

IoT Based Smart Black Box System for Road Vehicles

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Abstract: *The main goal of this work is to develop a prototype of the incident detection system using the black box. In the event of an accident, if an accident has occurred to the driver or passengers of the car, a loss of life may occur due to delays in medical assistance. The given sensor is connected to the micro controller and it is just record the various driving data parameters in ubidots (open source cloud). It presents the prototype automobile black box system it is having the group of sensor and also gives the black box sends an alert message to pre stored mobile number. The Black Box concept is derived from the aviation industry, a flight recorder, colloquially known as a black box; although it is now orange-colored for easy search, is an electronic recording device placed in an aircraft for the purpose of facilitating the investigation of aviation accidents and incidents. With the advancement in technology and cost coming down, in our project we attempt to build similar device for our cars, not only this device will help us in post-crash analysis but also it will help us in quicker emergency rescue operation. Our research has been targeted towards building an integrated system for emergency rescue services in the event of a road accident. The purpose of the project is to find the accident location using GPS module and to send this location by means of sending a message using to the pre-coded number. This system is usually placed inside the vehicle. It reduces the time it takes for emergency rescue to arrive at the crash location.*

Index Terms – Black box, Vibration Sensor, RTC Module and GPS etc.,

1. INTRODUCTION

The project aims to find the occurrence of any incident and to report the position of Incident with the previously fed contact number so that immediate assistance can be provided by ambulance to patient. Nowadays automobiles technologies are rapidly increasing each and every year and also each and every second accident count also increase. So while using some technologies like black box placed in the automobile means creating a new level of data service in vehicle. The vehicle black package has occupation comparable to an aircraft black package. It is highly useful to analyze the cause of vehicular accidents and prevent the loss of life and property arising from vehicle accident.

In today's world as the population increases day by day the numbers of vehicle also increases on the road and highways. These results in accident that leads to the traffic jams and people do not get the help instantaneously. Road accidents constitute the major part of the accident deaths all over the world [3]. This takes a toll on the property as well as causes human life loss because of unavailability of immediate safety facilities. [12]. During 2008, Road Traffic Injuries ranked fourth among the leading causes of death in the world. Nearly 1.3 million people die every year on the world's roads and 20 to 50 million people suffer non-fatal injuries, with many sustaining a disability as a result of their injury. Road traffic injuries are the leading cause of death among young people aged 15-29 years. If no action is taken, road traffic crashes are predicted to result in the deaths of around 1.9 million People annually by 2020. Those who

live, has a high chance of incurring a disability as a result of the impact. 91% of the fatalities on the roads occur in middle and low income countries [12]. Many campaigns have been conducted by the people for the awareness, but this problem is still increasing due to rider's poor behaviors such as speed driving, drunk driving, riding without sufficient sleep, etc. The numbers of death and disability are very high because of late assistance to people who got the accident. These cause huge social and economic burdens to people involved [4][7][10]. Therefore, several research group and major motorcycle manufacturers have developed safety devices to protect riders from accidental injuries. However, good safety device for vehicles is difficult to implement and very expensive [7]. Complete accident prevention is unavoidable but at least repercussions can be reduced [9]. In highly populated Countries like India, everyday people lose their lives because of accidents and poor emergency facilities. These lives could have been saved if medical facilities are provided at the right time [12]. In many situations the family members or the ambulance and police authority is not informed in time. This result in delaying the help reached to the person suffered due to accident. In order to give treatment for injured people, first we need to know where the accident happened through location tracking and then send a message to your related one or to the emergency services [3]. Many cases remain pending due to unknown reason of an accident. In order to react to this situation, the black box system draws the first step to solve problem. It is referred as electronic

data recorder. It records main driving data such as Engine Temperature, Distance from obstacle, Speed of vehicle, Brake status, CO2 Content, Alcohol content, Accident Direction, trip Time and Date. The recorded data will be analyzed to find out reason for the accident easily and to settle many disputes related to accident such as crash litigation, insurance settlements. It can be used to not only reconstruct what happened before an accident by Insurance agents and police but improve vehicle design, roadway design and emergency medical service by automakers, government and hospital [7].

1.1 Problem Statement

Whenever an accident is being met, the people nearby call the ambulance. The problem associated with this is that the victims depend on the mercy of nearby people. There are chances where no people nearby the accident spot or people who are around neglects the accident. This is the flaw in the manual system.

1.1 Project Scope

The Etching of Vehicle Information Black box to the Cloud in a Secure Fashion presents the prototype automobile black box system it is having the group of sensor and sends an alert message to pre stored mobile number. The given sensor is connected to the Micro controller and it just record's the various driving data parameters in ubidots (open source cloud) the system.

2. METHODOLOGY

A. Existing System

There are many solutions proposed for the concerned problem and each one have some advantage over others. Presently tracking system is introduced in vehicles to avoid accidents and save people's life. They have used microcontroller for this purpose. But the existing systems are available only in high-end vehicles, because the monitoring system is expensive.

