IoT BASED ACCIDENT MONITORING AND CONTROLLING SYSTEM WITH DATA LOGGING FACILITY

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Abstract-*Traffic in our country is increasing day by day. Many people are not giving a good response for the traffic rules in many places. Mainly accidents happen due to over speed and careless driving. Especially, in the school and college zone ,people are hesitating for decreasing the speed to its limit. This is the embedded project to indicate the over speed and to control the vehicle in over speed condition using MCT2E and to check tyre temperature, we have used LM-35 to indicate temperature of the tyre .With the help of PIC microcontroller the sensor signals are processed and if signals processed are abnormal then GPS locations are sent to GPS module which can be monitored using IoT module through CAYENNE PLATFORM. If the driver drives the vehicle at over speed means an indication is provided to the driver to slow down the vehicle. The components used in this project are small in size, low cost and easy replaceable.*

Keywords-**Vehicle black box system(VBBS), Driver safety, Accident prevention, Sensor, IoT module.**

1. INTRODUCTION

The main purpose of this paper is to develop a prototype of the vehicle black box system VBBS that can be installed into any vehicle all over the world. The VBBS can contribute to constructing safer vehicles, improving the treatment of crash victims, helping insurance companies with their vehicle crash investigations, and enhancing road status in order to decrease the death rate. In order to react to this situation, the black box system draws the first step to solve this problem that crosses national boundaries and threatens the safety and health of people worldwide. However in the latter case, the system was embedded in the vehicle. Therefore, in addition to improving the treatment of crash victims and the road status in order to decrease the death rate, constructing safer vehicles, and helping insurance companies with their vehicle accidents investigations, the main purpose of this paper is to develop a black box system that can be installed to any vehicle all over the world. That is why it is so important to have recorders that objectively track what goes on in vehicles before, during and after a crash as a complement to the subjective input that is taken usually from victims, eye witnesses and police reports. This system is committed mainly to two approaches. The first one is how to detect and record data from the vehicle. The second is how to present the data recorded to the user in a simplified way. To implement the first approach, some major components and different type of sensors were used. While the second approach was implemented using Internet of Things.

According to the World Health Organization, more than a million people in the world die each year because of transportation-related accidents. In order to react to this situation, the black box system draws the first step to solve this problem that crosses national boundaries and threatens the safety and health of people worldwide. Introduced to a part of the United States market in 1999, the black box system proved to be efficient.

The rest of the paper is organized as follows. Section II will provide an overview of the various related works in the area of using deep learning based computer vision techniques for implementing smart devices for the visually impaired. The detail of the methodology used is discussed in section 3. Proposed system design and implementation will be presented in Section 4. Experimental results are presented in Section 5. Future scope is discussed in Section 6. Conclusion is provided at section 7.

2. RELATED WORK

The application of technology to aid the accident prevention and driver safety development. Sensing and indicating abnormal signals in automobiles have been explored for luxurious vehicles only. Many systems rely on heavy, complex, and expensive handheld devices or ambient infrastructure, which limit their portability and feasibility for daily uses. Various electronic devices emerged to replace traditional tools with augmented functions of speed measurement, temperature and vibration measurement, however, the functionality or flexibility of the devices are still very limited. They act as aids for accident prevention. Some of such devices are:

A. Electroencephalogram:
Electroencephalogram (EEG) signals give important information about the vigilance states of a subject. Therefore, this study constructs a real-time EEG-based system for detecting a drowsy driver. The proposed system uses a novel six channels active dry electrode system to acquire EEG non- invasively.

B. Temperature sensing:
This invention generally relates to a temperature sensing device. More particularly, the invention relates to a pre-programmed smart temperature sensor having custom calibration coefficients uniquely characterizing the sensor stored in a memory local to the sensor invented by William C Schuch.

C. Speed sensing:
The present invention relates to an electronic control apparatus for use with an internal combustion engine using a digital computer, and more particularly to an engine speed sensing device wherein crank angle pulses are counted by a counter for a set time interval and the crank angle pulse count is read into a central processing unit of the computer to control, for example, the respective amounts of intake air and fuel supplied, spark timing and so forth.

D.Digitisers:
For touch screens or touch pads, characterized by the transducing means using propagating acoustic waves in which generating transducers and detecting transducers are attached to a single acoustic waves transmission substrate.

