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IOT Based Low End Automotive Drive Recorder As Blackbox

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Abstract— ***Automotive electronics plays an important role in the automobile industry and essentially addresses the safety and security concerns. The proposed work aims at a cost effective solution to the design and development of an event data recorder called black box which is more or less equivalent to the one that is being used in the aviation sector. The paper deals with the design of the black box that has features equivalent to the data recorder which could be very useful for domestic vehicles to record their parameters. It is also having additional features that could assist in reducing the number of accidents, by analyzing the previous accidents. The system also provides automatic accident alert system which helps in informing the nearest hospital and the traffic authority by providing not only the coordinates of the accident location but also the exact physical address for immediate medical attention which can save numerous lives every day. The system also provides other features like advanced web tracking and reduced overall cost optimization by integrating multiple features. The experimental results shows superior performance compared to the existing methods for accident analysis.***

Index Terms— ***Black box, Automotive electronics, accident analysis, web tracking, data recorder.***

I. INTRODUCTION

Internet of things is the combination of different technologies like real-time data analytics, machine learning, sensor networks and embedded systems. IOT extends Internet connectivity to range of non-internet-enabled physical devices. These devices are embedded with technology and so they can communicate using the Internet, and so they can also be monitored and controlled remotely.

Motivation and Objective for the Proposed system

The black box system has already been in use in aircraft since 1989 to store data and track the plane details. Two type of black boxes are used, one for capturing flight data that stores information on specific parameters like flight control and engine performance and the second one called as cockpit voice recorder – which records the background sound and conversation.

The objective of this work is to analyze the reason for accident and to prevent the future accidents by using a black box which monitors the whole vehicle by using different sensors such as gas sensor, vibration sensor, crash sensor, temperature sensor, and ultrasonic sensor. We have used GPS to track the location of vehicle and GSM is used to send alert message to the registered mobile number of the driver. The accident details have been stored both online and offline i.e., in the online mode, the webpage updation is done through an IOT module which is having unique URL to track the current location and accident details through sensors. In the offline mode, SD Card is updated and also we can send an alert message to nearby traffic authority and hospitals. IOT has become part of our overall infrastructure just like water, electricity, telephone, TV and currently the Internet. Internet typically connects full-scale computers, whereas the Internet of Things connects everyday objects in the physical world.

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II. RELATED WORK

Mallikarjuna Gowda et al [1] in their work developed a suitable system for automobile purposes using ZigBee protocols which overcomes the problems like inaccuracies in the calculation of speed, distance measurement, and slow response time, etc. Dan hang Tang1 et al [2] in their work proposed an inverse problem, which is optimized by using a 'black box' image generation procedure. Mohammad Nabi Omidvar[3] proposed a differential grouping algorithm DG2, which has a better efficiency and grouping accuracy. Toshiya Ohtaka Viktor Kertész[4] have presented a new black-box arc model that was validated using tests and the new arc model shows superior performance compared with four types of existing black-box arc models.

III. PROPOSED SYSTEM

In the proposed system, the vehicle parameters such as engine temperature, gas level, vehicle distance are continuously monitored and the data are stored in the memory card of the black box .The location can be obtained by interfacing the GPS. The vibration sensor and crash sensor used to detect external forces applied to the vehicle. These data are continuously uploaded to the cloud server which helps to easily monitor the vehicle.

At the time of accident the GSM may send a message to owner of the vehicle, the SD CARD get updated and location also identified by using GPS. The vibration sensor can be used to measure the sound of an accident. The crash sensor used to get clear idea about how much damage that may have caused. The ultrasonic sensor can be used to measure the distance between two vehicles involved in the accident . The burning of particle and leakage of gas can be measured by gas sensor. Then the temperature prevailing in that environment is measured by using temperature sensor In addition we can send these messages to nearby traffic controller and hospital Finally using the IOT module we can give a specific URL to the holder to know about the details of an accident through webpage updation.

A BLOCK DIAGRAM

Block diagram for the proposed system is shown in the figure 1.1.

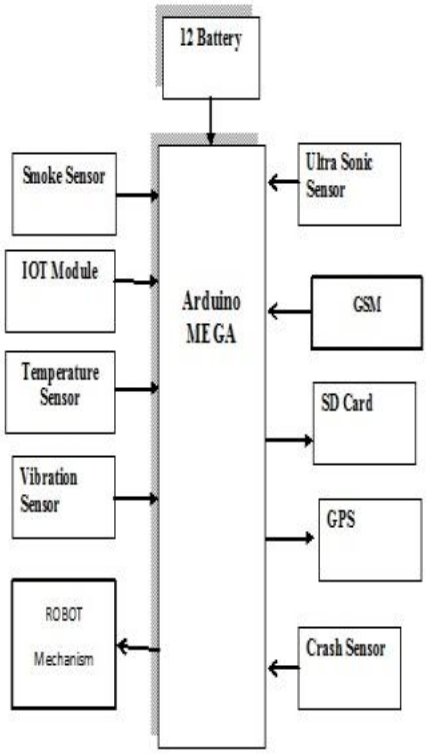

Fig :1.1. Block Diagram

B ARCHITECTURAL DIAGRAM

Architecture diagram reveals the graphical representation of the concepts, their principles, elements and components of the system. The architecture diagram of the proposed system is shown in the figure 1.2.

