Vehicle Tracking and Overload Detection System in Public Transport using IoT

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Abstract:
Now a day lots of accident happens due to overloading of the vehicles. Every vehicle has some number of seating capacity but most of the time they violate the law and allows more passengers which causes accident some time so that we need to provide auto overload detection system. The types of sensors employed are weight sensors on the vehicles suspension to detect overloaded vehicles. The device will automatically detect the in and out count of passenger/goods and Sensors will collect information from the vehicles, forward this to an on-board data analyser (normally to be placed at authority stations). Authority station will mark the time and location of that vehicle at that moment. Later that whole data will use to completely analyser the vehicle. In inspection of vehicle the authority stations will analyse the overloaded point and generate the fine according to that. So we have proposed a system in which the counter is getting count by using the IR sensors and manipulation done by server which will help to keep the eye on transportation system by RTO and owner of the transport system.

Keywords: Accident, GPS Tracking, Overload Detection, Vehicle Tracking.

I. INTRODUCTION

As the Wireless Sensor Networks have scientifically advanced more rapidly and more proficiently, they have become the key source for the advancement of IoT. They find it use in almost all fields including smart grid, smart transportation systems, smart home, smart hospitals, and so on. The accomplishment of the above leads to the smart city development as mentioned by our Indian Prime Minister. The new applications and businesses are created continuously with the help of technology through the internet. IoT (Internet of Things) can help in integration of communication, control and information processing across various transportation systems. Generally, in public transportation, there is lack of real time information. Carrying more passengers than capacity by bus is a huge problem. Some other buses squeeze people in the spaces between the seats. Example a space of 4 passengers will accommodate 5 passengers. Why have passengers become agents and disciples of impunity in the bus industry? The worst part is that the money never reaches the owner it goes into the pockets of the drivers and the conductors. In the situation when someone complains or refuses to squeeze the conductor and some of the passengers will tell them to buy their own car. The importance of controlling overloading passengers cannot be ignored because it helps to reduce deaths and casualties as the findings show that excessive passengers is one of the major causes of many deaths and casualties when accidents occur. There should be a way of controlling that because passengers have to sit and wear seat belts for their safety [1]. It is clear that, at some point, we need to limit the number of extra passengers to be accommodated. Worldwide people invest in quality control programs in order to assess and improve the services provided to the passengers [2]. Overload passenger in public transport is a serious problem in many countries across the world because it incurs huge costs in terms of life, property and maintenance of buses. Many countries have established a system to reinforce overload limit regulation (rule) and some are attempting to address the issue

and implement strict controlling mechanisms. The struggle for the problem since the last decades particularly after the introduction of public transport buses received more attention, and yet these are playing major roles in the transportation satisfying the transport demand generated by the growing economy and ever increasing population both in developed and developing countries. The problem of overloading is generally under control in many developed countries while it is still a challenge too many developing and under developed nations. Public transportation service available on sharing basis for the benefit of general public. It includes city buses, trolleybuses, trams, ferries. Unlike transportation modes like carpooling, rickshaws and taxis, this system encompasses an entirety of strangers. Now a day lots of accident happens due to overloading of the vehicles. Every vehicle has some number of seating capacity but most of the time they violate the law and allows more passengers which causes accident some time so that we need to provide auto overload detection system. The types of sensors employed are weight sensors on the vehicles suspension to detect overloaded vehicles. The device will automatically detect the in and out count of passenger/goods and Sensors will collect information from the vehicles, forward this to an on board data analyzer (normally to be placed at authority stations). Authority station will mark the time and location of that vehicle at that moment. Later that whole data will use to completely analyze the vehicle. In inspection of vehicle the authority stations will analyze the overload.

A. Objective and Scope of Project

The aim of this project is to identify the effectiveness of using overload system in enhancing the operations in enforcing vehicle weight limit regulations. Specifically, this project attempts to quantify the effect of overloaded vehicle and protect the system and infrastructure of the roads.

- Developing responsive and interactive way to manipulate the fine and check for the passenger security in public transport system.

- To implement feasible, efficient fine generation and manipulation system for the RTO department.
- Measuring the in out counter of incoming and outgoing passenger.
- Implementation of GPS tracking over the bus.

