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Safety Data Collection using Blackbox

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Abstract: *This paper presents Smart blackbox system. When information is required following an accident or crime, investigators or police might use the smart blackbox system to collect accident or safety information. Due to increased traffic and aggressive driving by drivers, car accidents are one of the most significant problems in the globe. This information can be used to check the state of the vehicle as well as to investigate accidents and notify family members. The blackbox system is used to continuously record and save vehicle position, temperature, voltage, and other data. The information is then stored in a storage device. We are able to examine, track, and evaluate vehicle situation and collisions. The objectives of the project are made zero accident level in real time all over world and if accidents occur to recover fast very short time.*

Keywords: Car Accident Detection; Temperature Sensor; Voltage Sensor; Blackbox; Location.

I. INTRODUCTION

In order to save time and recognize urgently required information instantaneously, real-time smart black box systems use it for detection and notification. In the "Black box" technology and aircraft data recorders on board a plane now play a vital part in the investigation of automotive accidents. A particular class of electronic device used for data collection and storage is referred to as a "black box." When we put a black box for help in the autos, the identical principle was used. In this instance, the black box is used to record and retain data on the vehicle's temperature as well as real-time interruption values and the vehicle's driving history. It is possible to analyze and trace the driving conditions of the car and the collision. Compile the analogue values produced by the sensors.

The project's major goal is to make all areas of the world accident-free in real time, and if accidents do happen, to quickly recover from them. The sensors continuously record the data, store it on a memory card, and send location specific text messages through SMS.

II. LITERATURESURVEY

Smart blackbox systems assist in determining the cause of accidents and provide information about those accidents that is necessary for both accident investigations and informing family members.

In this study, the system suggests an intelligent black box method for capturing safety information. We extend the functionality of the current blackbox system in various ways. While driving, the first capability involves analyzing and retrieving the crucial data from the nearby automobiles. We also include a recognition engine for this purpose, which extracts the color and license plate number of passing automobiles. The communication engine is then added to receive information requests from the server and upload previously saved data. Additionally, a GPS engine is included to track the time and the driving path, which are utilized to compare the requested and recorded data. Our clever blackbox system receives the server's request message when it broadcasts information at a specified time and location, checks the time and location tags, and then sends the matched data to the server.

This study includes a smartphone-based accident detection and warning system. A prototype smartphone based client/server application created for this system, named Wreck Watch, offers a technique to provide accident detection and warning utilizing the built-in sensors and communication interfaces of smartphones.

The primary problem with the Wreck Watch system is the deactivation of the system when the speed is below the speed threshold because the Wreck Watch detection process only records accelerometer data and searches for potential accidents if the vehicle's (and the smartphone's) speed is greater than the speed threshold, and this filtering will turn off the detection process in case of low-speed conditions and cannot detect the accident in low sp.

In this study, Intelligent Vehicle Control Using Wireless Embedded System in Transportation System Based on GSM and GPS Technology is used to secure automobiles by preventing unwanted access to them through an engine locking system. This method aids in pinpointing the precise accident site, and with the use of a server, an emergency vehicle can be sent to the precise place to lessen the loss of human life. Additionally, it uses sensors to identify the driver's behaviour and determine whether he or she is intoxicated or sleepy in order to prevent accidents. Using the Global Positioning System (GPS) and Global System for Mobile Communication, the location of the car was determined (GSM). This is less expensive, more dependable, and secure.

In this work, an Intelligent Transport System (ITS) is introduced to recognize accidents and their locations so that a local hospital may be discovered and an emergency vehicle can be dispatched to the accident site.

III. HARDWARE REQUIREMENT

A. Raspberry Pi

The Raspberry Pi 4 Model B is the most recent version of the popular Raspberry Pi computer range. Compared to, It offers radically improved CPU speed, multimedia performance, memory, and connectivity over the Raspberry Pi 3 Model B+ of the previous iteration while keeping backward compatibility and a comparable amount of power consumption. For the user, the Raspberry Pi 4 Model B's desktop performance is on par with that of entry-level x86 PC systems.

