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Weight Monitoring System for Truck Load

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Abstract: ***For cargo to be moved safely and effectively, a truck load weight monitoring system is required Overloading of trucks not only poses a risk to road safety but also causes excessive wear and tear on the vehicle, resulting in higher maintenance costs andreduced fuel efficiency. To address these challenges, an advanced weight monitoring system has been developed to measure and monitor the weight of truck loads using HX711 loadcell. When it comes to monitoring and managing the weight of truck loads. Overloading of trucks has been a longstanding issue in the industry. It not only compromises road safety but also has detrimental effects on the vehicles themselves. Excessive weight can lead to increased braking distances, compromised steering control, and increased risk of tire blowouts, all of which contribute to higher accident rates. This system utilizes advanced technologies and sensors to accurately measure and monitor the weight distribution of cargo carried by trucks. By providing real-time weight information using GPS and GSM modules, operators and fleet managers can make informed decisions to ensure compliance with weight regulations and prevent overloading***

Index Terms: HX711 load cell, GPS and GSM

I. INTRODUCTION

The weight-in-motion (WIM) system, the bridge weigh-in-motion system, the portable scale, and the stationary truck weigh station comprise the current system. Although they can measure the load, the first two are trustworthy. Measurements from the weight in motion system enable a continuous recording of vehicles as they weigh the axle length or wheel weights. The weight monitoring system typically consists of load sensors. The data from these sensors is then collected by data acquisition units, which convert analog signals into digital data for further processing. These units are equipped with microcontrollers or specialized signalprocessing circuits to ensure real-time data acquisition and transmission. The acquired data is then sent to the central monitoring system for analysis and display. The acquired weight data is transmitted to a central monitoring system, which serves as the controlcentre for the weight monitoring system. This system provides a user-friendly interface for operators to visualize and manage the weight information. It displays real-time weight distribution, alerts the operator in case of overloading, and stores historical data for analysis and reporting purposes.

II. LITERATURE SURVEY

B.Vishnupriya , M.Susmitha , S.Valarmathi , S.Dheenathayalan and R.Rajakumari published paper " Load Detection AndMonitoring System" in theyear 2020 under the international journal of scientific & technology It states that there is currently no way to check a vehicle's weight at the tollgate. This work will be implemented on the tollgate area to use a weight sensor to detectthe load carried by the vehicle. Determining whether the vehicle is overloaded is the primary goal of this work. The vehicle's loadwill be displayed on the display screen, and the weight will be compared to a database that contains the legal maximum weight for each kind of vehicle. An alert is generated in the event that the vehicle's capacity is exceeded. Because it prevents accidents by preventing the vehicle from carrying an excessive load and because it prolongs life, this work is regarded as protected work. time of the road. Hope that if it comes in practice, it will play a major role in government sector.

M.Lakshmi and K.Hariprasad published paper " Automatic Weight Monitoring Using Rfid and Load Cell" in the year 2016 under journal It claims that new scientific and technological innovations are thriving throughout the world. In our nation, the transportation of heavy vehicles is very important. Owners and operators of heavy vehicles in our nation risk fatalities, serious injuries, and lost cargo. The primary causes of traffic accidents are goods theft and the mid-stream addition of drugs. In our project, tollgate-based RFID technology is being used to gather sensor data. Two corners of the field will have sensors installed in order to position the vehicle and obtain load weight data through a load cell. Once the vehicle is in position, a camera will be activated, capturing a front image of the vehicle and storing data such as load weight, vehicle details, and image data for mailing., with the data client can cross verify the details regarding the transportation.

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III. PROBLEM STATEMENT

The current methods of weight monitoring for truck loads are manual and prone to errors, leading to noncompliance with weight regulations, increased safety risk. It often difficult for drivers and owner to accurately estimate the weight of their loads, especially when loads are constantly changing. This can lead truck being overloaded, variety of problem and decrease in the efficiency. To ensure theft of load in truck.

IV. NEW APPROACH

In order to prevent load theft and manage load-related issues, this paper proposes an integrated system that also helps to providereal-time feedback from the load cell and GSM module.

V. OBJECTIVES

1) To provide real time feedback to the owner or central dispatch system.
2) To ensure that truck is not overloaded. To provide easier convenience to the owner.
3) By ensuring that trucks are not overloaded, the system can help improve safety on the roads by reducing the risk of accidents caused by overloaded trucks.
4) To avoid the theft load in truck

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VI. BASIC WORKING PRINCIPLE

Whenever the truck is loaded, we cannot monitor the weight continuously so we have proposed weight monitoring system for truck load. It typically involves measuring and tracking the weight of the load carried by a truck throughout its journey. This is important for various reasons such as ensuring compliance with legal weight limits, preventing overloading.

