Smart Traffic Management System Using Internet of Things

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ABSTRACT

Many Indian cities, as well as other countries, suffer from traffic congestion. Congestion in the streets has been caused by signal failure, poor regulatory enforcement, and poor site visitor control. Because existing infrastructure in Indian cities cannot be enhanced any further, the most efficient option is to improve tourist management. Congestion is bad for the economy, the environment, and people's overall quality of life. As a result, it's past time to figure out how to effectively manage the site's traffic congestion. Infrared sensors, analysis of video data, inductive loop detection, wi-fi sensor networks, and more technologies are available for site visitor management. All of these techniques are effective ways to control visitors using a smart device. However, the issue with those structures is that construction time, as well as installation and maintenance costs, are prohibitively expensive. As a result, a brand Radio Frequency Identification (RFID) is a novel technology that may prove useful. combined with the current signalling machine to operate as a key to real-time smart visitor control.

Keywords- IoT, Smart Traffic Management, Smart City, Traffic Congestion, RFID

I. INTRODUCTION

Slower speeds, longer travel times, and increased car queueing are all symptoms of traffic congestion in avenue networks. When the number of cars on the route exceeds its capacity, traffic congestion occurs. In India's cosmopolitan cities Congestion is a major annoyance. When demand exceeds available street capacity, traffic congestion occurs. This is referred to as [1] saturation

Individual events, such as injuries or abrupt car braking in high traffic, have cascade effects and generate traffic gridlock [2]. There are also significant security concerns in the site visitor machine as a result of antisocial causes, which results in traffic standstill in one area. There could be a problem in countries like India. Congestion costs the country 60,000 crores per year (consisting of fuel wastage). Congestion in India has also resulted in slower freight vehicle speeds and longer wait times at toll plazas and checkpoints [3]. On crucial corridors such as Mumbai-Chennai and Delhi-Chennai, the average speed of motor vehicles is less than 20 kilometers per hour, while the Delhi-Mumbai stretch is only 21.35 kilometers per hour. According to the Indian Railways According to IIM, India's freight volume is growing at a 9.08 percent annual rate. while autos are increasing at a rate of 10.76 percent. However, avenue is growing at a rate of four.01 percent. As a result, roadway space has been lowered in accordance with the range of general cars . In India, the average gasoline mileage is barely 3.96 kmpl. The Congestion costs the country 60,000 crores per year (consisting of fuel wastage). India's traffic has gotten worse. The main reason for this is that the site is overburdened with visitors. India is Asia's second most populous country behind China, and as the population grows, so does the number of automobiles available [4]. The financial boom has had a significant impact on tourism to metropolitan sites. As earnings climb, a growing number of people mistakenly pass for automobiles rather than wheelers [5]. As a result, there may be a desire to manipulate site visitors in an intelligent manner, because traditional methods of controlling visitors, such as using a signaling machine, aren't always effective in reducing motor site congestion.

II. LITERATURE SURVEY

A smart traffic management system with queue detectors buried in the roads that detect traffic congestion and warn the central control unit, which is partially deployed in Cambridge city makes appropriate decisions. Because the system is centralized, it may slow down as a result of networking problems. Surveillance cameras were employed to detect traffic, and Optical Character Recognition (OCR) was used to identify automobiles using number plate recognition., Although this is a basic identification approach, the system will fail in Pakistan since there are numerous types of traffic that do not have a number plate, such as bicycles and donkey carts. To identify traffic density, proposed a system that included security cameras, MATLAB, a traffic controller, and a wireless transmitter. transmit photos to the server, which used them to calculate traffic density for each segment. This approach relied on predetermined (fixed) criteria based on the number of cars on the road. To define a period of time for a red light to stay on for a specific lane at an intersection, an algorithm was employed, which was decided Traffic density on the road is measured and communicated to the microcontroller, which subsequently sends the data to the server. Jadhav et al. employed security cameras, MATLAB, and KEIL to control traffic congestion (Microcontroller coding). Traffic

density on the road is measured and communicated to the microcontroller, which subsequently sends the data to the server. The priority-based traffic clearing and red signal broker are also discussed in this work (Number plate detection). It is tough to manage and becomes pricey due to the use of heavy gear Bui et al. looked into a management system based on real-time process synchronization. The traffic flow is constantly changing. Wireless communication devices were utilized to communicate from car to vehicle and vehicle to infrastructure, and sensors were used to detect traffic. The controller, stationed in the middle of the intersection, collected information and requests from both automobiles and pedestrians, and processed them using the first come, first served technique.

