IOT Based Solution for Tracking and Prevention of Stealing at Weighbridge

Anand Chauhan[1], C. S. Raghuvanshi [2], Hari Om Sharan [3]

[1,2,3] Department of Computer Science & Engineering, Faculty of Engineering & Technology,
Rama University,Kanpur (U.P.) India

Abstract- **Weighbridge stations are generally located in remote areas. Many heavy vehicles perform weighment with tonnes of cargo. Data manipulation is very easy due to sole control of the operator at point. Operators can steal money collection with data manipulation. Also cargo stealing is the major worry for cargo owners between the stations. IOT based chip solution, benefits cargo owners to track actual quantity through online software and help weighbridge station owners in prevention of stealing money collection at weighbridge. In the proposed system weighbridge statistics will be automatically saved on the cloud without giving liberty to operators for any manual manipulation. Connecting with all weighbridge station's data on cloud will help to assess data patterns between the stations. Theft of cargo quantity can be tracked during the transportation journey. Also money collection at weighbridge station manipulation can be tracked. Implementation of the system will reduce the huge hardware cost of weighbridge stations. Small electronic chip based computer – Raspberry Pi, will be the mediator between weighing machine and proposed web based software. Complete system will require a weighing machine with metric tonnes capacity, small electronic chip based computer – Raspberry Pi model 4, internet connection and basic input-output devices.**

Keywords: Weighing Machine, Weighbridge Station, Raspberry Pi, Cargo stealing, Data Manipulation, Money stealing

I. INTRODUCTION

Whenever cargo or commodities trade occurs between the two or multiple parties having multiple stations / sites which are located in intra-state, inter-states, inter-countries, the importance of the weighing of cargo is must and necessary before movement. There are various methods of weighment but the most commonly used these days is the electronic weighing system. The place where the weighing system is installed is known as 'Weighbridge'. Mostly in remote areas or the outer place of villages, cities, beside highways, god owns, warehouses, container freight stations etc. The Weighbridge is holding a big weighing scale which has the capacity of weighing in tons. Based on weighing capacity various vehicles or Lorries with different cargo or commodities are performing the weighment. There is another cabin where the operator can read and measure the weighing units on the terminal. Operator provides the weighing slip of the weighment to the customer after keeping the weighing record in installed software in the computer. So each and every station from where the cargo or commodities' journey is starting till end, whenever the

mode of transportation is changing like Roadway to Railway, Railway to Roadway, Roadway to Seaway, Roadway to Airway etc. Inter-god owns, Inter-warehouses weighment is common practice. During the journey of cargo or commodities the handling loss, stealing of cargo is the headache of cargo owner where as manipulation of weighbridge's records and stealing of money collection of weighbridge by the operator is the headache of weighbridge owner in addition the travelling and collecting the money from the weighbridge every day or in some interval of time is costing to weighbridge owner. Always in ideal condition the valuable cargo must be reached at destination without shortage but in practical scenario it is not possible whenever bulk cargo is travelling, in these cases 2% of cargo loss - shortage is allowed to transporters and when changing the mode of transportation. Cargo loss is also occurring during the shifting - repackaging by the labours. So with the electronic weighment system cargo owners can track the quantity.

II. PROBLEM

When some weighbridge owners have approached to provide the solution or build a new system for weighbridge management which will help them to manage daily operations smoothly without any interruption. The main problem arises to manage multiple weighbridge operations to different remote locations simultaneously. The time investment to reach out to remote locations on a daily basis is costing too much. Fuel consumption or travelling expenses to remote areas are burning money on a daily basis. Stealing cash money by the operators is the major threat, operators can also manipulate data of weighing records. Whenever the owner cross checks the records in the system against the collection of money can be manipulative and with excuses. Lack of smart system integration is the center point of the problem. Otherside second problem arises with the cargo owners being unable to track the cargo quantity during the cargo journey. Always tons of cargo is valuable in terms of money. Cargo movement from source to destination must be safe and actual in quantity to the receiver, if not then the amount of money can be deducted from the cargo owner's account while payment against shortage of quantity. Loss of shortage causes through stealing of cargo, manipulation with data at weighing points etc. Same thing is the lack of smart system integration of tracking correct cargo quantity is the center point of the problem.

III. PROBLEMS IN EXISTING SYSTEM

There are many companies which are providing weighing scales which have the capacity of tons. The technicians install the weighing scale at weighbridge station. They calibrate the scale properly and pass the various tests on scale to measure accuracy of weighing objects. The terminal fetches the weighing data in front of the operator where he/she is sitting. Fluctuation of weight may be 0.1% to 0.5% due to weather. Small software is also installed in the computer which is communicating with the terminal and showing figures to capture data. Operators have to fill a form with some necessary details of the weighing lorry like lorry number, driver name, contact details, type of cargo, amount in the software and have to save weighing data along with other details. All saving data is currently in offline mode; it means that the computer is holding data. There is no backup system at all if the computer data is corrupt by any reason there is no chance of recovery of data. Existing system of weighbridges is traditional which does not fit in the current modern world. It is burning cash in terms of fuel to reach at point for owner or travelling expense of staff for the collection and taking care of. Obvious thing to lose precious time. Now the stealing of cash money by the operators and not getting complete collection of money by the owner. Operators may alter the captured data in the system which shows correct collection of money at point. But in reality data is manipulated and the difference of cash collection is being kept in pocket. Manipulation with the cargo quantity shows shortage in the cargo while weighing, operator prints the weighing slip and hand over to the driver. Drivers may steal the difference of cargo which encashes in black market and benefits the driver with crew members. Driver shows the weighing slip to the cargo owners which is actually manipulated. Currently the weighing point's operators and drivers - crew staff are together in stealing matter and benefit themselves via the black market's benefits.

