TRUCK WEIGHING BASED ON THE SUSPENSION OF THE VEHICLE

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Abstract - This system proposes the dynamic method for estimation of truck load weight based on the compression of suspension. Conventional method for estimation of truck load weight depends on the weighing stations which are regularly introduced close to the highways. The present framework has a genuine burden that the truck must be conveyed to the weighing station every time to quantify the load which causes wastage of time and it additionally includes false estimation of weight. The proposed technique beats these downsides with the use of sensors and GSM module. This framework utilizes ultrasonic sensors for dynamic estimation of load weight. These sensors are appended to the base of the truck's holder. At the point when the truck is stacked, the heaviness of the load causes compression of suspension of the truck because of this there is variation in distance delivered by ultrasonic sensors. The normal estimation of the distances obtained by different ultrasonic sensors are taken to calculate the weight. With the various statures acquired, weight of the load can be estimated by experimentation strategy by utilizing known standard loads. This determined weight is shown in LCD screen conveyed in the driver's lodge. At the point when the heaviness of the load surpasses the limit esteem which is set by government standards amid establishment, motor start is halted which makes the truck to remain rest and does not encounter any movement. In the event that the vehicle is continually over-burden, the information are sent to the nearby regional transport office (RTO) through SMS so the drivers can be accused of punishment when the vehicle seeks the fitness test.

Key Words: Suspension, threshold value, overloading, fitness test

1. INTRODUCTION

The development of each nation's economy is estimated by the development of its road transportation. Among the accessible transportations, road transportation plays an essential job in improving the nation's economy in light of the fact that through road transportation we can interface each niche and corner of our nation.

Beginning from little tractors which are utilized for agrarian proposes to huge heavy duty vehicles which are utilized to convey enormous pieces of planes and rockets, trucks plays an essential job in transportation of cargoes. With fast improvement in the market economy and with quick increment in road cargo, over-burdening turns into a noteworthy issue. Vehicle which convey substantial burden present risk to human life and furthermore cause exorbitant wear and harm to road, scaffolds, asphalts and make the vehicle less steady. In 2017, the nation's street cargo volume has surpassed 367,000 million tons. There are 14 million trucks which are over-burden. Surpassing a vehicle's most extreme reasonable weight isn't just a threat to the driver and other street clients; it is an illicit offense which conveys with it a scope of dangers and punishments, from fixed fines to jail sentences. In this way, it winds up importance to gauge the truck's load before transporting it.

Fig 1: An overloaded truck

The proposed strategy utilizes ultrasonic sensors fitted to the base of the holder of truck. Because of the variation in distance delivered by the ultrasonic sensor, weight of the load is estimated by trial and error method by utilizing known standard loads.

1.1 Existing procedure

Current procedure for estimating truck load is through weighing stations. It is the most prominent innovation utilized. Customary interstate weight estimation frameworks would in general use gauging gadgets set near side of the road. Every cell is included a durable material, for example, steel or cement with at least one strain measures appended to or inserted in it. A strain check comprises of a wires that transmits a mild electric flow. As the cell is exposed to weight, the wire in the strain measure is adjusted or packed somewhat. The alteration in the wire results in a difference in the resistance to the current passing through it. The signal from every cell is sent to an intersection box, where sensors measure the difference in the current and ascertain the

measure of weight the scale is supporting. These frameworks are regularly introduced close to expressways.

1.2 Disadvantages of existing strategy

The current system utilizes load cells has a noteworthy hindrance that each time the truck must be conveyed to the gauging station. The static weighing of vehicles in parkways has a few inconveniences, including being tedious, costly, and perilous on intensely voyage roads. Wear and tear is serious, frequently bringing about a short life expectancy. Except if the methodology asphalt is especially smooth, these frameworks are regularly wrong in light of the fact that the gadgets are liable to expansive burden variances relying upon vehicle speed, vehicle suspension qualities and road harshness.

2. LITERATURE SURVEY

Yanling Liu et.al (2018) They have utilized vibration sensors to gather vibration information, as indicated by the shifted sizes of vibration information, they have identified over-burden. Raspberry pi is utilized as the center of information gathering gear. A signal conditioning circuit board is structured freely to channel and intensify unique vibration signal, and convert simple analog signal to computerized signals. The implanted hubs are associated by remote system. Classic SVM model is utilized to arrange the information and decide the vehicle status.

H. D. Kattimani et.al (2017) In their venture, the practicality of vehicle load control framework through the strain measure load cell introduced in the vehicle, the single-chip microcontroller gets the data transmitted by the weight sensors and computes the complete load of the vehicle load. If overweight, the single-chip microcontroller will send directions to the vehicle framework to avert the start of the framework.

