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Smart Self Weighing of Loads in Heavy Vehicles

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Abstract: ***In this modernized world everything has stepped into automation. The main objective of automation method is to reduce the man power and enhance the work than the manual one. In most of the automobiles at present the dashboard consist of speedometer, odometer, temperature indicator, ammeter, pressure indicator and fuel gages. There is no equipment to indicate the load on the vehicle. The load which is present in a vehicle is measured in a weighbridge. This project is the Development of Onboard Weighing System Using Sensor in the Truck found success in solving this problem. In this project the load in the vehicle is sensed and indicated in LED. In this project the strain gauge Loadcell is used as a sensing element. The resistance of strain gauge change electricaly when it is slightly deformed by deflection of chassis. voltage signal produced from this deformation is proportional to the load. The output range of Loadcell is in the order of very few millivolts. In order to process that succeeding section it should be in voltage range. To make it we need an 24 bit adc section where the input is in the form of analog and the output is in digital***

Keywords: Loadcell, Arduino, Deformation, OBW, Leaf Spring...

I. INTRODUCTION

In present scenario, transportation is one of the major requirements of the business people for transportation of goods or self from one place to a different place. To measure the weight of load in vehicle the transportation systems has introduced two new developed technologies are: weigh-in-motion (WIM) and on-board weighing (OBW). In WIM systems measurement of load is external and independent of the vehicle measured, and can be differentiated from OBW systems, which are built into the vehicle itself.WIM technology is used in vehicle to measure the axle load while in motion, and actually assesses the appropriate static axle load. Without weighing technology national and international trade, commercial transactions and industrial processes today are unthinkable. Weighing technology is no longer confined to simple weightings on stand-alone instruments. Intelligent weighing systems in networks is increasing and influence trade and industry by integration of the weight as reference quantity for man processes As other measuring instruments like automatic weighing instruments have developed from purely mechanical stand-alone instruments to electromechanical and electronic instruments which are nowadays microprocessor or PC based, software controlled and capable of communicating with peripheral equipment via digital interfaces. For all this they use APT sensor which have low accuracy rate. In order to provide effective solution, we have the alternate method of using Strain gauge loadcell which works effectively and provide error rate less than 1%.

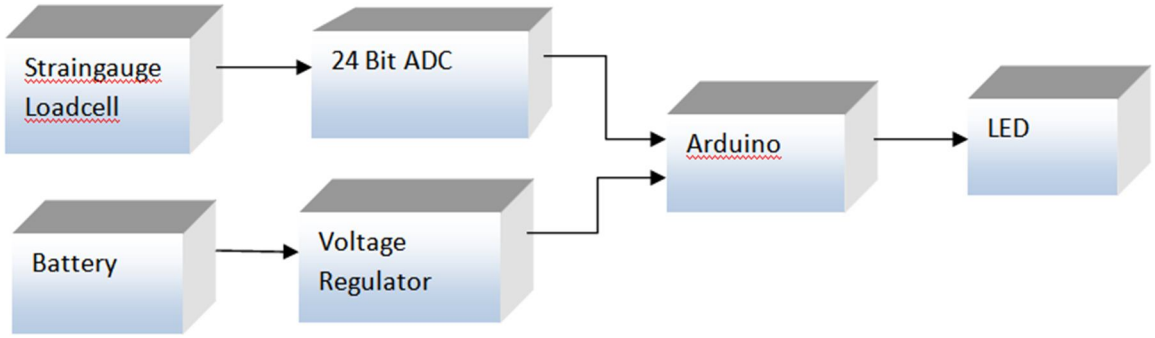
II. LITERATURE SURVEY

The project deals with strain gauge Loadcell, we have studied through a quite lot of research papers to get basic idea. Among them few are “Experience with an On-board Weighing System Solution for Heavy Vehicles” by Mr. Goran Radoicic Ph. D Sholar. In this we have learned the development of OBW measurement systems that is directed for finding stable and durable sensors of small dimensions and large carrying capacities with no maintenance requirement. Another paper is “Development of on board weighing system in a static truck" by Mr.R. Thanigaivelan. In this they used Payload indicator which serves as an easy means of indicating the load on the vehicle.

