Surveillance and Black Box for Car

Gagana B R [1,*], Chethana H T [2]

[1]M-Tech Student, Dept. of CSE, Vidyavardhaka College of Engineering Mysore - 570006, Karnataka, India
[2]Asst. Professor, Dept. of CSE, Vidyavardhaka College of Engineering, Mysore - 570006, Karnataka, India

Abstract

In recent years vehicle accident has become one of the most important problems in almost all over the globe. Drunk and drive, riding without adequate sleep and riding a car at faster speeds are the three significant reasons which lead to drastic increase in the number of accidents. Evidence Collection Car is a device used to record the driving history. This device is installed in a car which stores the readings of engine temperature, detection of obstacle and condition of seat belt. The snapshots inside a car and readings of engine temperature, detection of obstacle and condition of seat belt are collected. The collected information is notified through GSM to the concerned authorities. As a result rescue team will be informed automatically so that injured person will be assisted in a short span of time. The main aim of this paper is to reduce the percentage of road accidents occurring in real time.

*Corresponding author. Email:Gaganabr.12@gmail.com

1. Introduction

Vehicle mishap has become one of the pivotal issues throughout the nation. As indicated by WHO [3], improving wellbeing driving is a significant target that has driven numerous associations and organizations. Even vehicle producers are contributing huge measures of assets especially in improving street framework and to lessen the impact of accidents. But these issues are continuously expanding step by step, because of few reasons like drunk and drive, over speeding, riding vehicles without adequate rest. Despite the fact that distinctive vehicle riders have taken a few new plans in improving the security of the vehicle, but this issue will remain general because of the previously mentioned Reasons [3]. Due to this confine in the medical field, death rates are at the abnormal state. For security purpose, we can implement black box for four wheelers. Black box is characterized as an electronic gadget used to track the information and stores it in the aeronautics [9]. Similar idea has been implemented in the proposed system by actualizing the black box in the vehicle for help. Black box can record and store the details of vehicle accelerometer, temperature, liquor sensor, ultrasonic sensor and also stores the past driving information of a vehicle. We can examine and screen the driving condition of the vehicle and mishaps [3]. Here they have utilized ADC converter and sensors to gather the simple qualities which are fed into the microcontroller. Black box is a gadget which can withstand substantial impact i.e. the information kept in a black box can't be decimated effectively [4]. Due of this reason it is significant to have black box in the vehicle which records the data inevitably at the time of accident. In order to handle this situation the black box device has become one of the significant steps to solve the problem. In this paper [10], black box will give the total data about the various states of a vehicle. This information is utilized in legal sciences on account of mishaps or some other related violations.

Our proposed system focus on structure of the black box by utilizing any conjunctive segments like accelerometer, temperature, weights, ultrasonic and liquor sensors, ADC converter, microcontroller, LCD which shows GPS and GSM module[3]. All of these segments are actualized using implanted C programming.

2. Literature Survey

In this section extensive literature survey is carried out on Black box for car.

A writing study is of incredible helps in building strategies that are in effect which is always proposed through different analysts and are introduced in numerous national and universal meetings and distributed in different diaries. This section exhibits the best systems that are taken from different research distributions which are most appropriate for the proposed structure.

MamdouhiHelia et.al [1] proposed numerous endeavours and applications which provides security and wellbeing in the event of the mishaps. Bluetooth convention has been proposed to expand the security of street travel by utilizing the idea of remote sensor systems. It also deals with how vehicles can behave like portably appointed systems based on trade information sent by the installed sensor. DheerajPawaret.al [6] proposed a created coordinated framework to oversee, control and identify every one of the accessories inside the vehicles so as to accomplish the thought knowledge in the vehicle. Clients individual portable hand telephone can be used as a remote interface. Using smart phones mishap identification can conquer traffic blockage and explicit acknowledgment of crisis responders.

S. Rekha and B.S Hithaishi et.al [3] proposed system for driving assistance information like location and condition of the accident will sent as an SMS through GSM to the closest police headquarters and clinic. Emergency vehicle will be send to the location and travellers will be saved. This framework uses sensors to recognize the occurrence of mishap.

Venkatesh et.al [11] indicates how the sensors, GPS and GSM can be utilized to conquer the issue of identifying auto collisions without direct cooperation with a vehicle ready sensors. By watching past mishap history outline we can presume that there are progressively number of individual's that kicks the bucket in every nation. In addition, at regular intervals, injured person does not get crisis therapeutic salvage which can have an extensive effect in their survival rate.