III. EXISTING METHODOLOGY

Inductive Loop Detection

One or more turns of insulated wire are placed in a shallow cutout inside the highway, and a lead in wire flows from the street side pull field to the controller and electronic components located within the controller cabinet. The induction of the string is changed as a car travel over the loop or stops. There is an alternation within the frequency due to trade induction. The digital unit sends a signal to the controller as a result of the change in frequency, indicating the presence of the automobile[6]. Inductive loop detection can help you figure out how many vehicles are moving through a certain area[7]. This machine, however, has a few flaws. These include poor reliability as a result of improper

connections formed inside the pulley. The assumption behind inductive loop detection is that one or more turns of insulated wire are put into packing containers. as well as the usage of sealant over the street cutting. When this equipment is used on a defective pavement or in an area where road digging is widespread the problem of trustworthiness is exacerbated [8].

Video Analysis

In video analysis, a smart digital camera with sensors, a processing device, and a communication unit is employed. [9]. A smart digicam is used to continuously monitor the visitors. The collected footage is then compressed in order to reduce transmission capacity. The scene description is abstracted from the raw video information in the video analysis. After then, the description is utilized to calculate traffic statistics. The frequency of autos as well as lane occupancy are included in these [10] Statistics Concerns for video evaluation include: (a) the device's overall cost; (b) the system's complexity and (c) nighttime monitoring necessitates sufficient avenue lighting.

Infrared Sensors

Infrared sensors detect power released by cars, the road surface, and other things. Using an optical system, the energy received by these infrared sensors is focused onto an infrared sensitive fabric, which transforms it to electrical impulses. These are the indicators hung from the ceiling to provide a better view of the site's visitors. Infrared sensors are utilized for sign manipulation, pedestrian detection in crosswalks, and

traffic data transmission [11]. Infrared sensors have a number of drawbacks that their performance might be hampered by fog, and that their installation and maintenance are time-consuming[12].

IV. SMART TRAFFIC MANAGEMNT SYSTEM

Background

RFID tags and RFID controllers make up a RFID system.

Controller for RFID:

RFID interrogator is included in the RFID controller. This interrogator is used to communicate with the RFID tag verbally. The alerts/facts obtained from the interrogator are subsequently forwarded to the RIFD controller. The controller components employ messaging interference to send commands and information A controller core is found in the RFID controller. The controller core listens for interrogators, and the controller middle can either analyze or write the RFID tag, depending on the setting. To establish a twin radio device, external GSM/GPRS devices can be connected to the RFID controller via a serial interface.

Tags with RFID

RFID tags are wireless data transmission devices that employ radio frequency electromagnetic fields to identify and track objects. Tags with RFID. There are two types of RFID tags: active and passive [13] . Passive RFID does not have a battery, whereas active RFID does. Passive RFID is reliant on an external power source to function. Statistics about tags can be saved in a secure memory. A radio frequency transmitter and receiver are included in the tag[14]. A unique serial number can be issued to each tag.

Relevant Algorithm

Input:

The maximum amount of time the sign can be red is indicated by max red.

The maximum amount of time the signal can be inexperienced is specified by max green.

The minimal frequency of motors passing in accordance with 2d stored statically in controllers is denoted by Count the minimum frequency.

Act freq count is the real frequency of cars passing every 2d = vehicles/second.

The real timer is denoted by the term timer.

Algorithm :

1 .When the light changes to green.

2 .If (Timer Max_ green and Timer is not zero)

3 . (Act freq count>Min freq count)

4 .Maintain a green signal.