The main features include a powerful 64-bit quad-core processor, hardware video decoding at up to 4Kp60, support for dual displays at resolutions up to 4K via a pair of micro-HDMI ports, up to 4GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability.

The board can be certified for modular compliance for Bluetooth and dual-band wireless LAN. Reduced compliance testing when included into final products, increasing both cost and time to market.

Figure 1: Raspberry Pi 4 Model

B. Temperature sensor

The output voltage of the LM35 analogue linear temperature sensor changes linearly as the temperature changes. National Semiconductor's LM35 is a three terminal linear temperature sensor. It is capable of measuring temperatures between -55 and +150 degrees Celsius. For every degree Celsius that the temperature rises, the LM35's voltage output increases by 10mV. The standby current of the LM35 is less than 60uA and it may be run off of a 5V source. The image below depicts the LM35's pinout.

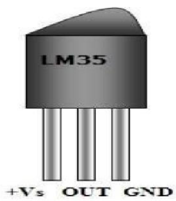

Figure 2: Temperature sensor

The LM35 sensor operates on the fundamental idea of a diode, wherein a voltage across a diode rises at a known pace as temperature rises. It is straightforward to produce an analogue signal that is directly proportional to temperature by carefully magnifying the voltage change.

C. Flame sensor

A flame-sensor is one type of detector that is specifically made for both detecting and reacting to the existence of a fire or flame. Depending on how it fits, the flame detection reaction may vary. It has a propane tank, a fire suppression

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system, a natural gas line, and an alarm system. Industrial boilers use this sensor. This mostly serves to verify whether or not the boiler is operating properly. Because of the way a heat/smoke detector works to detect a flame, these sensors respond more quickly and accurately than a heat/smoke detector.

Figure 3: Flame sensor

D. Voltage sensor

The voltage supply is monitored, computed, and determined using this sensor. The AC or DC voltage level can be determined by this sensor. This sensor's input can take the form of voltage, while its output can take the form of switches, analogue voltage signals, current signals, audio signals, etc. Other sensors can produce outputs like AM (Amplitude Modulation), PWM (Pulse Width Modulation), or FM. Some sensors produce sine waveforms or pulse waveforms as their outputs (Frequency Modulation). The voltage divider may affect how these sensors measure

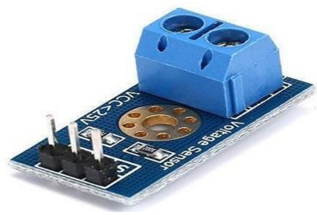

Figure 4: Voltage sensor

This sensor includes input and output. The input side mainly includes two pins namely positive and negative pins. The two pins of the device can be connected to the positive & negative pins of the sensor. The device positive & negative pins can be connected to the positive & negative pins of the sensor. The output of this sensor mainly includes supply voltage (VCC), ground (GND), analog o/p data.

E. MEMS Sensor

MEMS are inertial sensors with high accuracy and low cost that are employed in a wide variety of industrial applications. This sensor makes use of micro-electromechanical systems, a chip-based technology. These sensors are used to both detect and measure external stimuli like pressure. They then react to the recorded pressure by performing a few mechanical operations. The greatest illustrations of this primarily involve the rotation of a motor to account for pressure changes.

Silicon can be used to fabricate MEMS integrated circuits, with thin material layers being deposited or physically secured onto a Si substrate. The minuscule 3D structures such as diaphragms, beams, levers, springs, and gears were then selectively fastened away.

The manufacture of MEMS requires a variety of methods used to build other semiconductor circuits, including sputtering, diffusion, ion implantation, oxidation, and low- pressure chemical vapour deposition.

