AUGMENTATION OF SAFETY IN COMMERCIAL VEHICLES BY COUNTERING OVERLOADING PROBLEMS

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Abstract: Every year there is an increase in the growth of the population in India drastically, which leads to increase in usage of road transportations. The main aim of the project is to ensure the safety of the vehicle and reliable road transportation. The problem which is addressed in this paper is related to overloading in vehicles that is, the Vehicles is Overloaded in order to make profit by the owners. As per law overloading is illegal. So, to avoid overloading on vehicle an experimental setup was done which helps to identify the overloading in vehicles. The experimental setup consists of a model (like leaf spring), accelerometer sensor, microcontroller, alarm buzzer. The overloaded vehicle will be countered by the system equipped in the vehicle which gives warning to the driver and the initial motion of the vehicle will be arrested to enhance the safety of the vehicle.

IndexTerms - **Leaf spring, Accelerometer sensor, Microcontroller, Vehicle overloading counter.**

I. INTRODUCTION

Overloading is the key problem is addressed in this paper, so the main objective is to counter the overloading by installing a model in all the vehicle all over India. In vehicles leaf spring is the most commonly used suspension system. The purpose of leaf spring is to distribute the load throughout the chassis and shaft. In the leaf spring, if the vehicle get loaded there will be gradual deflection in it with respect to the load. So the accelerometer sensor in placed in the leaf spring, it detects the motion in x,y,z coordinates. Thus the output of the sensor will be connected to the microcontroller. Based on the output of the sensor the alarm will be activated and also arrest the initial motion of the vehicle.

Figure1.1 Overloading Vehicle

II. STATISTICS

As per the statistics here India,one in every three trucks in the country is Overloaded and they had to blame for 50% of road accidents. The statistics is taken from the source of Ministry of Road Transport and Highways from the year 2011-2014.From the statistics in the year between 2011-2012 10.12% of death rates has been reduced. Similarly, in the consecutive years the death rate reduces to 15.18 % in 2012-2013 and 20.24% in 2013-2014.
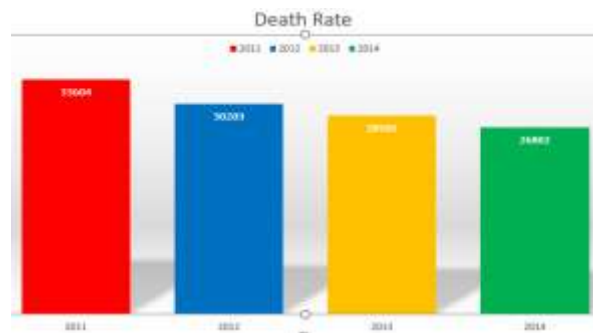
The death rates where gradually decreases in the year by year, but still a successful engineer work is to reduce completely the death rates due to overloading.

III. LITERATURE SURVEY

[1] Ms. Renju K Ms. Perpetua F Noronha, A Survey on Detecting Overloaded Vehicle in Video Surveillance Systems,In this paper they used Surveillance camera to identify the overloaded vehicles. They used one for identify in the front and back view of the vehicle and another one for side view of the vehicle, From this side view camera the tire pressure of the vehicle can be identified.Also they created algorithm for tire pressure with respect to the overloaded vehicle. If any overloaded vehicle is detected automatically the information passes to the nearby police station using this algorithm. In this paper they also mentioned the disadvantages, in some vehicles the front and back portion are same and also if two vehicle parallely moving in the road the camera cannot able to capture the side view of one of the vehicle, in such condition the system is difficult in finding the overloaded vehicles.

[2] ShanzhenXUa, Qian ZHAOa a*, Study on Vehicle-mounted Overloading Control System for
Passenger Vehicles,In this paper the authors designed the Microprocessor to identify the overloading and stops the motion of the bus. They used Infrared sensors in the door of the bus to and calculate number of passengers onboarding and off boarding in the bus. They programmed the average weight for a person. From that the Microprocessor calculate the overall weight of the passengers and If more number of passengers onboarding into the bus, then the motion of the bus automatically stopped.

[3] Rupal Shah, Yogesh Sharma, Binil Mathew, Vijay Kateshiya and JatinParmar, Review Paper on Overloading Effect, in this paper the authors mention causes of overloading and the effect on the environment because of overloaded vehicle. And they have designed a shock absorber for two wheelers by using 3D parametric software. They reducing the diameter and they performed stress analysis. They had analysis the model and it has less weight and its safe to use.