5 .Countdown timer decrement

by one

6. Otherwise, ifGo to 2. (Act freq count=Min freq count)

7 .End

Turn on the red signal. Make the next signal green. 1st step

Desired Results: Congestion control that works

System Overview

An RFID tag might be attached to each vehicle. This RFID tag could save all of the information about the car, including the vehicle's serial number and other details. RFID tags can be used to identify each car and can also help the driver receive messages from visitors. The RFID controller could be connected to the present signaling system. As shown Each signal in may have recordings for each car that passes by. Consequently, when a car passes by a signal, the sign can preserve a robotic memory of the vehicles travelling past it, assisting when it comes to traffic congestion detection Each sign should be charged to the bare minimum and must be red. An RFID tag might be attached to each vehicle. This RFID is new on the market. The timer can now be dynamically adjusted by relying on the frequency of the motors going through the signal in accordance with 2d. Each sign controller must be saved with a cost equal to the signal's minimum frequency of motors travelling across it. As soon as this is done, the shortest duration for which a signal can be purple is 30 seconds, and the shortest frequency of vehicles going by is five seconds. Assume the signal becomes inexperienced, and with a maximum price of 20, the timer starts. According to the frequency of cars passing the signal, 2d is initially 10; however, after 10 seconds, the frequency drops to five, and the RFID controller sends an instruction to the signal to turn red robotically. As a result, the signal goes purple, and the junction's adjutant sign turns green. This procedure repeats itself. As a result, dynamic signal regulation makes it easier to reduce time waste. This also aids in reducing site visitor congestion by prioritizing a high-volume motor site visitor channel. This device is capable of detecting traffic congestion. If, despite reaching the maximum value of the timer, the frequency of cars passing the sign in line with 2nd remains higher than the cost set, Congestion has developed at that point. When an RFID signal is discovered after the bottleneck has abated, the RFID controller can send a message to the prior signal's controller, warning it to discourage others from approaching the area of road After receiving the message from its successor sign, the RFID controller will switch on the purple signal for that stretch toward that crowded crossing factor for a set period of time. When the bottleneck at the crossing is relieved, the sign's controller indicates that the traffic float should be renewed in that direction. Accepting the message, the preceding sign's controller turned off the red light and turned on the green signal, restarting the sign cycle as before.

V. APPLICATION

Detection and Management of traffic Congestion

In addition to the earlier way of detecting visitor congestion, another method can be utilized. A server might be kept that could collect positive vital statistics calculated by the alarm controller. The major goal is to implement a system that can estimate character motors' journey times as they bypass roadside controllers and calculate a median trip time using a rule-based device to determine if the location is congested or not. If traffic congestion is detected, the device can send out traffic alerts and send

out automatic rerouting messages to select approaching vehicles.

Automatic detection of speed limit Violation

This method can be used to determine a motorist's speed and to determine if he is exceeding the prescribed/set speed limit. If the motorist breaks the rule of thumb, the motorist may receive a warning message via audio and/or video interface, and a penalty may be calculated on the server, and monthly charged to the automobile owner

Automatic Billing of Core Area/ Toll Charges

The same architecture is used for automatic tool series and automatic centre location rate collecting. The controller unit could be placed at the device sales area and alongside the motor in a position road around the centre area, allowing you to identify each car by photographing their device ids and recording information about when the vehicle became visible to those Controllers inside its reading region, the vehicle becomes unique within its area[15]. This data could be transmitted to a huge server.As a result, depending on the automotive ids, the primary server will compute the charges and generate bills.

