**Advances and Applications in Mathematical Sciences**
Volume 21, Issue 12, October 2022, Pages 7157-7162


# TRUCK OVERLOADING DETECTION AND ENGINE LOCKING SYSTEM

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## Abstract

Overloaded trucks increase the risk of traffic accidents and destruction of assemblies. They are also the result of out-of-line conflicts between means of transport and societies. There should be a standard weight measurement guideline for a truck. Currently, technologies are being developed for efficient overload testing without considering the weight and actuation of the truck. Transport is an important part of the society for safe transport system. Overload vehicles, especially big vehicles, damage our roads and infrastructure hindering economic development, and the damage increases to a large extent as the load increases. In this project, the load carried by the vehicle is measured and monitored using an inherent weighting mechanism. The controller is used to monitor and send data to the vehicle dashboard as a data acquisition. Its purpose is to reduce accidents from overloading of trucks and to detect the loss of goods during transportation.

## 1. Introduction

The purpose of the proposed work primarily focuses on the prevention of damage to roads by humans due to overloading and unauthorized, unlicensed driving. Road transport plays a very important role in every part of the world. Roads and streets are some of the most important modes of transport in the country. It is used almost daily by everyone. Apart from the fact that roads are provided for the benefit of common people, they also play an important role in promoting economic development and the standard of living of the

2020 Mathematics Subject Classification: 82C70.

Keywords: Load Cell, DC Motor, Overload, Data Acquisition.

Received December 7, 2021; Accepted January 21, 2021

population. According to the National Highway Traffic Safety Administration (NHTSA), 3,900 people died and 104,000 were injured as a result of truck accidents in 2012. A common cause of catastrophic injuries in truck collisions is the driver's loss of control of an overweight or overloaded truck.

Both central and state laws include weight limits for cargo trucks. Some states allow trucks to go beyond the specified weight, although with a special constraint. Some states However, trucks are allowed to exceed the specified weight with a special restriction. If related to weight and related rules Overload is wasted, resulting in a serious truckload Accident. Victims or victims can sue indemnity it is found that the legally loaded cargo vehicles cause relatively small amounts of damage to the road pavement structures, as opposed to overloaded cargo the share of vehicles is around 70% damage and accidents to the road network. Currently fined Convicts were imposed by the courts for heavy vehicles are negligible in most cases compared to overloading damage to roads and quite clearly. In addition, overloaded vehicles become traffic danger, especially concerning the braking of a heavy vehicle system and additional braking distance. Improper distribution of load makes rollover accidents or multivehicle accidents more likely and can cause the truck to fall and cause an accident. Trucks that are not properly loaded or balanced can also exceed their weight limits, especially when travelling on inclines, resulting in tire bursts, a rollover inconsistent overloading. If the problem of overloading is not controlled, this cost is borne by the road user, which would require a significant increase in road user charges such as fuel expenditure, vehicle license fee and toll charges. Overloading is a safety hazard that causes unnecessary loss of life, as well as the rapid deterioration of our roads, resulting in increased maintenance and transportation.

Thus, overloading a vehicle causes many problems resulting in loss of life, road and vehicle damage. This proposed idea suggests suitable measures for mitigation.

## 2. Hardware Setup

The main components required for the project are listed below:

The different components used for the hardware setup are Load cell, HX711 Load Amplifier module, Arduino UNO, LCD, L298 bridge IC, DC

motor, Breadboard, and the jumper wires for connections. The software tools used for the setup were Arduino IDE Software (for Arduino interfacing) and Proteus PCB design software.

## 3. Performance Evaluation

The working principle of this Truck overloading detection weight measurement project is simple. Before going into the details, first, we need to calibrate this system to measure the correct weight. The system will automatically start calibrating when the user turns it on. And if the user wants to verify it manually then press the push button.

We have created a function for verification purposes. For calibration, wait for the LCD indication to put on the 5kg load cell as shown in the figure below. When the LCD shows "Put 5kg", place the 5kg load on top of the load cell and wait. The calibration process will end after a few seconds. After verification, the user can place any weight (maximum 40kg) on the load cell and get the value in grams above the LCD. In this project, we have used Arduino to control the entire process. The load cell detects the weight and then comes up with an electrical analogue voltage to the HX711 load amplifier module. The HX711 is a 24-bit ADC, which amplifies and then digitally converts the load cell output.

It is based on the apparent Arduino. Now the Arduino HX711 is calculated, and it calculates the indicators on the LCD and we can see the movement of the DC motor in both direction but when a weight greater than the specified weight is put on the Load cell the movement of the motor is not possible.