H. Takei et.al [14] proposed frameworks per WHO, in excess of millions of people on the planet which kick the bucket every year in light of vehicle mishaps. In order to respond to this circumstance, the discovery idea was utilized as an initial step for actualizing the idea of "black box" in the vehicle. Vehicle black box is a gadget used to record the information like motor temperature, nearness of deterrent, liquor content and definite area of the mishap about the vehicle. Advanced mobile phones are used to get the depictions about the mishaps. Information along with the snaps will be sent to nearest police headquarters.

Chanjin Kang et.al [2] proposed boundless discovery framework, a smart technique to gather the mishap or security data. When the data is required after a mishap, agents look for conceivable signs non-methodically by hand. A precise technique savvy Blackbox has been proposed that collects the together data and performs breaks down, accumulates data of neighboring vehicles during driving. Due to this reason, acknowledgment motor has been added to concentrate and record the tag number and shade of neighboring vehicles. IOT devices were also added to get the data from the server and transfer the coordinated data to the server.

Qizhi et.al[15] In proposed framework when mishap occurs vehicle itself only switches into reconnaissance mode, sends a quick message to their relatives using GSM and GPS and also sends an alert information to the nearest police stations then ambulance will brought to the accident location to rescue the injured people.

3. Proposed System

Our proposed system provides safe and secure travelling to all the travellers by making use of GPS and mobile application.

Black box consists of liquor sensor, temperature sensor, ultrasonic sensor, and Accelometric sensor, LED marker, opening sensor, flip switch, DC engine, dump switch, GPS, GSM and 16x2 LCD as shown in the Figure 1.
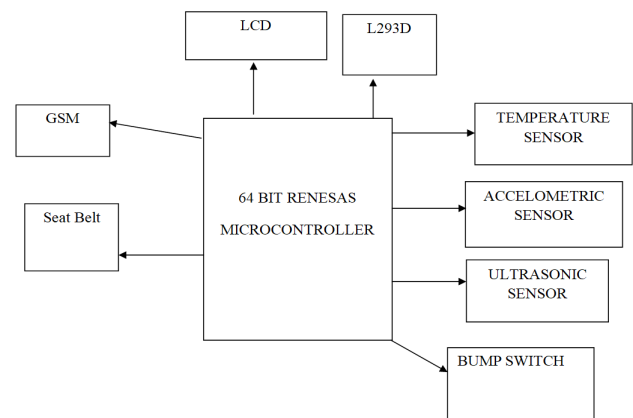
Figure 1. Block diagram of   Black box for car

Black box identifies the motor temperature, area (GPS), obstruction detection, quick detection of alcoholic substance. The results of this will be displayed on LCD. The gathered information will be send to the police server as well as to the rescue team through the web. GPS framework has been designed in our proposed system which helps in tracking the location of the vehicle, when mishap occurs. Renesas microcontroller starts recording the information using the sensors like engine temperature, detection of obstacle and condition of seat belt. This gathered data is will be sent to the police server through mail. By utilizing this data, police can know the location of mishap area quickly.

3.1 Components of the Proposed System

In our proposed system components like LCD, ultrasonic sensor L293D IC, Bluetooth, DC motor power supply, and Renesas microcontroller are used.

Renesas Microcontroller

Renesas microcontroller is a 16 bit On-chip fast andlow-speed oscillator with 8051 group of microcontrollers[16] having different in-assembled highlights as shown in Figure 2[17] . The greater part of the pins of Renesas has performed various tasks. These microcontrollers provides unbending assortment as well as it is less inclined to harm because of electrostatic charge of 5V Control supply.
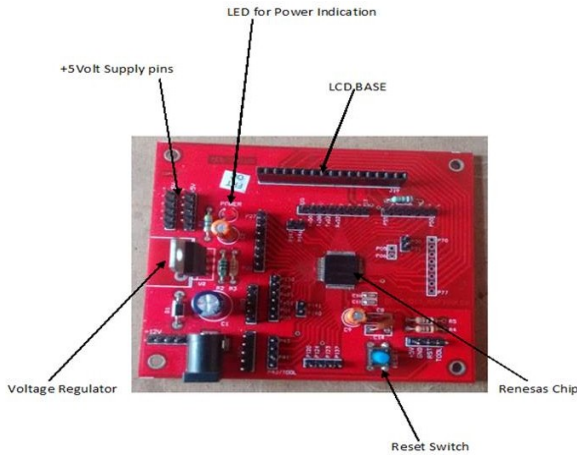

Figure 2. Renesas microcontroller [17]