E. Clinometer:
The present invention relates to a tilt sensing device and method for its operation, the device being of the type comprising ahousing, a radiation transmitter and a radiation receiver arranged in or at the housing to form a beam path.

3. METHODOLOGY

ACCIDENT PREVENTION uses MPLab IDE(OPENSOURCE COMPUTER SIMULATION).

Computer Simulation Technology has played a vital role in helping simulating the model, people to understand about the electrical components without much dependency on other people. Smart devices are the solution which enables one to know more about the electrical components characteristics. ACCIDENT PREVENTION is an attempt in this direction to build a IoT based smart device which has the ability to extract and recognize temperature, speed and vibration signals captured from the connected sensors and convert it to Digital signals. Detection is achieved using the MPLab IDE software and open source ISIS compiler tools based on PCB circuit simulation techniques. The signals are converted into microcontroller readable and the recognized signals is further processed for the indication using displaying message and Buzzer. The novelty of the implemented solution lies in providing the basic facilities which is cost effective, small-sized and accurate. This solution can be potentially used for accident preventing and monitoring applications. It consists of a PIC 16F877A microcontroller which processes the signals captured by sensors.

The block diagram indicates the process taking place in Accident sensing using IoT.(Fig-1)

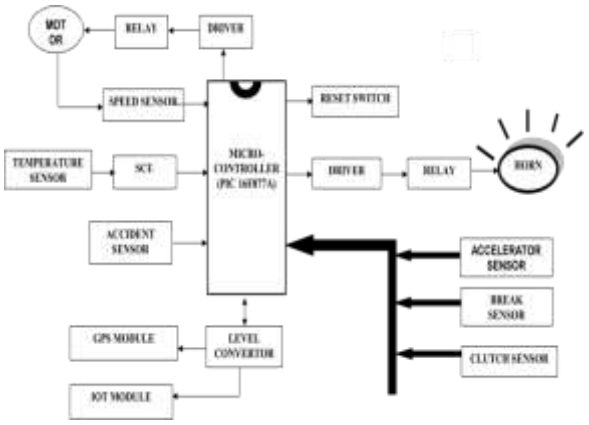


Fig-1: BLOCK DIAGRAM

The components used in Accident sensing device can be classified into hardware and software. They are listed and described below,

A. Hardware Requirements:

1) PIC16F877A: The name PIC initially refers to Programmable Interface Controller. PICs are popular with both industrial developers and hobbyists alike due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost or free development tools, and serial programming and re-programming with flash memory capability.

2) IoT Module:

An IoT module is a small electronic device embedded in objects, machines and things that connect to wireless networks and sends and receives data. Sometimes referred to as a "radio chip" or "IoT chip", the IoT module contains the same technology and data circuits found in mobile phones but without features like a display or keypad. Another key differentiator of IoT modules is that they provide always- on connectivity. This is because IoT applications need to send data automatically, in real-time without someone hitting a send button

3) Temperature Sensor:

The frequently measured environmental quantity is temperature. The temperature affects physical, chemical, electronic, mechanical, and biological systems. Certain chemical effects, biological processes, and even electronic circuits execute best in limited temperature range. The LM35 is commonly used temperature sensor that can be used to measure temperature with an electrical output comparative to the temperature (in °C).

4) Speed sensor:
Infrared radiation (IR) is electromagnetic radiation with a wavelength between 0.7 and 300 micrometers, which equates to a frequency range between approximately 1 and 430 THz. Its wavelength is longer (and the frequency lower) than that of visible light, but the wavelength is shorter (and the frequency higher) than that of terahertz radiation microwaves. Bright sunlight provides an irradiance of about 1 kilowatt per square meter at sea level. Of this energy, 527 watts is infrared light, 445 watts is visible light, and 32 watts is ultraviolet light.

5) Vibration sensor:

This sensor buffers a piezoelectric transducer. As the transducer is displaced from the mechanical neutral axis, bending creates strain within the piezoelectric element and generates voltages. Vibration is the motion of a particle or a device or system of connected devices scattered around the balanced position.

B. Software Requirements:

1) MPLAB IDE Libraries:

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC and dsPIC microcontrollers, and is developed by Microchip Technology. MPLAB X is the latest edition of MPLAB, and is developed on the NetBeans platform. MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB is designed to work with MPLAB- certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontroller using a personal computer.

2) ISIS:

CDS/ISIS is an acronym which stands for Computerised Documentation Service / Integrated Set of Information Systems. In 2003 it was stated that "This package is accepted by libraries in the developing countries as a standard software for information system development".