Vinoth. A et.al (2016) They proposed a system dependent on the pressure of the spring. Two wooden sheets are utilized. At the point when load goes past its admissible cutoff the spring gets packed and the littler springs inside the spring contacts the base screw which is appended to the lower board. Subsequently, the model turns into a short out leaving the electron stream from positive to negative of the battery. This prompts the discovery of over-burden.

Renju K et.al (2015) In their proposed methodology they have utilized video surveillance framework which mounted at the signals to catch the over-burden vehicle data automatically and send to server for handling. The framework catches vehicle number, time, place automatically and prompt move would be made against the proprietor of the vehicle. There are various strategies to distinguish over-burden vehicle, for example, separating data about pivot load, tallying the quantity of travelers and furthermore by gauging vehicle utilizing Weigh In Motion (WIM) sensors.

Jimin Yuan et.al (2013) Their system depends on getting the scope and the longitude of vehicles through the GPS satellite situating, The CDMA remote correspondence system will communicate with the observing centre in order to genuine opportune send the different data of transport vehicles to the observing centre. At that point the checking centre can inquire and dispatch the entire traffic group. This framework cannot just give full play to the incredible application improvement abilities of the normal altering apparatuses, yet in addition exploit the rich usefulness of the current GIS framework.

3. PROPOSED SYSTEM ARCHITECTURE
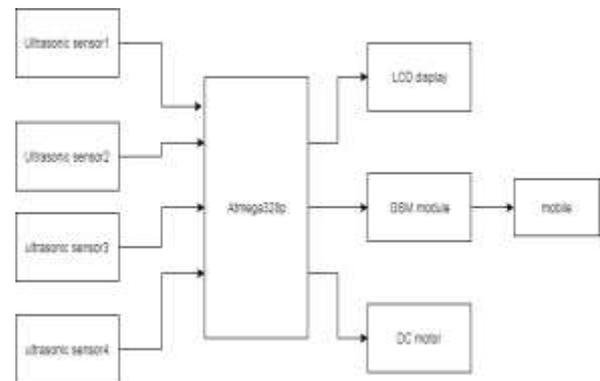
Fig 2: Block diagram of the system

3.1 Arduino Uno board

The Arduino Uno R3 is a microcontroller board dependent on the ATmega328 (datasheet). It has 14 advanced info/yield pins of which 6 can be utilized as PWM yields, 6 simple sources of info, a 16 MHz oscillator, a USB association, a power jack, an ICSP header, and a reset catch. It contains everything expected to help the microcontroller. The ultrasonic sensors which are utilized for this undertaking are associated with Arduino Uno board.

3.2. Ultrasonic sensor

Ultrasonic sensors measure remove by utilizing ultrasonic waves. The sensor head emanates a ultrasonic wave and gets the wave reflected once again from the objective. Ultrasonic Sensors measure the separation to the objective by estimating the time between the discharge and gathering. In this undertaking, two ultrasonic sensors are associated with the base of the truck's compartment above suspension; these sensors are utilized for estimating the separation of the pressure of the truck's suspension dependent on the heaviness of burden. Time taken by pulse is really for to and from movement of ultrasonic signal, while we need just 50% of this. In this manner time is taken as time/2.

Separation = Speed * Time/2
Speed of sound at sea level is found as 343 m/s or 34300 cm/s
In this manner, Distance = 17150 * Time (unit cm)

3.3. DC motor

A DC motor is any of a class of rotating electrical machines those changes over direct flow electrical vitality into mechanical vitality. The most widely recognized sorts depend on the powers delivered by attractive fields. DC motor is associated with the wheels which help in its revolution. At the point when the heaviness of the heap surpasses the edge esteem, the supply to the Dc engine is cut off showing the vehicle has been over-burden. Just when the heap weight falls inside the edge esteem, DC motor begins pivoting which thusly lead to the turn of the wheel.

3.4. LCD display

The display contains two interior single byte registers, one for directions and the other for characters to be shown on the showcase. It comprises of a client programmable RAM territory (the CGRAM) that can be modified to show wanted character, framed by utilizing a 5x7dot network. To choose between these two information regions, the hex order byte 0x80 will be utilized to imply that the display RAM address 00h is chosen.LCD is exceptionally useful in troubleshooting reason. The LCD controller is HITACHI 44780 which gives a straightforward interface between the controller 1& speck lattice. These LCD's are exceptionally easy to interface with the Arduino Uno alongside a potentiometer. In our undertaking LCD is utilized to show our heap weight to the driver in kilograms.

3.5. GSM module

A GSM module or a GPRS module is a circuit that will be utilized to set up correspondence between a cell phone or a processing machine and a GSM or GPRS framework. In our framework when the vehicle has been continually over-burden over a specific breaking point it will advised to the close-by territorial transport office by means of SMS.

