

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.

Accelerometer

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.

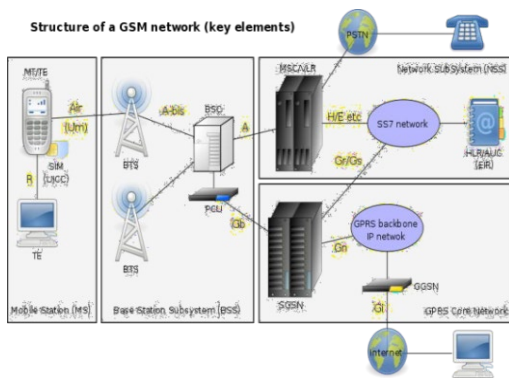


Figure 7. GSM network Topology [20]

- 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

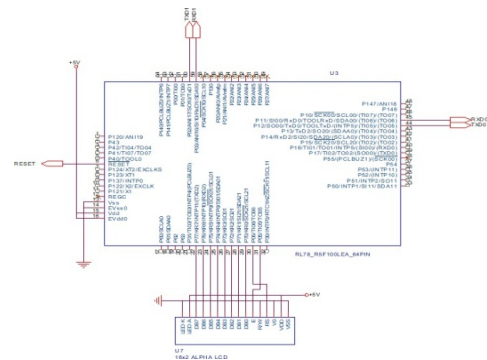


Figure 8. Circuit Diagram of LCD with 64 Pin Renesas

Alpha Numeric showcase structure is an 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 if a 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.

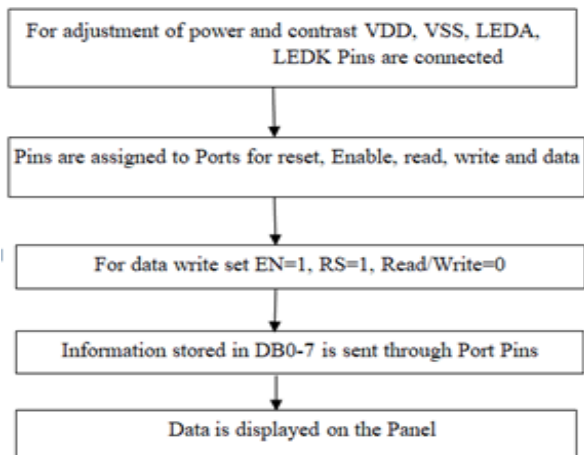


Figure 9. Flow Chart of LCD Display

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

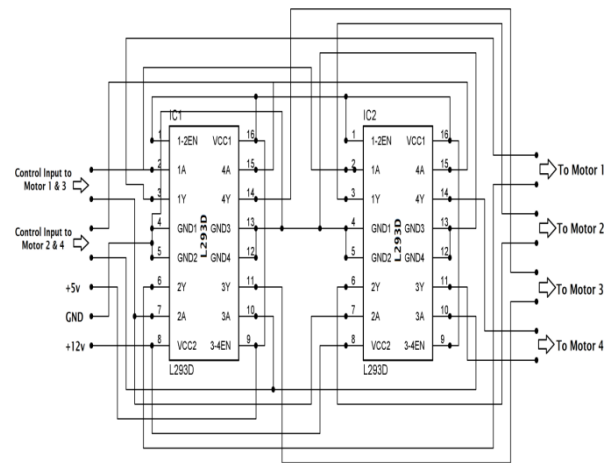


Figure 10. Circuit diagram of L23D Motor Driver IC

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.

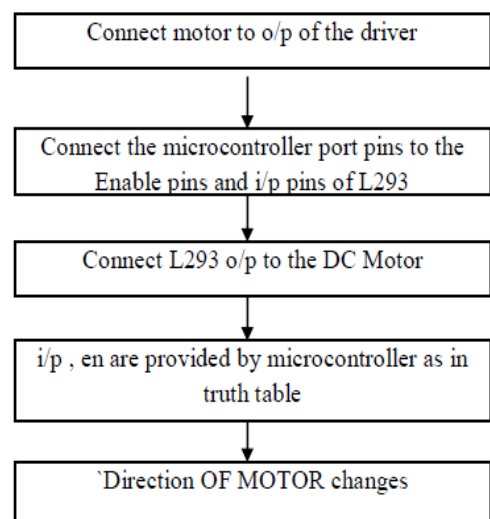


Figure 11. Flow Chart of L23D Motor Driver IC and DC Motor

Table 1. Renesas Component Testing

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

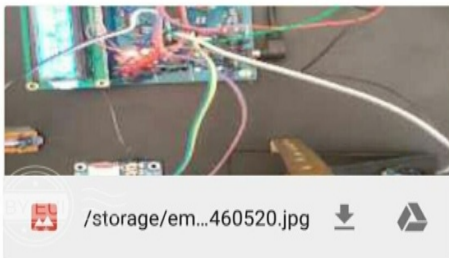


Figure 12. Result of the proposed system

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.

