DESIGN OF IOT BASED DATA LOGGER FOR MONITORING AND CONTROLLING OF VEHICLE ACCIDENT

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Abstract - *Traffic is through day by day in our region. Most people don't in most places offer a good answer to the traffic laws. Accidents often occur due to over- and reckless driving. Particularly in school and college areas, people hesitate to lower speed to its limit. This project is embedded to show the over speed and monitor the vehicle in the over speed condition.*

Key Words –Internet of Things, and Wi-Fi enabled processor, Support vector machine.

1. INTRODUCTION

The main objective of this paper is to build a prototype of the black box VBBS vehicle system that can be mounted on any vehicle worldwide. This system can be constructed with minimal circuit count. The VBBS will contribute to the development of safer cars, improving the care of victims of accidents, assisting insurance agencies with their inquiries into traffic collisions and improving road status in order to decrease the death rate.

According to the World Health Organisation, more than one million people die every year in the world as a result of incidents related to the transport. To respond to this situation, the black box program is taking the first step to address this problem that crosses national borders and threatens the protection and health of people around the world.

The black box program, implemented into a part of the US market in 1999, proved to be successful. The device was embedded in the vehicle but in the latter case. Therefore, in addition to improving the care of victims of collisions and road conditions with a view to lowering the death rate, designing safer cars and helping insurance companies investigate traffic accidents; The main goal of this paper is to create a black box device that can be mounted on any vehicle worldwide. As in aircraft flight data recorders, "black box" equipment will now play a crucial role in the investigation of motor vehicle accident.

Currently, a large number of vehicles on the roads contain electronic devices that record details in case of accident. That is why it is so important to have recorders that objectively monitor what is happening in vehicles before, during and after a collision as a supplement to the anecdotal information typically obtained from victims, eye witnesses and police reports. This system is mainly related to two strategies. The first is the way the vehicle senses and stores data. The second is a simpler way of showing the reported data to the customer. Some major components and various types of sensors were used for implementing the first approach. The use of the Internet of Things was applied the second method. This program collects the data serially from the black box memory, presents it in real-time graphics and then saves it for future use to a structured excel report.

BLACK BOX

A black box is a tool, system or entity in science, computation, and engineering that can be interpreted in terms of its inputs and outputs (or transfer characteristics), without any understanding of its internal workings. Its "opaque" (black) implementation is. One might call almost anything a black box: a transistor, an algorithm, or the human brain.

To evaluate it, only the stimulus / response behavior will be accounted for as an open method, with a traditional "black box approach," to infer the (unknown) box. The normal representation of this black box device is in a box based data flow diagram.

The opposite of a black box is a device in which the internal components or logic are open for inspection, most frequently referred to as a white box (also known as a "simple box" or "glass box" sometimes).

1.1 HISTORY

The current sense of the word "black box" appears to have come into English around 1945. In electronic circuit theory, the idea of network synthesis from transfer functions resulted in electronic circuits being known as "black boxes" defined by their response to the electronic circuits signals applied to their ports, can be traced to Wilhelm Cauer, who published his ideas in his most developed form in 1941. While Cauer did not use the term himself, the approach has certainly been defined by those who followed him as black-box analysis. Vitold Belevitch puts the idea of black boxes much earlier, attributing to Franz Breisig in 1921 the explicit use of two-port networks as black boxes and arguing that two-terminal components had been implicitly regarded as black boxes before that.

In cybernetics Ross Ashby gave a full treatment in 1956. In 1961 Norbert Wiener defined a black box as an unknown device that was to be identified using device identification techniques. He saw the first step in self-organization as being capable of copying a black box's performance actions. Some other architects, scientists and epistemologists, such as Mario Bunge, have taken advantage of this black box theory in the 1960s.

1.2 FLIGHT RECORDER

A **flight recorder** is an electronic recording system mounted in an aircraft to enable the investigation of accidents and incidents at the aircraft. The misnomer black box is also applied as flight recorders — they are bright orange in reality as help with their recovery following collisions.

The **Flight Data Recorder (FDR)** is a tool that preserves the flight's recent history by recording several times per second tens of parameters obtained. The voice recorder (CVR) in the cockpit records the recent background of the cockpit sounds, including the pilots 'conversation. The two recorders give an exact testimony, narrating the flight history of the plane, to aid with any subsequent investigation.