Normally black box cost is high so no one prefer to install in the vehicle and normally black box is just store the data In existing system black box is done by using the sensors with GSM if any of the parameter reach above the threshold level it sends only the message. In an existing system circuits looks very bulky and not in compact. Black Box has proved indispensable to improve the reliability of safety.

Unfortunately, in most real-life situations, Black Box fails to deliver their most essential feature: a faithful replay of events in real time. The flight recorder of the aircraft, Black Box continuously records the various run parameters, even on distributed systems, record the execution for postmortem analysis. We plan the flight recorder for real-time traffic accident info.

B. Proposed System

The proposed system is designed such that, the device itself sends a message to the concerned person when an accident is met. Proposed system uses Node MCU Arduino board that provides an easy access to input/output and analog pins and easy burning/uploading of a program. The system uses GPS to find the location of the accident and to send that location in the form of SMS to the previously coded number. It also includes the feature to detect the presence of alcohol.

To monitor the various sensors, GPS are connected to Arduino board which is Node MCU. Arduino board is connected to Ubidots (open source cloud). The output of the sensors is read from Arduino and communicated to single board computer. The data is stored in the cloud the given system is proposed in IOT.

3. IMPLEMENTATION

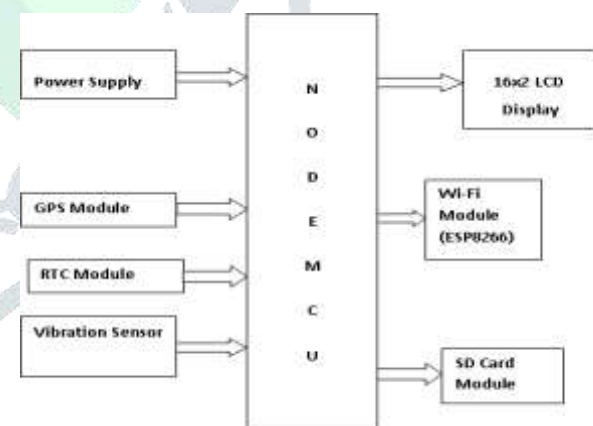


Fig.1 Proposed Block diagram

A. Node MCU

Node MCU is an open source Lua based firmware for the ESP8266 Wi-Fi SOC from Espressif and uses an on-module flash-based SPIFFS file system. Node MCU is implemented in C and is layered on the Espressif NON-OS SDK. The firmware was initially developed as a companion project to the popular ESP8266-based Node MCU development modules, but the project is now

community-supported, and the firmware can now be run on *any* ESP module.

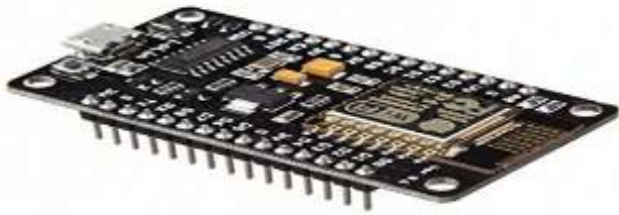


Fig.2 Node MCU

B. GPS

The Global Positioning System satellites transmit signals to equipment on the ground. GPS receivers passively receive satellite signals; they do not transmit. GPS receivers require an unobstructed view of the sky, so they are used only outdoors and they often do not perform well within forested areas or near tall buildings. GPS operations depend on a very accurate time reference, which is provided by atomic clocks on board. Each GPS satellite transmits data that indicates its location and the current time. All GPS satellites synchronize operations so that these repeating signals are transmitted at the same instant. The signals, moving at the speed of light, arrive at a GPS receiver at slightly different times because some satellites are further away than others. The distance to the GPS satellites can be determined by estimating the amount of time it takes for their signals to reach the receiver. When the receiver estimates the distance to at least four GPS satellites, it can calculate its position in three dimensions. There are at least 24 operational GPS satellites at all times plus a number of spares. The satellites, operated by the U.S. Department of Defence, orbit with a period of 12 hours (two orbits per day) at a height of about 11,500 miles travelling at near 2,000mph. Ground stations are used to precisely track each satellite's orbit.

C. Vibration Sensor

Tilt sensor works on a similar principle of mercury switches (but is it not mercury type sensor) and also known as tilt switches, inclinometer, and rolling ball sensors. The sensor measures the tilt, orientation, and inclination in different axes in reference to a plane. It measures the tilt in reference to gravity and enables the easy detection of inclination and orientation. The sensor is very simple to use as has a digital output and an M3 mounting hole to mount

with the object. It uses SW-460D/SW-520D sensor to detect tilt.



Fig. 3: Vibration Sensor

D.RTC Module

RTC means Real Time Clock. RTC modules are simply TIME and DATE remembering systems which have battery setup which in the absence of external power keeps the module running. This keeps the TIME and DATE up to date.