The original CDS/ISIS ran on an IBM mainframe and was designed in the mid-1970s under Mr Giampaolo Del Bigio for UNESCO's Computerized Documentation System (CDS). It was based on the internal ISIS (Integrated Set of Information Systems) at the International Labor Organization.

4. PROPOSED SYSTEM

Accident sensing using Iot is a device that is designed to prevent the accident and monitoring using computer simulation technology to sense the signals and convert it into microcontroller readable using MPLAB IDE. The overall system can be viewed in three stages. They are,

A. Primary Unit:

1)Sensing:
The first unit is sensing unit. It comprises of temperature, vibration and speed sensor. Whenever the signal abnormality is noticed, the intimation message and buzzering are provided.

2)Signal acquisition:
In this step, the signals are processed and sensed by microcontroller, the quality of the signal processed depends on the sensors used.

B. Processing unit:
It is a technique through which data's are obtained in the form of numbers. It is done using MPLAB and ISIS tools. The libraries which are commonly used for processing and simulation.

This step consists of

1) Code conversion:
The code is converted to machine understandable because MPLAB IDE functions tend to work on the embedded C language includes array objects for representing collection of data's(includes speed, temperature, vibration), matrices, pointers and arithmetic functions. The array concept allows more number of inputs depending upon size of an array and can be used for matrix multiplication, solving equation systems Arrays in embedded C are multi-dimensional and consists of pointers, matrices, arrays etc. After reading data's in arrays, mathematical operations are performed.

2) Supplementary Process:
Buzzer sound is eliminated using reset switch. Sensor signal detection is performed on the PIC 16F877A for better detection of the accidents. In the end, data's are processed and done to check with standard or reference value to allow the IoT module to display the data on connected mobile or PC.

C. Final unit:
The last step is to send the GPS location to mobile numbers which are connected with IoT module. And additionally buzzer sound is continuously provided if accident occurs. The quality of the motor speed depends on the motor used.
ACCIDENT PREVENTION technique implements a sequential flow of algorithms. The flow of the process is

depicted below(Fig-2)

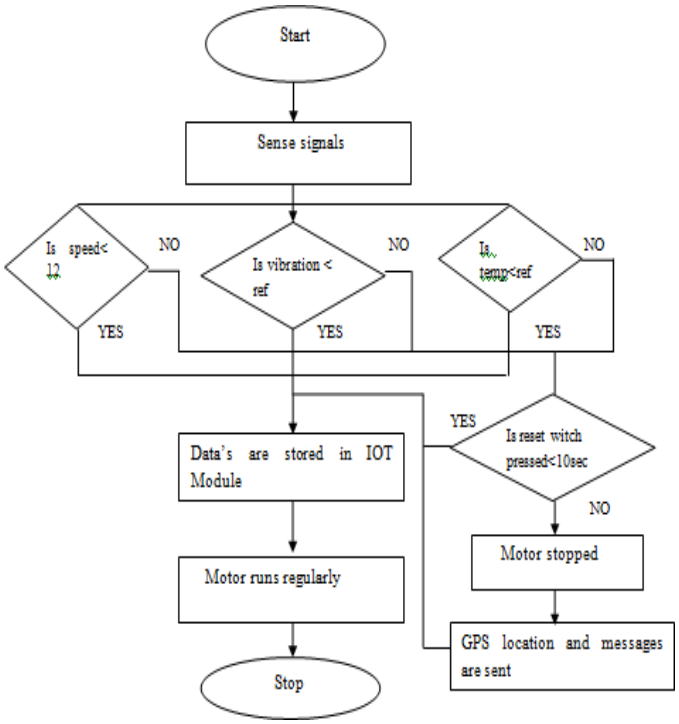
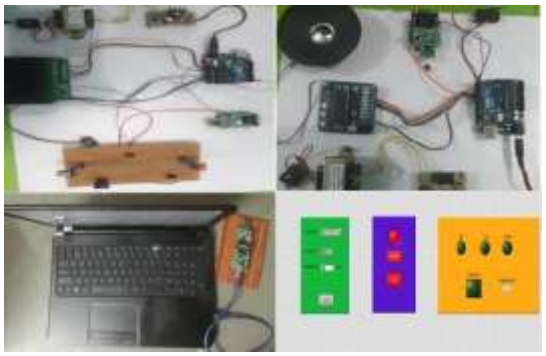


Fig-2: Flowchart

5. EXPERIMENTAL RESULTS

The figure shows the final prototype of ACCIDENT PREVENTION device. It is noted that the hardware circuit (PIC16F877A) is placed on the brown board piece and the sensors are placed on the different places in the board which consists of the rectifier, buzzer, display, relay etc. Though it is not highly comfortable, it is comparatively cost effective and beneficial.



