

Black Box for the Industrial Vehicle

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ABSTRACT – Black Box is similar to the black box for air crafts which helps determine the cause of an airplane accident. This Black Box helps determine what has caused a vehicle & the events that to collision by using sensors. It is a storage device which stores real time vehicle's status information. The main advantage is that it will allow analysts to determine whether the cause of incident was a vehicle error, operating error or environmental factor which will help reduce accidents and major injuries caused due to mishandling of vehicle. The main purpose of this paper is to develop prototype of vehicle Black Box system that can be installed into Industrial vehicle. This can be designed with minimum number of circuits. This will help to reduce accident rate, injuries, property loss in workplace.

Key Words: Industrial vehicle, Arduino interface, Black Box, Sensors

1. Introduction

In industry constructional vehicles are widely used for lifting and transporting materials. Every year there is number of accidents leading to bad injuries, deaths or property damage. According to OSHA(Occupational Safety & Health Administration) There are somewhere between 20,000 to 35,000 accidents every year. By being aware of the danger and ensuring proper training, prevention of life can be done. It is always necessary to examine the performance of the vehicle and behavior of the driver who is driving the vehicle. Most of the injuries and damage occurs due to lack of training, improper handling of vehicle by driver. The reasons for accident are not following safety rules, failure to follow safe operating speed ,sometimes due to heavy load vehicles collapse, maintenance related problems all these are the reasons for accident. These accidents can be avoided by following proper training and following safety rules. Black Box is a device used to store sensor parameters which will helps to examine the vehicle performance.

1.1 PROBLEM STATEMENT

A current system does not show the authentication details and the status of vehicle continuously ,which will help to find the actual cause of accident. It is also necessary to off the vehicle in ideal condition and this function is not provided by the current system and there is not an arrangement for mishandling indications. So the proposed system will help to overcome all these issues by providing continuous data in

the form of excel sheet to examine the vehicle performance properly.

- Shows the data continuously and it will be stored permanently in SD card.
- It is possible to check the data anytime.

1.2 Objectives

- Vehicle starts only when Seat is occupied & Seat belt is engaged
- Shows Authentication details.
- Over weight indication.
- Current Status is displayed (ON &OFF Indication).
- Check whether vehicle is OFF in ideal condition.
- Shows temperature indication.
- Gives mishandling alerts.

2. HARDWARE INTERFACES

2.1 Arduino

Arduino is an open source electronic prototyping platform Enabling users to create interactive electronic objects. Arduino platform has become quite popular with People Just starting out with electronics. It does not required separate piece of hardware to load new code onto the board. These board are equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards.

2.2 Force Sensor

It is an Electromechanical device which is used to measure the acceleration force. It shows acceleration, only due to cause of gravity and measures acceleration in g unit. This Accelerometer is also used for dynamic acceleration resulting from motion, vibration.

2.3 Level Sensor

This sensor is the one which determines the level of fluids or other substances which flows in open or closed system. Sensor includes transmitter, receiver and control circuit. This is connected usually to the output side for transmitting the results to the monitoring system.

2.4 Temperature Sensor

The LM35 series is known as a precision integrated-circuit temperature sensor, it produces an output voltage which is linearly proportional to the Celsius (Centigrade) temperature. It can measure the temperature ranging from -55 to 155 Celsius.

2.5 SD Card Module

Micro SD card is used for transferring data. Controller creates a file in an SD card to write & save data using SD card Library. SD card module is compatible with controller and also can be used with other microcontrollers which allows the mass storage & data logging

2.6 Limit Switch

Limit switch is an electromechanical device with an actuator mechanically linked to a set of contacts. When an object and actuator comes into contact with each other, then this device can be used to make or break an electrical connection.

2.7 RTC

RTC Module is simply time & data system. It has battery setup in absence of external power which keeps the module running. RTC modules are mainly used in data loggers to know the date and time. It keeps the time & date Up to date.

2.8 Buzzer

Buzzer is audio signaling device. When power is applied, mechanical device will energize and by doing so interrupt the power source & cycle continues until the power is removed.

3 SOFTWARE INTERFACES

3.1 Arduino IDE

The Arduino Integrated Development Environment (IDE) Contains text editor for writing code, message area text console, a toolbar with buttons for common functions. It is open source electronics platform to use hardware and Software easily. Supports the languages C & C++ using special rules of code. Arduino boards are able to read inputs -light on a sensor, finger on a button and turn it into an output activating a motor, turning on an LED.

4. PROPOSED SYSTEM DESIGN

The box is hidden from the driver therefore known as Black Box. This is situated behind the control panel of the vehicle. This Box is an electronic memory device used to store sensor parameter as input and data is permanently stored as a output in EPROM memory device. Ignition of vehicle starts

only when seat is occupied and seat belt is engaged. This is the first requirement to run the vehicle. When vehicle user press accelerator and presses the brake for long time, an alert of mishandling will be displayed in data sheet.