II. LITERATURE REVIEW

Evans, "traffic safety and the driver". "Traffic Safety and therefore the Driver synthesizes&summarizes a good array of essential world analysis on topics that vary from automotive, roadway, and traffic engineering, to driver performance and behaviour. This absorbing volume will prove invaluable to professionals in human factors, traffic engineering, criminology, sociology, gerontology, public health, psychology, medicine, education, driver training, and law enforcement[1]. Yannis T. and A Georgia, "A complete methodology for the standard management of passengers Services within the public transport". The quality of the services provided to the passengers is synonymous with a wide range of characteristics of the transportation system, such as safety, on-time performance, accessibility, efficiency, and many others. Today, a lot of and a lot of conveyance operators and associated bodies (e.g. ministries and oversight organizations) worldwide invest in internal control programs so as to assess and improve the services provided to the passengers. The authors provide an overview of the Methodology developed by the Hellenic Institute of Transport to assess the levels of quality and performance of public transport services [2]. Chen, "People enumeration system for obtaining in/out of a bus supported video process in Intelligent Systems style and Applications. The author proposed an automatic people counting system for getting in/out of a bus based on video processing. The basic theme is to line a celestial point camera within the bus for capturing the rider flow bi-directionally. Experimental results shows that the proposed bus passenger counting algorithm can provide a high count accuracy of 92% on average [4]. Kodavati, "GSM and GPS based mostly vehicle location and pursuit system". This system contains the RF transmitter is attached with the vehicle which has its own identification. This knowledge are going to be endlessly transmitted to the RF receiver connected to the microcontroller. This GPS will be location the position of vehicle and transmit that data to the microcontroller [3]. Deeksha Jain, P. Venkata Krishna and V. Saritha. (2012 June), "A Study on web of Things based mostly Applications". The Authors focus on privacy and security issues involved in Internet of Things. According to author product information, electronic tag, standard expressed and uploading information are the properties of Internet of Things [7]. Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic, Marimuthu Palaniswami. (2013 Sept.), "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions." Journal of Future Generation Computer Systems. The Authors presented a Cloud centric vision for worldwide implementation of Internet of Things. Aneka user centric cloud implemented which based on the interaction of private and public cloud. They designed a framework that permits computation, storage, networking and visualization themes based on shared environment. The proposed framework associated have been highlighted ranging from appropriate interpretation and visualization of the vast amounts of data, through to the privacy, security and data management issues that must underpin such a platform in order for it to be genuinely viable [8]. Somayya Madakam, R. Ramaswamy,

Siddharth Tripathi. (2015 May), "Internet of Things (IoT): A Literature Review Journal of Computer and Communications. The Authors researched on review papers on IoT. According to authors of [9] there is no standard definition in worldwide, in architectural level universal standardizations are required, technologies are varying from vendor-vendor, so needs to be interoperable and need a customary protocol for higher international governance. Antonio J. Jara, Latif Ladid, and Antonio Skarmeta. (2013 SEPT), "The Internet of Everything through IPv6: An Analysis of Challenges, Solutions and Opportunities". The Authors provides an summary concerning the addressing the challenges in terms of property, reliability, security and mobility of the Internet of Things through IPv6 in order to reach the Internet of Everything. They describes the key challenges, how they have been solved with IPv6 and the roadmap of the Internet of Everything in order to reach an interoperable, trustable, mobile, distributed, valuable, and powerful enabler for rising applications like Smarter Cities, Human Dynamics, Cyber-Physical Systems, Smart Grid, inexperienced Networks, Intelligent Transport Systems, and omnipresent care [10].

III. SYSTEM ARCHITECTURE

The nation's growth and therefore they have to be compelled to meet quality, environmental, and energy objectives place demands on transportation systems. Current systems, that ar previous and in want of upgrading, should expand spot, increase service frequency, and improve potency to serve these demands. Research is important to unravel in operation issues, to adapt applicable new technologies from alternative industries, and to introduce innovations into the transit industry[5]. In the past, passenger count was mostly tiring and was both labor and cost intensive. So, it is important to develop an automatic method for counting passengers[6]. Many specialists are presently performing on totally different comes to extend the protection of cars and reduce the amount of accidents on the roads. Currently in Tanzania the technology keeps growing each day. There is a need to change from manual control to automatic control of excessive passengers. We have some good coverage for mobile network along the major roads. We have fibre optic in most parts of the Country Region. There is growth of ICT Industry in Tanzania; hence the introduction of new technology can be a great start in the transport area. The new systems will automatically control the excessive passengers in public transport and enforce safety of the passengers. Worldwide people invest in quality control programs in order to assess and improve the services provided to the passengers. The table below shows the number of public service vehicles that are being registered each year. There has been a steady increase in the number of registered vehicles. This justifies that if the system for controlling excessive passengers is to be implemented, it can be put into effect in each public vehicle that is being registered.
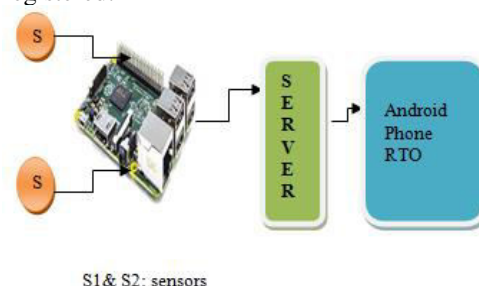

S1& S2: sensors

Figure.1. Proposed Work System

Above figure shows the actual design of the project. Which include Sensors, Raspberry pi kit, server and android application. We are going to fetch the data through sensors which are transmitted by Raspberry pi kit. Then data will be sent to server then we can see the actual implementation in an android application. In our project, we are using two IR sensors one for IN count and one for OUT count.