The FDR and the CVR may be paired together in a single unit. Under international law, governed by the International Civil Aviation Organization, it is expected that the two recorders will be able to survive conditions likely to be encountered in a serious aircraft accident. We are usually defined for this purpose to withstand an effect of 3400 g and temperatures above 1,000 ° C (1,830 ° F)as required by EUROCAE ED-112. Since 1967, they have been needed on commercial aircraft in the US.II

2. LITERATURE SURVEY

Radhakishan Maske, Satesh Surwase, Balbhim Moharir,Vrushabh Mahajan,Vijay Kedar, Prof.Amol Adkine et al proposed "AUTOMATIC BRAKE FAILURE INDICATOR AND BRAKING SYSTEM ",IJARIIE.2017

One of the key causes of brake failure, due to very poor maintenance as well as product defects, in order to safeguard the valuable life from accident brake monitoring is very important in automotive safety Vehicle safety is the avoidance of automotive accidents or the minimization of the harmful effects of accidents, particularly as regards human life and health. Only car drivers, and some for the benefit of others, had special safety features built in. The most efficient approach to this issue is the automatic brake failure indicator and braking system. This is the most efficient and easiest technique used to minimize accident incidence due to brake failure. The components used in this system are relay, buzzer, battery, motor, wiring system. And finally, the most successful system to be developed is the breaking system mounted in the two wheeler by using those components.

DISADVANTAGE: Monitors only accidents due to brake failure.

Prof. Pandit Biradar, Jitendra Baravkar, Komal Bhujbal, Avi Bhapkar et al proposed "Automatic Brake Failure Detection with Auxillary Braking System", IJSART.2017

Once a day, control device loosely regulates machines. This is important to fulfill the need to blast the population economically and effectively operate machines. The system is designed and developed by the use of IR Sensor, a control device based on an electronically operated automatic break failure indicator. Automatic break failure indicator and auxiliary braking system consists of an IR sensor circuit. control unit and frame. The sensor is used to identify the alarm device break cable, which is the control signal. Likewise, the auxiliary brake is attached to the frame of the wheel and this can apply the brake and stop the vehicle. A sensor with a friction transducer controls the friction in the brake lining.

DISADVANTAGE: The system does not employ failure due to manual error such as drunk and drive

P. Ajay Kumar Reddy , P.Dileep Kumar , K. Bhaskar reddy, E.Venkataramana , M.Chandrasekhar Reddy et al proposed "BLACK BOX FOR VEHICLES",IJEIJ.2012

The paper's main aim is to create a Black Box system for vehicle diagnosis which can be mounted into any car. This system can be constructed with minimal circuit count. It will lead to the development of safer cars, enhancing care for victims of accidents, assisting insurance agencies with their traffic crash investigations and increasing the road condition to decrease the death rate.

DISADVANTAGE: Does not include GPS technology to provide the exact location.

Divyashree K, Likhithesh M D, Arpitha M,MadanRaj K S,Raghu S,Vinay Kumar S B et al proposed "Proof collection from car black box using smart phone for accident detection"IJERA.2015

This method uses architecture to insert a black box in a vehicle. Car black box is a tool used for recording information such as engine temperature, hazard existence, alcohol content, and precise location of the vehicle accident. In addition, we use the smart phone to get the accident-related snapshots and send this information along with the snaps to police server
DISADVANTAGE Does not include measuring tyre pressure,

Speed of the vehicle

Karthik K S, Poonam B T, Darshan B, Benaka Santhosh et al proposed "Design and Implementation of Car Black Box with Collision Avoidance System", ICETSE–2017

This paper is being proposed to build a low cost framework that will provide a solution to the current problems of automotive regulation. The system has two main components: Vehicle to Vehicle Collision Avoidance Unit (VVCAU) is used to prevent vehicle collisions and Black Box (BB) records the actual vehicle data such as engine temperature, obstacle size, vehicle speed, CO2 content, alcohol content, Location of the crash. The design selects AVR as the embedded controller, UART (Universal Synchronous Receiver Transmitter) is the typical peripheral found on microcontrollers commonly used for on-board communication with external devices and systems, I2C (Inter-Integrated Circuit), Electrically Erasable Programmable Read Only Memory, and GSM module.

DISADVANTAGE Does not involve real-time monitoring

Swapnil K. Phadtare et al "BLACK BOX FOR VEHICLE INVESTIGATION AND MONITORING" – IRJET,2016.

Black box applies to collecting different recording devices. Car black box is "File Recorder for Things" Black Box records specific vehicle data such as engine temperature, obstacle size, vehicle speed, vehicle vibration detector Detector of vehicle orientation or inclination. The specification selects ARM7(LPC 2148) as an embedded controller, the peripheral configuration is UART found microcontroller widely used for Real Time Clock, GSM module, GPS module. The data from the record is decoded using the SD card.

