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An advanced Vehicle safety alert system using Arduino for future applications

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Abstract

In today's world there is a severe increase in the use of vehicles. Such heavy automobile usage has increased traffic and thus resulting in a rise in road accidents. This takes a toll on the property as well as causes human life loss because of unavailability of immediate preventive and safety facilities. Complete accident prevention is unavoidable but at least repercussions can be reduced. This embedded system can prevent the accident to occur and proper preventive measures are taken in this system. The ambulance service and the police station can easily find the location as the location along with the google map link was sent to their smart devices with mobile network accessibility. The system consists of eye blink sensor, temperature sensor, alcohol sensor, accelerometer, GPS module, GSM module, motor, buzzer, led etc. and all these devices are interfaced with the central micro controller unit. We are going to use eye blink sensor for detecting sleep by setting the certain time limit, if the driver gets sleepy, we can warn him. Temperature sensor helps us in detecting the heat of the engine and if the engine is overheated then that of a normal condition, we can warn the driver. Alcohol sensor helps us in detecting if the driver is drunk or not. If he/she is over drunk the vehicle provides warning and the engine stops functioning. Accelerometer detects the occurrence of accident and sends signal to the micro controller for further functioning. GPS module provides us the location, speed, time and date of the certain place where the vehicle is in the real time. If accident occurs, the location of accident that we get from the GPS is send to the ambulance service and police by the help of GSM module. Everything might be all right after a simple accident so the driver can re-inform the ambulance service and police station in this case.

Keywords: Arduino, vehicle estimation,

Introduction

Approximately 1214 road accidents occurring every day. Major road accidents in India are caused due to the over speeding and violation of traffic rules. The road accident rates are increasing day by day due to large numbers of vehicle running on the road. In all these Vehicles, the speed control needs to be implemented[1][2]. Here is the new idea of ours to install an automated speed control system in the vehicles to control the speed mainly in the restricted areas like school, college zones etc. When the vehicle enters the speed limiting zone, the colour sensor detects the colour of the strips which is painted on the road before entering the speed limiting zone. Then the speed is controlled by the speed controlling system to restricted limit[3][4]. The current speed of the vehicle is sensed by the dc motor and the output is verified with given data and speed is controlled. By implementing our system in every vehicle, we can drastically reduce the rate of road accidents happening every day[5][6]. Another

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major cause of death due to road accident is due to delay of medical treatment. So, we came up with an idea of using vibration sensor to detect the vibrations caused by the accident and sending alert message to the nearby medical centre and to the family members[7][8]. This can save millions of people who are in need for medical emergencies [9][10][11]. When an accident happens an automatic alert message will be sent to the family members through the mobile application. In addition to that we are using touch sensor to prevent the vehicle from theft. A touch sensor is used to detect the touching of vehicle while it is locked. The alert message is sent to the owner of the vehicle through the mobile application[12-14].

The carelessness of a single individual may cause damage to many people. In every state there is some road which deals with high traffic over the year. There are a certain speed limit for vehicle for convenient vehicle running. These zones are school, universities, hospital, accident zones etc.. By statics 30% cases were fatal accidents, 27% grievous injuries, 36% minor injuries and 7% noninjury accidents are revealed. The fatal crash incidence density was more than two times higher in rural than in urban areas as expected. This was primarily driven by the injury fatality. There is need for better security system because there is high level of theft nowadays. There must be system to monitor and communicate to respective person to save their life before the danger. There are many people in need for medical assistance due to road accidents. But there is delay in medical emergency because of the poor network[15][16][17].

Methodology

In this proposed project we are going to control the speed of the vehicle according to the respected zones. Our project explains that a various colour strips are marked on the road where we need to control the speed within the limit and vehicle will have a colour sensor attached in it which will recognize the colour marked on the road and accordingly maintain the vehicles speed in that particular limit. Unfortunately, if any accident happens the family members or emergency services are not informed in time [18][19]. This results in late emergency service response, which can lead to an individual's death or cause severe injury. In this project we are using android smartphone to detect accidents and report it to the nearest available emergency responding stations with the exact location of victims where accident took place through mobile application[20][21].

