

Load Crown – Royalty Management with Overload Awareness System

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Abstract - Overloaded trucks are one of the biggest safety risks in the transportation and logistics industry. Even a small increase beyond the permissible weight can lead to brake failure, tire bursts, or road accidents if not detected in time. Most existing systems rely on manual checking or delayed response, which is not always accurate or reliable. To solve this problem, we developed the Load Crown – Royalty Management with Overload Awareness System, an affordable and smart solution that can detect and report overloading automatically. The system uses load sensors connected to a microcontroller (ArdESP32) to constantly measure the truck's load weight. When the load crosses the safe limit, the system instantly gives a warning through a buzzer and LED light to alert the driver.

At the same time, it uses GPS to capture the real-time location of the truck and sends instant alerts through an SMS API service to owners or authorities. The alert message includes the truck's location and overload details, allowing quick action to be taken. This system can be used in logistics, mining, and construction industries. It can also be integrated with web-based dashboards or fleet management systems for large-scale monitoring. Overall, Load Crown provides a simple, reliable, and cost-effective solution to prevent overloading, ensure safety, and protect infrastructure.

Key Words: Load Monitoring System, Load Sensors, ESP32, SMS API, GPS Tracking, Road Safety, Real-Time Alert System, IoT-Based Monitoring, Transportation Safety.

1. INTRODUCTION

The transportation and logistics industry plays an important role in economic growth and infrastructure development. Trucks are commonly used to transport goods in sectors such as logistics, mining, and construction. However, truck overloading has become a serious and widespread problem. When a truck carries weight beyond the permissible limit, it increases the risk of brake failure, tire bursts, reduced vehicle stability, and road accidents. Overloading also damages roads, bridges, and other infrastructure, leading to higher maintenance costs and safety hazards for the public.

Most existing methods for detecting overloaded trucks depend on manual checking at toll booths or weighbridges. These traditional systems are time-consuming and may not provide real-time monitoring. In many cases, overloading is detected only after the vehicle has traveled a significant distance, which can result in accidents, penalties, and financial losses. Therefore, there is a need for a smart and automated system that can monitor truck continuously and provide instant alerts.

To overcome these challenges, the Load Crown – Royalty Management with Overload Awareness System has been developed as an affordable and efficient solution. The system uses load sensors connected to an ESP32 microcontroller to continuously measure the weight of the truck. When the load exceeds the predefined safe limit, the system immediately activates a buzzer to alert the driver.

In addition, the system uses GPS technology to capture the real-time location of the vehicle. When overloading is detected, an alert message containing the truck's location and overload details is sent through an SMS API service to the vehicle owner or concerned authorities. This enables quick action to prevent accidents and ensure compliance with load regulations.

The proposed system can be implemented in logistics, mining, and construction industries. It can also be integrated with web-based dashboards or fleet management systems for large-scale monitoring. Overall, this system provides a simple, reliable, and cost-effective solution to prevent overloading, improve road safety, and protect infrastructure.

2. LITERATURE SURVEY

The document named "IoT-Based Vehicle Overload Monitoring System" written by R. Kumar, P. Sharma, and A. Verma presents an intelligent system based on load cell sensors and GSM communication to detect vehicle overloading and alert concerned authorities through SMS. The proposed system is expected to reduce the need for manual monitoring and improve road safety. However, the main focus of this system is only on overload detection and SMS alerting, without the ability to track in real-time or connect to online monitoring systems. Our proposed system will improve this by adding GPS tracking and SMS API

functionality for faster and more efficient alerting, along with the ability to integrate with a dashboard for comprehensive fleet management. [1]