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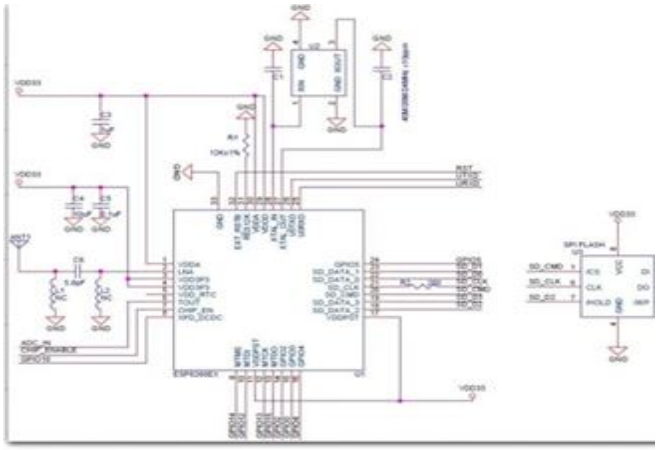

Fig 1.2 : System Architecture Diagram

C MODULE DESCRIPTION

A GPS tracking unit is normally carried by a moving vehicle or person that is used to track the device's movements and determine its location. The recorded location data can either be stored within the SD Card or transmitted to webpage through satellite connection. This allows the location to be displayed with latitude and longitude in degrees. Data tracking software is available for smart phones with GPS capability. A GPS "track me" essentially contains a GPS module that receives the GPS signal and calculates the coordinates. Satellite-based GPS tracking units will operate anywhere on the globe using IOT module along with a unique URL. They do not require a cellular connection.The main purpose of the SD Card is to store the accident details of the vehicle in the offline mode. It also stores the data from different sensors and data related to GSM, GPS details. The IOT cloud webpage updation is used to know the details as same as the SD card but in online mode storage.

IV. EXPERIMENTAL RESULTS

The hardware requirements for the implementation of the system should be a complete and consistent specification of the whole system. They are specified as Smoke sensor, Temperature Sensor, Ultrasonic Sensor, Vibration Sensor, Crash Sensor, IOT Module, SD Card, 12V battery and ROBOT mechanism.

Crash sensors are Inductive and Capacitive Proximity Sensors that records change in electricity in a circuit as a result of material approaching the sensor head. Inductive sensors are used to sense metals and capacitive sensors detect all material including liquids, powders and pastes.

Ultrasonic sensors are based on the principle of of radar which tracks attributes of a target by interpreting the echoes from radio or sound waves respectively. Sensors determine the time interval between sending the signal and receiving the echo to calculate the distance to an object.

The LM35 is a temperature sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ^{o}C) . The electrochemical reaction in the gas sensors will result in an electric current which passes through the external circuit. Vibration sensor is used to track the vibration that has occurred by the movements of the environment, The rollers of the conduction current in the switch will produce a movement or vibration and trigger the circuit.

The software requirements of the system are Arduino IDE and Embedded C. Output obtained using simulation is shown in the figure 1.3 and output of GSM and SD card details are shown in figures 1.4 and figure 1.5.

A SIMULATION RESULT

Simulation analysis is used to summarize and analyze the results, that helps in yielding [5] maximum insight and help with decision-making.

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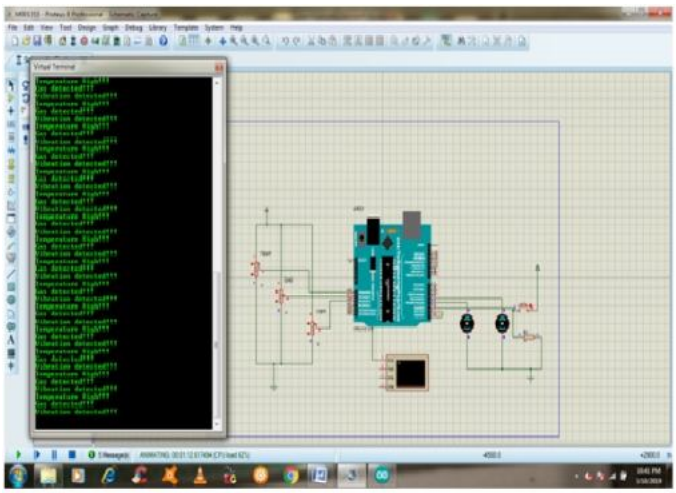