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
Accelerometer	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 comPort 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 → Accelerometer sensor Output → Display and SMS alert			Pass
TC-05	Unit Testing	Executing main program which involves all the modules such as GSM, Ultrasonic, Accelerometer 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.

References

- [1]. Mamdouhi, Helia, SabiraKhatun and JavadZarrin. Bluetooth Wireless monitoring, managing and control for inter vehicle in vehicular Ad-hoc network. International Journal. 2019.
- [2]. Chanjin Kang, SeoWeonHeo, Seoul, Republic of Korea. Intelligent Safety Information Gathering System Using a Smart Blackbox. IEEE International Conference on Consumer Electronics (ICCE). 2017.
- [3]. S. Rekha, B.S Hithaishi. Car surveillance and driving assistance using black box with help of GSM and GPS Technology. International conference 2017.
- [4]. SharvinPingulkar, Haroondeep Singh Sandhu, Jayant R. Mahajan. A Research Paper on Upgraded Black Box for Automobiles. DIO: 2393-8374, International journal of current engineering and scientific research, 2016.
- [5]. Pramod Mathew Jacob, M. Prasanna. A Comparative analysis on Black Box Testing Strategies. DIO: 978-1987-1-5090-8. International conference on Information science. 2016.
- [6]. DheerajPawar, PushpakPoddar. Car Black Box with Speed Control in Desired Areas for Collision Avoidance. Engineering, Technology & Applied Science Research, Vol. 2, No. 5, 2012, 281-284. 2015.
- [7]. Nikhil tripathi, rameshwarsingh, Renuyadva. Analysis of speed control of DC motor. ISSN: 2395-0056. International journal 2015.
- [8]. Amrita sneha, Abriami, Ankita, R. praveena. R. Srimeena. Agriculture Robot for automatic ploughing and seeding. IEE Technological innovation in ICT 2015.
- [9]. Mr. RamchandraPatil, Mr. ShivarajHublikar. Design and Implementation of Car Black Box with Collision Avoidance System using ARM. International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-4, Issue-3, August 2014.
- [10]. Ashish B. Dudhale, Seteve Felix S ,HarshaPhatak. Car Black Box System for Accident Prediction and Crash Recovery. DIO:10.4010/1.014.193. International Journal,. 2014.
- [11]. Venkatesh. A GSM and GPS based system for automatic accident notification and severity estimation. International journal. ISSN: 2349-2163, 2014.
- [12]. Zhu haishui, wanggdahu, zhang tong, huangkeming. Design on DC motor speed control. DIO: 10.1109. International conference 2010.
- [13]. Alessiocarullo, Macro parvis. An ultrasonic for distance measurement in automotive application. DIO: 10.1109, international journal 2010.
- [14]. H. Takei, M. Mori, H. Aoyama, E. koka and Y. Honkura. Accelerometer using MI sensor.

DIO:10.1109/INTMAG.2005.1463633.International conference 2005.

[15].Qizhi Wang. Using Bluetooth and sensor network for intelligent transportation system.International conference 2004.

[16] Muhammad Ali Mazidi, Janice GillispieMazidi. The 8051 Microcontroller and embedded systems.6th edition. Pearson Education.

[17]“Renesas microcontroller board”,
[https://m.indiamart.com/proddetail/renesas-rl78-series-development board.html](https://m.indiamart.com/proddetail/renesas-rl78-series-development-board.html).

[18]. “LCD Display”, <https://www.expolerlabs.com/lcd-display-16x2-hd44780-green-black>.

[19]“DC Motor”, <https://m.indiamart.com/prodetail/12v-gearred-dc-motor.html>.

[20]“GSM three layer network”,
<http://www.google.com/amp/s/www.researchgate.net/figure/the-sturcture-of-a-GSM-network>.

[21].“GSM modem”, <http://www.andcircuit.com/product/sim9000-gsm-module-arduino>.