Manish Bhelande, Viraj Chaudhari "Car Black Box " – IJARCCE, 2016.

This current paper addressed the design of the Car Black Box System and its functions. This program focuses on real-time driving tracking and also uploads the tracked data to cloud server for further analysis in the case of an accident. This program helps both accident investigators and insurance firms figure out what caused the crash. The author analyzes the problems faced by the proposed earlier models and guides the development of an integrated design with streamlined hardware and high performance. This device uses Android Smartphone as its hardware portion to provide accident tracking functionality enabled with an Android update. Android Phone used as it offers all the functionality to help minimize hardware consumption, as Android Smartphone functions as an embedded device to promote all the functionality. In addition to video surveillance, the device also offers other functionality such as navigation, speed monitoring and anti-theft applications.

Ms. Kontham Lavanya, Mrs. Y. Roji et al "EVIDENCE COLLECTING SYSTEM FROM CAR BLACK BOX" – IEEE. 2010.

This paper demonstrated the processing of real-time data after collision detection in an area around the vehicle and analyzed the data collected to infer the collision when transmitting the data over the wireless network simultaneously. The Evidence Collection System is a vehicle-based tool that collects data such as speed, temperature of the engine, acceleration, location of GPS, motion of the wiper and time. Such data may be used to investigate allegations related to crime, emergency operations and

insurance. This data was then sent to the database server so that web application could access this information at different locations such as Police Station, Insurance Company.

D. Haripriya, Puthanial. M et al "Accident Prevention

System and Security for Vehicles" – IJCTT, 2014.

This current initiative focuses primarily on road accidents that occur in both two wheelers and four wheelers due to inadequate sign board signal, drowsy state and drunken driver condition. The eye blink sensor senses a drowsy state and uses buzzer to alert the driver. The alcohol sensor detects the alcohol from breath and automatically stops the motor by micro controller. The light sensor detects and changes the light intensity accordingly. Placing the transmitter modules at specific zones shows the areas. Theft of vehicles is avoided by the use of Transmitter-Receiver module.

S.P. Bhumkar, V.V. Deotare et al "ACCIDENT AVOIDANCE AND DETECTION ON HIGHWAYS" – IJETT.

Technology approached to detect and monitor driver fatigue rates continues to evolve and many are now in the phases of development, validation testing or early implementation. Previous studies analyzed available fatigue detection technologies and prediction methodologies. As the name suggests this project is about advanced automotive technology to make it smarter and more social to prevent road accidents. This system is rendered more powerful, reliable and successful by using ARM7.There are far fewer devices introduced in or for vehicles for identification of human behaviour. Within this paper we define a system of real-time online safety that regulates the speed of the vehicle under driver fatigue. Such a model has the function of advancing a program to identify fatigue symptoms in drivers and to regulate vehicle speed to prevent accidents.

3. EXISTING SYSTEM

The existing system does not require the tracking in real time. In addition, the systems established focus primarily on the four-wheelers as MVEDR (Motor Vehicle Event Device Recorder). That records the pre-collision events while reconstructing the pre-collision events. The black box of the car records pace, acceleration, breakdown and other significant pre-collision behavior.