In the research paper titled “Smart Weighing and Alert System for Heavy Vehicles” by S. Patil and M. Deshmukh, a microcontroller-based overload detection system is presented that uses load sensors and buzzer signals to alert the driver of their vehicle exceeding the maximum permissible weight limit. Although the system alerts the driver in real time, the lack of remote notification capabilities and real-time tracking makes it less useful for fleet managers and traffic authorities. On the other hand, our proposed system not only alerts the driver through a buzzer signal but also sends information about the overload and the current location of the vehicle via an SMS API service, making it more useful for immediate monitoring and action. [2] detect obstacles and assist drivers with voice navigation support. Although the system improves mobility and security, it is highly dependent on various sensors, making the system more complex, expensive, and prone to maintenance problems, particularly in real-world scenarios. Our proposed system, on the other hand, is not dependent on various sensors and instead uses camera-based AI object detection, making the system less complex while still providing adequate navigation support. [2]

The article entitled “GPS-Based Fleet Monitoring and Tracking System” by L. Wang and H. Li describes a fleet management system using GPS and IoT technology to monitor and track vehicle movement, thereby improving efficiency. Although the system has the capability to monitor location and route history, it does not have the capability to monitor loads, making it inadequate for dealing with the issue of overloading. Our system combines load monitoring with GPS tracking in one system. [3]

The research paper titled “Wireless Sensor-Based Vehicle Load Detection System” by A. Singh, K. Rao, and V. Mehta presents a wireless system that calculates the weight of the vehicle and transmits it to a central server. Although it is an improvement over the automation benefits, the need for a complex hardware setup and wireless connectivity makes it more expensive to maintain. Our proposed system makes it more affordable by utilizing an ESP32 microcontroller that comes with Wi-Fi and an SMS API for alert transmission. [4]

The study named “Real-Time Overload Detection and Alert System Using IoT” by M. Khan and S. Iqbal proposes an IoT-based system that detects overload conditions and uploads information to cloud services for monitoring. Although this system allows for central monitoring, it is extremely dependent on the availability of internet connectivity, which can cause delays in distant areas. The proposed Load Crown system increases reliability by providing real-time buzzer alerts

to the driver and sending overload notifications via an SMS API, which helps in faster communication even in distant areas. [5]

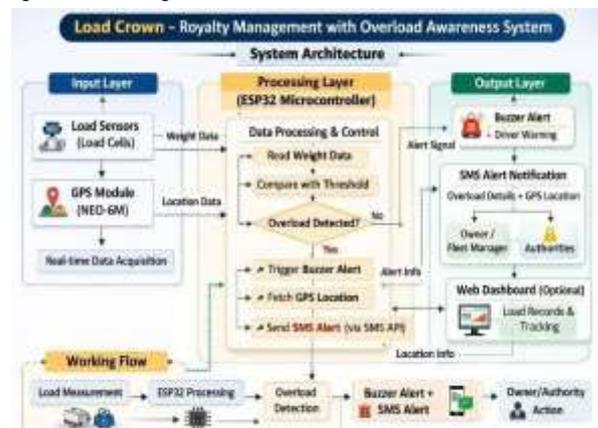
3. PROPOSED SOLUTION

The concept of the Load Crown – Royalty Management with Overload Awareness System aims to deliver an intelligent and automated method for identifying truck overloading and facilitating continuous safety monitoring through IoT technology. This system is designed to regularly measure vehicle weight, provide immediate alerts to the driver in the event of an overload, and inform relevant authorities with location information for prompt action.

The key components of the system include load sensors, an ESP32 microcontroller, a GPS module, a buzzer, and an SMS API service. The load sensors are installed on the vehicle to continuously monitor its weight. The sensor data is processed by the ESP32 microcontroller, which compares the measured load with the predefined safe limit. If the load exceeds this limit, the system immediately activates a buzzer to alert the driver about the overload condition.

At the same time, the GPS module captures the real-time location coordinates of the vehicle. When an overload is detected, the ESP32 sends an alert message through an SMS API service. The message includes overload details along with the current location of the truck. This alert is sent to vehicle owners or concerned authorities, enabling timely monitoring and corrective action.

The system is developed using a modular architecture in which load monitoring, alert generation, and location tracking operate as integrated yet independent modules. This structure improves flexibility and allows future enhancements such as web dashboard integration or fleet management connectivity. The proposed Load Crown system is cost-effective, reliable, portable, and suitable for practical implementation in



logistics, mining, and construction industries.

