

Vehicle Overloading Detection and Protection using Raspberry Pi and IOT Application

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ABSTRACT: The growth of every country's economy is measured by the growth of its transport infrastructure. With the gradual development of economy, the scale of transportation industry continues to expand. The problem of overload in the vehicle transport has emerged. Therefore, how simple and conveniently to know the vehicle load and how to effectively limit overload has become a key issue. Vehicle load control system integration device can detect conveniently vehicle load to prevent overloading of vehicle and improve vehicle safety and it can effectively reduce heavy work of the vehicle load testing station and improve work efficiency in transport sector.

KEYWORDS: Overloading, Road safety, Vehicle protection.

I. INTRODUCTION

The present works focus on prevention of damage of roads and prevent vehicle damage. Roads now a day play a very important role in every part of world. The value lies in providing safe and convenient travel for the users. As the device is working in the loading process, it can ensure to prevent vehicle overloading; in the process of driving, the drivers don't have to worry about being fined due to overload syndrome; ensure the personal safety of driving. At the same time the system is designed to save the national highway maintenance fees and to ensure the safety of people's lives and property; it can solve the problem of the damage of highway bridges, can also travel to provide a more humanized service life for the people and for the country's economic construction contribute a strength. To sense the overloading effect well in advance there has to be a technology which focus on the calculation of the pay load and compares with the legal limits.

1.1 Overload and Road Safety:

The safety issues and the cost issues are to be identified based on overloading and hence the National department of transport has incorporated a campaign against overloading in its Road Safety strategy. Overloading of commercial vehicles has a major impact on the life expectancy of road networks. The cost of premature road failure and repairs is a major burden on many governments particularly in developing countries where this problem diverts vital funding that could otherwise be spent on health and education. The overloading problems should be controlled or else the extra expenses will be barred by the people who will result in extra wages to be paid in terms of overloading penalty, extra fuel consumption charges and also the trucks carrying goods beyond the permitted load will end up paying 10 times higher the toll charges. This imposes a serious problem on both economical aspects and also upon maintenance of roads. Overloading is a safety hazard that leads to unnecessary loss of life and also the rapid deterioration of our roads, resulting in increased maintenance and transportation costs. In India the midst of building national highways under the NHDP(NATIONAL HIGHWAY DEVELOPMENT PROGRAMME) entails huge investment ,which will last for at least 10-12 years. However even a 10% overloading of goods carriage in excess of prescribe weight can reduce the life of roads and highways by 35%.

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1.2 Overloading a Vehicle will pose the following risks:

Different vehicles have different maximum weights for which they are designed .Hence if this maximum weight exceeds than it is difficult to stop the vehicle and thus the vehicle becomes less stable .Effectiveness to stop the vehicle decreases due to overheating of breaks which will result in harder breaking mechanism as the vehicle is heavier. The parts of the vehicle are of great concern and overloading will incur major loss or reduction in their effective usage and will decrease the efficiency of the vehicles. As the overloading is illegal the insurance covered by it becomes invalid. Overloaded vehicles produce higher kinetic energy, resulting in greater impact forces and damages to other vehicles or to the infrastructure. The other common problems on National highways is overloading of trucks beyond the specified height and length limits. In 2014 these two causes have resulted in 36,543 deaths. In a significant judgment on November 9, 2005 ,the supreme court said the issuance of gold cards/tokens under notifications issued by 9 state government ,allowing overloading of trucks in excess of prescribed weight limits, after payment of fixed charges ,was a violation of motor vehicle act 1988,and central motor vehicle rule 1989 and should not only be stopped immediately but also the over loaded cargo should be offloaded at the point of penalty the cost of which has to be borne by the transporter. This all causes a major uncertainty, does need a solution to prevent the risks.

1.3. Objective of the Project:

The aim of this project is to identify the effectiveness of using overload system in enhancing the operations in enforcing vehicle weight limit regulations. Specifically, this project attempts to quantify the effect of overloaded vehicle and protect the system and infrastructure of the roads.

