Load Detection And Monitoring System

B.Vishnupriya, M.Susmitha , S.Valarmathi, S.Dheenathayalan, R.Rajakumari

Abstract: Nowadays there is no facility to check the heaviness of the vehicle in tollgate. This work will be implemented on tollgate area to detect the load carried by the vehicle using weight sensor. The main objective of this work is to check whether the vehicle is overloaded or not. The load of the vehicle will be showed on the display screen and the weight will be checked against the database which consists the ideal weight of each type of the vehicles as per the government law. If the vehicle capacity is overloaded then it creates an alarm. This work is considered as a protected work because it prevents accident by preventing the vehicle to carry extra load and also it increases the life time of the road. Hope that if it comes in practice, it will play a major role in government sector.

Keywords: weighing sensor, HX711 amplifier, capacity, heaviness, vehicle, check rod, accuracy.

1. INTRODUCTION

Automation plays an increasingly very important role in the world economy and in daily life. Automatic systems are being preferred over any kind of manual system. Among all exciting applications, this work plays a vital role in this environment especially in Tollgate. Weight machines have seen at many shops, where machine displays the weight just by placing any item on the weighing platform. So here we are building the same Weighing machine by using Arduino and Load cells, having capacity of measuring upto 5kg. This limit can be further increased by using the Load cell of higher capacity. In this work it have three modules, First Fixing the Load cell with Platform and base then to place a vehicle (Weight Item) on the weighing platform. Connect the Load cell to Load cell amplifier then the Signal can be amplified and converted into an output value. The last module is connecting the Load cell amplifier to Arduino and also connects LCD with Arduino to measure and compare the weight using Arduino. And to display the weight on LCD. Nowadays there is no facility to check the heaviness of the vehicle in tollgate. By implementing this work on tollgate area it is useful to detect the load carried by the vehicle using weight sensor. By weighing the vehicle when loaded, the load carried by the vehicle can be calculated. To create an alarm when the vehicle capacity is overloaded. There is an ideal weight of each type of the vehicles as per the government law. The load of the vehicle will be showed on the display screen and the weight will be checked against the database which consists the ideal weight and then it will show whether the vehicle is overloaded or not. If the vehicle is overloaded then it creates an alarm. This work helps to prevent the vehicle from an accident by preventing the vehicle to carry extra load and also it increases the life time of the road, so this work is considered as a protected work.

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2 LITERATURE SURVEY

The load cell or weight sensor is mainly used in vehicle manufacturing company to calculate the capacity of the vehicle after the production of each vehicle. Most weigh stations use either piezo- based or strain gauge load cells. These are embedded into the road surface and the load created by each axle measured. A recent innovation is so-called Weigh-in-Motion (WIM) technology where the truck can be weighed accurately without needing to stop. These systems use a combination of load cells and inductive loops, that detect vehicle presence. They are fast and accurate, and most importantly, eliminate the need for each truck to stop to be weighed. This overcomes the problems of traffic backups experienced at busy times, which often forces the temporary closure of the weigh station. As with trucks systems are available for both static and WIM measurement. These can determine individual axle loads, bogey loads and even the weight of an entire wagon or locomotive. Load cells are used in these systems and have accuracies of ±1% or better.

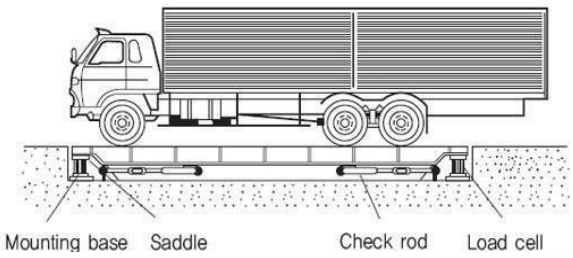

***Fig. 1** Measuring the truck capacity*

In this Fig.1 it can able to see how the load cell or weight sensor is fixed to calculate the capacity of the vehicle. In this the Load cell is fixed under a surface of wooden plane or metal plane along with some equipment such as Mounting base, Saddle and Check rod. Now the vehicle will place over the wooden plane or a metal plane at that time the compression given by the vehicle will detect by the load cell and finally it calculates the capacity of the vehicle.