[4] Siquan Hu, Min Kong, and Chundong She, Design of vehicle overload detection system based on geophone, In this paper the authors create a new method to find overloaded vehicles. They identify overloaded vehicles based on geophone sensor and SVM algorithm. This system worked based on the vibration signals which was created by the vehicles. This system is very small in size and adapt any environmental conditions. This system has high reliability in practical applications.

[5] Raj Reddy, Analysis of Overloading Prevention System in Trucks, in this paper the author design an experimental model which is used to avoid overloaded vehicles. They are providing micro switch below the material which is held below the spring on chassis. If the weight exceeds the limits then the alarm is activated inside the vehicle. If the vehicle moves with the heavy load, then the information passes to nearby police station.

III METHODOLOGY

Step 1: The flow of the project is that the problem due to overloading on vehicle was identified.
Step 2: Literature survey related to overloading on vehicles and accidents due to overloading was taken and studied.
Step 3: From the study, it is known that the load on the vehicle will first act on the chassis and it will be uniformly distributing in the leaf spring.
Step 4: Weight restrictions on the vehicles are taken from the Ministry of Road transport and Highways.
Step 5: Identifying the sensors which will detect the weight and motions.
Step 6: Taking Arduino Uno as microcontroller and studied about it.
Step 7: Designing the complete circuit.
Step 8: Leaf spring shaped model was made using Teflon sheet and the sensor was placed in the model in order to verify the proof of concept.
Step 9: The sensor was placed in the open coiled helical spring and compressive load was applied in the spring in order to test in the real time.

Step 10: The prototype will be made using the Sensor and applied in the static leaf spring model.

IV. LEAF SPRING

Leaf spring is used as a commonly used suspension system in heavy loaded vehicles. A leaf spring which takes the form of a slender arc-shaped length of spring steel of rectangular cross- section. In many of the configuration, the center of the arc provides location for the axle, while loops formed at either end provide for attaching to the vehicle chassis. In heavy vehicles the leaf spring can be in the form of multiple leaves are shaped on the top of the each leaves with several layers. Leaf spring can be served as suspension system as well as extend damping.

V. ACCELEROMETER SENSOR

Accelerometer sensor can able to detect motions in 3 directions i.ex,y,z coordinates. In this sensor MEMS technology is used. Compared with proximity and tilt sensor, Accelerometer sensor will be more applicable for this application.

VI. EXPERIMENTAL MODEL

Components Used:
- Accelerometer sensor
- Arduino UNO board
- Alarm Buzzer
- 3v Dc Motor
- 10k potentiometer
- 220 ohm resistor
- 16*2 LCD display
- Bread Board
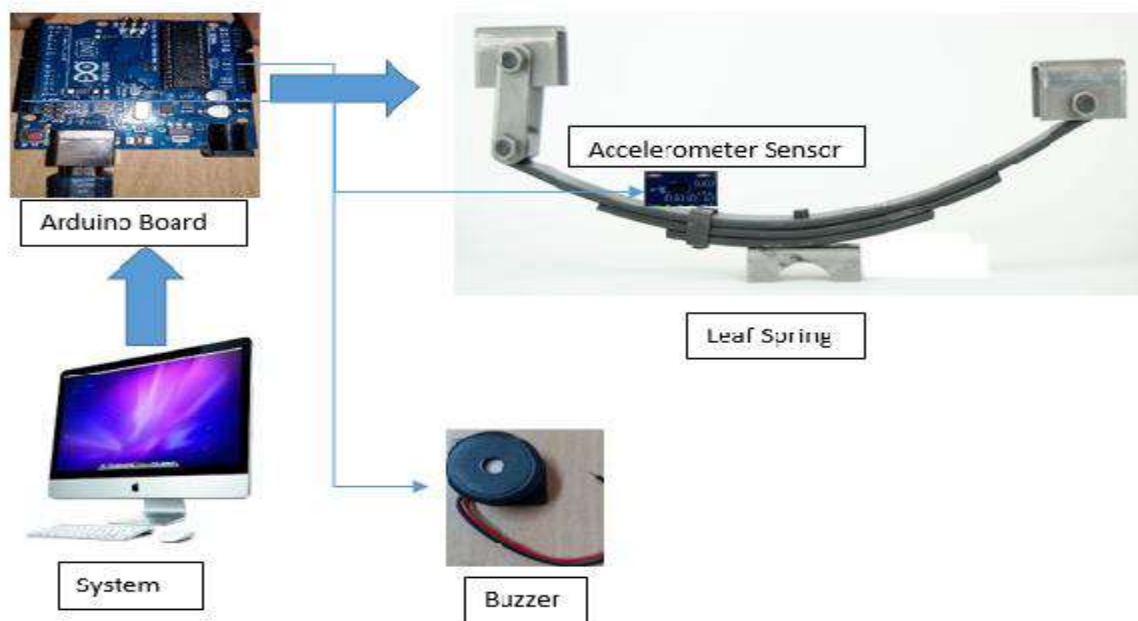- Connecting Wires
- Tefflon made leaf spring

