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Black box for trucks using labview

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Abstract

In our nation, the amount of traffic is growing daily. In many regions, individuals are not responding well to traffic regulations. Careless and too fast driving are the main causes of accidents. Particularly in the school and college zones, many are reluctant to slow down to the absolute minimum. This embedded project is designed to alert the driver of an excessive speed and provide control over the vehicle. Wireless communication is used in the construction of this. We are use a microcontroller called MyRio. In order to monitor the temperature of the tires, we have an interfaced temperature sensor that can detect high temperatures and sound an alarm to notify the driver. The GPS-based accident information system will notify the vehicle's owner, a relative, or a neighboring hospital of the accident's location. The driver can press the reset switch and resume driving if the collision is mild. The pressure sensor checks the tire's proper air pressure and alerts the driver if it isn't. The brake failure sensor indicates whether the brake wire is connected correctly. The positions of the brake clutch and accelerator are indicated, respectively, by the steering position sensor and the accelerator.

Keywords: Myrio, Black box, Truck, GPS, Labview.

1. Introduction

The main objective of the paper is to develop a prototype black box system for the truck BBS-Truck that can be installed in trucks worldwide. This prototype can be designed with as few circuits as possible. This can assist in improving road conditions, helping insurance companies with their truck crash investigations, helping to construct safer cars, and improving the care given to collision victims in order to reduce the death rate.

Over a million individuals worldwide lose their lives in transportation-related incidents every year, according to the World Health Organization. In response to this condition, the black box system takes the first step in resolving the problem, which crosses national boundaries and jeopardizes everyone's health and safety.

When black box technology was first made available to a portion of the US market in 1999, it took off. However, in the latter case, the technology was integrated inside the vehicle. Thus, this paper's primary objective is to create a black box system that can be installed in trucks anywhere in the world. It also aims to build safer cars, help insurance companies with their vehicle accident investigations, and improve the care provided to crash victims and the condition of the roads to lower the death rate. Similar to flight data recorders in aircraft, "black box" technology is becoming increasingly significant in the investigation of truck crashes.

These days, a sizable fraction of cars on the road are outfitted with technological gadgets that record information in the event of an accident. Because they serve as a supplement to the subjective information frequently obtained from victims, eyewitnesses, and police reports, recorders that objectively capture events within the car before to, during, and after a crash are essential. Many police cases are still pending since it is unclear what caused most traffic accidents. To avoid these problems, a black box is made to examine the truck's state at the moment of a collision.

A black box is a computerized electronic device that records and keeps track of vehicle data, including truck speed in real time. It facilitates the process of determining the origin of an accident, assessing its severity, and resolving a range of auto-related concerns, such as insurance claims and collision litigation. Automakers, the government, and hospitals can use it to improve car and roadway designs as well as emergency medical services. Insurance agents and police can use it to reconstruct what transpired before an accident. An integrated system is required in order to address every one of the aforementioned problems.

2. Existing System

There are no specialized cars in the current system. Additionally, the systems created, such as MVEDR (Motor Vehicle Event Device Recorder), primarily focus on four-wheelers. which reconstructs the pre-collision events by recording the events prior to the collision. The vehicle's black box records critical activities such as braking, acceleration, and speed before to a collision.

3. Need for this Project

Real-time monitoring, straightforward control of several variables, and quick fault detection and repair are critical in today's market. The system will ease the process of investigation after the accident. Also, prevent from the accident by the rapid analysis.

4. Proposed System

This project establishes the truck monitoring and control using the Myrio controller, LabVIEW software, and GPS module. This technique seeks to accomplish efficient monitoring and controlling by making an effort to analysing the different parameters in the system.

5. Methodology

The device analyses the truck temperature, pressure among other vehicle data, and stores the results in a brief memory for later analysis. The primary goal of our suggested design is to provide an efficient and reasonably priced vehicle analysis system. A small, reasonably priced, and real-time monitoring black box is designed for our suggested solution. Our designed black box makes use of a controller called MYRIO, to which an accident sensor is interfaced to determine whether an incident occurred or not. Accident sensors detect when an accident occurs and sound an alarm to notify the public. As a result, prompt assistance can be provided, saving lives. Using a GPS module, the accident information system will notify a local hospital or a relative of the car owner about the accident's location. In the event that the accident is minimal, the driver can drive normally by pressing the reset switch, which stops erroneous information from being delivered. The primary cause of accidents is inadequate maintenance for vehicles. Using sensors, our system assesses the vehicle's condition and notifies the driver of any abnormalities. The temperature sensor is used to measure the tire's temperature, and the brake failure sensor will tell whether or not the brake wire is connected correctly. The temperature sensor will also verify that the tire has the necessary air pressure. The position of the accelerator and brake clutch is indicated by the accelerator and brake clutch sensors, respectively.