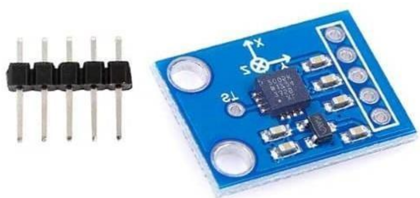

Figure 5: MEMS sensor

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F. Moisture Sensor

The soil moisture sensor is one type of sensor used to estimate the volumetric water content of the soil. Gravimetric measurements of soil moisture must be removed, dried, and sample weighted. These sensors assess the volumetric water content indirectly by replacing the moisture content with electrical resistance, neutron interaction, dielectric constant, and other soil law

Replenishment of the moisture content as well as the dielectric constant and other soil laws.

It is necessary to modify the link between the computed property and soil moisture since it may change in response to changes in temperature, soil type, or electric conductivity. The reflected microwave emission, which is mostly employed in hydrology and agriculture, can be affected by the soil's moisture content.

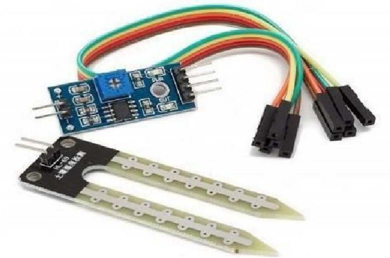

Figure 6: Moisture Sensor

G. GPS

A satellite-based navigation system that transmits and receives radio signals is called the Global Positioning System (GPS). These signals are gathered by a GPS receiver, which then informs you. With the aid of GPS technology, you can locate yourself anywhere in the world at any time, regardless of the weather, and for initially created for the military, GPS was once known as NAVSTAR (Navigation Satellite Timing and Ranging), orthe Global Positioning System. The government made the system available for public usage due to its well-liked navigational features and the fact that you may access GPS technology using modest, inexpensive equipment. GPS technology is owned by the USA and is maintained by the Department of Defense.

Figure 6: GPS

IV.PROPOSED SYSTEM

Our system's black box houses the Raspberry Pi 4, together with temperature, voltage, fuel, and voltage sensors. It determines the engine's voltage, temperature, etc. These parameters' results are displayed. The Raspberry Pi is triggered and begins gathering data from the sensors, such as temperature and obstacle presence checks, when an accident happens. This gathered data is shown on the screen and communicated to the user via SMS. The precise location of the accident scene can be determined thanks to the GPS in mobile communications. With this information, authorities can quickly identify the accident site and obtain the necessary evidence to deliver justice.

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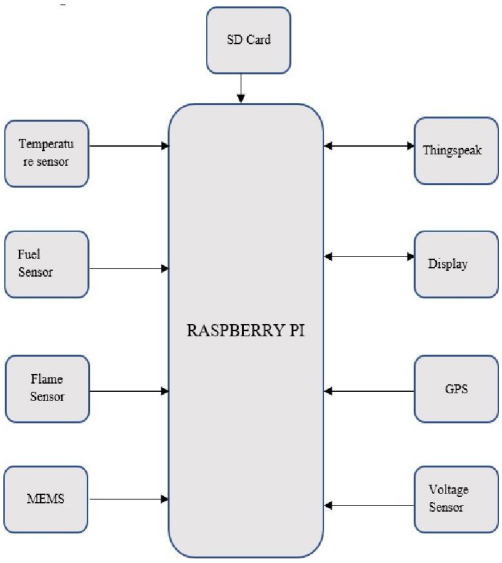


Figure 7: Block Diagram of Proposed System

V. SOFTWARE IMPLEMENTATION

Python: Python is an interpreted and object-oriented programming language which was made by Guido Van Rossum in the year of 1991. It reduces the code as compared with other languages.