II. BLOCK DIAGRAM AND COMPONENTS

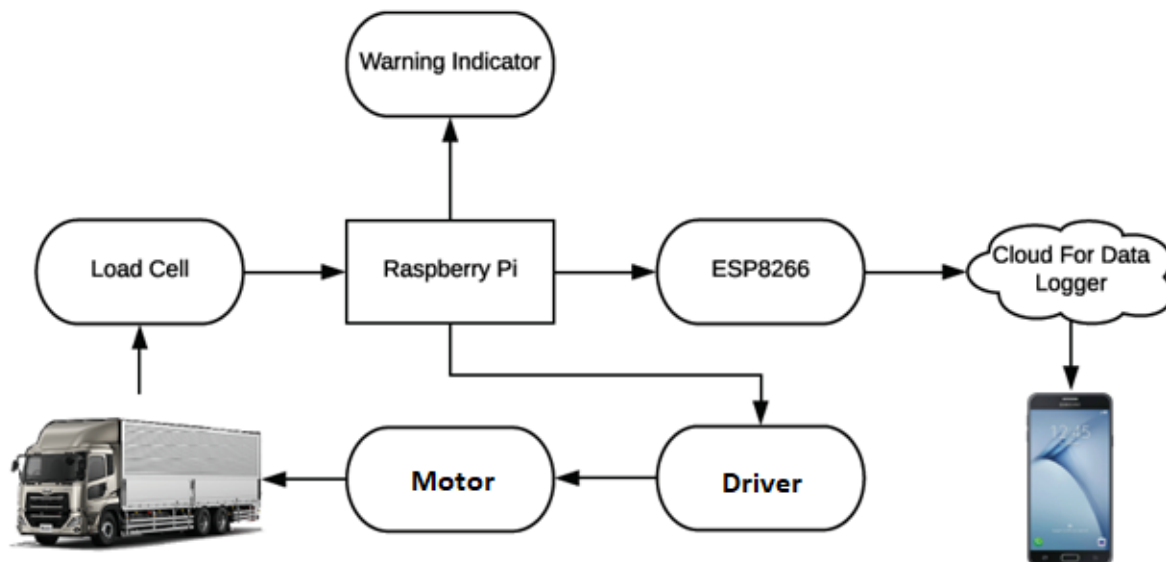


Fig1. Flow Chart of Vehicle Overloading Protection System

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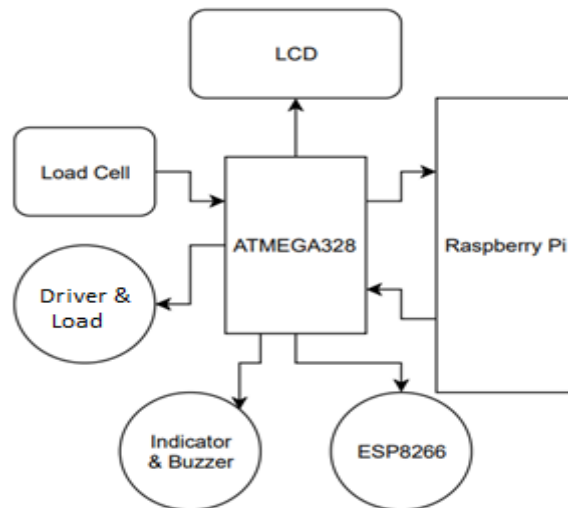


Fig2. Controlling Block Diagram of Vehicle Overloading Protection System

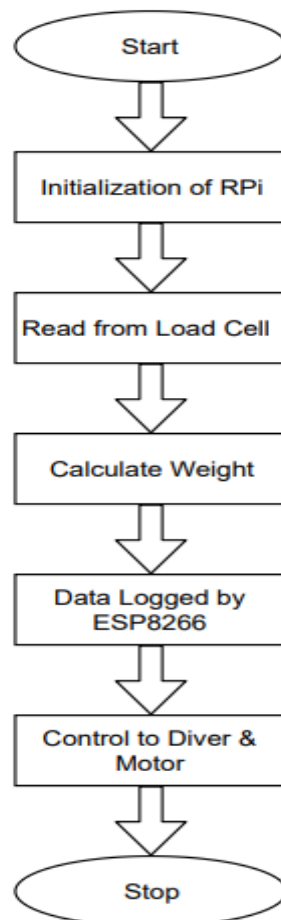


Fig3. Algorithm of Vehicle Overloading Protection System

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2.1 Raspberry Pi

Raspberry Pi is a small Size Linux based Computer. We are using Python Script for controlling the entire hardware with ATMEGA328 as I/O interface.

2.2 HX711 Load Cell

Load Cell Convert weight into digital value using inbuilt amplifier and ADC.

2.3 LCD

LCD shows weight and penalty of over loaded vehicle as well as provide user interface for monitoring the overall processes.

2.4 ATMEGA328

Raspberry is a SOC (System On Chip), which need I/O interface. Here we are using ATMEGA328 as I/O interface for LCD, Load Cell, ESP8266, Indicator and RF Tx etc.

2.5 ESP8266

ESP8266 is a mini WiFi module, which is using for data logging of the system into IOT Cloud application. We are using UBIDOTS for IOT Cloud.

III. WORKING

The workings of Vehicle Overloading Project have following steps,

1. 5v regulated power is provided by the Battery and Regulator Unit.
2. LCD Shows the status of Raspberry Pi.
3. We put some light weight on load cell.
4. LCD shows the weight and no penalty.
5. RP enable the ignition of the under loaded vehicle and gives green indicator.
6. We put some heavy weight on load cell.
7. LCD shows the weight and penalty.
8. RP disable the ignition of the over loaded vehicle and gives red indicator & buzzer.
9. ESP8266 logged vehicle details and penalty into the cloud.
10. After paying the penalty, system permits to the ignition of the over loaded vehicle and gives green indicator.