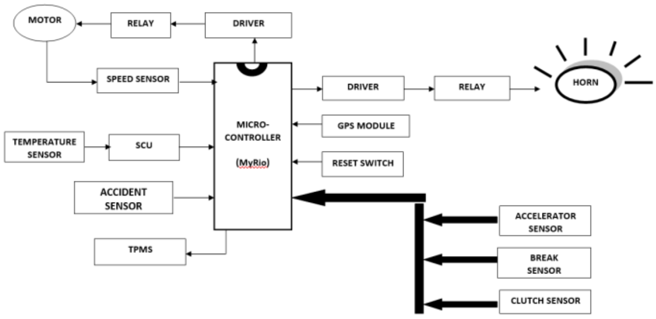

Figure.1. Block Diagram of the system

6. Hardware Description

6.1. Speed Sensor

The basis for the operation of an IR (Infrared) sensor is the idea that every item that is heated above absolute zero releases heat energy in the form of infrared radiation. Once these radiations are detected, these sensors transform them into a form that can be measured or understood. An IR LED (Light Emitting Diode) serves as the emitter in the infrared sensor. The IR LED produces infrared light when it is energized. The infrared photodiode is the detector's component. It is responsive to infrared light at the same wavelength as the infrared LED emits. The photodiode's resistances and output voltages alter in direct proportion to the amount of infrared light it receives. The beam of infrared light that is released is pointed at the moving item (like a car). The object reflects the infrared light back towards the sensor when it collides with it. The amount of reflected light is measured by the infrared detector. The speed of the moving object is represented by the intensity of the reflected infrared light. Based on the amount of time it takes for the reflected light to return, the sensor determines the object's speed by examining variations in the photodiode's output voltage.

6.2. Tire Pressure Measurement

Tire Pressure Monitoring System is referred to as TPMS. With the help of cutting-edge technology, the air pressure inside pneumatic tires on a variety of vehicles, including trucks, can be continuously monitored. The main goal of TPMS is to warn drivers of potential tire failures and monitor tire pressures. TPMS sensors for trucks usually use internal sensors to measure tire pressure directly, or they use data on wheel speed and rotation to estimate tire pressure indirectly.

6.3. Accelerator, Brake, Clutch Sensors

These sensors are used to find the data of acceleration, brake and clutch after the accident. These will be turned on only after the accident. This helps to analyse the difficulties in a short period of time using the restored data.

6.4. DC motor

DC motors are a subset of electric motors that run on DC electricity. These gadgets convert mechanical energy from electrical energy. The fundamental idea of DC motors is the same as that of electric motors in general: spin is produced by the magnetic interaction between the rotor and stator.

6.5. Horn (Buzzer)

A buzzer, sometimes known as a beeper, is an electrical signaling device that is commonly seen in cars, home appliances like microwaves, and competitions. It typically consists of several switches or sensors that are connected to a control unit that detects whether a button was pressed and which button it was, as well as whether a predetermined amount of time has passed. It then typically turns on a light at the relevant button or control panel and emits a warning sound, which can be either continuous or sporadic, in the form of a beeping or buzzing sound.

6.6. Global Positioning System (GPS)

The worldwide Positioning System (GPS) is a satellite-based worldwide navigation system that is based in space and gives accurate position and time data whenever and wherever there is an unhindered line of sight to four or more GPS satellites, regardless of the weather. Anyone with a GPS receiver can freely access it, and it is maintained by the US government. Other systems are being developed or are in use in addition to GPS. The Russian military uses the GLONASS (Russian Geodetic Navigation Satellite System).

Additionally, there is the European Union's (EU) Galileo positioning system and the projected Chinese Compass navigation system. The U.S. Department of Defense (DOD) developed and implemented GPS, which was initially operated by 24 satellites. It was created in 1973 to get around the drawbacks of earlier navigational systems.

