WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

IOT BASED AUTOMATIC TRUCK OVERLOAD DETECTION SYSTEM

Mayuri Bhadane[1], Tanishka Chavan [2], Aarti Dhurandhar [3],Darshana Kakade[4],Prof S. A. Suryawanshi [5]

[1] MVPS'S RSM Polytechnic, Nashik mayuribhadane4@gmai.com
[2] MVPS'S RSM Polytechnic Nashik tchavan1906@gmail.com
[3] MVPS'S RSM Polytechnic, Nashik dikshadhurndhur@gmail.com
[3] MVPS'S RSM Polytechnic, Nashik kakadedarshana18@gmai.com
[5] Prof S. A. Suryawanshi of MVPS'S KBT College Of Engineering, Nashik 1002suryawanshisa@gmail.com

ABSTRACT -

The increasing prevalence of overweight trucks on roads poses significant safety risks and regulatory challenges. This project presents an innovative IoT-based system designed for automatic detection of overweight loads in transport trucks, enhancing operational efficiency and safety for transport companies. The system employs a weight sensor integrated with a Node MCU microcontroller to continuously monitor the load weight of trucks. When the detected weight exceeds predetermined limits, the system activates a relay module that can automatically switch off the truck's motor, preventing potential overloading and ensuring compliance with transportation regulations. The solution is powered by a compact 11.1V lithium-ion battery pack, making it suitable for mobile applications. Additionally, real-time weight data is transmitted to a cloud platform, allowing for remote monitoring and analysis. This system not only improves load management but also helps in reducing maintenance costs and enhancing road safety by mitigating the risks associated with overweight vehicles.

KEYWORDS :-

- Node MCU
- Display
- Load cell
- Weight sensor

INTRODUCTION :

The transportation sector faces significant challenges due to overloaded trucks, which increase the risk of accidents, accelerate vehicle wear and tear, and result in regulatory penalties. Traditional weighbridges are inefficient, requiring trucks to stop for manual weight checks. To overcome these limitations, an IoT-based automatic truck overload detection system ensures real-time monitoring and compliance with weight regulations.

This system integrates weight sensors on the truck chassis to continuously measure cargo load. A Node MCU microcontroller processes the sensor data and transmits it to a cloud-based platform using Wi-Fi connectivity. Fleet operators can access live updates and historical records through a centralized dashboard. If a truck exceeds its permissible weight limit, real-time alerts are sent to drivers and management, allowing immediate corrective action. Additionally, a relay module can automatically disable the vehicle's operation until the overload issue is resolved. The system is powered by an 11.1V lithium-ion battery pack, ensuring uninterrupted functionality in diverse environments.

Implementing this IoT-based solution enhances road safety by reducing accident risks associated with overloaded trucks. It ensures strict regulatory compliance, preventing legal issues and financial penalties. By maintaining optimal load limits, transport companies reduce maintenance costs, extend vehicle lifespan, and improve operational efficiency. The elimination of manual weight checks and reduced delays contribute to streamlined logistics and increased profitability. Furthermore, the system provides valuable data insights, helping fleet managers optimize load distribution and enhance overall transport performance. This smart, automated approach revolutionizes truck load monitoring, making transportation safer, more efficient, and cost-effective.

BLOCK DIAGRAM :

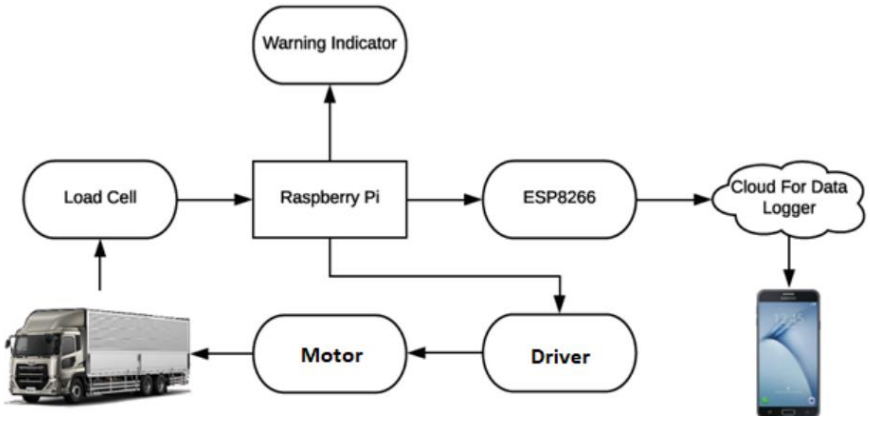

Figure 1: Block Diagram

WORKING :