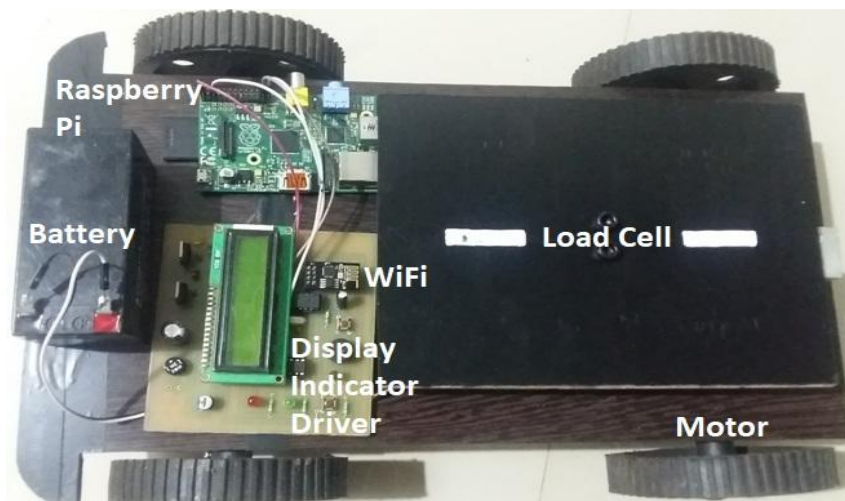


Fig4. Complete hardware implementation of vehicle overloading protection system.

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Fig5. Control system of vehicle overloading protection system.



Fig6. Load Cell mechanism of vehicle overloading protection system.

IV. RESULT AND DISCUSSION

We can monitor and control the over load of vehicle using Raspberry Pi based Embedded System. Penalty is generated according to over load weight. We have IOT based live dashboard of our complete system, which is accessible over all worldwide.

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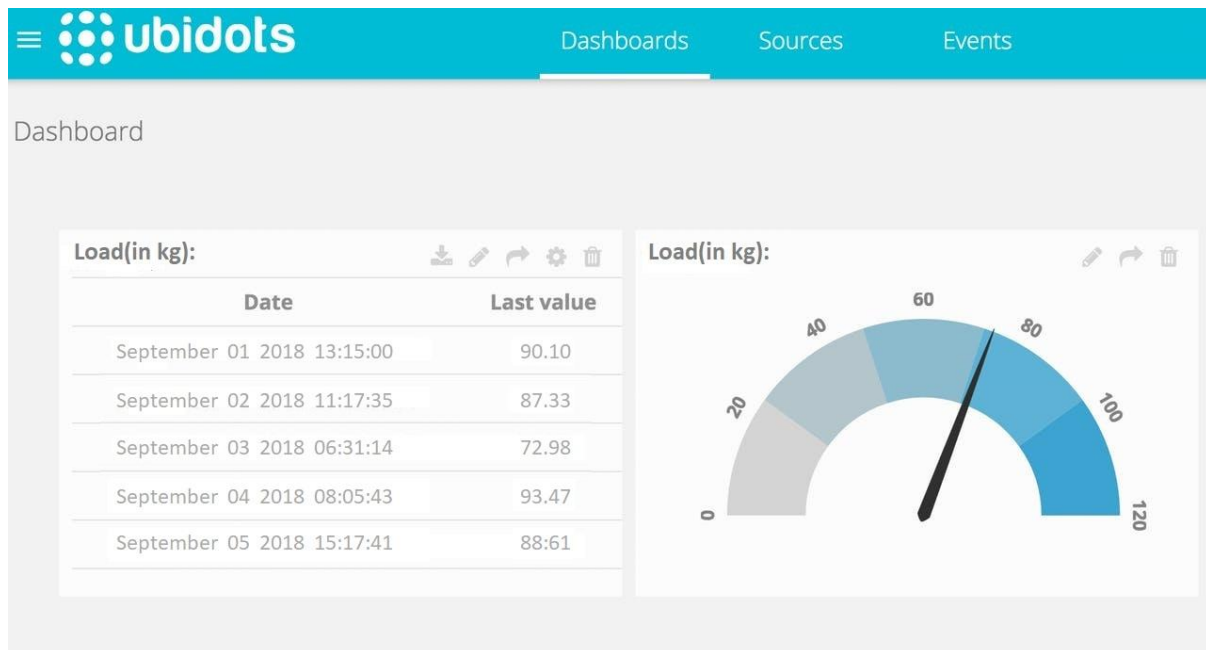


Fig7. IOT dashboard of vehicle overloading protection system.

We have taken up to 50kg as a threshold weight in our project for demonstration. Below table contained some cases of different load condition.

Case	Weight(Kg)	Decision	Data Logged
1	21	Under	No
2	46	Under	No
3	50	Moderate	No
4	63	Over	Yes
5	75	Over	Yes

V. CONCLUSION

Overloading prevention system is a useful tool to contribute towards more compliance with mass regulation. It could help to reduce the number of overload trucks and contribute to the more efficient and effective use of roadways. A reduction in overload trucks is also conducive to a reduction in crashes and serious damage to people's lives and property. New applications of these systems are expected both for traffic and heavy vehicle regulation enforcement. Therefore this system is simple and convenient to know the vehicle load and solve the problem of vehicle overloading effectively.

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