DRAWBACKS

1. Does not include real-time monitoring.

2. Designed mainly for four wheelers

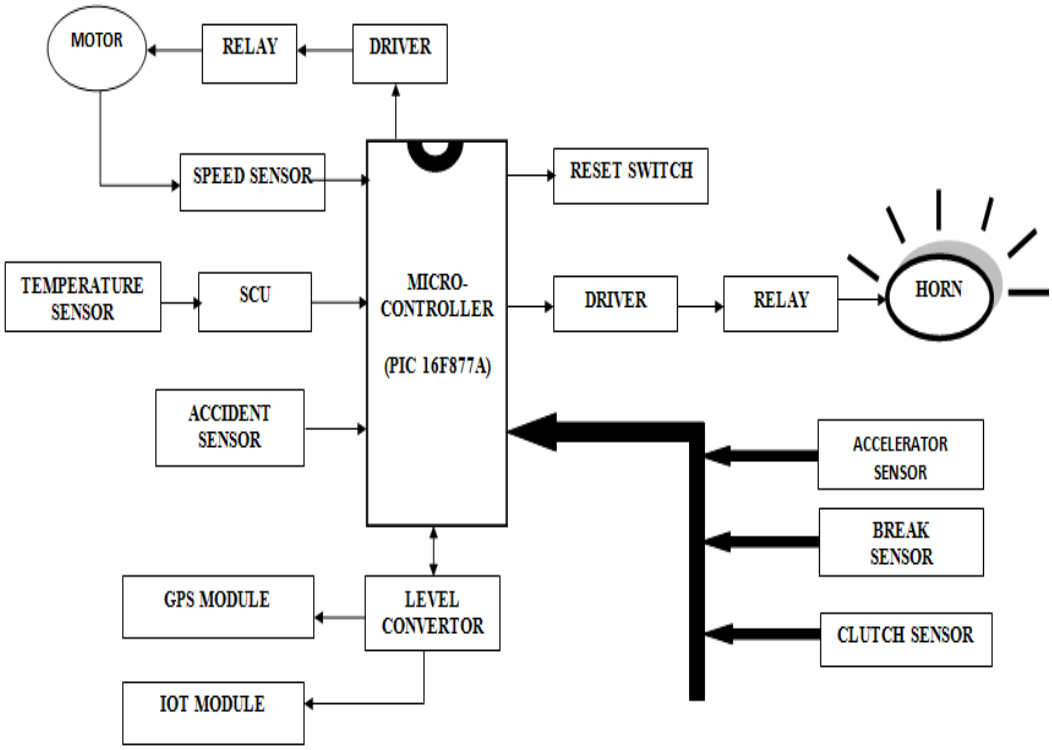
4. PROPOSED SYSTEM

Because much of our population uses two-wheelers, it is important to incorporate a system that is compact in size and cost-effective. For future research, the program uses research of vehicle parameters such as alcohol content, weight, vehicle temperature and storage of the parameters in the short memory.

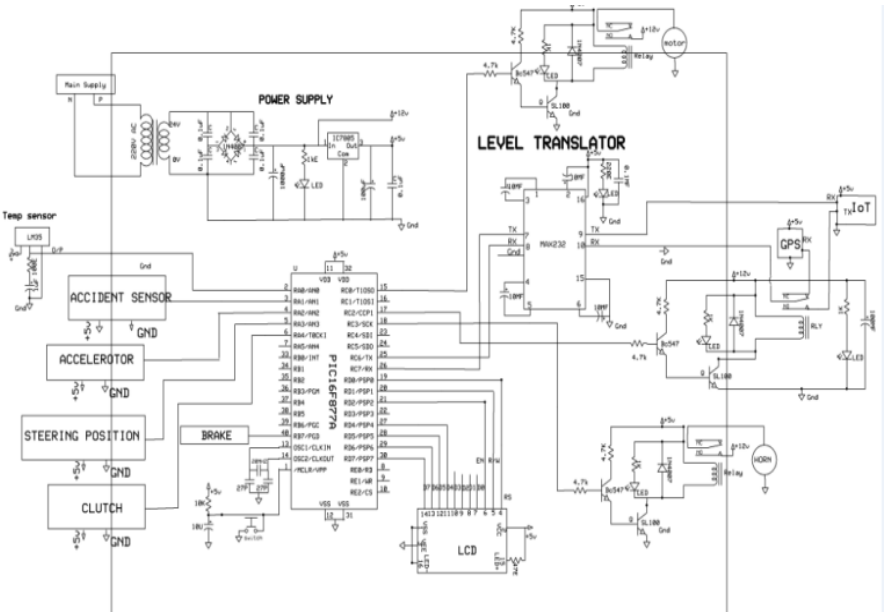
Our proposed design focuses primarily on developing a low cost and effective framework for analyzing vehicles. A lightweight, cost-effective and real-time black box is built in our proposed framework. The black box that we've built uses PIC16F877A, which is programmable IC, is interfaced with an accident sensor to test whether or not it has happened. Accident sensor indicates accident occurrence and alerts the public via alarm. The prompt assistance may be sought to avoid loss of life. The accident information system will use GPS module to warn the relative of the vehicle owner or nearby hospital via IoT module with the location of the accident. When the incident is minor then the driver will press the reset switch to prevent incorrect information from being transmitted and usually drive.

The key explanation for incidents happening is the vehicle maintenance failure. Our device uses sensors to verify the vehicle's status and alerts the driver if any abnormality is identified. The brake failure sensor shows whether or not the brake wire is properly attached and the temperature sensor measures the right air pressure of the tyre. Accelerator, brake clutch, and steering position sensor indicate respectively the direction of the accelerator, brake clutch steering. In Cloud the entire process is tracked.