- **Weight Sensor -** Measures the load on the truck in real-time, generating an analog signal proportional to the load.
- **Node MCU (ESP8266)** Acts as the central controller, reading weight sensor data, comparing it with the predefined weight limit, and making decisions.
- **Relay Module** Acts as a switch to control the motor based on load conditions.
- **Motor** Represents the truck's movement system.
- **Buzzer** Provides an audible alert in case of an overweight condition.
- **11.1V Lithium-Ion Battery Pack** Provides the power supply for the system components, including the Node MCU, sensor, motor, and buzzer.
- **IoT Dashboard (e.g., Blynk)** Displays real-time load data and system alerts.

Working Principle:

 Load Cell
- The load cell is mounted on the truck and measures the weight of the load in real-time.
- It converts the physical force (load weight) into an electrical signal.

 Raspberry Pi (Processing Unit)
- The Raspberry Pi receives the weight data from the load cell.
- It processes the weight values and compares them with a predefined threshold.
- If the detected weight exceeds the legal or safe limit, the system triggers appropriate actions.

 Warning Indicator
- If the truck is overloaded, the Raspberry Pi activates a warning indicator (e.g., LED, buzzer, or display).
- This alerts the driver and concerned authorities about the overload condition.

 ESP8266 (Wi-Fi Module)
- The ESP8266 module is used for wireless data transmission.
- It sends the processed weight data from the Raspberry Pi to the cloud for remote monitoring.

 Cloud for Data Logging
- The cloud stores the real-time weight data for record-keeping and further analysis.
- It enables fleet managers or regulatory authorities to access the truck's weight status via a mobile device.

 Motor and Driver Mechanism
- If an overload condition is detected, the Raspberry Pi can trigger an automatic response using a motor driver.
- The motor driver can be used for different control actions, such as restricting the truck's movement or activating mechanical adjustments.

LITERATURE SURVEY :

- **Alharbi, F., Alzahrani, A., & Alharthi, A. (2020**). IoT-based vehicle load monitoring system. International Journal of Advanced Computer Science and Applications, 11(5).
- **Mukherjee, S., Ghosh, A., & Bhaduri, D. (2021).** IoT-based smart truck load management system using load cells and microcontroller. Journal of Ambient Intelligence and Humanized Computing, 12(5)
- **Zhang, X., Wang, Y., & Li, J. (2023).** A review on energy management systems for IoT applications: Focus on battery technologies. Energy Reports, 9, 103-115.

- **Jain, A., Singh, S., & Gupta, P. (2022).** Development of an IoT-based vehicle weight monitoring system using Node MCU. Materials Today: Proceedings, 46

METHODOLOGY :

The methodology for the IoT-based automatic transport truck load overweight detection and weight monitoring system involves several key steps. First, a weight sensor is integrated into the truck's structure to continuously monitor the load. The weight sensor transmits data to a Node MCU, which processes the readings in real time. When the weight exceeds the predefined threshold, the Node MCU triggers a relay module to activate an alert system, which can include visual indicators or notifications sent to the transport company's management system. The system is powered by a 11.1V lithium-ion battery pack, ensuring energy efficiency and reliability. Additionally, the Node MCU can communicate wirelessly with a cloud-based platform, allowing for remote monitoring and data logging of weight measurements over time. This setup provides an automated and efficient solution for managing truck loads, ensuring compliance with transportation regulations while facilitating better load management for the transport company.