A. Components Required

1) Loadcell
2) 12V Battery
3) Voltage regulator
4) 24 Bit ADC
5) Arduino
6) LED

Block Diagram



III. MECHNICAL SETUP

The chassis is one of the most important structures of any self propelled construction of any vehicle and it is made up of aluminum The chassis dimension is about 2*3 feet. The length is about three feet and breadth is about two feet .It is to support the vehicle's mechanical components and body. To deal with static and dynamic loads, without undue deflection or distortion. The main target is to evaluate the chassis deformation, based on static analysis in order to find the weight. The design is carried out based on specific standards and limitations of components. The main purpose of the vehicle chassis is to provide a lightweight and durability. For this reasons the space frame type chassis is made up of aluminum. In this vehicle it consists of four wheels and two wheels are connected through axle. Load cell is located where the maximum load occurs.

IV. CIRCUIT SETUP

The output from the load cell is connected to 24 bit ADC. Loadcell(CZL 642) is nothing but it is a alloy aluminum material. Inside this there are four strain gauges placed at the corner, which are connected in bridge configuration. Its input resistance is 400Ω and have the ability to provide output resistance of 350Ω.When the load acts on it, the resistance value changes and produces electrical signal. This suit for electronic top scale, floor scale and other weighing equipment. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. Load cells of one strain gauge (quarter bridge) or two strain gauges (half bridge) are also available. The electrical signal output is typically in the order of a few millivolts (mV) and requires amplification by an instrumentation amplifier before it can be used. The 12V battery is converted into 5V using voltage amplifier. This supply is used to provide supply for arduino, Light Emitting Diode and Liquid Crystal Display.