BLOCK DIAGRAM



CIRCUIT DIAGRAM



5. COMPONENTS DESCRIPTION

5.1 BATTERY CELLS

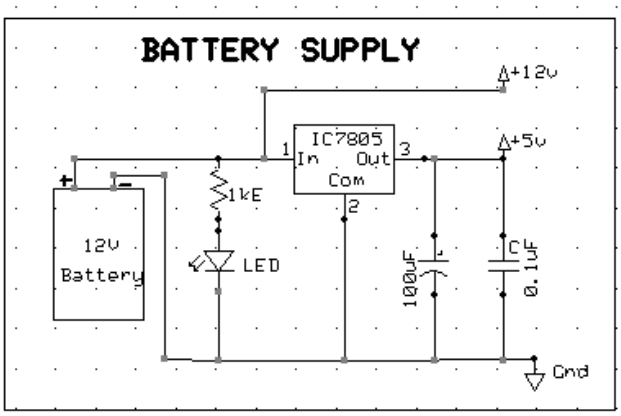
Battery cells are the single most essential part of a battery. They consist of a jar which can communicate with the electrolyte and the lead plates. Every lead-acid cell fluctuates in voltage from about 2.12 Volts when empty, when full, to about 1.75 Volts. Note the slight difference in voltage between a full and an empty cell (another advantage that lead-acid batteries have over rival chemistries).

1. A 12V dc supply of battery is fed to the 7805 regulators which converts it into regulated 5V DC supply.

2. It is then, distributed to all the driver and relay circuits.

3. The 5V is supplied to the microcontroller and to all the components used in the system.

5.2 Battery Supply Circuit



ADVANTAGES

1. Low cost.
2. Reliable.
3. Robust.
4. Tolerant to abuse.

SHORTCOMINGS

1. Very heavy and bulky.
2. Typical coulombic charge efficiency only 70% but can be as high as 85% to 90% for special designs.
3. Danger of overheating during charging
4. Not suitable for fast charging

APPLICATIONS

1. Automotive and traction applications.
2. Standby/Back-up/Emergency power for electrical installations.
3. Submarines
4. UPS (Uninterruptible Power Supplies)

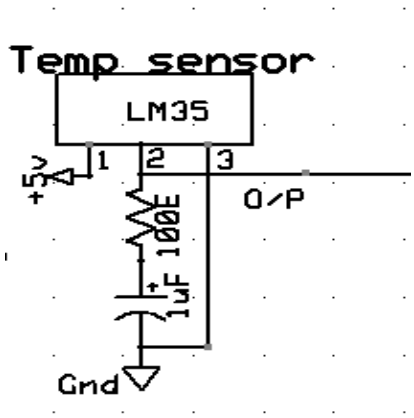
5.3 ACCIDENT SENSOR

A piezoelectric sensor is used as sensor for identification of incidents. A piezoelectric transducer has very high impedance from the DC output and can be modeled as a proportional source of voltage and filter network. At source the voltage V is directly proportional to the power, pressure, or strain applied. This mechanical force then applies to the output signal as if it had gone through the corresponding circuit.

5.4 TEMPERATURE SENSOR

LM35 Temperature Sensor the LM35 series are precision built-in LM35 temperature sensors whose output voltage is linearly proportional to the temperature of Celsius (Centigrade). The temperature is set within the skin sheet. The temperature output is provided to the RA0 pin. Therefore, the LM35 sensor has an advantage over the ° Kelvin calibrated linear temperature sensors.

5.5 Temperature Sensor Circuit



5.6 PIC MICROCONTROLLER

1. PIC is a family of microcontrollers made by Microchip Technology from Harvard architecture, originating from the PIC1640. Originally developed by Microelectronics Division at General Instrument.

2. Originally the term PIC applied to "Programmable Interface Controller."

3. Microcontroller is a general-purpose computer that incorporates a variety of microprocessor system components into a single chip.

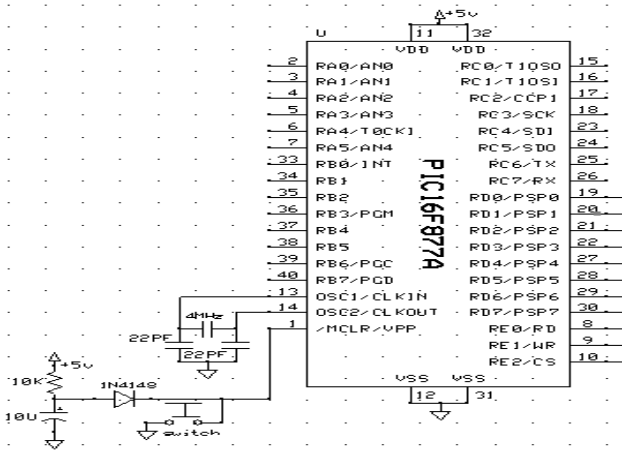
4. It has CPU, memory, and peripherals built in to make it a mini computer.