Prototype:

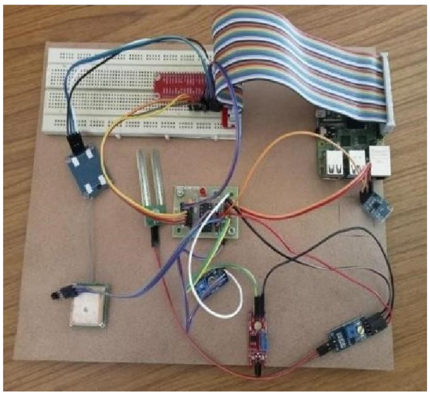


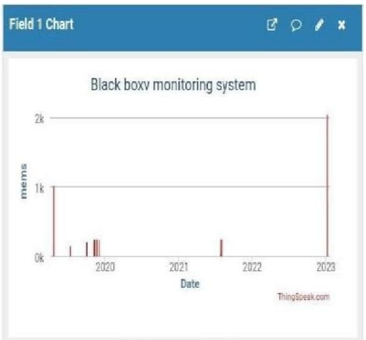
Figure 8: Prototype of Smart Blackbox using Raspberry pi

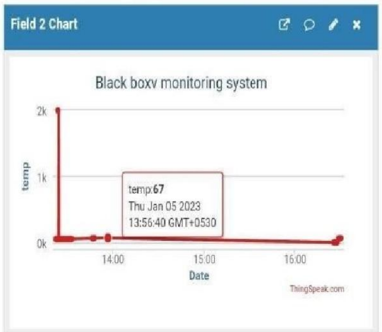
VI. EXPERIMENTAL RESULT

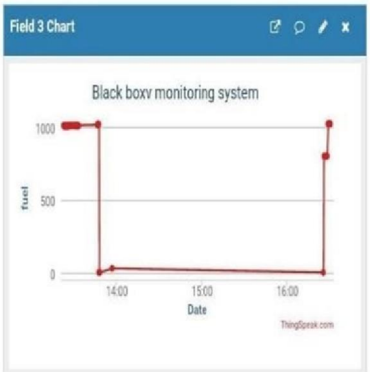
This section shows how the project model performs when using the Raspberry Pi as hardware and Python as the programming language to produce results. By using software, we are able to produce the project's results.

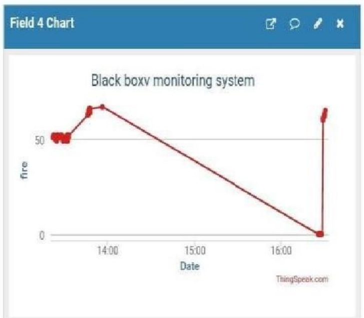
When an accident happens, black boxes are used in vehicles to collect information. The Thingspeak.com server can be used to monitor the various typical values.

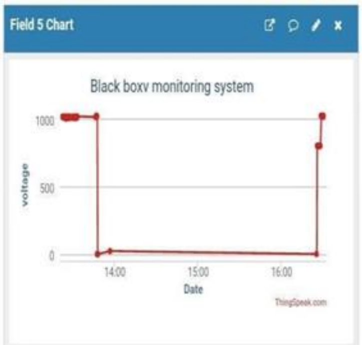
Graphs can be used to visually observe sensor values. MEMS sensor, temperature sensor, moisture sensor, flame sensor, and voltage sensor values can all be shown.



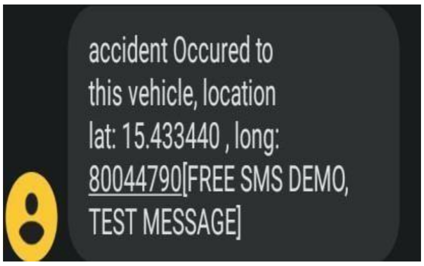








Whenever there is an accident occurs, the location is shared to the mobile number via a text message along with the coordinates of the vehicle.



By using the coordinates we can know the location of vehicle where the accident occurred.

VII. CONCLUSION

In this project, we suggested a smart black box device for capturing safety data. It is currently applicable to vehicles. We are currently using it in our own cars. In order to convey data links over servers and find accidents, we need sensors. So that if an accident happens, information with a link to the location will be sent right away to the supplied mobile numbers. The sensor values can be displayed on a webpage. In order for it to be more beneficial during the research.

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