Fig 1.3 Simulation Result

B OUTPUT FOR GSM

Fig 1.4 GSM output

C OUTPUT FOR SD CARD AND GPS

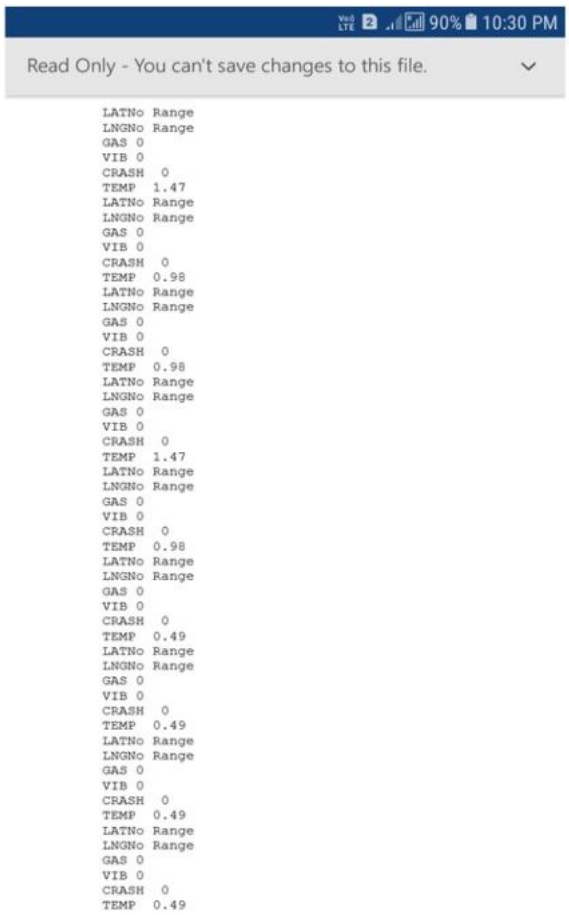

Fig 1. 5. Output For SD Card And GPS

D OUTPUT FROM WEB PAGE USING IOT MODULE

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859	NO_CRASH	12/3/2019__10:43:50
860	TEMP:0.49	12/3/2019__10:43:51
861	GAS_DETECTED	12/3/2019__10:43:53
862	VIB_DETECTED	12/3/2019__10:44:3
863	NO_CRASH	12/3/2019__10:44:5
864	TEMP:0.49	12/3/2019__10:44:8
865	GAS_DETECTED	12/3/2019__10:44:10
866	VIB_DETECTED	12/3/2019__10:44:11
867	NO_CRASH	12/3/2019__10:44:13
868	TEMP:0.49	12/3/2019__10:44:15
869	GAS_DETECTED	12/3/2019__10:44:16
870	VIB_DETECTED	12/3/2019__10:44:18
871	NO_CRASH	12/3/2019__10:44:20
872	TEMP:0.49	12/3/2019__10:44:22
873	GAS_DETECTED	12/3/2019__10:44:23
874	VIB_DETECTED	12/3/2019__10:44:25
875	NO_CRASH	12/3/2019__10:44:27
876	TEMP:0.49	12/3/2019__10:44:29
877	GAS_DETECTED	12/3/2019__10:44:31
878	VIB_DETECTED	12/3/2019__10:44:32
879	NO_CRASH	12/3/2019__10:44:34
880	TEMP:0.98	12/3/2019__10:44:36
881	GAS_DETECTED	12/3/2019__10:44:37
882	VIB_DETECTED	12/3/2019__10:44:39
883	NO_CRASH	12/3/2019__10:44:41
884	TEMP:0.98	12/3/2019__10:44:43
885	GAS_DETECTED	12/3/2019__10:44:44
886	VIB_DETECTED	12/3/2019__10:44:46
887	NO_CRASH	12/3/2019__10:44:48
888	TEMP:0.49	12/3/2019__10:44:50
889	GAS_DETECTED	12/3/2019__10:44:51
890	VIB_DETECTED	12/3/2019__10:44:53
891	NO_CRASH	12/3/2019__10:44:56
892	TEMP:0.49	12/3/2019__10:44:58
893	GAS_DETECTED	12/3/2019__10:45:0
894	VIB_DETECTED	12/3/2019__10:45:3
895	NO_CRASH	12/3/2019__10:45:7
896	TEMP:0.49	12/3/2019__10:45:9
897	GAS_DETECTED	12/3/2019__10:45:10
898	VIB_DETECTED	12/3/2019__10:45:13
899	NO_CRASH	12/3/2019__10:45:17

Fig1.6 Output From Web Page Using IOT Module

V. CONCLUSION

Thus our proposed system concludes that, the usage of black box is rapidly increasing monitoring process. Essentially, our system monitors when and where a vehicle is met with accident and then they record the data in both online and offline mode to give the accident details and by performing analysis with the stored parameters accidents can be prevented in the future,. Our system also provides a live tracking of the webpage updation and also uses GPS and GSM to send a alert message to nearby traffic controller and hospitals whenever accidents occur. It has great potential to include the driving standard and prevent the future accidents.

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