The HX711 load cell, which we utilized in our model, amplifies the low electric output. The amplified signal is then digitally converted and fed into the Arduino to determine the weight. It comes with a small breakout board that houses a dual-channel, 24-bit precision A/D weight pressure sensor load cell amplifier. For ease of interface, the board has pinouts for the microcontroller and load cell in two different directions. The LCD (liquid crystal display) shows the weight. Through Arduino we have connectedGPS and GSM module. It facilitates keeping track of and monitoring the truck's weight. GPS is a navigation system that is based on satellites and offers precise timing and location data.

In a weight monitoring system for truck loads, GPS can be used to track the location of the truck and monitor its movement. The GPS receiver receives signals from at least four satellites and calculates its precise location based on the time delay of the signals. This location information is then transmitted to a central monitoring station or server via a communication network (such as GSMor internet). By integrating GPS and GSM technologies, the weight monitoring system can not only track the location and movement of the truck but also transmit weight-related data to a central monitoring station in real-time. This enables remote monitoring, data analysis, and timely decision-making regarding the truck's load status, route optimization, and compliance with weight regulations. Figure 1 shows the block diagram of proposed method of our project.

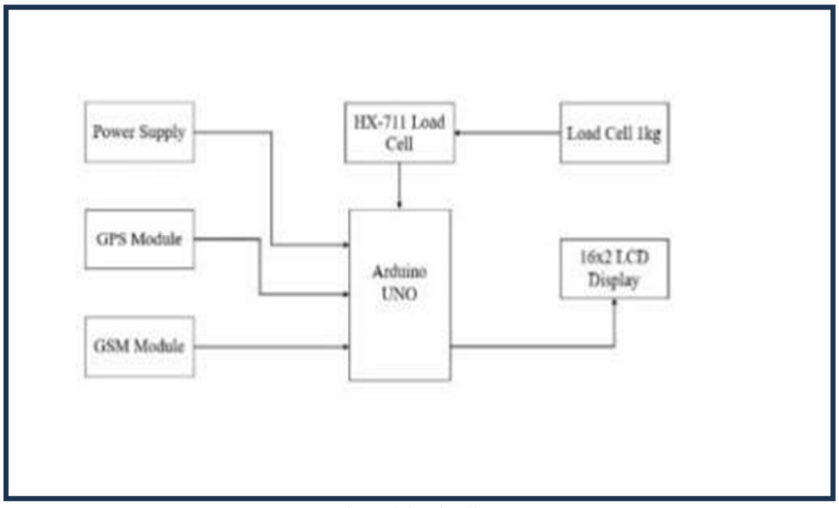

Fig.1 block diagram

VII. BASIC COMPONENTS USED LOAD CELL

In order to convert force into electrical signals, we bond a sensor called a “HX711” to the load cell.

A. HX711

The low electric output is amplified, and the signal is subsequently digitally converted and fed into the Arduino to determine the weight. It comes in a compact breakout board and has a dual-channel, 24-bit precision A/D weight pressure sensor load cell amplifier. Figure 2 shows the HX711 load cell.

Fig.2 HX711 load cell

B. GPS Module (Neo 6m)

It is a navigation system that uses satellites to deliver precise timing and location data. Its receiver receives signals from aminimum of four satellites and uses the signals' time delay to determine its exact location. Figure 3 shows GPS neo 6m.

Fig.3 GPS neo 6m

Features

- High sensitivity for tracking
- Low supply current (~45mA)
- Is able to track 5 locations per second with an accuracy of 2.5m (horizontal).
- Comes equipped with PSM also known as Power Saving Mode. This mode causes very less power consumption by turningthe module ON/OFF according to the need.
- Great use as GPS trackers in smart watches due to very low power consumption (~11mA)

C. GSM (SIM 900A)

GSM is a standard for mobile communication that allows voice and data transmission over cellular networks. SIM900A GSM module delivers GSM/GPRS 900/1800MHz. The GSM module can transmit data, such as weight measurements or GPS coordinates,to a central server or monitoring station via the Cellular network. Figure 4 shows GSM SIM 900A.

FIG 4 GSM SIM 900A

D. Arduino (UNO)

Arduino is an open-source electronics platform featuring user-friendly hardware and software components. It includes a programmable microcontroller equipped with digital and analog input/output pins, making it versatile for a wide range of applications. Its simplicity, coupled with the Arduino IDE and a simplified version of C++ programming language, makes it accessible to beginners and hobbyists interested in electronics and programming. Arduino finds applications in diverse fields suchas robotics, home automation, art installations, and scientific research. With a vibrant community of users, Arduino encourages collaborative learning and innovation by facilitating the sharing of projects, code, and knowledge. This open approach has democratized electronics, empowering enthusiasts, students, and professionals to create interactive and intelligent projects effortlessly.