CODE COMPILATION

Code compilation is done through MPLAB IDE which directly converts to microcontroller understandable language and fused into microcontroller through PICKit software.

Fig-3: Code compilation

SIMULATION

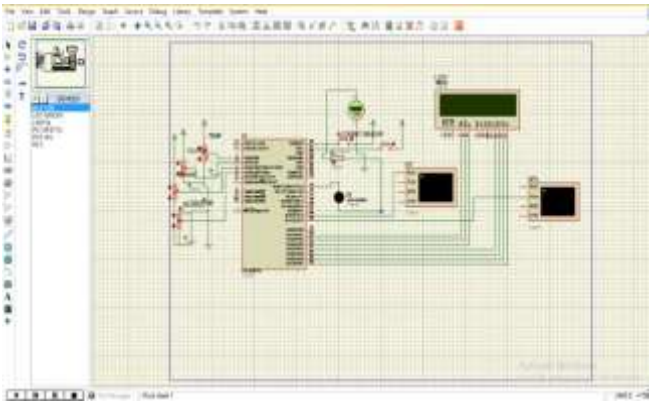


Fig-4: Circuit design

Fig-4 shows starting of simulation and connections made through ISIS PROTEUS circuit design platform which is open source or open platform.

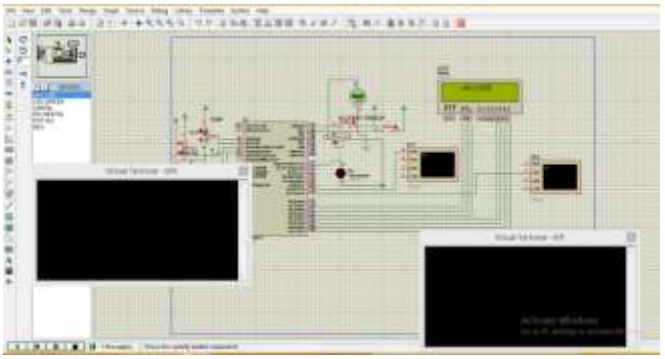


Fig-5: Program run

Fig-5 shows the program runs in ISIS platform of ACCIDENT PREVENTION device which is used to prevent the accident and providing safety to driver.

IoT MONITORING AND DETECTING

Fig-6: Iot data monitoring and detecting

Fig-6 shows Iot data monitoring and detecting using Cayenne platform which is used to detect the data from vibration, speed, temperature and location of the device. If accident occurs data's are collected and sent to connected PC or mobile number.

6. FUTURE SCOPE

However, there are some limitations in the proposed solution which can be addressed in the future implementations. Hence, the following features are recommended to be incorporated in the future versions.

- Time taken for each process can be reduced for a better usage.
- Translation module can be developed, in order to cater to a wide variety of users, as it would be highly beneficial if it were a multi- lingual featured device.
- To improve the direction and warning messages to the user, GPS-based navigation and GSM system can be included.
- Recognizing more amounts of inputs would be helpful for performing more tasks.
- High space accuracy can be provided for vibration sensor to detect signals correctly and eliminate minor problems.
- To provide for more real-time experience, video processing for detecting driver is preferred.

7. CONCLUSION

This paper has presented a new vision for the vehicles industry, which is the Black Box system used for vehicles. A full and detailed description was made for every part of this system. This paper has also offered a user Internet of thing based data of the accident. In addition, the transmission method between the two parts has been introduced and developed. The Black Box system built can be implemented in any vehicle. As soon as the driver runs the motor, this system will begin saving the events of the corresponding vehicle. The last 21 seconds are always saved in the EEPROM of the Black Box, and in case of an accident, an additional 10 seconds of events after this accident will be saved. The data saved can be retrieved only after the accident for privacy purposes. Using serial transmission, a PIC program will read the data from the EEPROM and display it to the user in Graphical format in the cloud server. In addition, a detailed report will be given to the user containing all necessary information.

8. REFERENCES

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