Figure 6.1 Experimental Setup

Project description:

Accelerometer Sensor has 5 pins they are Vcc,Gnd,x,y,z.The connections with the Arduino is given below:

- VCC - 3.3 Volt
- GND- GND
- x-PIN A0
- y-PIN A1
- z-PIN A2

3V DC Motor has two pins Positive and Negative.The connections with Arduino are:

- Positive-5 Volt
- Negative-PIN 7

Alarm Buzzer has two pins Positive and Negative.The connections with Arduino are:

- Positive-5 Volt
- Negative-PIN 8

Personal Computer is the power supply to the arduino board. In the system Arduino software is installed. Code will be coded in the software and it can be uploaded to the Arduino board.

16*2 LCD Display has 16 pins.

Potentiometer has 3 pins. The connections with Arduino are

LCD PINS	ARDUINO	POTENTIOMETER
VSS	GND	-
VCC	5V	-
VEE	-	PIN 2
RS	PIN 12	-
R/W	GND	-
E	PIN 11	-
DB0	-	-
DB1	-	-
DB2	-	-
DB3	-	-
DB4	PIN 5	-
DB5	PIN 4	-
DB6	PIN 3	-
DB7	PIN 2	-
LED +	5 V	-

LED -	GND	-
-	5 V	PIN 1
-	GND	PIN 3
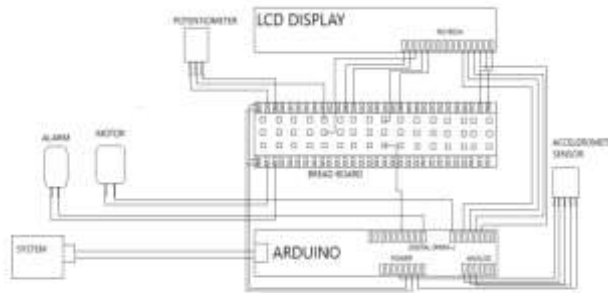
CIRCUIT DIAGRAM

VII. WORKING OF THE MODEL
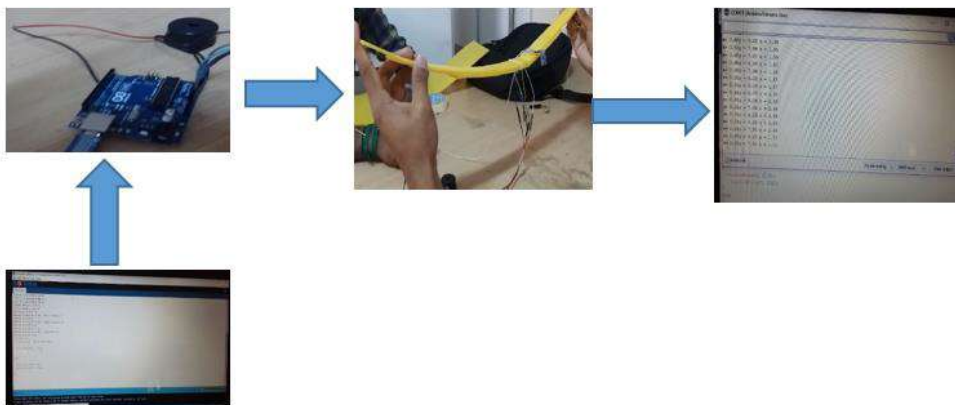
The Teflon made leaf spring is taken and the accelerometer sensor is placed in the leaf spring. Reference is taken, by connection with Arduino and accelerometer sensor. After knowing the reference, the related code is done. Now the alarm buzzer,3V DC motor and 16*2 LCD display is connected to the Arduino. The Arduino board connected to the system for the power supply. Upload the code to the Arduino board. After uploading code, as per the setup and the code, initially the motor will run at normal loading condition and the LCD shows the normal condition. If the load exceeds the reference the accelerometer sense the readings and the motor will stop running, alarm buzzer will ON and the LCD gives warning as Vehicle is overloaded.

VIII. RESULTS AND DISCUSSION

Overloading countering system is a useful model to increase safety towards road transportation . It could able to decrease the overloaded vehicles and contributed to reliable and effective road transportation. Lowering the number of overloaded vehicle is also leads to a decreasing in accidents. There are some challenges for this model which need more research and development work. The primary objective of this model is to make the road transportation legal.

IX. ACKNOWLEDGMENT

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