## 4. Block Diagram


## 5. Simulation Setup of Trucks Overload Detector and Controlling

To control the overloading of an overload truck auto etc a proteus Automatic modal for controlling the overload of the vehicle is designed by us. It is mainly composed of IN4007,2N2222,2N4403, Arduino uno, Battery, Button, CAP-ELEC, CAPACITOR, CONN4, GROVE-UART, HX711, L298, L298 MOTOR DRIVER, LED-YELLOW, LM016L load cell, HX711 module, DC motors. Load cell, Logic state, Motor, POT, Relay, RES, Resistor. When the load gets loaded to trucks load cell detects the weight, and the rated truck capacity was stored and coded in the Arduino program. When it is overloaded, the control unit-controlled DC motor system to stop ignition. So, that the vehicle will not start, which controlled the overloading.

There by it also detects the conditions whether the truck consumed overload or not. The diagram of simulation is shown in the figure below:

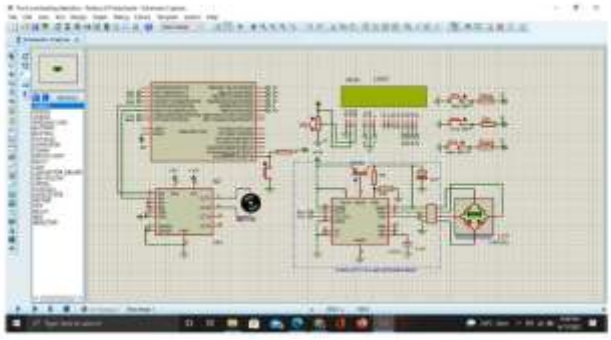

**Figure 1.** Simulation Model of Truck Overloading in Proteus.

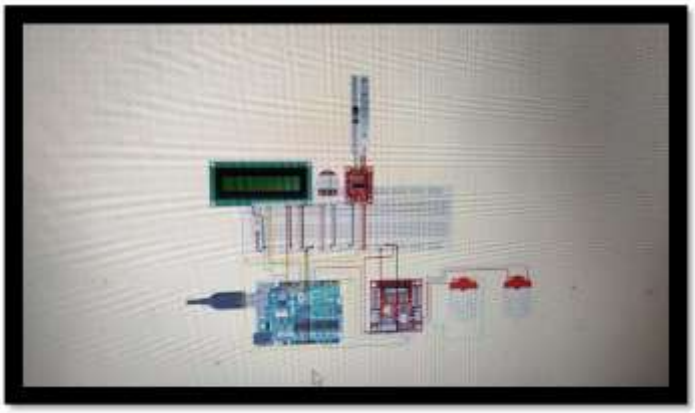

**Figure 2.** Hardware Setup of the Project.

## 6. Results and Discussion

The results and discussion for the Trucks Overload Detector and Engine locking system. Observation of the truck overload detector and engine locking at the base of the load cell shows that the load cell measures the load in the truck and compares it to the setpoint (load). If the load is less than the specified point (load), the motor starts running and the engine catches on fire. And when the load is above the setpoint (load) the engine ignition does not occur until the additional weight is un-mounted.

## 7. Conclusion

To control the overloading of the vehicle, the automatic control system for the overloading vehicle was simulated using PROTEUS and Ardiuno IDE. Circuit mainly consists of load cells, DC motors and processing circuits. In this project, the load cell detector and HX711 load amplifier module were installed under the axle on top of the chassis. Rated truck capacity was coded into the Ardiuno IDE. When the load is within limits, the engine will ignite normally. When the load exceeds the rated capacity, ignition will not occur. This prevents overloading and largely contributes to greater compliance with the regulation. This helps reduce the number of overloaded trucks, which contributes to more efficient and more effective use of roadways.

Reduction in overload trucks is also conducive to a reduction in accidents and serious damage to people's life and property.

## References

[1] Mulyono Agus Taufik et al., Analysis of loss cost of road pavement distress due to overloading freight transportation, Journal of the Eastern Asia Society for Transportation Studies 8 (2010), 139-139.

[2] Kasimani Ramesh, P. Muthusamy, M. Rajendran and Sivaprakash Palanisamy, A review on road traffic accident and related factors, International Journal of Applied Engineering Research 10 (2015), 28177-28183.

[3] Mohan Prakash and Janarthanan Srikanth, Prevention of heavy vehicular accidents using raspberry PI, Asian Journal of Research in Social Sciences and Humanities 6(417) (2016). 10.5958/2249-7315.2016.00622.5

[4] Sadaqat Ullah Khan, Tehmina Ayub and Adnan Qadir, Effect of Overloaded Vehicles on the Performance of Highway Bridge Girder: A Case Study, Procedia Engineering 77, (2014), 95-105. ISSN 1877-7058,https://doi.org/10.1016/j.proeng.2014.07.010.

[5] Y. Liu and Z. Liu, An optimized method for dynamic measurement of truck loading capacity, 2018 3rd IEEE International Conference on Intelligent Transportation Engineering (ICITE) (2018), 120-124. doi:10.1109/ICITE.2018.8492669