A. Flowchart

This flowchart shows the actual flow of our project. The initial stage to start the project is to go inside the bus for which we have used IR sensors(In sensor) that is used for IN count which will increase count by one. Like IN sensor we have used one more IR Sensor(Out sensors) to get out of the bus which will automatically decrease the count. This IN and OUT count will calculate total passenger in the bus. If the count is greater than the given limit it will send the message alert to the owner of the bus. And it will mark the fine to the user. For which owner have to pay fine.
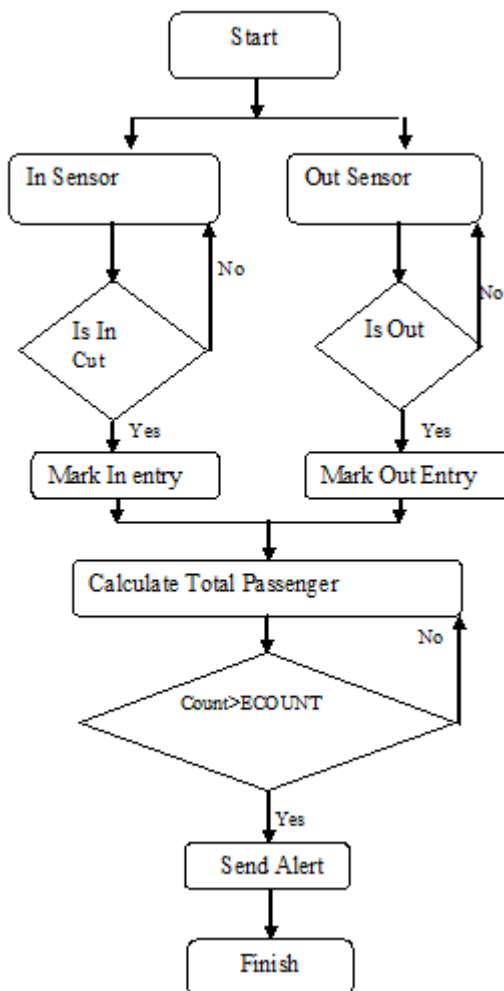
Figure.2. Flowchart

IV. IMPLEMENTATION AND RESULT

A. Software Implementation
- JDK8.0
- Android Studio 3.0
- XAMP/WAMP
- MySQL

In our project we are using following languages:
In which we have used XML(Extensible Markup Language) for designing GUI(Graphical User Interface). Overall project contains following parts frontend and backend in which frontend includes XML and backend includes MySQL for

controlling purpose we are using java language. Till now have achieved one objective i.e. XML which is the front end of project. In which there are six parts: Find Bus, Seat availability, Bus Schedule, Live Location, Admin, Helpline

B. Hardware Implementation

Figure.1. Hardware Design

This is the hardware design of our project. There is a bus which have two doors. At First door one sensor is connected. And Second sensor is connected at second door. First sensor is connected for IN count and second Sensor is connected for OUT. There is one load cell which is connected to HX711 sensor through which one can measure weight.

C. Result:
Following are the output of the GUI which is taken from the application called Vehicle Application.
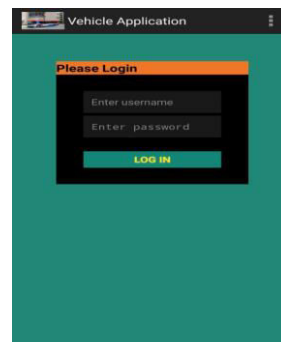
- **Front End Output**

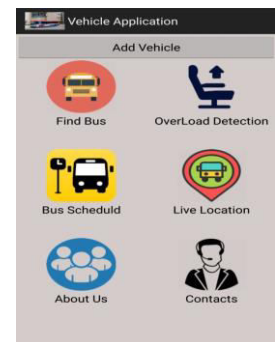**Figure.2.Home Page**   **Figure.3. Home Page**

First RTO department will login to the application by entering Username and Password. After login he will get to see home page which includes seven sections as shown in figure 3 namely:

- Add Vehicle
- Find Bus
- Overload Detection
- Bus Schedule
- Live Location
- About Us
- Contacts

V. ADVANTAGES AND DISADVANTAGES

A. Advantages
Among all the advantages of exploitation vehicle pursuit system we are able to notice price saving, discounts on insurance, improved safety of staff and fleet, higher service for

patrons, improved time and worker management as well as administration and theft prevention.