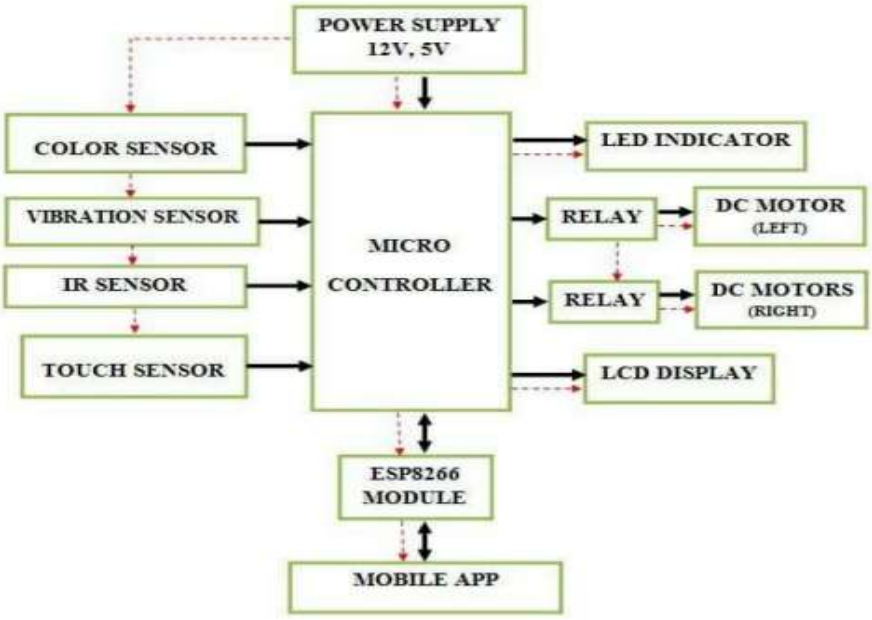

Figure :1 proposed block diagram

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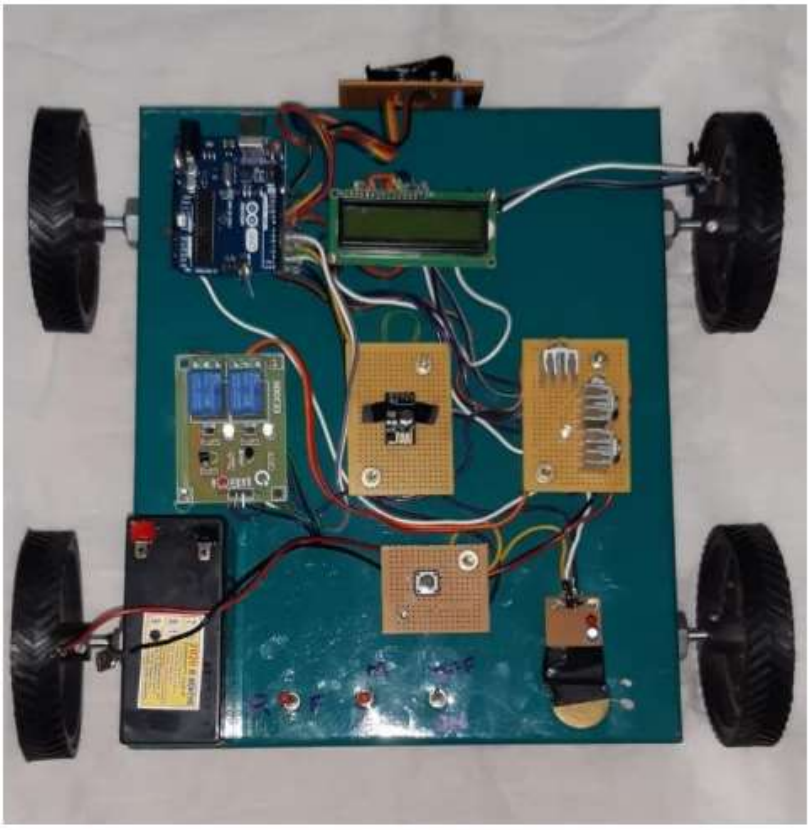
Additionally, we are using touch sensor to detect whether someone is trying to steal it while it is locked [22][23]. In this way crimes can be reduced as vehicles today are being stolen in large number. Hence, vehicles today require security which can be achieved with the help of this application [24][25]. Through the mobile application we can constantly monitor the speed of the vehicle, whether the vehicle is met with an accident or someone is trying to steal the vehicle. We propose a vehicle system for accident prevention and accident alert to make the world a much better and safe place to live [26][27].



When the vehicle enters the zone the color sensor in the vehicle detects the colour of the paint which is already painted in the road before the respective zones. The Arduino controls the speed of the vehicle according to the zone. If any accidents happens the vibration sensor in the vehicle gets energized and send alert message to the respective persons through mobile app. Added to that if anyone touches the vehicle while it is locked it will send an alert message to the owner through the mobile app.

This project demonstrates the design of working model of accident prevention and alert system using arduino.

1. Arduino(ATmega328p)

2. Colour sensor(TCS3200)

3. Touch sensor(TTP223)

4. IR sensor

5. 4 Wheel robotic chassis

6. Vibration sensor

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7. Esp8266

8. Battery

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pin, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

TCS3200-DB Color Sensor Daughterboard is a complete color detector, including a TAOS TCS3200 RGB sensor chip, white LEDs, collimator lens, and standoffs to set the optimum sensing distance. The input voltage for colour sensor is 2.7V to 5.5V. The TCS3200 has an array of photo detectors, each with either a red, green, or blue filter, or no filter (clear).

When an external conductor like a human finger comes in contact with the surface, a capacitance is formed between them and draws more current from the corners. The current at each corner is measured and their ratio will determine the position of the touch on the surface

The vibration sensor uses piezoelectric effects by measuring the changes in force , acceleration. Sensitivity ranges from 10mV/g to 100Mv/g. the working voltage is 3.3v to 5V. we used normally closed type vibration sensor SW -420. It uses LM393 wide voltage comparator.

The NodeMCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with inbuilt Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

This system is very efficient in reducing the road accidents and prevent overspeeding in restricted zones. It also a combination of both accident alert system and theft prevention system. In existing project, there is no autonomous speed restriction in the vehicle to avoid accidents. We can also add live tracking of speed and location in the mobile application. If we detect the living things which are crossing before the vehicle we can prevent many accidents and can save, millions of lives.

Conclusion

The proposed system mainly designed in order to avoid accidents and to alert when an accident happens. An effective solution is provided to develop the intelligent vehicle which will operates on safest speed at critical zones and send alert message to the family and emergency centres when the vehicle is met with an accident. Hence it is concluded from the above study that the use of Automatic vehicle speed control and accident alert system to minimize unwanted accidents to a great extent compared to normal behaviour.

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