3.1 System Architecture of Load Crown – Royalty with Overload Awareness System

4. METHODOLOGY

The concept behind the Load Crown – Royalty Management with Overload Awareness System is to provide an intelligent and automated solution for detecting truck overloading while ensuring real-time safety monitoring using

IoT technology. The system is designed to continuously monitor the load applied to a vehicle, instantly alert the driver in case of overload, and notify the concerned authorities along with the vehicle’s location for timely action.

The major components of the system include load sensors, an ESP32 microcontroller, a GPS module, a buzzer, and an SMS API service. The load sensors are installed on the vehicle to continuously measure the weight of the truck. These sensors convert the applied load into electrical signals, which are processed by the ESP32 microcontroller. The microcontroller compares the measured load value with a predefined maximum permissible limit stored in the system. If the detected weight exceeds the safe threshold, the system immediately activates a buzzer to alert the driver about the overload condition.

Simultaneously, the GPS module continuously acquires the real-time geographical location of the vehicle. When an overload situation is detected, the ESP32 integrates the overload status with the GPS coordinates and sends an alert message through an SMS API service. The message contains details of the overload condition along with the current location of the truck. This alert is transmitted to predefined mobile numbers such as vehicle owners, fleet managers, or transport authorities, enabling quick monitoring and corrective action.

The system follows a modular design approach in which load monitoring, alert generation, and location tracking operate as independent yet interconnected modules. This design improves system flexibility and allows future enhancements, such as integration with a web-based dashboard or connection to fleet management systems. The proposed Load Crown system is cost-effective, reliable, portable, and suitable for practical implementation in industries such as logistics, mining, and construction.

5. HARDWARE AND SOFTWARE REQUIREMENTS

5.1 Hardware Requirements

The hardware components form the physical foundation of the proposed Load Crown – Royalty Management with Overload Awareness System. Each component performs a specific and essential role in load measurement, data processing, location

tracking, and alert communication, ensuring the efficient and reliable operation of the system.



Component	Purpose
Load Cell	Measures the applied weight and converts force into an electrical signal.
HX711 Amplifier Module	Amplifies the small signal received from load cell and converts it into digital data for the controller.
ESP 32	Acts as main microcontroller to process weight data and manage communications.
GPS Neo-6M Module	Provides real-time location tracking (latitude and longitude) of the system.
LM2596 Voltage Regulator	Regulates and stabilizes the input voltage to provide a safe power supply to components.
Buzzer	Gives an alert sound when the load exceeds the predefined limit.
Jump Wires	Used to connect all electronic components properly.
Power Supply / Battery	Supplies required electrical power to the entire system.

5.2 Software Requirements

It combines web technologies and database management tools to provide full system functionality including data processing, storage, and user interface management.

Software/Tool	Purpose
Eclipse IDE	Used to develop and manage backend application
Html	Used to design Structured web pages.
CSS	Used to style and format web interface.

JSP	Used to create dynamic web pages and handle server side processing
MySQL Workbench	Used to design , manage and monitor the MySQL database
MySQL Database	Stores system data such as weight records, GPS location, alerts, and user information.
Java(JDK)	Required to run JSP and backend server logic.

tracking of delivery progress in the system.

2. Truck and Profile Access

Drivers can view assigned truck details and update personal profile information.Maintains proper coordination between driver and company records.

3. Payment Monitoring

Drivers can check completed trip payments and earning details.Provides transparency in payment status and financial tracking.

6. Results and Output

6.1 Web Application

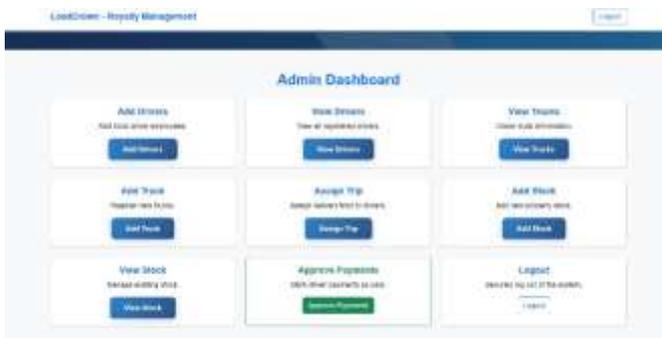


Image :1 Admin Panel

1. Driver and Truck Management

Admin can add drivers, register new trucks, and view all records.Ensures proper management of fleet and workforce.

