



Sensor-Based System for Preventing Vehicle Overloading and Reducing Road Accidents

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ABSTRACT

Vehicle overloading is a global problem causing accidents and infrastructure damage. We propose a sensor-based system to detect and alert drivers of overloading. The system consists of sensors that measure weight and compare it to the maximum limit. A trial will test its efficacy. The system aims to improve road safety and reduce accidents caused by overloading. The proposed system has significant potential for widespread implementation. Further development could lead to improved public safety and reduced infrastructure damage.

Keywords: Accident prevention ▪ Public safety ▪ Property loss

1. INTRODUCTION

Vehicle overloading is a worldwide problem that poses risks to public safety and causes accidents. To address this issue, we propose a sensor-based system that detects the weight of a vehicle and alerts drivers when they exceed the maximum allowable weight limit. The system consists of strategically placed sensors in the vehicle that measure the weight of the load. A central processing unit calculates the total weight and compares it to the maximum limit. If the weight exceeds the limit, the system alerts the driver and provides guidance on reducing the load.

A randomized controlled trial will be conducted to test the system's efficacy. Participants will be assigned to either the intervention or control group, and data on accidents and incidents caused by overloading will be collected. The proposed sensor-based system is expected to prevent accidents caused by overloaded vehicles and reduce infrastructure damage, ultimately improving road safety. With further research and development, the system could be implemented on a larger scale, leading to increased public safety and reduced financial costs associated with vehicle overloading.

2. LITERATURE SURVEY

Let us discuss several techniques adopted by various authors through this survey.

- Khalil presented research on how implementing a vehicle telematics system can effectively reduce costs and risks and improve safety in road accidents in Abu Dhabi. This study assists the government in enhancing the transport system and fulfilling the Abu Dhabi Department of Transport's vision of contributing to quality of life, economic growth, and environmental sustainability. Despite a consistent decrease in the number of road accidents each year, road safety remains a significant concern in Abu Dhabi, with the city being the most affected region. According to statistics, road accidents claimed the lives of 5,564 individuals in the UAE over six years, resulting in an average of more than two fatalities each day [1].
- Jat, Tomar, and Satya Prakash Sharma discussed the use of VANET systems in reducing road accidents and traffic congestion. In vehicular ad-hoc networks, the VANET system increases road safety and minimizes the likelihood of accidents between moving vehicles. One significant aspect

of VANET is connectivity and traffic congestion analysis. The authors simulated a four-lane path using SUMO and evaluated the results with the assistance of nets. Throughput and time were among the physical parameters used to simulate vehicle connectivity in the VANET system [2].

- Legan and Afanaseva analyzed incidents that took place at electric power enterprises due to hazardous working conditions. They also explored the effectiveness of modern adult education methods, including a blended learning model, in enhancing the quality of staff training programs.
- Luis, Kozievitch, and Gadda discussed the importance of research on current accident situations and trends for developing effective accident reduction projects. They emphasized identifying accident hot spots to improve safety management and presented a case study of traffic accidents in Cidade Industrial de Curitiba, Brazil. To identify potential accident-reduction measures, the authors used GIS and exploratory analysis to visually and statistically identify road accident hot spots [3].

3. PROPOSED SYSTEM

Initially, the individuals will enter the vehicle and the weight sensor will measure their weight. This data will then be transmitted to a control device such as Raspberry Pi 4 or Arduino. The sensor will compare the measured weight with the pre-defined weight threshold, and if it detects that the weight exceeds this limit, it will prevent the vehicle from starting.

3.1 Algorithm

1. Begin the process.
2. Turn on the vehicle.
3. The weight sensor measures the weight of the person or people based on the pressure they exert on the vehicle.
4. The calculated weight is transmitted to a control device such as Raspberry Pi 4 or Arduino, which then communicates with the weight sensor installed in the vehicle to determine if the weight exceeds the limit.
5. If the weight of the load surpasses the weight limit, the vehicle's engine will not start due to safety concerns regarding vehicle stability.
6. If the weight of the load reduces, the vehicle will start.
7. Stop the process.

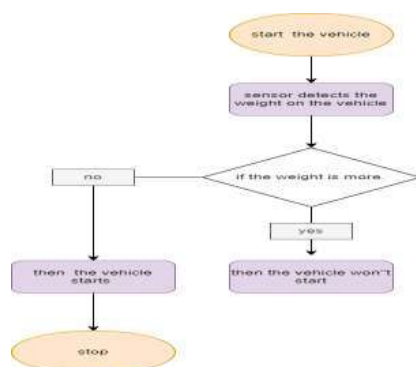


Figure 1. Proposed flow chart.

Table 1. Main components of the proposed system

Component	Function
Weight sensor	Measures pressure exerted by passengers or load.
Control device	Processes sensor readings using Arduino or Raspberry Pi 4.
Threshold logic	Compares measured load with the allowed capacity.
Vehicle ignition control	Prevents starting when the weight exceeds the limit.

4. RESEARCH ANALYSIS

The focus of this study is to highlight the benefits of using vehicles and transportation facilities without causing harm to individuals or organizations. The system operates by using a weight monitoring system that measures the pressure exerted on the vehicle to determine its weight. The software tracks the vehicle's stability to prevent further damage and ensures that the vehicle is operating smoothly within the load limits it can handle. The software controls the vehicle's operating conditions to maintain a stable condition on the road.

4.1 Advantages

- **Ensure user comfort:** By providing the driver with more control over the vehicle, the driver can handle it better in an unfortunate situation.
- **Enhance safety:** The main purpose of the system is to improve safety for people traveling in the vehicle, reducing the risk of accidents.

4.2 Disadvantages

- **Limited capacity:** In the case of a motor vehicle, capacity is limited to the number of people it can carry. For example, in the case of a family, it might be difficult for everyone to fit into the vehicle.
- **Waiting time:** In the case of government transport such as buses, it can be hard for people to get inside the vehicle, leading to increased waiting time and potential delays in their daily schedule.

5. CONCLUSION

The paper highlights the significance of a system developed using an Arduino or Raspberry Pi 4 control system that plays a crucial role in enhancing safety measures for people and reducing accidents. The system utilizes a weight monitoring system, which is a vital safety feature for the current and future automobile industry. By detecting the weight of people or objects in a vehicle, the system ensures that the vehicle is within its capacity to maintain stability, thus avoiding accidents. The use of this technology can save lives and prevent accidents, making it an essential feature in today's world. The mention of the Arduino and Raspberry Pi 4 control systems highlights the advanced technology used to develop this system, showcasing the potential of technology to make a significant impact on people's safety.

6. FUTURE WORKS

The use of this feature in the future is set to play a critical role in providing safety measures for people, thereby ensuring the safety of future generations on the road. With an increasing population, this system is expected to be in high demand, making it an indispensable aspect of daily life. Its inclusion in the automobile industry will not only guarantee the protection of drivers and passengers but also pave the way for a safer and more secure transportation system. Therefore, the development of this feature is a necessary step in ensuring the safety of road users and promoting sustainable transportation practices.

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