5. Combines a microcontroller to the same microchip: CPU core, Memory (ROM and RAM)

Pin Description:

PIC16F877A consists of 40 pins enclosed in 5 ports. Each port holds 8 pins which are bidirectional input/output pins

PIC 16F877A CIRCUIT



5.7 DARLINGTON RELAY:

1. A relay is an electro-magnetic device that is useful to turn on and off a light bulb (or something else) connected to the 220v mains supply if you choose to use a low voltage circuit.

2. The current required to control the relay coil is more than most chips (op. amps etc.) can produce, so typically a transistor is required.

5.8 ALARM AND SWITCH

1. A buzzer or beeper is a signaling device; when an incident happens, this provides an audible alarm.

2. If it's a false alarm or if the driver thinks he doesn't need immediate assistance, there is a switch in the system that he can use to stop the machine from operating.

5.9 GPS - Global Positioning System

1. GPS-The module is used both for tracking and navigation in vehicles.

2. Tracking systems allow a base station to keep track of the vehicles without driver interference where, as a navigation device, the driver is helped to reach the destination.

3. The design is more or less identical, be it navigation system or tracking system.

4. If an accident happens somewhere then the GPS device monitors the vehicle's location and sends the details via the cloud to the individual person by alerting the person through the IoT module (ESP 8266).

5.10 IOT MODULE (ESP 8266 – 12E NODE MCU)

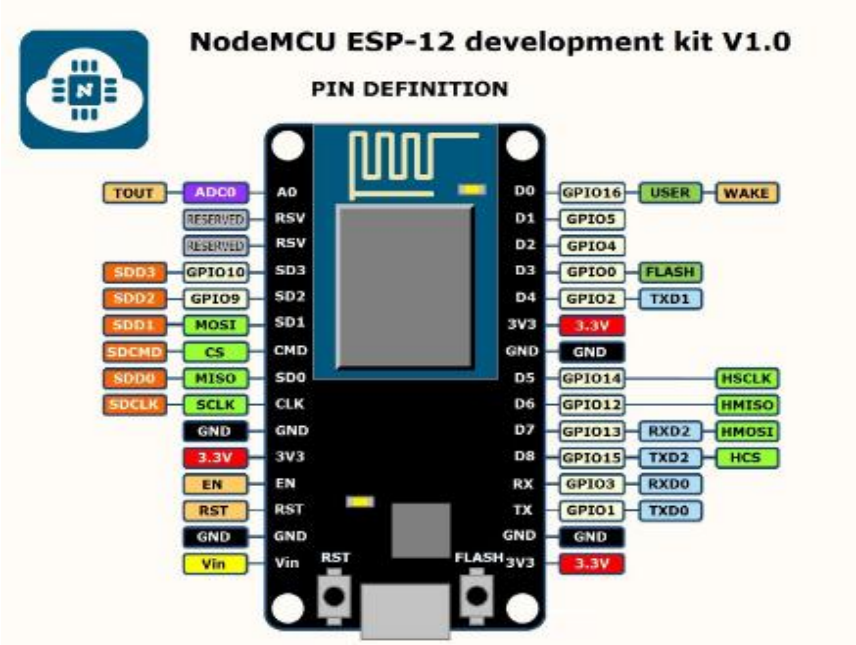
1. NodeMCU is an open source IoT platform.

2. It includes firmware running on Espressif Systems 'ESP8266 Wi-Fi SoC, and hardware based on the ESP-12 board.

3. By design, the word "Node MCU" applies to the firmware and not the dev kits.

4. The software uses the language for Lua scripting.

5. It is based on the eLua project, which is based on the ESP8266 Espressif Non-OS SDK.



APPLICATIONS:

Stolen Vehicle Recovery:

It is possible to equip both consumer and commercial vehicles with RF or GPS units to allow police to track and recover. In Lo Jack's situation, police will directly activate the vehicle's monitoring device and monitor the monitoring signals

Fleet Management: Understanding the real-time position of all drivers when running a fleet of vehicles allows management to more efficiently meet customer needs. If it is distribution, operation or other multi-vehicle businesses, drivers now only need a cell phone with telephony or internet access to be easily monitored and efficiently dispatched.

Asset Tracking: Companies who need to track valuable assets for insurance or other tracking purposes may now trace the location of the real-time assets on a map and control the movement and operating status closely.

