Surveillance and Black Box for Car

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Abstract: Evidence collection car is a device to record driving history which can be used for car judicial in case of car accident or related violations. This device is installed in car to store readings of engine temperature, detection of obstacle and condition of seat belt that could be judicial hint for investigating car-related violations. Using GSM images captured inside a car can be collected through android. This whole process used to collect captured image and information like temperature, obstacle and seat belt. This collected data is then sent through GSM to concerned authorities. The main aim of the paper is to make zero accident level in real time all over the globe and if accidents occur to recover fast in very short time, increases the probability of stretch of the injured person, and reduces the severances. And automatically rescue operation is needed for reducing the time to assist injured person.

Keywords: Black box, GSM, GPS, Mishaps

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1 INTRODUCTION

VEHICLE mishap is one of the pivotal issues in practically everywhere throughout the nations. As indicated by the WHO, in excess of a million of individuals on the planet pass on every year due to transportation-related mishaps [11]. As of late, improving wellbeing driving is a significant target that has driven numerous association and organizations like vehicle producers to contribute huge measures of assets, essentially in improving street framework and to lessen the vehicle crashes not withstanding of numerous mindfulness crusades, these issues continues expanding step by step, because of a few reasons, for example, plastered and drive, over speeding, riding vehicles without adequate rest, etc. Despite the fact that distinctive vehicle producers have taken a few new plans in improving the security of the vehicle this issue will in general stay because of the previously mentioned reasons [11]. Due to confine in the medicinal help the death rates is at the abnormal state, this makes monetary and social weights individuals who are included. Like in airplane flight information recorder, "discovery" innovation currently assumes a significant job in the engine vehicle crash examination. Great and the security measures are extremely staggering expense and furthermore it is hard to actualize so it is wanted to execute in four wheelers utilizing black box.

Black box is characterized as an electronic gadget. It is utilized to track and stores the data particularly in the aeronautics. We have utilized a similar idea here in actualizing the black box in vehicle for the help. To record and store vehicle accelerometer, temperature, liquor sensor, ultrasonic sensor are using black box and also esteem progressively and furthermore it stores the past driving history of a vehicle. We can likewise examine and screen the driving condition of the vehicle and mishap [11]. We utilized ADC converter to gather simple qualities gathered by the sensors and convert them into an advanced an incentive to bolster into the microcontroller.

Black box is gadget which is planned so that it can withstand substantial impacts; so the information put away in it can’t be decimated effectively. Because of this reason it is so critical to have black box in the vehicle which records the data inevitably and also after an accident. Here in this paper black box will give the total data about the states of the vehicle. This information is utilized in legal sciences on account of mishaps or some other related violations.

In proposed framework, it focuses on the structure of the black box by utilizing any conjunctive segments, for example, accelerometer, temperature, weights, ultrasonic and liquor sensors, ADC converter, microcontroller, LCD show GPS and GSM module [11]. It is actualized by utilizing the implanted C programming. Implanted C programming helps for information recording as well as aides in recovering the information from Microcontroller.

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2 Literature Survey

A writing study is of incredible help strategies are in effect 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 that are most appropriate for the proposed structure.

Using Bluetooth and sensor networks for intelligent transportation systems: There are numerous endeavors; applications have been proposed to give security and wellbeing in the event of the mishaps. In epic perspective to expand the security of street travel utilizing the idea of remote sensor systems and Bluetooth convention has been proposed. Inspected, how vehicles can detail portable specially appointed systems trade information sent by the installed sensor [4].

Using smart phone to detect accidents and provide specific recognition to emergency responders: Is it created coordinated framework to oversee, control and identify every one of the extras inside the vehicles so as to accomplish the thought knowledge vehicle with capacity to client’s individual portable hand telephone as a remote interface. Mishap identification can conquer traffic blockage and explicit acknowledgment of crisis responders utilizing Smartphone [5].

A GSM & GPS based systems for automatic accident notification and severity estimation: In this paper the mishap can be advised consequently utilizing sensors and the area and seriousness of mishap additionally send as SMS through GSM to the closest police headquarters and clinic to convey the emergency vehicle to the spot to save the travelers. Our framework thinks about most significant factors, (for example, sensors) that can recognize the seriousness of mishap.

Street mishaps are distress for human. As a result of that human enduring a ton and they spent colossal expenses regarding not well coordinated demise, wounds. Sadly, the greater part individual is in the dynamic age gathering of 25-65 years. Presently multi day’s life sparing advances is utilized, for example, electronic quickness control for lessening wounds. By watching past mishap history outline we can presume that there are progressively number of individual’s kicks the bucket in every nation. In addition, at regular intervals that injured person does not get crisis therapeutic salvage can have an extensive effect in their survival rate. This paper indicates how the sensors and GPS, GSM can be utilized to conquer this issue for identifying auto collisions without direct cooperation with a vehicle's ready sensors.