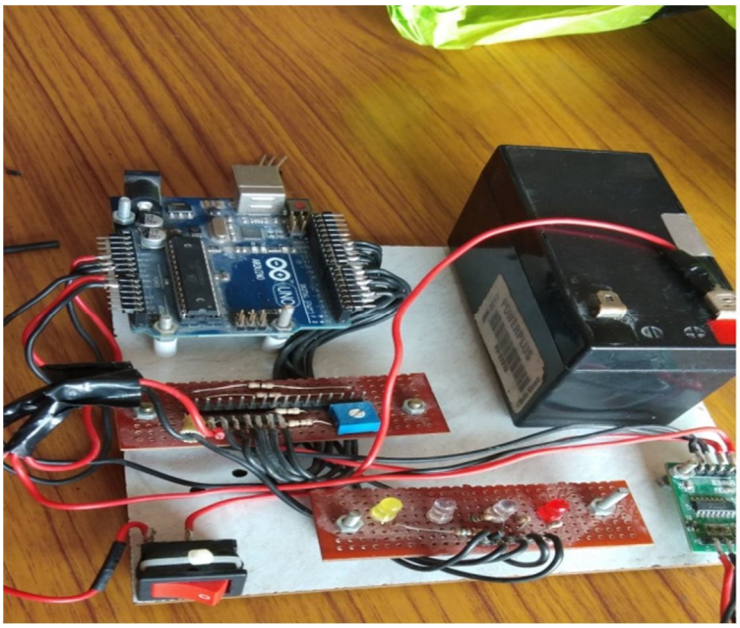


Fig 1.Circuit setup

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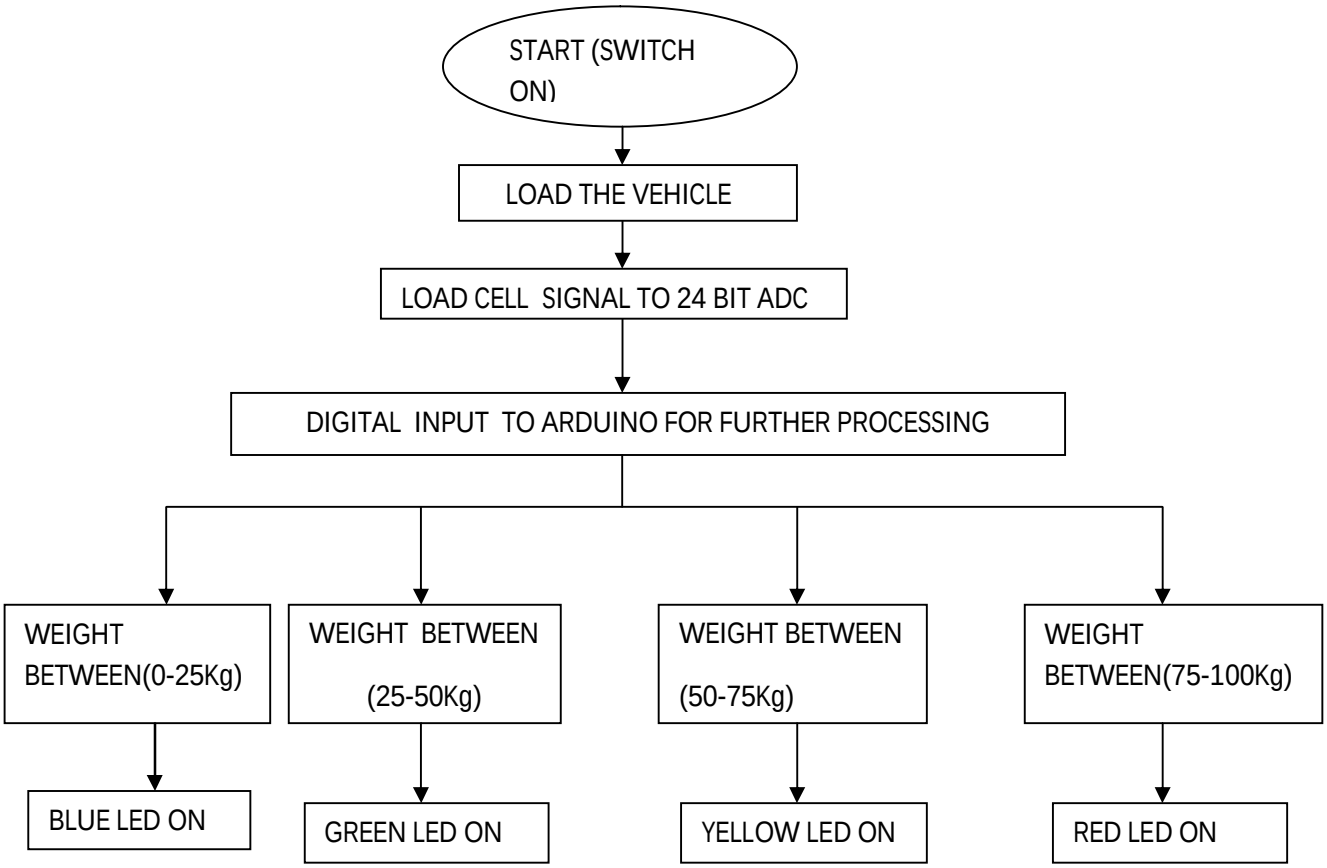
Flow Chart

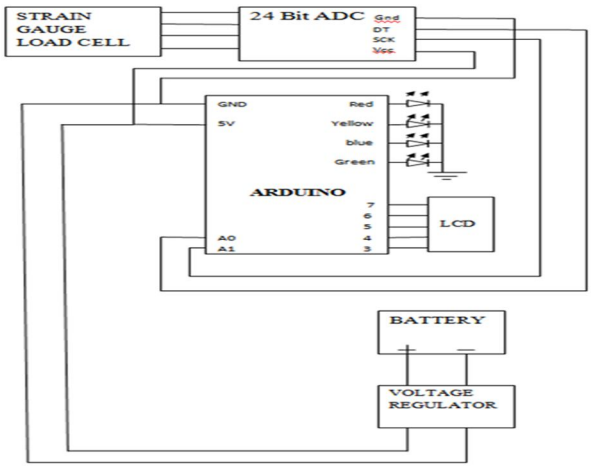


V. WORKING

Load cell used for this operation is strain gauge loadcell. After loading the vehicle, switch is to be on. The load acts on the Strain gauge Loadcell, according to the load given it produces the output in millivolt analog signal.

This analog signal is given to 24 bit ADC which converts into serial digital output data which has gain ratio of 128,64 and 32. The supply for the arduino is given by 12v battery, which then converted to 5v by means of voltage regulator. According to weight received by Loadcell, it sends high or low signal to channel A of 24 bit ADC. Controller which process the data received from the ADC and blinks the different colors of LED based on weight calculated.

VI. CIRCUIT DIAGRAM



VII. HARDWARE MODEL

VIII. CONCLUSION

Today, load in any vehicle measured with help of weighbridge. For this type of measuring the load, we go to weighbridge centre. Its leads to waste of time and money . In this paper we presented our work on developing an affordable and efficient method that can avoid this problem by using strain gauge loadcell in vehicles, Which measure the load and indicate the weight of each load added. Strain gauge is fixed in each suspension of vehicle . So no need to go for weighbridge. This can be implemented in heavy vehicles such as track, lorry, cement mixers, mobile cranes, etc.