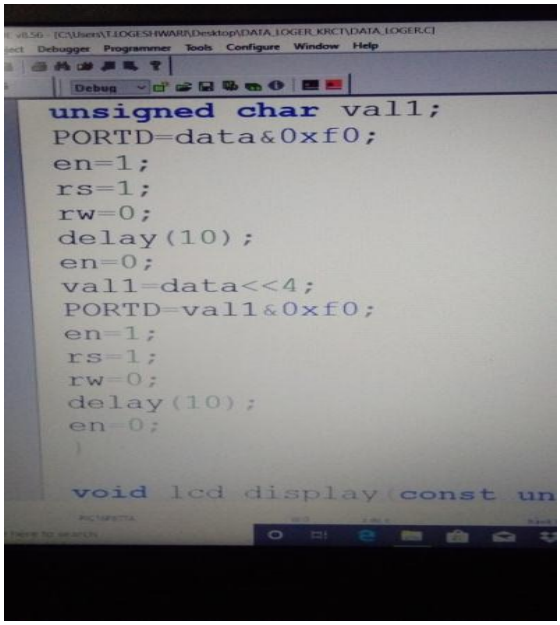


Fig 2

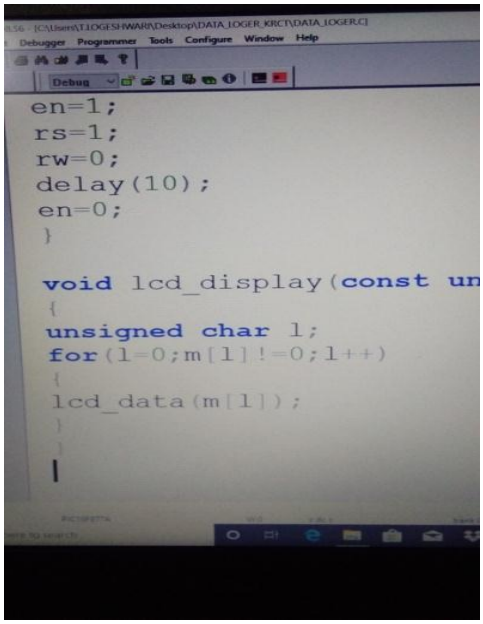


Fig 3

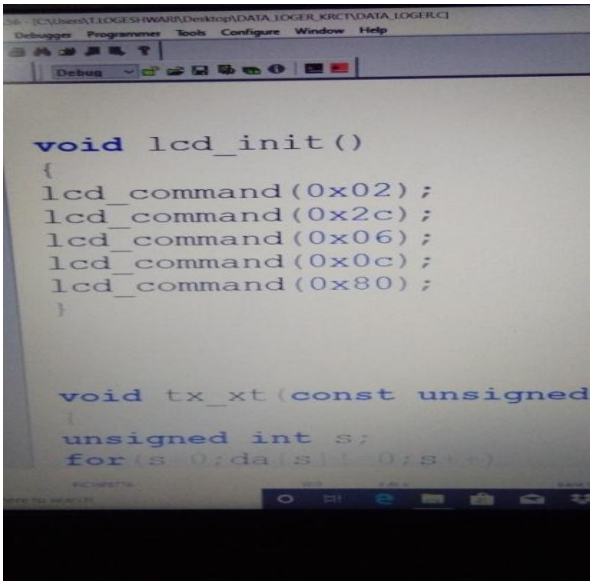


Fig 4

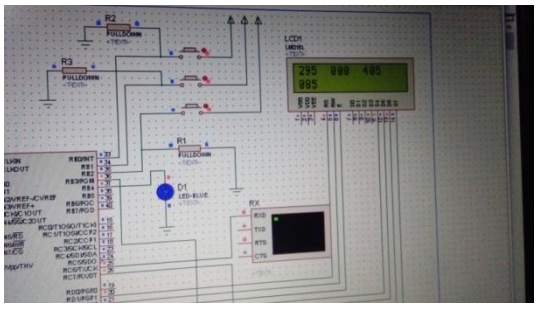


Fig 5

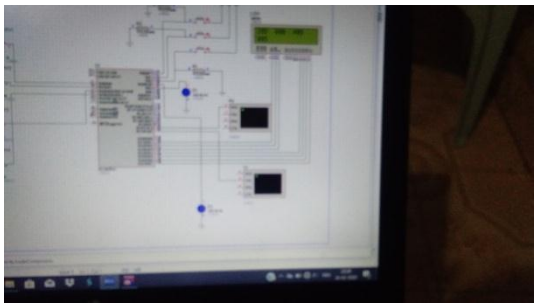
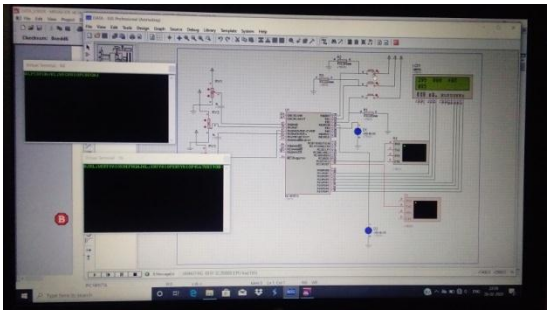