Proof collection from car black box using smart phone for accident detection: As per the WHO, in excess of a million people on the planet kick the bucket every year in light of vehicle mishaps. So as to respond to this circumstance, the discovery idea is utilized as initial step to take care of the issue. To defeat this issue, in this paper we are endeavoring to actualize the idea of “black box” in the vehicle [2]. Vehicle black box is a gadget used to record the data’s, for example, motor temperature, nearness of deterrent, liquor content and definite area of the mishap about the vehicle. Alongside this we are utilizing advanced mobile phone to get the depictions which are identified with mishaps lastly send this data alongside the snaps to police disjoint.

Intelligent Safety Information Gathering System Using a Smart Black box :In this paper shows a smart technique to gather the mishap or security data utilizing the boundless discovery framework. Customarily, when data is required after a mishap or wrongdoing occurred, agents look for conceivable signs non-methodically by hand. We propose a precise technique for get-together that data utilizing a savvy Blackbox framework which breaks down and accumulates data of neighboring vehicles while driving [3]. For this reason, we add an acknowledgment motor to concentrate and record the tag number and shade of neighboring vehicles. We additionally add the IOT usefulness to get data from the server and transfer coordinated data to the server [1].

Car Surveillance and Driver Assistance Using Black box with the help of GSM and GPS Technology, This paper has been proposed a framework for vehicle reconnaissance, when there is a mishap occurred people will lose their life, here we proposed framework where in which the vehicle itself switches into reconnaissance mode and send a short message to their relatives using GSM and GPS, also send the alert information to the nearest fire stations and ambulance to rescue the injured people [1].

3 Proposed System

Fig 1 indicates Block diagram for proposed framework. Black box contains the liquor sensor, temperature sensor, ultrasonic sensor, and Accelometric sensor, and LED marker, opening sensor, flip switch, and DC engine, dump switch, GPS, GSM and 16x2 LCD. It identifies the motor temperature, area (GPS), obstruction existences, quickening and alcoholic substance. The yields of this structure are shown on the LCD. This gathered data’s along are send to the police server, rescue vehicle through the web. In this paper we created GPS following framework which tracks the vehicle if there should be an occurrence of mishap and empowers specialists to broaden quick crisis restorative administration.

At the point when mishap happens the microcontroller gets begins and gets the information, for example, temperature, impediment location utilizing sensors. This gathered data is shown and is sent information to the police server through mail. By utilizing this data police can without much of a stretch know the mishap area and they get the right verifications for the mishap to give equity.
4 COMPONENTS OF THE PROPOSED SYSTEM

In this proposed work different components are used which includes LCD, ultrasonic sensor L293D IC Bluetooth dc motor power supply Renesas microcontroller.

4.1 64 Pin Renesas Microcontroller

Fig.2 Renesas microcontroller is a8051 group of microcontrollers, with different in-assembled highlights. Renesas is a 16 bit. On-chip fast and also a low-speed oscillator are available. The greater part of the pins of Renesas has performed various tasks highlights. Unbending assortment of microcontroller henceforth less inclined to harms because of electrostatic charge. 5v control supply required to work.

4.2 LCD

LCD is electronic showcase module which is found in a wide scope of uses. A 16 digit showcase and is generally utilized in the majority of the gadgets and circuits [12]. There are two kinds of LCD’s that is NUMERIC LCD and ALPHANUMERIC LCD.
4.3 Alpha-Numeric LCD Display
A fluid-precious stone showcase (LCD) is a level board show, electronic visual presentation or video show that utilizes the light adjusting properties of fluid gems. Fluid precious stones don’t emanate light legitimately. To show accessible discretionary pictures utilizing LCDs (as when all is said in one reason PC show or fixed pictures which can be shown or covered up, for example, preset words, digits and 7-fragment shows as in an advanced clock). They utilize a similar essential innovation expect that self-assertive pictures are comprised of a substantial number of little pixels, while different presentations have bigger components. A fluid precious stone presentation comprises of a variety of minor sections (called pixels) that can be controlled to exhibit data. Fluid precious stones don't transmit light straightforwardly rather they utilize light tweaking methods.

Fig.3. LCD.

4.4 Motor
A DC engine is a gadget that changes over electrical vitality into mechanical vitality. It can provide high torque also control wide range of speed [9]. For driving the wheels associated with the robot with the assistance of two Dc engines [7]. L293d is a dc engine utilized for driving dc engines. To guarantee longer life and better mileage properties we have used steel rigging motor. Gearbox is fixed and greased up with lithium oil and require no upkeep. The engine is in a bad way to the apparatus box from inside [7].