IX. FUTURE SCOPE

In Future,the work can be implemented by making use of LCD.LCD can be used to display the weight of loads(Numerical Value) present in trucks.This assembly can be placed near the streeing of the Vehicle to show the limit and overlimit and to ensure safety.

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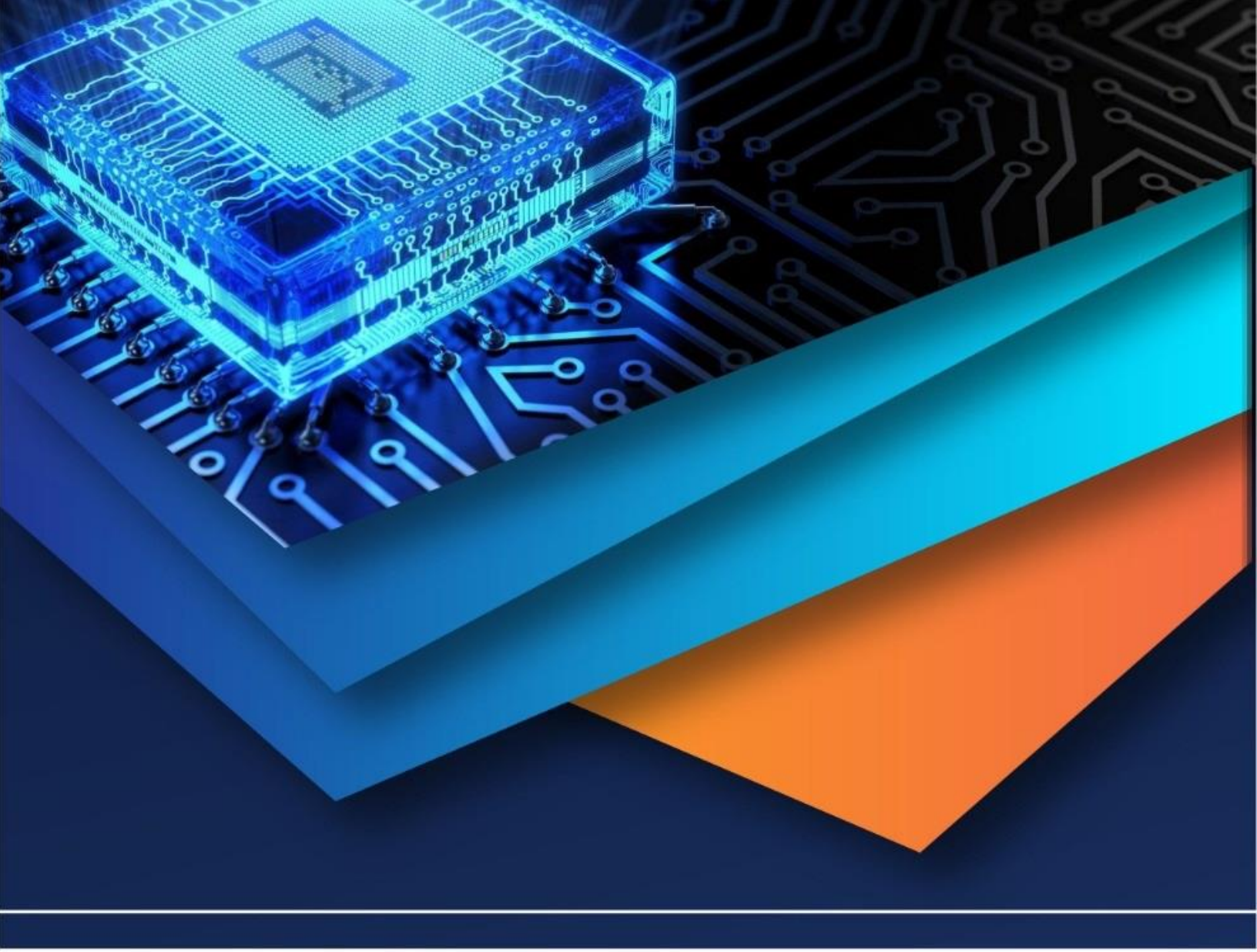

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