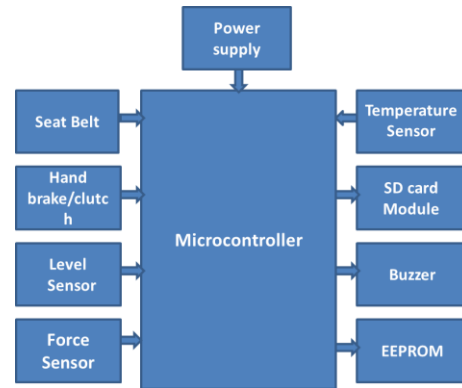


Fig-1: Block diagram of proposed system

Above block diagram shows different sensors as input to the microcontroller. If hand brake is pressed for long period then it will give alert in display. These is the case of mishandling. When vehicle is in state to lift the load the pallet blade must be in 90 degree. It must not slide to one side for this force sensor is used. Temperature is continuously displayed after certain period. This data is stored in EEPROM memory.

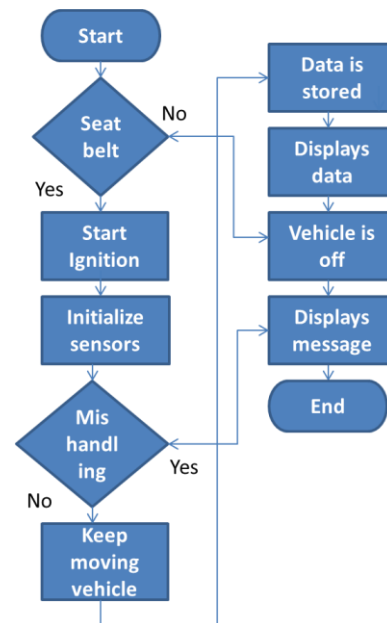


Fig-2: Flow chart for the system



Fig -3: Prototype of Black Box system

5. RESULTS

This system displayed the real time values of different sensors and the authentication details. We can see data in excel sheet. EPROM stores its values in SD card. So we can examine vehicle properly. Using this we can easily analyze the parameters and status of the vehicle. In this way the status of the vehicle and behavior of driver will be examined.



Fig -4: Result in Excel Sheet

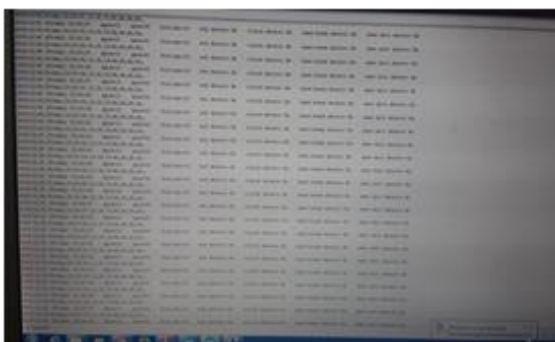


Fig- 5: Result

6. CONCLUSION

This paper has presented new idea for industrial vehicles which is the Black Box for industrial vehicle. This system would serve as an effective source of information at the event of an accident. This system consist of different sensors & each sensor was tested and found to give desired output. These outputs were communicated to microcontroller. The

important feature is that it starts the ignition only if safety rules are followed, otherwise vehicle could not start as it is a pre accident detection factor. In this way the data received from input sources are stored on the SD card successfully and able to retrieve when required.

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REFERENCES

- [1] Thomas K. Kowalick , "Black Boxes: Event Data Recorder Rulemaking for Automobiles",MICAH,SUMMER 2006for Automobiles", MICAH, summer 2006.
- [2] Thomas K. Kowalick, "Fatal Exit: The Automotive Black Box Debate",Wiley ,IEEE Press,feb.2005.
- [3] <http://www.airbagcrash.com> (General Motor Event Data Recorders)
- [4] J.Lawrence and T.Newbery, "Crash Data Recorders in Motor Vehicles",MacInnis Engineering , Associates,2003.
- [5] Yogesha K. R,Mrs Shwetha Mk," Design & implementation of car black box for evidence collision system to avoid the collision" Volume 2,issue 06, june2016
- [6] Hong hong Wang and Shuhua Xu, "An Automatic Supervisory Control System Based Real-Time Technology and GSM or GPRS Network
- [7] Abdallah kassem,Rabih jabr,Ghady salamouni, Ziad khairallah Maalouf, " Vehicle Black Box System", 2 nd Annual IEEE System Conference, IEEE 2008,pp.1-6.

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