Fig.4. 12v 100 rpm DC Geared Motor.

NR-DC-ECO is top notch minimal effort DC adapted engine. It contains Brass apparatuses and steel pinions to guarantee longer life and better mileage properties.

4.5 Ultrasonic moduleHC-SR04
The HR-SR04 ultrasonic sensor is utilized to gauge the separation to an item. It creates high recurrence sound waves. HC-SR04 is utilized to compute the separation between the sensors and object [8]. It utilizes sonar outflow method to decide separate with an article. It offers amazing reach discovery without contact however with high exactness of stable readings to utilize the bundle in a simple way.

4.6 LM35 Temperature Sensor
Temperature of the motor is most significant parameter in control unit, if this esteem goes to strange, some undesirable gases exhaust from vehicles because of ill-advised ignition. In this paper, we utilized LM35 temperature sensor to get the vehicle motor temperature. It consistently faculties the motor temperature immediately and support into the microcontroller. It changes over temperature.
The LM35 are flawless coordinated circuit temperature sensors; its yield voltage is straightly corresponding to the Celsius temperature.

![Fig.5. Temperature sensor.](image)

The LM35 can be relating effectively as same as other temperature sensors. It very well may be stick into a surface and its temperature will be inside about 0.01°C of the surface temperature.

### 4.7 Accelerometer

Accelerometer is utilized to measures legitimate quickening. It isn't as same as synchronized speeding up. It has numerous applications in businesses. It is utilized to see trembling in pivoting hardware. Accelerometers are utilized in PCs and advanced cameras with the goal that pictures showed on screens are constantly upstanding. Accelerometers are utilized in automatons for flight adjustment. MI accelerometer used to mechanical endurance and fast response [10].

### 4.8 GSM Modem

Worldwide framework for versatile correspondence is a compact correspondence innovation. GSM is an open source innovation utilized for transmitting voice and instant messages administrations with the recurrence transfer speed is 850MHz, 900MHz. Time division numerous entrance (TDMA) is utilized for versatile correspondence starting with one portable then onto the next portable in GSM. It sends the data through channel like customer and server with its own specific schedule vacancies. In that every cell has diverse sizes, for example, large scale measure, smaller scale size and Pico estimate. GSM bolsters the GPRS innovation for transmitting information from customer to server. GSM is circuit-exchanged innovation. Contrasting and GPRS, GPRS has higher information transmission recurrence than GSM.

![Fig.6. GSM Modem.](image)

GSM networks consist of three major systems. It shows in figure 3.3.8, they are switching System, the base station system and the mobile station.
1) The Switching framework: The Switching System is utilized to direct numerous critical activities. Exchanging frameworks is utilized to play out the associations between the one portable to another versatile for correspondence. Exchanging frameworks has 5 databases that are given from exchanging framework. Verification Center gives security to the framework.

2) The Base Station System (BSS): Base station framework has real job in giving system to portable correspondence. BSS are act has as interfaces between portable station and exchanging station or system subsystems. Associating endorsers of portable systems are obligation of BSS. All the correspondence is made inside the radio transmission and it comprises in handset station. The base station framework is additionally isolated in two frameworks. These two frameworks are BTS and BSC. BTS (base handset station) handles correspondence station utilizing radio transmission with versatile station and BSC (base station controller).

3) Mobile Station (Subscriber): Mobile stations comprise a portable handset and processor which are constrained by a brilliant card, for example, a supporter character module (SIM) card. This card put inside the GSM modem and gives the client progressively close to home portability. The SIM card ought to have one of a kind distinguished number known as the global portable Equipment Identity (IMEI). A standout amongst the most significant undertakings in versatile station for example it should controls calls from same systems just as calls from different systems. GSM modem utilizes set of AT directions. AT directions are utilized for Reading, composing and erasing SMS messages, Sending SMS messages and furthermore for checking the flag quality.

5 Implementation of the Proposed System

5.1 Interfacing of LCD Display with Renesas 64 Pin Microcontroller

Alpha Numeric showcases structure an essential piece of the Embedded Systems. Microcontroller is utilized to show information. The Control pins like RS, R/W and EN are controlled through the Microcontroller Ports according to the waveforms. In the event that you need backdrop illumination than interface stick 15 of LCD to 5V and stick 16 of LCD to GND. By changing 10k resistor make stick 3 of LCD at 0V. On the off chance that associations are legitimate you will see this after power on. The user may choose whether the LCD is to work with a 4-bit or 8-bit information transport. In the event that a 4-bit information transport is utilized, the LCD will require an aggregate of 7 information lines if an 8-bit information transport is utilized, the LCD will require a sum of 11 information lines. The control lines are alluded to as EN, RS, and RW.
LCD initialization
This is the pit succumb to learners. Appropriate working of LCD rely upon the how the LCD is introduced. Direction must be sent to instate the LCD. Straightforward strides to instate the LCD are: Specify capacity set, Display On-Off control, Entry mode set and Clear presentation.