LCD

LCD is electronic showcase module which is widely used. It is a 16 digit showcase generally utilized in majority of the gadgets and circuits Shown in Figure 3 [18]. NUMERIC LCD and ALPHANUMERIC LCD are the two kinds of LCDs. In our proposed system alphanumeric LCD is used.
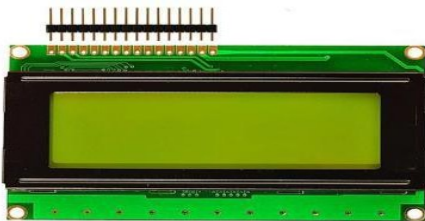

Figure 3. LCD [18]

Motor

A DC engine is a gadget that changes over electrical vitality into mechanical vitality. It can provide high torque over wide range of speed [7]. DC engines are used for driving the wheels associated with the robot [12]. L293d is a dc engine used for driving dc engines. Steel rigging motors are also used to provide longer life and better mileage properties. Gearbox is fixed and greased up with lithium oil. The engine is in a bad way to the apparatus box from inside [12].

Figure 4. 12v 100 rpm DC Geared Motor [19]

NR-DC-ECO is top notch minimal effort DC adapted engine shown in above Figure 4 [19]. It contains Brass apparatus and steel pinions provide longer life and better mileage properties.

Ultrasonic moduleHC-SR04

The HR-SR04 ultrasonic sensor is used to gauge the separation to an item. It creates high recurrence sound waves. HC-SRO4 is utilized to compute the separation between the sensors and object [13]. It utilizes sonar outflow method to separate an item.

LM35 Temperature Sensor

Temperature of the motor is most significant parameter in control unit [14]. LM35is used for single power supply either plus or minus supplies as shown in Figure.5. In our proposed system we have utilized LM35 temperature sensor to get the vehicle motor temperature. It consistently facilitates the motor temperature and reads into the microcontroller. It changes over temperature.
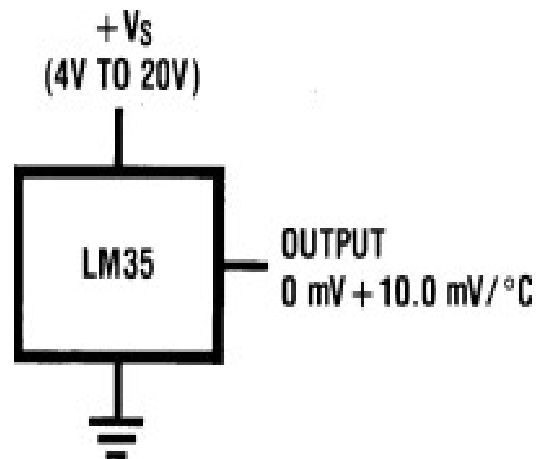

Figure 5. Temperature sensor

The LM35 can be relatively effective as compared with other temperature sensors. Its temperature will be closed to 0.01˚C of the surface temperature.

Accelometer

Accelerometers are used in PCs and advanced cameras with a goal that pictures displayed on screens are constantly up standing. It also has numerous applications in business. Accelerometers are utilized in automation for flight adjustment. MI accelerometer is used for mechanical endurance and fast response [14].

GSM modem

GSM is an open source innovation used for transmitting voice and instant messages with the recurrence transfer speed of 850MHz- 900MHz as shown in Fig.6[20]. Time division multiple access (TDMA) is used. It sends the data through channel like customer and server with its own specific schedule. Every cell has diverse sizes ranging from large scale to pico estimate. GSM uses the GPRS for transmitting information from customer to server.GSM is circuit-exchanged innovation. But GPRS has higher information transmission recurrence than GSM shown in Figure 6 [21].

Figure 6. GSM Modem [21]

GSM networks consist of three major components shown in Figure 7 [20]. They are switching System, base station system and mobile station.
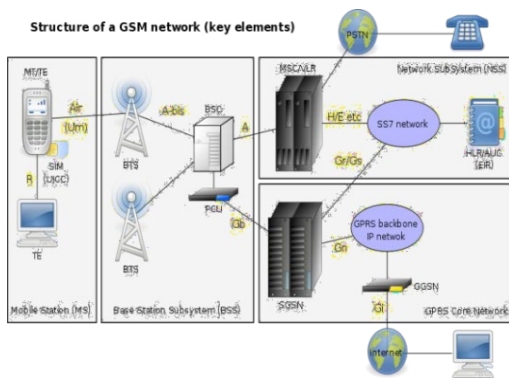

Figure 7. GSM network Topology [20]

- The Switching framework: The Switching System is used to direct numerous critical activities. Exchanging frameworks are used to gather associations between the one port to another port. Exchanging frameworks has 5 databases. Verification Centre gives security to the framework.