ACTUAL SYSTEM :

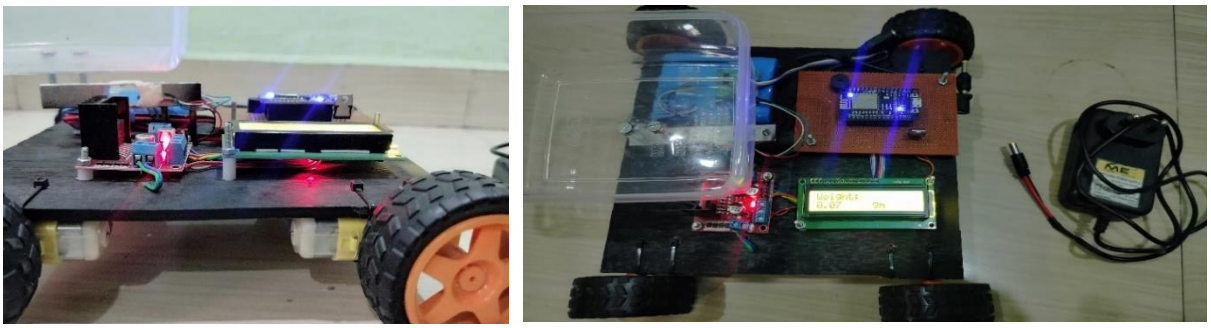

Figure 2: Actual System

FLOWCHART :

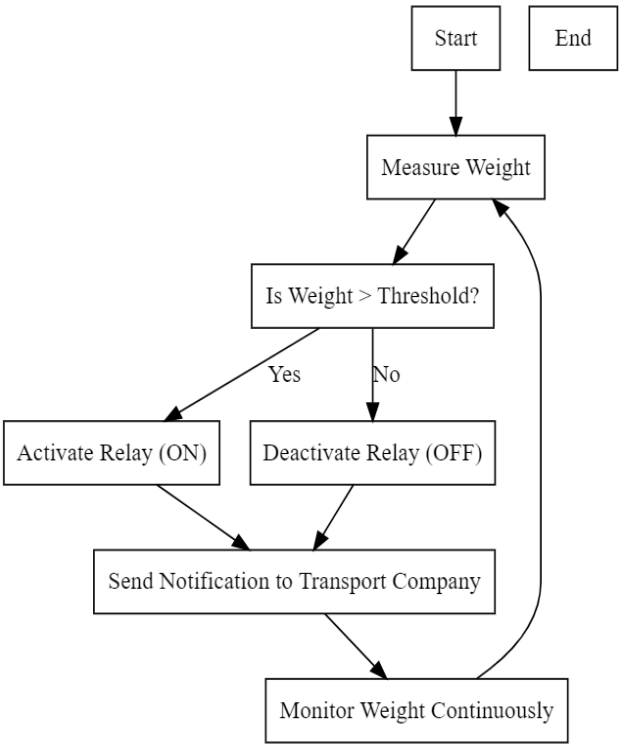

Figure 3: Flow chart

CONCLUSION :

In conclusion, the IoT-based automatic transport truck load overweight detection and weight monitoring system represents a significant advancement in ensuring efficient logistics and vehicle safety for transport companies. By integrating a weight sensor with a Node MCU, this system enables real-time monitoring of truck loads, automatically activating an ON/OFF mechanism via a relay module when an overweight condition is detected. The use of an 11.1V lithium-ion battery pack ensures a reliable power source for sustained operation. This innovative solution not only helps in compliance with weight regulations but also minimizes the risk of accidents caused by overloaded vehicles, leading to enhanced operational efficiency, reduced maintenance costs, and improved safety standards in the transportation sector. Overall, this system exemplifies the potential of IoT technology to transform traditional practices in logistics and contribute to a more sustainable future.

REFRENCES :

1. "IoT-Based Truck Overload Detection System Using Load Cell Sensors" by S. S. Iyer et al., published in the Journal of Intelligent Information Systems, 2019.
2. "Real-Time Truck Overload Detection Using IoT and Machine Learning" by A. K. Singh et al., published in the Journal of Transportation Engineering, 2020.
3. "IoT-Based Overload Detection System for Trucks Using Accelerometer and GPS Sensors
4. "IoT-Based Overload Detection System for Trucks Using Sensor Fusion" by M. A. Khan et al., presented at the International Conference on Sensor Systems and Software (S-CUBE), 2019.