• Real Time Tracking

One of the dominant options of today's GPS pursuit systems is that the ability to observe fleets in real time. You can track the movement of your vehicle on a virtual map once it moves from one purpose to a different. This helps in fast route management just in case of obstacles and in fast disaster management, in case, something of the kind happens. Also, you'll be able to see the vehicle speed beside the main points of its location, status (whether it is in a parked state or moving condition) etc. Hence, multiple vehicles can be managed effortlessly using the feature.

• Cost Saving

Vehicle pursuit system will bring the advantage of higher monetary management. This is due to the data on fuel consumption and higher fuel management, eliminating unwanted behaviour from drivers such as speeding and better management of idle and maintenance time.

• Discounts on Insurance

Cost saving and cost cutting can be further facilitated by discounts offered from insurance companies. These companies tend to give discounts for companies, who use vehicle tracking system in their fleet management as it provides more information on fleet and improves safety of employees and the fleet.

• Safety of Drivers and Trucks

Thanks to vehicle pursuit systems it's doable to scale back traffic accidents, as well as avoid any problems on the way, traffic jams and construction on the roads. Fleet management benefits also from theft prevention feature.

• Better Service for Customers

All the data gained from vehicle pursuit system will lead into higher management of all business processes.That additionally includes higher service for the purchasers, as it is possible to see the route, stops, idle time and possible arrival time.

• Employee Management

Vehicle pursuit system will bring the advantage of higher worker management due to data on fuel management and observance of driver's behaviour. Thanks to these features, it is possible to see better and worse performing employees. Besides this, it is also possible to use all the information gained for better training of drivers.

• Improved Administration

Administration is facilitated thanks to vehicle tracking systems. Time saved on administration is used for processes that require a lot of attention and so it may lead to a lot of economical business.

B. Disadvantages

• Tracking systems can be an invasion of privacy. Managers will use thedata regarding employees WHO are utterly honest and tireless so as to fireplace them. These perhaps the littlest of discrepancies, however taken out of context could create the employees look extremely unhealthy.
• They are another piece of technology to go wrong and cause stress to the staff that come to rely on the tracking devices.

VI. CONCLUSION

Overload monitoring system is becoming increasingly important and it is more secured than other systems. The current situation for controlling overloading passenger in public buses needs to be improved. As the manual check is difficult during the bad weather such as rain, difficult at night, can increase the possibilities of bribe its costs to operate and it need immense labor power. Apart from that it is not accurate as the checks are done at random not all the buses are checked. There is a need to device a new system which can overcome all these difficulties. It is completely integrated so that once it is implemented in all vehicles, then it is possible to control the bus. As the technology is growing we need to utilize it for the development of our country. By using Raspberry pi, Load cell and Load measuring sensor we can control the overloading of transportation system.

Future Scope

- We can use our kit to help the traffic. By keeping the kits in entire vehicles and by knowing the locations of all the vehicles.
- If anybody steals our car we can easily find our car around the globe. By keeping vehicle positioning vehicle on vehicle.
- With the help of high sensitivity vibration sensor we can detect the accident. Whenever vehicle unexpectedly had an accident on the road we can detect the accident with the help of vibration sensor and we can send the location to the owner, hospital and police.

VII. REFERENCES

[1]. Evans, L., "Traffic safety and the driver", 1991: Van No strand Reinhold Company.

[2]. Yantis, T. and A. Georgia, "A complete methodology for the standard management of traveller services within the conveyance business", 2008.

[3]. Kodavati, B., et al.,"GSM and GPS based vehicle location and tracking system. International Journal of Engineering analysis and Applications (IJERA) ISSN", 2011: p.2248-9622.

[4]. Chen, C.-H., et al. "People investigation system for obtaining in/out of a bus supported video process in Intelligent Systems Design and Applications",2008. ISDA'08. Eighth International Conference, 2008: IEEE.

[5]. Boyle, D.K., Passenger counting technologies and procedures 1998.

[6]. Mukherjee, S., et al. Anovel framework for automatic passenger counting in Image process (ICIP), 2011 18th IEEE International Conference on 2011:IEEE.

[7]. Deeksha Jain, P. Venkata Krishna and V. Saritha. (2012 June), "A Study on Internet of Things based Applications"

[8]. Jayavardhana Gubbi, Rajkumar Buyya, Slaven Marusic, Marimuthu Palaniswami. (2013 Sept.), "Internet of Things (IoT): A Vision, Architectural Elements, and Future Directions." Journal of Future Generation Computer Systems. Vol. 29, No. 7, pp. 1645-1660.

[9]. Somayya Madakam, R. Ramaswamy, Siddharth Tripathi. (2015 May), "Internet of Things (IoT): A Literature Review." Journal of Computer and Communications. Vol. 3, No. 5, pp. 164-1

[10]. Antonio J. Jara, Latif Ladid, and Antonio Skarmeta. (2013 SEPT), "The net of Everything through IPv6: AN Analysis of Challenges, Solutions and Opportunities".