- The Base Station System (BSS): BSS acts as a interface between portable station and exchanging station or system subsystems. It consists of two framework such as BTS (base handset station) and BSC (base station controller). Both will handle correspondence station by utilizing radio transmission with versatile station.

- Mobile Station (Subscriber): A mobile station comprises of portable handset and processor which are constrained by a brilliant card, for example, a supporter character module (SIM) card. This card is put inside the GSM modem. The SIM card consists of distinguished number known as the global portable Equipment Identity (IMEI). GSM modem consists of AT directions which are used for reading, composing and erasing SMS messages, Sending SMS messages and for checking the flag quality.

3.2 Working Flow of the Proposed System

Interfacing of LCD Display with Renesas 64 Pin Microcontroller
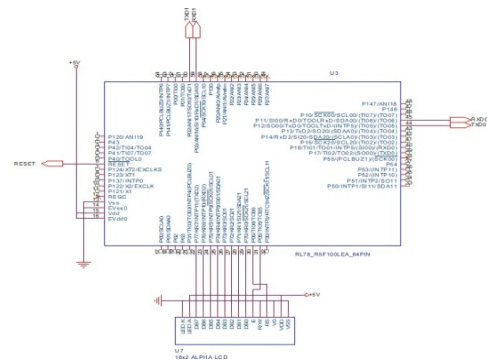
Figure 8. Circuit Diagram of LCD with 64 Pin Renesas

Alpha Numeric showcase structure isan essential structure of the Embedded Systems. Microcontroller is used to display the information. The Control pins like RS, R/W and EN are controlled through the microcontroller ports according to the waveforms. The user may choose whether the LCD is to work with a 4-bit or 8-bit information transport. If a 4-bit information transport is

utilized, the LCD will require an aggregate of 7 information lines. But ifa 8-bit information transport is utilized; the LCD will require a sum of 11 information lines. The control lines are set according to EN, RS, and RW.

LCD initialization

Appropriate working of LCD relies upon how the LCD is introduced. Direction must be sent to instate the LCD. Specify capacity set, Display On-Off control, Entry mode set and Clear presentation are the states of LCD for initialization as shown in Figure 9.

Algorithm shows the sequence for send data to LCD

Stage 1: Set read write as low.
Stage 2: If information byte is in order then set RS=0.
Stage 3: If information byte is in ASCII esteem, then set RS=1.
Stage 4: Then information byte is kept on information register.
Stage 5: Pulse E (HIGH to LOW).
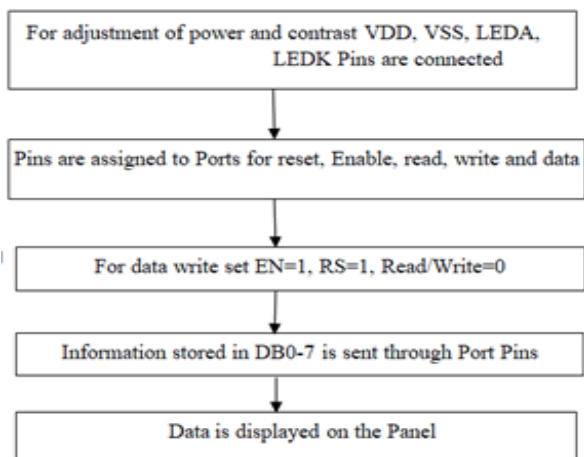Stage 6: Repeat the above steps to send another information byte.

Figure 9. Flow Chart of LCD Display

Interfacing of L293d Motor Driver IC and Dc Motor with Renesas 64 Pin Microcontroller
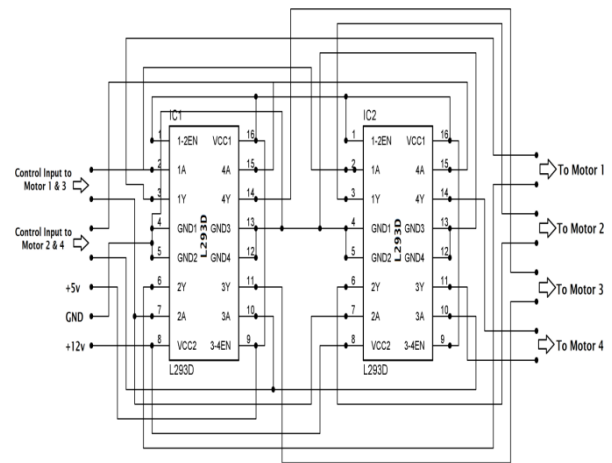

Figure 10. Circuit diagram of L23D Motor Driver IC

Two distinct engines tasks can be constrained at pins 2, 7, 10 and 15. Empower pins 1 and 9 should be high for working engines.

