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Vehicle Safety Using Load Detector and Gas Sensor for Determining the Amount of Pollutant

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I. ABSTRACT

***Abstract*—In order to reduce accidents increasing day by day especially due to heavy loaded vehicles we have come up with the idea which involves Real-time monitoring of load and take the necessary actions as explained in paper further. Apart from this the project also involves monitoring of the amount of CO emitted from the exhaust, which provides an indication about the servicing of vehicle therefore making an attempt to reduce the air pollution. This project laid the foundation for the in-vehicle load and CO monitoring system for heavy vehicles.**

***Keywords*- Overloading, CO Emission.**

II. INTRODUCTION

As we know that overloading is one of the major issues which are resulting in vehicle accidents. In order to reduce these accidents we have come up with above idea which can be implemented by fixing an automatic load sensor in the vehicle itself. This load sensor is interfaced with the Arduino kit along with gas sensor and CLCD. Here the weight loaded in the vehicles is detected by the load sensor. According to the prescribed weight for vehicles corresponding messages are displayed on the CLCD whether the loaded weight is normal or it is overloaded. The next sensor i.e. Gas sensor is used to determine the amount of pollutant (Carbon Monoxide) coming out thought the exhaust pipe of the vehicle, then according to the prescribed limit a message is displayed and through this the person can easily understand the condition of the engines.

III. METHODOLOGY

As we have described our idea, so now the technical details about the idea are described in details as given below. The mastermind which controls the whole working of the project is Arduino Mega 2560. Arduino Mega 2560 is the microcontroller which we have used in our project which provides good amount of memory space for our program code and decent digital and analog pins.

The load sensor which we have used here is rode type that has the range to measure 0 to 10kg of weight loaded on it. This load sensor is given to the analog input pin of the Arduino. The Arduino obtains the analog signals once the load is loaded on load cell and compares it to a reference value, now here we have considered the reference value is the prescribed limit for the vehicle above this prescribed limits if the loaded weight exceeds then an message is sent as vehicle overloaded on CLCD screen.

If the above case happens and still the owner of the vehicle neglects it and continues to drive, then a simply a traffic police who notices that the vehicle is overloaded can stop the vehicle and put him fine. This provides strict law enforcement for overloading of vehicle.

The second sensor is the Carbon Monoxide sensor MQ-7 this sensor we have used to sense the amount of the carbon monoxide coming out from the exhaust pipe of the vehicle. The carbon monoxide is the harmful gas and it has to be controlled in order to avoid harmful diseases and environmental pollution. Every vehicle in the market comes with prescribed limits for the amount of exhaust air which it can give out such as Bharat 1,2,3,4. So in our project we have considered our own reference limit above which

if the carbon monoxide air comes out from the exhaust pipe then the message will be displayed on the CLCD screen as your vehicle requires a servicing as carbon monoxide prescribed limit violated.

Even in this case if the owner or the driver of the vehicle neglects it then simply the traffic police can stop and check the CLCD screen whether it has not violated the prescribed limits for air emission.

IV. BLOCK DIAGRAM

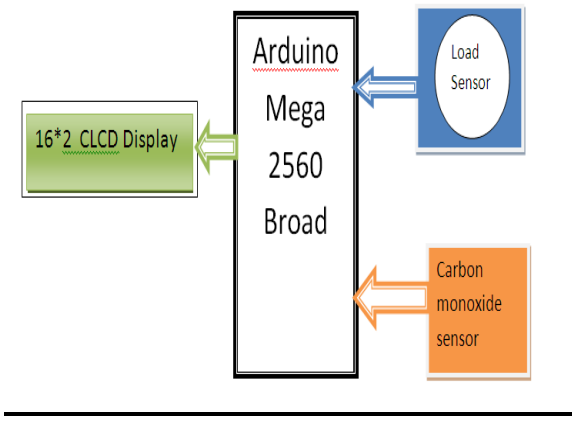

Fig. 1. Basic Block Diagram

Arduino Board has in built power supply and all other sensors and CLCD display power supply is provided from the board.

V. COMPONENTS

A. Arduino Mega 2560

Fig. 2. Arduino Mega 2560

Arduino Mega 2560 is based on Atmega 2560 microcontroller board. It comes with 16 analog inputs, 54 digital input/output pins (of which 15 can be used as PWM outputs), a 16 MHz crystal oscillator, 16 analog inputs, 4 UARTs (hardware serial ports), a USB connection, a power jack and a reset button.

TABLE I

Technical specifications

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	54 (of which 15 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by boot loader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz
Length	101.52 mm
Width	53.3 mm
Weight	37 g

B. Load Sensor

A load cell is a type of sensor that acts as transducer that converts a load or force acting on it into an electronic signal. This electronic signal may be the form of voltage change, current change or frequency change depending on the type of load cell and circuitry used.

Fig. 3. Load sensor.

Resistive load cell works based on the principle of piezo-resistivity. When we apply load/force/stress is on the load sensor, it changes its resistance. This change in resistance leads to a change in output voltage.
Here we have used a rode type or Single Point Load Cells which can be in found in the range 3 kg, 5 kg, 10 kg, 20 kg, 50 kg, 150 kg but for our project we have used a rode sensor of the range 10 kg.

C. Carbon Monoxide Sensor MQ-7

Fig. 4. Carbon Monoxide Sensor MQ-7

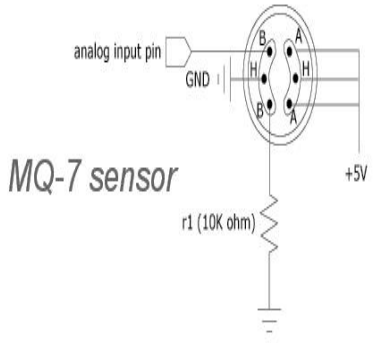

Fig. 5. Pin connections for MQ-7

Carbon Monoxide (CO) sensor is meant for sensing CO concentrations in the air. The MQ-7 can sense CO gas concentrations anywhere from 20 to 2000ppm.

This sensor has a high sensitivity to CO gas and fast response time. The sensor's output is an analog signal given to Arduino Board.

The first figure shows the MQ-7 carbon monoxide sensor and the 2nd figure shows the pin connections when interfaced to Arduino board. To sense the carbon monoxide in the environment the MQ-7 analog pin is connected to analog pin of the Arduino Mega.

D. CLCD Display

Fig. 6. Character Liquid Crystal Display

CLCD plays an important role to establish a good communication between human world and the device. And so they are an important part of embedded systems. The 16x2 will have 32 characters in total 16 in 1st line and another 16 in 2nd line on CLCD screen.

VI. Advantages

Overloading of the vehicles can be monitored easily. Periodic maintenance of vehicle leads to less pollution. Easy law enforcement when overloaded. The greatest advantage in this project is that it will avoid the risk of accident through the load sensor and even tells whether the vehicle needs to get serviced periodically.

VII. Additional features to add-on

Above idea will lead to more successful impact on addition of the GSM technology to it. Through the use of GSM if above situation occurs such as overloading or CO limit is violated then GSM will directly inform the traffic control room about its location and traffic police can easily take action on that vehicle.

VIII. Conclusion

As overloading is critical issue which sometimes results in causing accidents. Through above idea overloading of the vehicle can be detected and strict action can be taken on them. By the use of CO sensor air pollution can be controlled. Hence this project laid the foundation for the in-vehicle load and CO monitoring system for vehicles.

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