Algorithm to Send Data to LCD
Stage 1: Set read write has low.
Stage 2: If information byte is order then set RS=0.
Stage 3: If information byte is information (ASCII esteem) then set RS=1.
Stage 4: The information byte is kept on information register.
Stage 5: Pulse E (HIGH to LOW).
Stage 6: Repeat the means to send another information byte.

Flow chart of LCD display

![Flow chart of LCD display](Fig.9)

5.2 Interfacing of L293d Motor Driver IC and Dc
Two distinct engines tasks can be constrained by info rationale at pins 2 and 7 and 10 and 15. Empower pins 1 and 9 should be high for working engines.

![Circuit diagram of L23D Motor Driver IC](Fig.10)

Two L293D's are utilized to drive four engines. At the point when both the sources of info are low the engine will be in the stop state, when the primary information is high and the second info is low the engine will move the forward.
way, when previously input is low and second info is high the engine will move in the invert course and when both the data sources are low the engine will be in the end state.

**Flow chart**

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

6 ** EXPERIMENTAL RESULTS**

This screen capture indicates mail gotten by the client when there is mishap happened figure demonstrates how the mishap happened with point by point data of the vehicle like vehicle-id, scope-of-temperature, botches-tally and so forth.

**Conclusion**

The proposed framework utilizes GPS and android applications by giving sheltered and secure making a trip to the explorer. It finds the present area of vehicle. Voyager’s wellbeing component is additionally given utilizing temperature, ultrasonic, smoke and accelerometer sensor. According to explorer's security concern, the proposed framework additionally gives ready back rub to approve versatile with the goal that approved individual likewise thinks about their voyager's wellbeing.

**REFERENCES**

[1] Kang, Chanjin, and Seo Weon Heo. "Intelligent safety information gathering system using a smart blackbox." In 2017 IEEE International Conference on Consumer Electronics (ICCE), pp. 229-230. IEEE, 2017.

[2] Patil, Ramchandra, and Shivaraj Hublikar. "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.

[3] Sawant, Hemjit, Jindong Tan, Qingyan Yang, and Qizhi Wang. "Using Bluetooth and sensor networks for intelligent transportation systems." In Proceedings. The 7th International IEEE Conference on Intelligent Transportation Systems (IEEE Cat. No. 04TH8749), pp. 767-772. IEEE, 2004.

[4] Mamdouhi, Helia, Sabira Khatun, and Javad Zarrin. "Bluetooth wireless monitoring, managing and control for inter vehicle in vehicular ad-hoc networks." Journal of Computer Science 5, no. 12 (2009): 922-929.

[5] Pawar, D. R., and Pushpak Poddar. "Car black box with speed control in desired areas for collision avoidance." Engineering, Technology & Applied Science Research 2, no. 5 (2012): 281-284.

[6] Mazidi, Muhammad Ali, Janice Gillispie Mazidi, and Rolin D. McKinlay. The 8051 microcontroller and embedded systems: using Assembly and C. Vol. 626. Pearson/Prentice Hall, 2006.

[7] Haishui, Zhu, Wang Dahu, Zhang Tong, and Huang Keming. "Design on a dc motor speed control." In 2010 International Conference on Intelligent Computation Technology and Automation, vol. 2, pp. 59-63. IEEE, 2010.

[8] Carullo, Alessio, and Marco Parvis. "An ultrasonic sensor for distance measurement in automotive applications." IEEE Sensors journal 1, no. 2 (2001): 143.

[9] Tripathi, Nikhil, Rameshwar Singh, and Renu Yadav. "Analysis of Speed Control of DC Motor-A review study." International Research Journal of Engineering and Technology (IRJET) 2, no. 08 (2015): 1616-1621.

[10] Takei, H., M. Mori, E. Kako, H. Aoyama, M. Yamamoto, and Y. Honkura. "Accelerometer using MI sensor." In 2005 IEEE International
[11] Rekha, S., and B. S. Hithaishi. "Car surveillance and driver assistance using blackbox with the help of GSM and GPS technology." In 2017 International Conference on Recent Advances in Electronics and Communication Technology (ICRAECT), pp. 297-301. IEEE, 2017.

[12] Praveena, R., and R. Srimane. "Agricultural robot for automatic ploughing and seeding." In 2015 IEEE Technological Innovation in ICT for Agriculture and Rural Development (TIAR), pp. 17-23. IEEE, 2015.