3 SYSTEM MODEL AND WORKING

This work is to implement the load cell sensor in tollgate area to calculate the heaviness of the vehicle by applying the existing system. The system is going to compare the load of the vehicle with its capacity. By weighing the vehicle when loaded, the load carried by the vehicle can be calculated.To create an alarm when the vehicle capacity is overloaded.

3.1 Weighing Sensor

By weighing the vehicle when loaded, the load carried by the vehicle can be calculated. To create an alarm when the vehicle capacity is overloaded. Load cell is fixed under a surface of wooden plane or metal plane and then the vehicle will place over the wooden plane or a metal plane at that time the compression given by the vehicle will detect by the load cell. The load of the vehicle will be compare to the capacity of that vehicle which is already initialized in the coding. When the load of the vehicle cross the particular capacity, the buzzer will create An alarm (beeeeeep sound).

3.2 Architecture diagram

An architecture diagram is a graphical representation of a set of concepts that are part of architecture, including their principles, elements and components. The below figure 2 represents the connection of the work. At first the load cell is connected with the amplifier which converts the signal taken from the load cell into value and then it connected with the Arduino which calculate the weight as per the coding. These can determine individual axle loads.

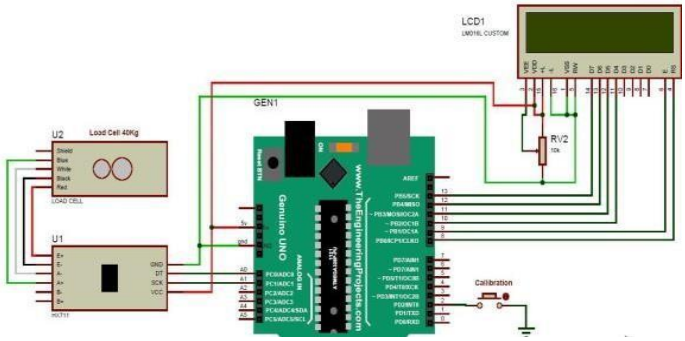

Fig .2 *Architecture Diagram*

3.3 Data flow diagram

Fig. 3 represents the flow diagram of the system. The diagram represents the step by step process, first to initialize the load cell sensor and then sensing the load then send the signal to HX711 amplifier. HX711 Weighing Sensor Module has HX711 chip, which is 24 high precision convertor. Then the signal is digitalized and send to LCD then the value is displayed to the viewers. The weight value is compared to the limited capacity value of the vehicle. The load value is greater than a particular weight then it will activate a buzzer and it will create a beep sound.

