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Vehicle Overload Detection System Using Pic Microcontroller

Sini S L¹, Thenmozhy P², Abisha Jey J B³

¹Student, ME Applied Electronics, Narayanaguru College of Engineering

²Assistant Professor, Narayanaguru College of Engineering

³Assistant Professor, Narayanaguru College of Engineering

ABSTRACT

Most of the road accidents in the present era are due to overloading the vehicles. Highways are where most accidents occur due to vehicle overloading. Most of the overloaded vehicles are truck/lorries and other vehicles are buses, car and bikes. Overloaded vehicles also damage to the road. Overloaded buses can cause passengers a variety of injuries in a crash, such as broken bones, herniated disc, organ damage etc. Nowadays there are very few systems to detect vehicle overloading in real time. The main purpose of this project realizes real-time detection of vehicle load.

Keywords: Vehicle Overload Detection, Magnetic Reed Sensor, Distance Measurement

1 Introduction

This project detects real time overload of the vehicle and send a message to the handheld device. Vehicle overload causes many accidents and injuries on the road. The Times of India reported on 22 Feb 2019 “over 60,000 killed by overloading vehicles in 3 years”. This project prevents the overloading of the vehicle. This project based on the vehicle load causes the distance change between the axle and the frame. The main advantage of this project is low cost.

2 Literature Survey

The main aim of this project is to detect the vehicle overloading and reduce the accidents and injuries on the road. Few literatures are available on the aspect of controlling of overloading vehicle. Researchers suggested changing axle load pattern. Two axle vehicles are responsible for maximum damage of the road in India. Many researchers suggested that convert two-axle vehicles into three-axle/four-axle vehicles so that heavy loads to be distributed and reduce damaging effects.

3 Proposed System

It includes,

- Overload protection system
- Driver monitoring system

In this system, the components present are PIC microcontroller, sensor, LCD display and GPS Module. The vehicle load causes a change in the distance between the axle and the



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frame, which is the distance between the magnetic reed sensor and the permanent magnet.

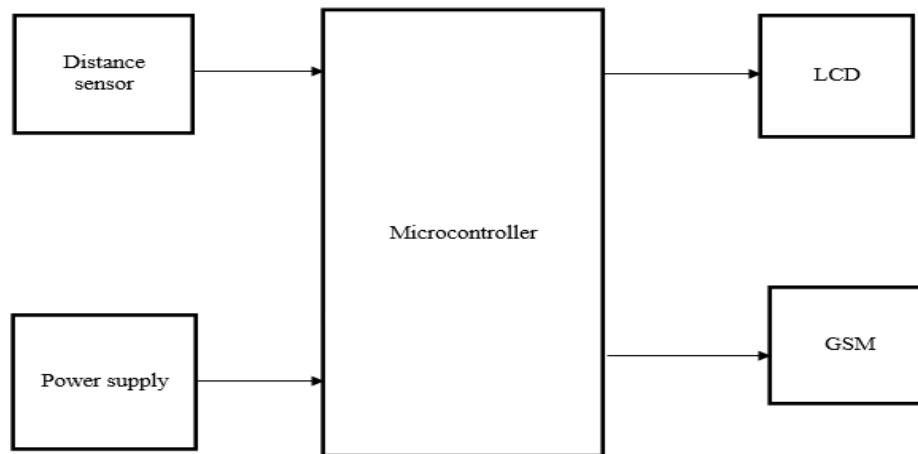


Figure 1: Block Diagram

3.1 Working

Figure shows the block diagram of proposed system. It included a PIC microcontroller, LCD display and GPS module. Vehicle load detection system based on magnetic reed sensor and a permanent magnet, which do not change the structure of the vehicle and can realize real-time detection of vehicle load. Vehicle load causes the distance change between the axle and the frame. In order to detect vehicle load, the system uses magnetic reed sensor to detect the distance change. And the system sends vehicle load information to the driver's hand held device

3.2 Microcontroller

The microcontroller PIC16f877A is the most famous microcontrollers in the industry. It is convenient to use and coding or programming is easier. It can be write-erase because it use FLASH memory technology.

It has total 40 pins and 33 pins for input and output. This microcontroller has application in digital electronics circuits. Self programming, 256 bytes of EEPROM data memory. So EEPROM makes possible to store information permanently.