Two L293D's are used to drive four engines as shown in Figure.10. At the point when both the sources of info are low the engine will be in stop state. When the primary information is high and the second information is low the engine will move the forward. But when previous input is low and second information is high the engine will move in the reverse direction. When both the data sources are low, the engine will be in the end state.
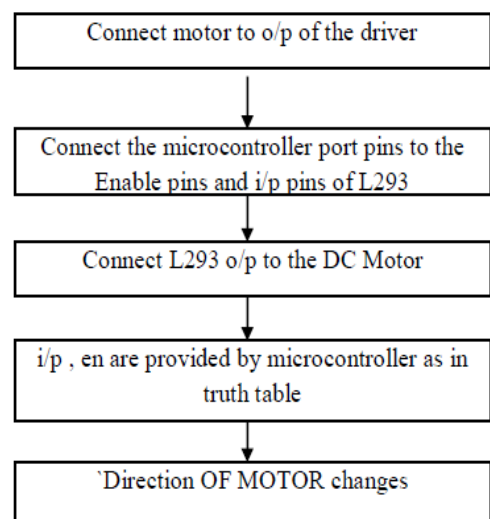
Figure 11. Flow Chart of L23D Motor Driver IC and DC Motor

3. Experimental Results and Discussions

This section presents the result of the experiments conducted to study the performance of the proposed system based on dataset collected by the user.

Hi User,
Vehicle Id: 25
Temperature: 29
Accelerator level: accelerator low
Front Obstacle Not detected
Seat Belt is LOCKED UP
Mistakecount:05
Accident Occured
Location: null

/storage/em…460520.jpg
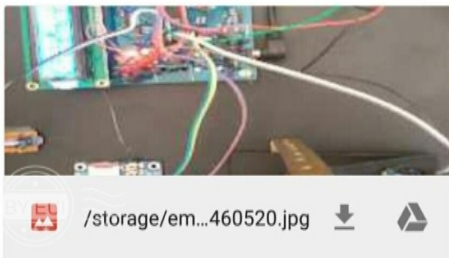
Figure 12. Result of the proposed system

Figure 12 depicts the mail received by the client when there is mishap happened.

It also demonstrates how the mishap happen in each step consisting of actual data of the vehicle like vehicle-id, temperature, accelerometer level, condition of seat belt, obstacle detection as well as location of the accident.

3.1 Test Cases

Software testing involves following phases: unit testing and integration testing [5]. Various test cases are performed to check whether all the components are working fine or not.

Table 1. Renesas Component Testing

Components	Description	Action	Working
Renesas Development Board	No argument	Check for power led and code dump	Yes
GSM Module SIM 300	No argument	Check for messages sent and received via AT Commands	Yes
Accelometer	No argument	Check for the Speed	Yes
Temperature Sensor	No argument	Check for the heat detection around sensor	Yes
GPS module	No argument	Check for Latitude and longitude of the location	Yes

Various tests performed on the model

Table 2. Test Cases

Test case ID	Test case Name	Test case descriptions	Test Steps			Test states P/F
			Input given	Expected output	Actual output	
TC-01	Black Box Testing	Application should run without errors or warnings.	Application is executing without warnings or errors.			Pass
TC-02	White Box Testing	UART Ports are used as a medium of communication between Renesas and Sensors	Successfully runs all components on receiving inputs from respective sensors			Pass
TC-03	Integration Testing	Connection between GSM AND with RENESAS	The com Port number identified, configured and successful connection takes place			Pass
TC-04	Integration Testing	Integration is checked with Embedded C programming	Input → GSM Output → Receive SMS Input → GPS Output → Receive Location latitude and longitude Input →temperature Sensor Output→SMS and Display alert Input → Accelometer sensor Output → Display and SMS alert			Pass
TC-05	Unit Testing	Executing main program which involves all the modules such as GSM, Ultrasonic, Accelometer and Temperature.	Successful execution of program			Pass

4. Conclusion

The proposed framework uses GPS and android applications by giving safe and secure trip to the travelers. It finds the present area of vehicle where mishap has happened and also it gives information about vehicle like speeds, temperature, obstacle detection, that will be help to the police when car met with an accident for car judicial. The proposed system gives alert message to the authorized mobile in order to know about their traveler's safety.

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