Fig .4 *Modules of the work*

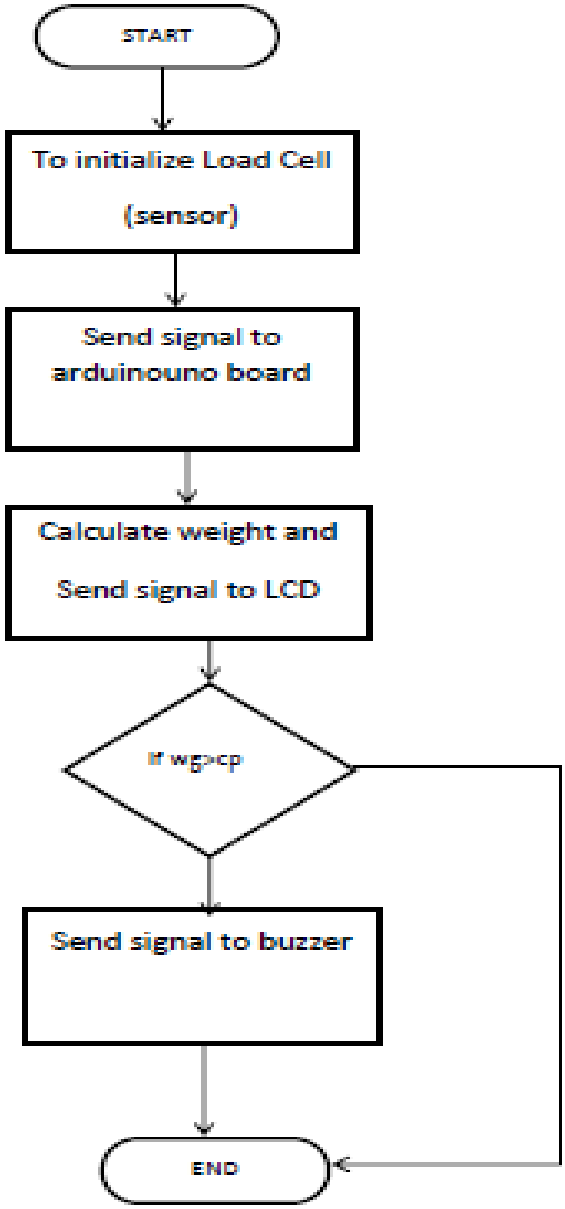

Fig.3 *Flow Chart*

4 IMPLEMENTATION AND RESULTS

4.1 Modules

The Fig.4 shows the modules of the work Fixing the Load cell with Platform and base,

- To place a vehicle (Weight Item) on the weighing platform.
- Connect the Load cell to Load cell amplifier.
- Signal can be amplified and converted into an output value.
- Connect the Load cell amplifier to Arduino and also connect LCD with Arduino.

To measure and compare the weight using Arduino. And to display the weight on LCD. Based on the weight the buzzer will ON or OFF.

5 PHASES

5.1 Setup phase1 (Connection between Load cell and amplifier)

In this section, the setup of the whole research work is depicted in a step by step manner. Sample screenshots are displayed once the components are fixed and connected to each other. In this phase Load cell is connected to the amplifier using the jumper wires and thus completes the system setup.

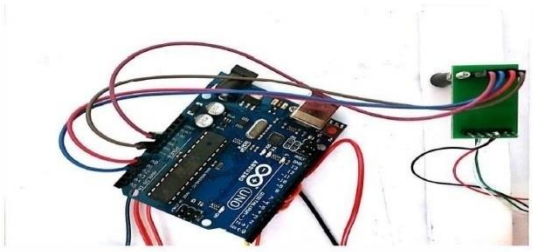

Fig.5 *Connection between Load cell and Amplifier*

The Fig.5 depicts the initial setup of the hardware. All the components are in accordance to every other component. The Arduino board is about to be mounted and connected to the external power supply for the flow of current. Then the amplifier is going to be connected to the Arduino board. All the wirings with the breadboard are installed.

5.2 Setup phase 2 (Arduino coding)

The code has been uploaded into arduino board and compiled using Arduino IDE. The Arduino code is written that includes some header files like “Liquidcrystal.h” and then some functions. The main functions are setup(), loop() and calibrate(). In setup function all the values and necessary variables are declared and initialized. In loop function all the necessary functions are written and calculation method is built. Calibration refers to the act of evaluating and adjusting the precision and accuracy of measurement equipment. So the calibrate method includes all the constraints based on the vehicle’s load and limited capacity for checking. The code is written and dumped into Arduino using Arduino cable.

5.3 Setup phase3 (Connection between Arduino and LCD)

It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with AC-to-DC adapter or battery to get started. The Arduino Uno R3 uses an ATmega16U2 instead of the 8U2 found on the Uno. This allows for faster transfer rates and more memory. No drivers needed for Linux or Mac (in file for Windows is needed and included in the Arduino IDE), and the ability to have the Uno show up as a keyboard, mouse, joystick, etc. The Arduino Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. The LCD (Liquid Crystal Display) is fixed on the breadboard, and the LCD pins are connected to the Arduino pin port. The Figure 7 shows the connection between Arduino and LCD.

- 8 and 9 pin of Arduino is connected to RS and E pin of LCD
- 10 and 11 pin of Arduino is connected to D4 and D5 pin of LCD
- 12 and 13 pin of Arduino is connected to D6 and D7 pin of LCD
- 5v pin of Arduino is connected to VDD and L+ pin of LCD

6 CONCLUSION

This work is used to detect whether the vehicle (truck) is Overloaded or not based on IOT application. Here the load of the vehicle detected by the load cell, which is also connected with amplifier [HX711]. The amplifier is used to convert the electrical signals to Arduino. After the load detection the system is going to compare the load of the vehicle with its capacity. When the load of the vehicle cross the particular capacity, the buzzer will create an alarm (beeeeeep sound). This work play a vital role in this environment especially in tollgate.

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