Features

1. It has smaller 35 instructions set.
2. Operating voltage between 4.2v to 5.5v.
3. Operate upto 20MHz frequency.
4. It doesn't have internal oscillators like PIC18F4550 etc.
5. Available in four IC packaging are 40-pinPDIP, 44-pinPLCC, 44-pinTQFP, 44-pinTQFN.



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3.3 Magnetic Reed sensor

The reed switch is an electrical switch operated by an applied magnetic field. It was invented at Bell Telephone Laboratories in 1936 by Walter B. Ellwood. In its simple stand most common form, it consists of a pair of ferromagnetic flexible metal contacts in a hermetically sealed glass envelope. The contacts are usually normally open, closing when a magnetic field is present, or they may be normally closed and open when a magnetic field is applied. The switch may be actuated by an electromagnetic coil, making a reed relay, or by bringing a permanent magnet near it. When the magnetic field is removed, the contacts in the reed switch return to their original position.

The reed is the metal part inside the reed switch envelope that is relatively thin and wide to make it flexible. It somewhat resembles part of some reed plants. The term "reed" may also include the external wire lead as well as the internal part.

A magnetic field from an electromagnet or a permanent magnet will cause the reeds to attract each other, thus completing an electrical circuit. The spring force of the reeds causes them to separate, and open the circuit, when the magnetic field ceases. Another configuration contains a non-ferromagnetic normally-closed contact that opens when the ferromagnetic normally-open contact closes. A thin layer of non-ferromagnetic material is applied to the reed switch contact area to serve as an electrical contact switching (wear) surface and, for normally-open contacts, as a magnetic spacer whose thickness is important in controlling the magnetic field level at which the contact opens (the drop-out). One important quality of the switch is its sensitivity, the amount of magnetic field necessary to actuate it. Sensitivity is measured in units of ampere-turns (AT), corresponding to the current in a test coil multiplied by the number of turns in the test coil. Typical pull-insensitivities for commercial devices are in the 10 to 60 AT range. The lower the AT, the more sensitive the reed switches. Smaller reed switches, which have smaller parts, are generally more sensitive to magnetic fields.



Figure 2: Sensor

3.4 GSM/GPRS Module

SIM800 is a complete Quad-band GSM/GPRS solution in a SMT type which can be embedded in the customer applications. SIM800 support Quad-band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. With tiny size of 24*24*3mm, it can fit into slim and compact demands of customer design. Featuring Bluetooth and Embedded AT, it allows total cost savings and fast time-to-market or customer



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applications.

Key Features

- AT command interface
- Quad-band and Dual-band variants*
- Make and receive voice calls
- Send and receive SMS messages
- Send and receive GPRS data (TCP/IP, HTTP, etc.)
- Bluetooth:compliantwith3.0+EDR*
- USB Connect or for Firmware Updating*
- Configurable Baud rate(9600-115200,factorydefaultvalue:9600)
- Connectors f or external speaker and mic.
- Selectable inter face between hardware serial port and software serial port
- In built Powerful TCP/IP protocol stack for Internet data transfer over GPRS.
- Level shifting circuitry to make it Arduino-safe
- SMA Connector with external antenna
- Indicator LEDs or Power and connectivity
- Standard Flap type SMA Socket
- ESD Protection over TVS Zener array
- Separate Reset switches for both Arduino and the shield
- Slide switch to swap the shield between Arduino and PC
- Provision to select between hardware and software serialports

3.5 16x2 LCD Display

LCD means liquid crystal display; it is used as a display device. Commonly used LCD display is 16x2 LCD. The main advantages are it is easily programmable and economical.16x2 represent it can display16 character per line and there are two such lines i.e., it has 16 columns and 2 rows. It will have total 32 characters. These modules are used commonly over seven segment and other multi segmented LCDs. These LEDs have two registers, command and data register. Command register store the command given to the LCD. Command is like an instruction given to the LCD. The functions of these register are initializing the LCD, clear screen, cursor position setting, controlling the display etc. Data register is used to store the data to be displayed on the LCD. The data is the ASCII code of the character displayed on the display.

3.6 Advantage

- Low cost
- Does not change the vehicle structure



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- Portable

4 Conclusion

Vehicle overload detection system based on magnetic reed sensor and permanent magnet is designed. The system can obtain the load information by measuring the distance between the axle and the frame. Through experiments, the system can detect the load of vehicles in real time. When the vehicle is overloaded, the system can send vehicle overload message information to the hand held device.

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