Identified that the weighbridge owner provides the computer system unit to operate the weighment of lorries. A good Computer system costs around Rs. 20K to Rs. 25K. Without computer system setup operation won't work. The software installation becomes mandatory in such cases. It is very difficult to record and maintain weighing data manually because on an average hundreds of operations are performed daily. Since the records are manually maintained, the chance of losing the track of data is high. It also causes a lot of hindrances during an annual audit.

IV. PROPOSED SOLUTION

The proposed solution is to create an IOT based solution for tracking cargo quantity, money collection at various points and prevention of stealing cargo and money collection at weighbridge stations. System can be created with the help of a small electronic chip based computer - Raspberry Pi model 4, some input output devices, internet connection, cloud server, customised software which will act online and offline mode. Raspberry Pi model 4 will replace the computer CPU which will save cost around Rs. 14K to Rs. 16K. Raspberry Pi model 4 is holding 2 USB 2.0 ports, 2 USB 3.0 ports, 2 Micro HDMI ports, 1 Gigabit LAN port, Power port which is USB type-C and MicroSD memory card slot.
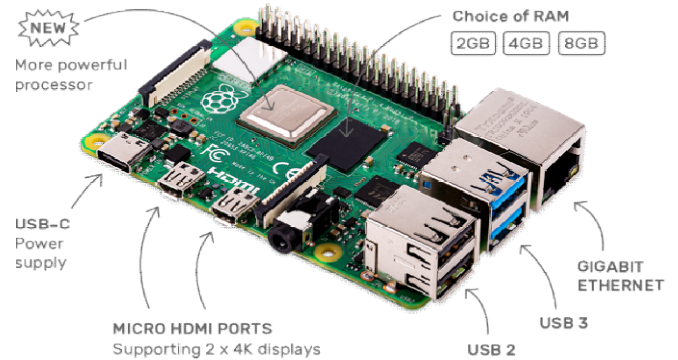
(Raspberry Pi Foundation, n.d.)

Developed software can be installed in Raspberry Pi system in offline mode, through internet connectivity it will throw captured data online immediately which will act as central repository for all weighbridge stations. Raspberry Pi model 4 is working on 3A or 5V power adapter which will save the electricity cost comparative to CPU power consumption. Installed customized software will interact with the weighing scale's terminal, capture data and show it to the operator on the software screen.

(AHNE Weighing Solutions Private Limited, n.d.)

(Microsensor, n.d.)

Operator has only the option to accept weighing data, not to modify. Along with weighing data, operators can fill the basic details of lorry and driver on the form.

Captured data in the software will be thrown to the cloud server automatically on set interval. Weighbridge owners can manage his/her multiple weighbridges which are located in remote places. Owner can track each and every record live from the cloud data center parallely. Money collection against weighing operations. By analysis of records, owners can get statistics of money collection at point which will prevent the stealing of money collection. Other scenario cargo owners can track their bulky cargo lorry where weighment has been done. The cargo owners can only track their own data by combining a portal. Throughout the journey of cargo if quantity may vary then they can directly contact the transporter and can trap the driver or crew members and can enquire for the cause of cargo quantity difference. Prevention of stealing cargo quantity plays a major role in the cargo owner side scenario. Providing a common platform to both sides by the proposed IOT based solution in a cheaper way with less maintenance then traditional computer systems. This will not only keep a proper track of the data but will also aid the weighbridge owner in their business planning strategies. This will also make the audit process hassle free and less chaotic.

V. OTHER POSSIBLE IMPLEMENTATIONS

On huge collective data and on overtime periods experts can perform data mining techniques and can study data patterns. Through analysis, data can be used in AI Techniques like

1. Measures average weight of particular commodities during the journey with different capacities of Lorries and distance.
2. Measures average days and time between the stations of lorry.
3. Humidity portion always reduces weight from the cargo due to evaporation.
4. Average loss or shortage of cargo during the journey.
5. A notification system (can be done via email or sms) for the cargo owners notifying them every time their cargo is weighted on a weighbridge. Allowing them to keep track of the cargo as well as the lorry location.

May measure the accuracy of the weighing scale with analysis of data patterns on time intervals. If the accuracy is not in proper desired figures can send an alert to the weighbridge owner to recalibrate the weighing scale.

REFERENCES

[1] AHNE Weighing Solutions Private Limited. (n.d.). 100 Ton Pitless Weighbridge, Foundation Less Weighbridge in RR Nagar, Bengaluru , AHNE Weighing Solutions Private Limited | ID: 19889544373. India MART. Retrieved February 19, 2022, from https://www.indiamart.com/proddetail/100-ton-pitless-weighbridge-19889544373.html

[2] Microsensor. (n.d.). Weighbridge Indicator, Weighing Indicator in Bally, Howrah, and Micro sensor | ID: 10466818730. India MART. Retrieved February 19, 2022, from https://www.indiamart.com/proddetail/weighbridge-indicator-10466818730.html

[3] Raspberry Pi Foundation. (n.d.). Raspberry Pi 4 Model B – Raspberry Pi. RaspberryPi.com. Retrieved February 18, 2022, from https://www.raspberrypi.com/products/raspberry-pi-4-model-b/