Fig 6



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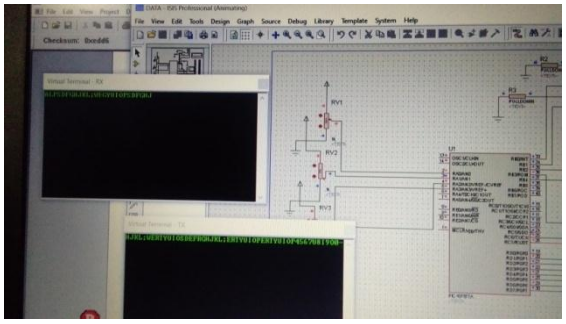
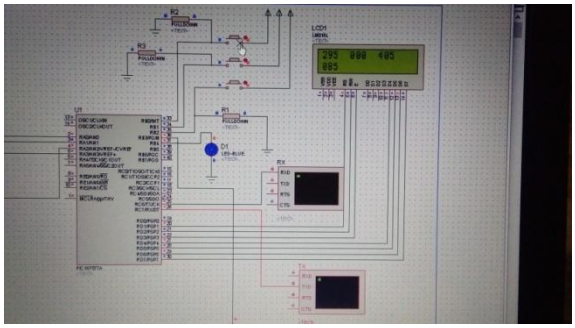


Fig 8



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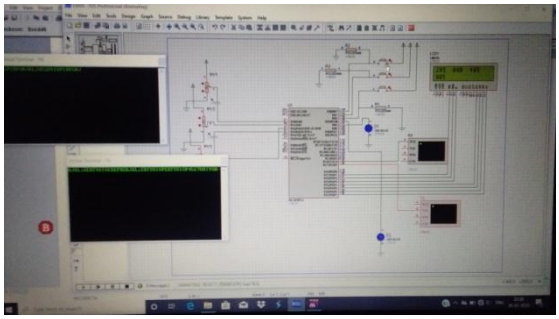

Fig 10

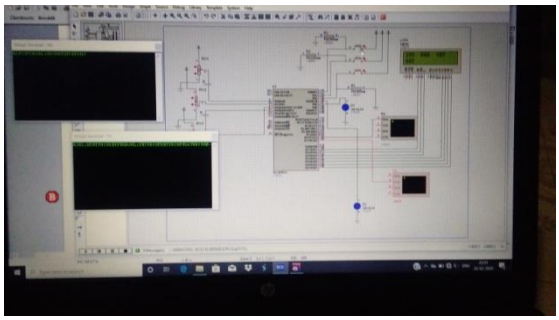

Fig 11

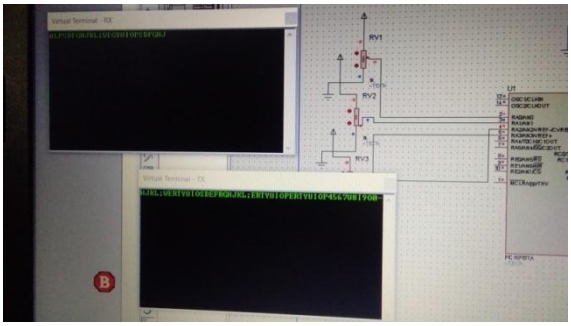

Fig 12

6. CONCLUSION

This paper provided a new vision for the automotive industry, the Black Box system used in the vehicles market. For every part of this program a complete and thorough explanation has been made. This paper also provided an Internet consumer with accident data dependent on stuff. Furthermore the method of transmission between the two parts was introduced and developed. The designed Black Box system can be used on any vehicle. This device will start saving the events of the respective vehicle as soon as the driver starts the engine. The last 21 seconds are still stored in the Black Box's EEPROM, and in the event of an incident another 10 seconds of events will be stored after this incident. The data saved can only be recovered for privacy purposes after the accident. Using serial transmission, the EEPROM data will be read by a PIC program and presented to the user in the cloud server in graphical format. Additionally, the user will receive a comprehensive report containing all the relevant details.

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