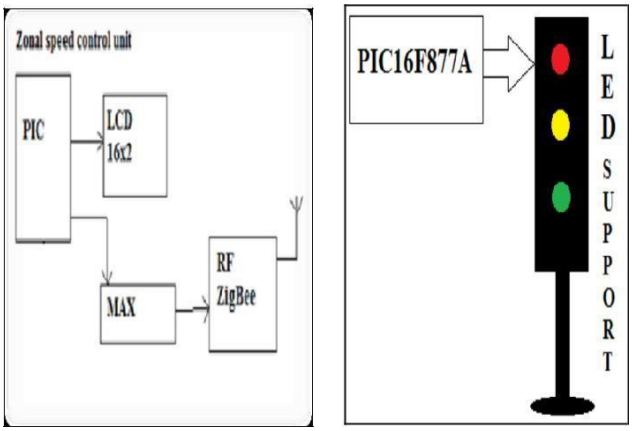

Figure 2: Block Diagram of Receiver

The transmitter is to be fixed at the locations where speed of vehicle needs to be controlled .The job of the transmitter is to transmit the signals that specify the minimum speed limitation must be implemented. Whenever the vehicle passes nearby transmitter, receiver in the vehicle detects the signal and get ready to receive the signal.[2]

B. RECEIVER

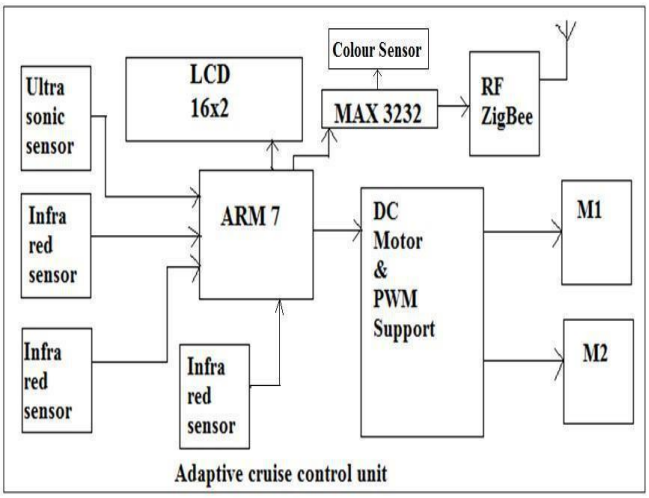

Figure 3: Block Diagram of Receiver

In the receiver section, RF receiver receives the transmitted signals from wireless module of the transmitter, decodes it and sends to the ARM controller. Then the decoded signals sends it to the DC motor 1 & 2, by using the DC motor driver which is connected to microcontroller speed and direction of vehicle is also controlled. It totally reduces the chances of the accident occurrence as a electronic system will have the fast response as compared to human response.[3]

IV. IMPLEMENTATION

- ✓ Adaptive cruise control and obstacle detection & avoidance using ARM LPC2138
- ✓ Zonal speed control using PIC 16F877A
- ✓ Traffic signal detection using PIC16F877A

A. ADAPTIVE CRUISE CONTROL AND OBSTACLE DETECTION & AVOIDANCE UNIT

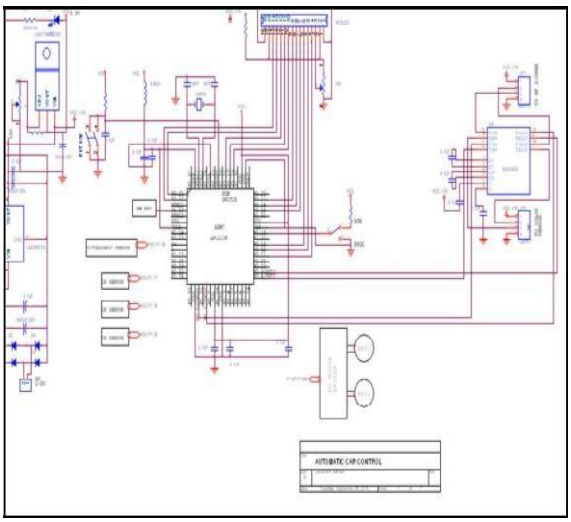

Figure 4: Circuit diagram of receiver section

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This is the circuit diagram of the reciever section (adaptive cruise control & obstacle detection & avoidance). ARM LPC2138 requires 3.3V-1A VI rating. The ultrasonic sensor HCSR04 required for adaptive cruise control and 3 IR sensors required for obstacale detection are interfaced to the PORT 1 of the controller. Ultrasonic sensors generate high frequency sound waves and evaluate the echo is received by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. - Infrared radiation enters through the front of the sensor. At the core of a PIR sensor which is a solid state sensor or set of sensors, made from pyroelectric materials which generate energy when exposed to heat [4]

The color sensor SUNROM1185 [5] is connected to LPC2138 for color detection purpose. This color sensor identifies color and gives serial output of RBG value. It can identify millions of color shades giving RGB value for the detected color. The detected color is identified as amount of three primary color values namely Red, Green & Blue with 8 bit accuracy for each primary color. Any color can be separated into three primary colors Red, Green and Blue using the RBG values.