Fig.4: RTC Module

4. EXPERIMENTAL RESULTS



Fig.5 : Experimental Setup

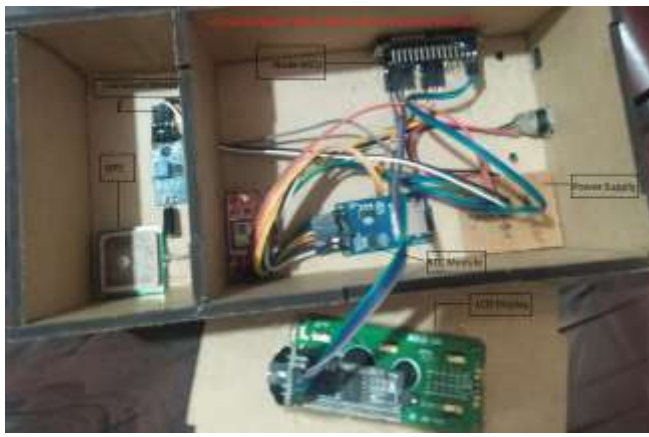


Fig.6: Internal parts of Black Box system

5. CONCLUSION

A working model of a Black Box with SMS alert for road vehicles has been developed for vehicle accident detection and reporting. It is a system that uses Node MCU, GPS tracking system developed for vehicle accident and reporting. It provides crucial information to emergency responders in the earliest possible time. The crucial time between the accident and getting victim medical attention can often be the difference between life and death. This system provides better safety rather than no safety. The system uses GPS module to find the location of the accident and send an SMS notification to the precoded number.

FUTURE SCOPE

In future we can interface the system with vehicle airbag system. This will optimize the proposed technology to the maximum extent and deliver the best accident detection system. The proposed system can be improvised by adding other components which will be able to collect several information such as recording the voice, recording the video, to detect the part of the vehicle where it is hit.

REFERENCES

1. Abdallah Kassem, Rabih Jabr, Ghady Salamouni and Ziad Khairallah Maalouf, "Vehicle Black Box System", IEEE International Systems Conference, April 2008.
2. P. Ajay Kumar Reddy, P.Dileep Kumar, K. Bhaskarreddy, E. Venkataramana and M.Chandrasekhar Reddy, "Black Box For Vehicles", International Journal of Engineering Inventions (IJEI), Volume 1, Issue 7, October 2012.
3. Sri Krishna Chaitanya Varma, Poornesh, Tarun Varma and Harsha , "Automatic Vehicle Accident Detection And Messaging System Using GPS and GSM Modems", International Journal of Scientific & Engineering Research (IJSER), Volume 4, Issue 8, August 2013.
4. Shaik Khadar Basha and P Sireesh Babu , "Wireless Black Box Report for Tracking of Accidental Monitoring In Vehicles", International Journal Of Professional Engineering Studies (IJPRES), Volume 1, Issue 2, Dec 2013.
5. Rajashri R. Lokhande and Sachin P. Gawate, "Design & Implementation of Vehicle Black Box For Driver Assistance And Alert", IOSR Journal of Computer Science (IOSR-JCE), 2014.
6. Prof. Ashish B. Dudhale, Steve Felix S, Harsha Phatak and Sayali Jathar, "Car Black Box System for Accident Prediction and Crash Recovery", International Journal of Engineering Science and Computing (IJESC), May 2014.
7. Ramchandra Patil 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), Volume4, Issue3, August 2014
8. Vikram Singh Kushwaha , DeepaYadav , Abusayeed Topinkatti and Amrita Kumari, "Car Accident Detection System Using GPS and GSM", International Journal of Emerging Trend in Engineering and Basic Sciences (IJEEBS), Volume 2 , Issue 1, Jan- Feb 2015
9. Mr.Dinesh Kumar HSDK, Shreya Gupta, Sumeet Kumar, Sonali Srivastava, " Accident Detection and Reporting System Using GPS and GSM Module", Journal of Emerging Technologies and Innovative Research (JETIR), Volume 2, Issue 5, May 2015.
10. Shailesh Bhavthankar and Prof. H. G. Sayyed, "Wireless System for Vehicle Accident Detection and Reporting using Accelerometer and GPS", International Journal of Scientific& Engineering Research (IJSER), Volume 6, Issue 8, August 2015.
11. P. Kaliuga Lakshmi and C. Thangamani , "An Efficient Vehicle Accident Detection Using Sensor Technology", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET), Volume 5, Issue 3, March 2016.
12. Namrata H. Sane, Damini S. Patil, Snehal D. Thakare and Aditi V. Rokade, "Real Time Vehicle Accident Detection and Tracking Using GPS and GSM", International Journal on Recent and Innovation Trends in Computing and Communication (IJRITCC), Volume 4, Issue 4, April 2016.