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RIDESENTRY: INTELLIGENT PASSENGER LOAD MONITOR

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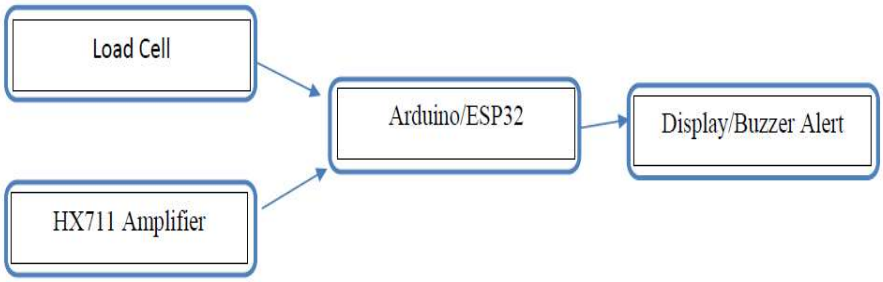
Abstract

The Ride Sentry is an intelligent passenger load monitoring system designed to enhance passenger safety and optimize vehicle load capacity. This system utilizes a load cell sensor interfaced with an Arduino UNO, along with an HX711 amplifier module, a DC motor for actuation, and an LCD for real-time data display. The Ride Sentry ensures efficient load monitoring and prevents overloading, making it a crucial innovation for public transport systems.

Introduction

Overloading in public transport vehicles is a common issue leading to safety hazards, discomfort, and reduced vehicle lifespan. This project introduces an intelligent system that continuously monitors passenger load in real time, alerting drivers when the safe capacity is exceeded. The system integrates key hardware components such as a load cell, HX711 amplifier, Arduino UNO microcontroller, a DC motor for potential actuation, and an LCD for displaying load data.

Block Diagram of the Project:



Components Used

1. Load Cell (5kg) + HX711

- The load cell measures weight (up to 5kg). If more weight needs to be measured, multiple load cells can be used in parallel.

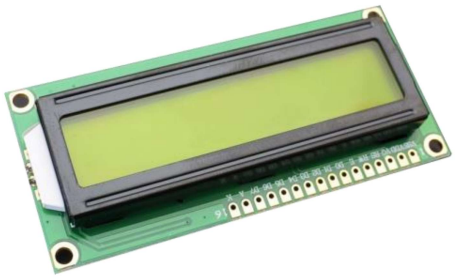
- The HX711 is an analog-to-digital converter (ADC) that amplifies and converts the load cell's signal into a readable value for the Arduino UNO

2. Arduino UNO

- It processes data from the HX711 module.
- It calculates the weight and displays it on the 16x2 LCD.
- It controls the DC motor based on the weight conditions (e.g., enabling/disabling motor if the weight exceeds a set limit)

3. 16x2 LCD

- Displays real-time weight data for passengers.
- Can also show alerts if the weight exceeds a threshold.



4. DC Motor

- Can be used for automatic adjustments, such as adjusting seat height or alerting the driver in case of overload.
- Controlled via Arduino UNO using an H-bridge driver or relay if necessary.

5. Power Supply (9V)

Powers the Arduino UNO and other components.
A regulated 5V supply (via Arduino's onboard regulator) can power the HX711, LCD, and load cell.

Provides the necessary operating voltage for components.

System Architecture

- The Ride Sentry system operates as follows:
- The Load Cell detects the weight of passengers and transmits an electrical signal proportional to the load.
- The HX711 module amplifies and converts the signal for processing.
- The Arduino UNO reads the data, processes it, and compares it against a predefined threshold.

- If the weight exceeds the threshold, the system triggers a DC motor (e.g., to control access doors or alarms) and displays a warning message on the LCD screen.

Working Mechanism

- Initialization: The system initializes by calibrating the load cell.
- Weight Measurement: The load cell continuously monitors the weight.
- Data Processing: The Arduino processes the data and displays it on the LCD.
- Overload Detection: If the weight exceeds a predefined limit, an alert is triggered.
- Automated Response: The DC motor can be activated to control access or provide a mechanical response.

Implementation

Circuit Connection:

- Load Cell → HX711 → Arduino UNO (A0, A1 pins)
- HX711 VCC, GND → 5V, GND (Arduino)
- LCD → Arduino digital pins (via I2C or direct connection)
- DC Motor → Motor Driver → Arduino digital output

Advantages

1. *Enhanced Safety* – Prevents bike overloading, reducing accident risks.
2. *Real-Time Monitoring* – Instantly measures and displays passenger weight.
3. *Automatic Alert System* – Triggers a buzzer if the weight exceeds the limit.
4. *Scalability* – Can integrate higher-capacity load cells (50kg, 100kg) for real-world applications.
5. *Cost-Effective* – Uses affordable components like Arduino and HX711 amplifier.
6. *User-Friendly Interface* – Displays weight on an OLED screen for easy readability.
7. *IoT Integration Potential* – Can be expanded to send alerts via mobile apps.
8. *Energy Efficient* – Consumes minimal power for continuous operation.
9. *Versatile Applications* – Useful for public transport, rental services, and delivery bikes.
10. *Prevents Legal Issues* – Helps ensure compliance with weight regulations in transportation.

Real-Life Applications of RIDESENTRY

1. *Bike Safety Monitoring* – Ensures motorcycles are not overloaded, reducing accident risks.
2. *Public Transportation* – Can be integrated into auto-rickshaws and shared bikes to monitor passenger weight and avoid overloading.
3. *Bike Rental Services* – Helps rental companies ensure safe weight limits for users.
4. *Delivery Services (E-commerce & Food Delivery)* – Ensures that delivery bikes carry loads within safe weight limits, preventing breakdowns or accidents.
5. *Fleet Management* – Logistics companies can use this system to monitor vehicle loads and optimize transportation efficiency.

6. *Traffic Regulation Compliance* – Helps riders adhere to legal weight limits set by transportation authorities.

7. *Smart Cities & IoT Applications* – Can be linked to cloud-based systems for real-time monitoring in smart traffic management.

8. *Educational & Research Purposes* – Used in engineering and research projects for advancements in intelligent transportation systems.

9. *Insurance & Vehicle Warranty Protection* – Helps insurance companies track bike usage and prevent damages due to overloading.

10. *Two-Wheeler Manufacturing* – Can be integrated into smart bikes by manufacturers to enhance safety features.

Results and Discussion

The Ride Sentry system successfully detects passenger load and displays real-time data on the LCD. Overload conditions activate the warning mechanism, demonstrating effective weight monitoring. The DC motor-based actuation ensures automated response for load management.

Conclusion

The Ride Sentry is a valuable innovation for public transport systems, enhancing passenger safety and preventing overloading. Future improvements may include wireless connectivity for remote monitoring and integration with IoT platforms for real-time tracking.

Future Scope

Integration with GPS for location-based alerts.

Wireless communication (Wi-Fi/Bluetooth) for remote monitoring.

AI-based load prediction to optimize passenger distribution.