6.7. Temperature Sensor (LM35)

With an electrical output proportionate to the temperature (measured in degrees Celsius), the LM35 integrated circuit sensor is a useful tool for temperature measurement. Compared to thermocouples, the LM35 produces a larger output voltage, hence the output voltage may not need to be amplified.

6.8. Microcontroller

National Instruments (NI) created the embedded hardware device known as myRIO, which stands for my Reconfigurable I/O. It offers an adaptable framework for instruction, research, and practical system design. Here are some important myRIO details:

6.9. Goal and Characteristics

- Educational Tool: myRIO was created with teachers and students in mind.
- Embedded Solution: For learning controls, mechatronics, and capstone projects, it provides an embedded, WiFi-enabled solution.
- Reconfigurable I/O: With the help of myRIO's reconfigurable I/O, students can use a single device to investigate a variety of engineering concepts.
- Analog and Digital Interfaces: It is appropriate for high-speed control applications since it has both analog and digital interfaces.

6.10. Specifications for Hardware

- Processor: Real-time operating system (OS)-based dual-core ARM Cortex-A9 processor.
- FPGA: 28,000 programmable logic cells in a customizable FPGA. Six analog outputs and ten analog inputs make up analog I/O.
- Digital I/O: Digital input/output (DIO) with up to 40 lines.
- Extra Features: WiFi, LEDs, a push button, integrated accelerometer, audio I/O channels, and more.

7. Software Description

7.1. LABVIEW

With the graphical programming language LabVIEW, programs may be created with icons rather than text lines. LabVIEW employs data flow programming as opposed to text-based programming languages, where instructions dictate the sequence of execution. Block diagrams that belong to a VI contain code and functions, and the data flow that travels through nodes establishes the order in which the operations are performed. To put it another way, a node will execute after receiving all of its inputs and generate output data that is then sent to the following node along the data flow path.

The block diagram that houses the source code makes up the VI (Virtual Instrument) that LabVIEW creates. However, it also has a GUI called a front panel that allows you to add controls, indicators, buttons, graphs, and other elements by choosing them from a drop-down menu. Because of this, creating interactive and beneficial applications is really simple.

8. Results

This system's GPS module will be useful in locating the accident site and facilitating prompt rescue efforts. The current system can be improved to examine more data such as the vehicle's brake clutch position, accelerator and tire pressure. It is possible to read and save many more important parameters in the memory. In the case of an accident, the proposed system would provide a useful source of information. Car black boxes supply the information needed to create accident reports and details the reasons of accidents when they happen for whatever reason. This document provides an easy-to-use application for analysing accident data. Any car can use this black box technology that has been developed. This system starts gathering data from all of the sensors as soon as the driver turns on the motors. The data and time are then stored in memory.

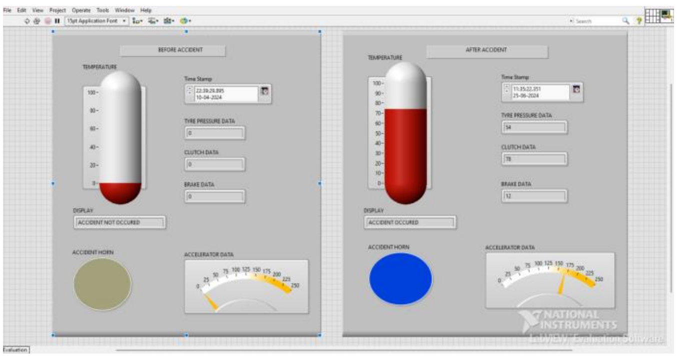

Figure. 2. Output of the system (LABVIEW)

9. Conclusion

A prototype of the Black Box Analysis System for Vehicles was designed and implemented successfully. The designed system comprises of GPS, accelerator sensor, brake sensor, clutch sensor, speed sensor, TPMS and motor drive which were placed in and around the prototype model. Each of the sensors was tested and found to give desired output. These outputs were communicated to the MyRio controller. The controller communicate with each other and regulate the sensors successfully. The data retrieved from the sensors are stored successfully and can be fully retrieved when required. The system also incorporates an emergency help module which automatically alerts the relatives about the accident with the location.

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