2. Trip and Stock Control

Admin assigns trips to drivers and manages available stock inventory.Streamlines logistics operations and improves resource management.

3 .Payment Approval System

Admin verifies completed trips and approves driver payments.Maintains financial accuracy and secure transaction processing.

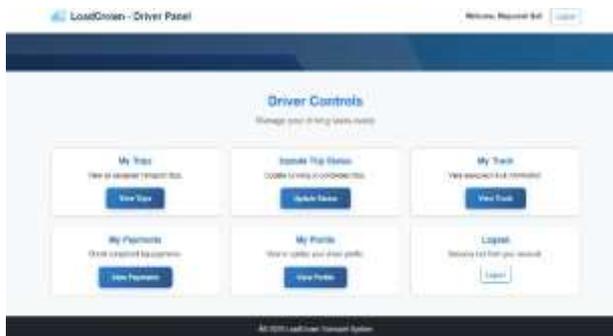


Image : 2 User Panel

1.Trip Management

Allows drivers to view assigned trips and update trip status (running or completed).Ensures accurate

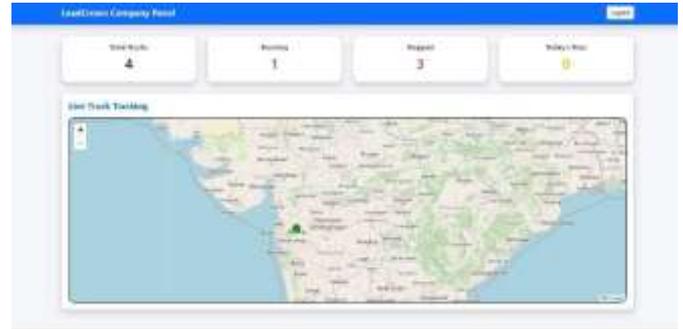


Image : 3 Company Panel

1. Fleet Overview Summary

Displays total trucks, running vehicles, stopped trucks, and today's trips in one dashboard view. Helps management quickly analyze real-time fleet performance and operational status.

2. Live Truck Tracking

Provides an interactive GPS-based map showing real-time truck locations. Enables better route monitoring and improves delivery efficiency.

3. Operational Control Panel

Centralized system to monitor all company transport activities.

Supports faster decision-making with instant vehicle status updates.

6.2 Overload Detection System



Image : 8 LCD Screens



7. CONCLUSIONS

The LoadCrown project successfully demonstrates the design and implementation of a smart weight monitoring and tracking system using Internet of Things (IoT) technology. The system effectively integrates a load cell sensor with the HX711 amplifier, ESP32 microcontroller, GPS Neo-6M module, and a web-based backend to provide accurate real-time weight measurement along with location tracking. By combining hardware sensors with IoT connectivity, the project ensures continuous monitoring and improves overall load management efficiency.

The system is capable of detecting overload conditions and immediately activating a buzzer alert when the measured weight exceeds the predefined safety limit. This feature enhances safety by preventing potential structural damage, vehicle overloading issues, and accidents. The addition of GPS tracking further strengthens the system by allowing users to monitor the exact geographical location of the load in real time.

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As a final note, the authors express their sincere gratitude to everyone who has contributed in any way toward the successful completion of this project.

9. REFERENCES

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10. BIOGRAPHIES

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Mayuresh Kiran Sali is a final-year Diploma student pursuing Information Technology at K. K. Wagh Polytechnic, Nashik, Maharashtra, India. His areas of interest include Internet of Things (IoT), Artificial Intelligence, Embedded Systems, and Full-Stack Development. He has actively contributed to the system architecture design and overall implementation of the project.

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