DC motor driver i.e. speed control sensor L293D is connected to the PORT 1.L293D is high current four channel driver assigned to accept standard DTL or TTL logic levels and drive inductive loads such as DC and stepping motors. Emergency key is connected to PORT 1.RF Zigbee is connected to PORT 0.

B. ZONAL SPEED CONTROL UNIT

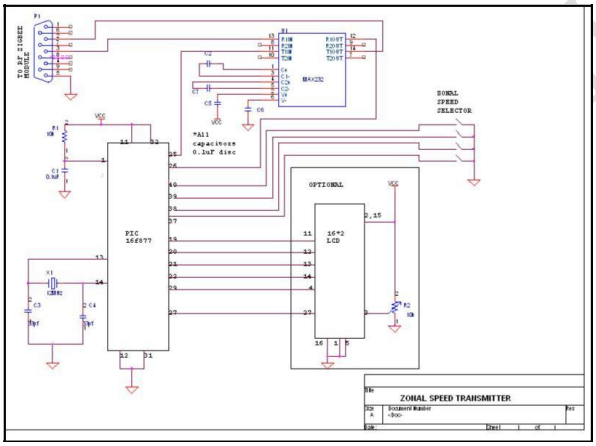

Figure 5: Circuit Diagram of Zonal Speed Control Unit

This is the circuit diagram of the transmitter section (Zonal speed control unit).PIC16F877A requires 5V-4mA VI rating. Four keys are connected to PORT B which decides the speed of the vehicle in that zone. When any particular key is pressed then that speed value is stored in PIC controller, zigbee connected to the controller continuosly transmit that signal wirelessly. The speed of the zone is displayed on LCD for the understanding purpose.[6]

C. TRAFFIC SIGNAL DETECTION UNIT

This is the circuit diagram of the transmitter section (Traffic signal detection unit). PIC16F877A requires 5V-4mA VI rating. Traffic signal is made up of three LEDs are connected to PORT B of controller. SUNROM 1185 color sensor which is interfaced to the ARM controller when comes in the range of line of sight of traffic signal LEDs, color of traffic signal is sensed by the SUNROM 1185 sensor and it is given to the controller. Depending upon the signal corrective action takes place that is if red light is on speed of vehicle reduces to zero and if green light is on speed remains unchanged and if yellow light is on speed will reduce from original speed.[7]

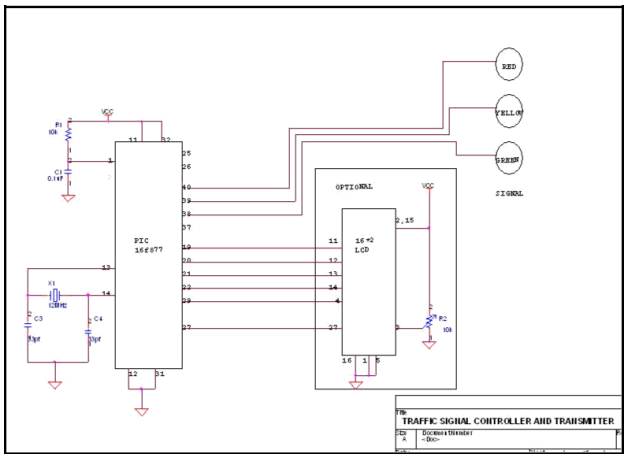

Figure 6: Circuit Diagram of Traffic Signal Detection Unit

V. CONCLUSION

It has been developed by combining features of all the hardware components used .Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit .

A low cost and simple system has been developed to ensure the safety of passengers and pedestrians. It certainly provides a hope for bringing down the alarming rate of road accidents.

This is very useful technique to control the speed and direction of the vehicle automatically.

- ✓ By using microcontroller we control the speed of the vehicle according to the zones.
- ✓ As in a city traffic control to conserve the fuel and implement the traffic rules.
- ✓ This system is mainly useful in the areas where high rate of accidents are recorded
- ✓ Adaptive Cruise unit and Obstacle detection unit are used to avoid the accidents which occur due to sudden change in the vehicle speed.

VI. FUTURE SCOPE

- ✓ Deterministic path unit can be modified by using GPS for larger area
- ✓ Hands free driving in certain conditions 3] Vehicle to vehicle communication
- ✓ Real time scanning of traffic signs
- ✓ Hands free driving in complex situations

- ✓ Provisions may be included to cut out out the fuel supply to the engine to provide a smooth deceleration if the speed of vehicle accedes a threshold value.

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