3.6. L239D Motor Driver

L293D engine driver can drive two DC engines all the while. L293D IC is a double H-connect driver IC. Single H-connect can drive a dc engine in the two headings. L293D IC is a present enhancer IC as the yield from the sensor isn't adequate to drive engines itself so L293D is utilized for this reason. L293D has 16 pins, having two empowers pins. This stick ought to dependably be high to empower both the H-spans.
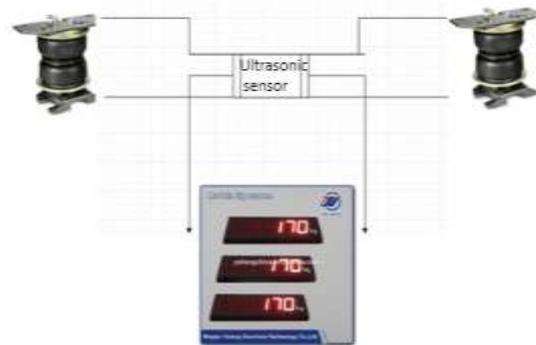
Fig3: conceptual diagram of the system

4. METHODOLOGY

This technique is utilizing ultrasonic sensors to gauge variety in the stature created by various burdens. At the point when the truck is stacked it prompts the pressure of the truck's suspension because of this there is a variety in stature which is estimated with the utilization of ultrasonic sensor. In light of the deliberate distance obtained we can ascertain the weight. So a transformation from height to weight is required which is made utilizing the experimentation strategy. The standard loads are utilized and the height delivered by the ultrasonic sensor is noted. This height is corresponding to the standard weight. Utilizing distinctive known standard loads, various statures (in cm) are obtained. Multiplicative estimation of experimentation strategy can be utilized for computation of extensive burden loads. The determined weight is shown in the LCD screen. At the point when the heaviness of the heap surpasses the edge esteem, the vehicle does not encounter any movement this shows there is no start to motor .This thusly demonstrates the driver that the vehicle is over-burden and a specific measure of weight must be emptied to make the heap fit for Transportation. At the point when the vehicle is always over-burden it is insinuated to the adjacent provincial transport office (RTO) by means of sms which is made conceivable utilizing GSM module. So when the vehicle comes for fitness test, the driver might be charged dependent on the recurrence of over-burdening.

Fig 4: Prototype of the system

Fig 5: working module of the system

5. WEIGHT CALCULATION

Weight of the heap is determined dependent on the experimentation strategy. The normal estimation of two statures is relative to the heaviness of the heap.

Table 1: weight calculation

Sn	Known weight (in kgs)	Height1 (in cms)	Height2 (in cms)	Average Height (in cms)	Engine ignition status
1	5	15	16	15	on
2	6	14	15	14	on
3	7	13	14	13	on
4	8	12	13	12	on
5	9	11	12	11	on
6	10	10	10	10	off

6. RESULTS

The separation created by the ultrasonic sensor shifts as per the heaviness of the heap. The loads are estimated dependent on the experimentation technique by utilizing known weight. The heaviness of the heap is shown on the LCD show. In light of the recurrence of over-burdening, the over-burden weight can be implied to the adjacent RTO by means of sms. So this framework gives a proficient on-board estimation of weight of the heap.
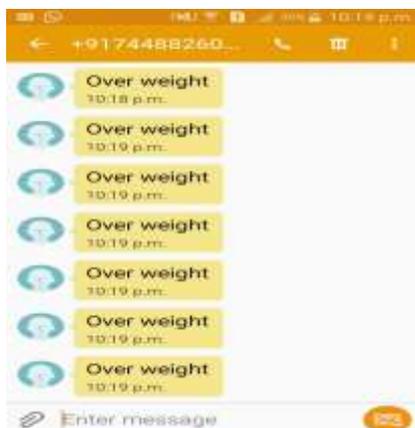

Fig 6: SMS received in mobile when system is overloaded

7. ADVANTAGES

- Simple on board load weight estimation of trucks.
- Simple and practical
- Simple to actualize in a wide range of vehicles
- Less wear and tear.
- Framework requires straightforward circuit association
- Requires less setup space.

8. CONCLUSION

This framework gives a methodical and dynamic method for estimation of trucks' heap weight. This framework has a more prominent favorable position that it is less mind boggling contrasted with other proposed strategies. It tends to be effectively introduced in a wide range of vehicles which contains a suspension framework. Besides this framework is effectively reasonable and it requires less execution cost. This framework guarantees aversion of transportation of trucks with over-burden since the framework gives an exact method for ceasing motor start when there is recognition of overweight. This thus will assist us with avoiding mishaps and furthermore counteract harm of roads along these lines guaranteeing the wellbeing of the general population.

9. FUTURE SCOPE

At present the framework utilizes just GSM module to send the deliberate weight by means of SMS to RTO when there is consistent over-burdening. So in future we are wanting to have a database to keep up these records so it can used to follow the vehicle and drivers and accuse them of punishment within proper time.

10. ACKNOWLEDGEMENT

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