VIII. RESULT AND DISCUSSION

Table 8.1 Weight Regulation of the model

Weight of the load is more than 800 gram	Weight of the load is less than 800 gram
Truck load is more with how much extra weight it is carryingin gm and with location of the truck	Truck load is less with how much extra weight it is carryingin gm and with location of the truck

Table 8.1 gives the data of our model in which we have taken 1kg load cell to calculate the weight of the truck load where we have set 800gm has constant value in which if the load is above the normal weight we get the information of the increased weight and live location of the truck if the weight is less than the normal weight then also same procedure follows.

IX. ACKNOWLEDGMENT

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X. CONCLUSION

In conclusion, the weight monitoring system for truck loads is a valuable tool for tracking and managing the weight carried by trucks. However, it is important to be aware of its limitations. The system's accuracy depends on proper calibration and maintenance of the weighing equipment. External factors like road conditions and temperature can also impact the accuracy of weight measurements. Furthermore, the system may face challenges in measuring dynamic loads and detecting certain types of load tampering. By acknowledging these limitations and taking appropriate measures to address them, the weight monitoring system can be effectively utilized to enhance truck load management and ensure compliance with weight regulations.

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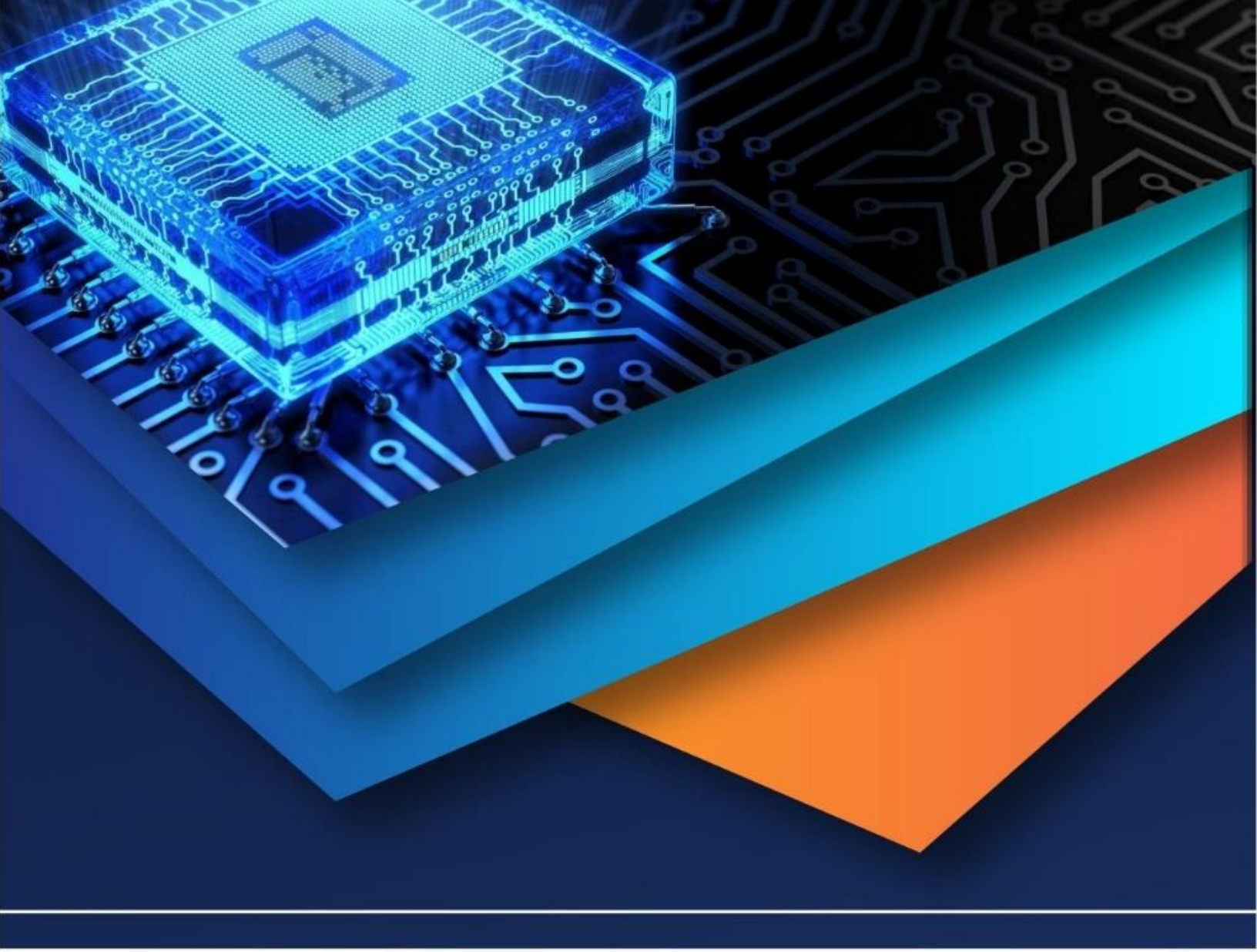

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