RESULT AND DISCUSSION

To show the applicability of our suggested approach, a prototype was created. The suggested algorithm's efficiency was tested using real-world traffic data in a series of experiments. As illustrated in the traffic density was tracked and computed using vehicle detection. When the traffic density on a road exceeds the specified, the system
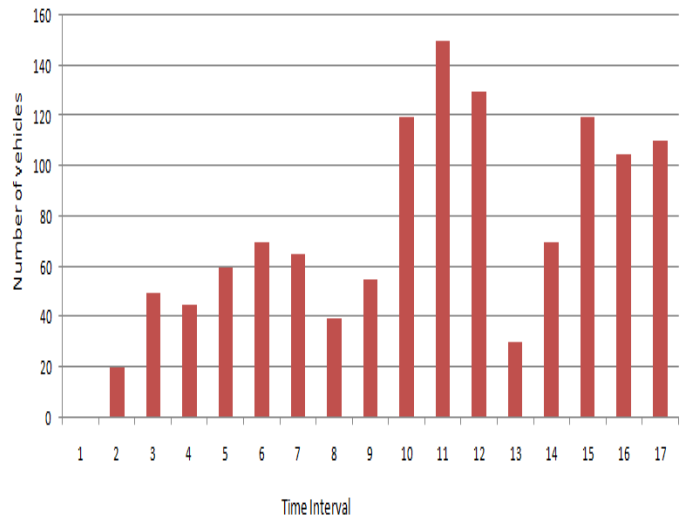
suspends normal operations and switches on the green light the traffic condition on the road improves. The information was provided in real time to both the local and central servers. In addition, a web interface was created for authorities to display traffic as explained in Section III, they needed road

statistics to make real-time and future judgment. depicts statistical traffic data, such as the number of cars passing via a given road over a given period of time. Real-time traffic data is represented by the bar graph.

This application draws various bar graphs based on historical and real-time data, which is useful for traffic departments and other associated agencies in I managing traffic congestion on highways and ii) future planning.

VI. CONCLUSION AND FUTURE WORK

The proposed project is for a Smart Traffic Control System that uses RFID to overcome the limitations of current technologies.such as high installation costs, reliance on environmental conditions, and so on. The proposed technology intends to effectively control site visitor congestion.It also feels more powerful than the current machine. Furthermore, the study examines the problems that congestion and associated resources cause in metropolitan regions all over the world. Congestion has become a problem that has a global economic impact. Under these conditions, metropolitan regions are particularly hard struck. Congestion has a negative impact on a country's financial situation, the environment, and, as a result, on the general standard of living Any other effective communication network outside GSM could be used to make the proposed gadget more suited.

6. REFERENCES

[1] twenty first Century operations Using 21st Century Technologies. U.S Department Of transportation Federal Highway Administration.2008-08-29. Retrieved 2008-09-25. Http://www.Ops.Fhwa.Dot. Gov/aboutus/opstory.HtmW illiamBeaty.Jan1998.Traffic Waves‒Sometimesone driver can vastly improve traffic‖.

[2] Dash, D. K. (2012). India loses Rs 60,000 Crore due to traffic congestion: Study. Http://articles.Timesofindi a.Indiatimes.Com/2012-05-31/india/31920307_1_toll-plazas-avenue-space-stoppage

[3] FHWA-HRT-06-108. October 2006. Traffic Detector Handbook: Third Edition—Volume I. Http://www.Fhwa.Dot.Gov/gu ides/research/operation s/its/06108/

[4] Haller, S., &Kubach, U. (2007). *U.S. Patent No. 7,245,220*. Washington, DC: U.S. Patent and Trademark Office.

[5] FHWA-RD-ninety six-a hundred. July 1995. Detection Technology: IVHSVolume-1.Http://ntl.Bts.Gov/DOCS/96 100/index.Html

[6] Bing-Fei Wu. Dept of Electr. And manage eng, Nat. Chiao Tung Univ, Hsinchu, Taiwan. A new Approach to Video-primarily based Traffic surveillance the use of fuzzy hybrid Information Inference Mechanism.March 2013.IEEE IntelligentTraffic Society.

[7] Lanke, N., &Koul, S. (2013). Smart traffic management system. *International Journal of Computer Applications*, *75*(7).

[8] Hussain, T.M. ; Dept. Of Electr. Eng., City Univ. Of New York, NY, USA ; Saadawi, T.N. ; Ahmed, S.A.: Overhead infrared sensor for monitoring vehicular visitors:Vehicular Technology, IEEE Transactions on (Volume:42 , Issue: 4) 0018-9545

[9] http://ieeexplore.Ieee.Org/xpl/login.Jsp?Tp=&arnumber=260764&url=http%3Apercent2Fpercent2Fieeexplore.Ieee.Orgpercent2Fxplsp.C2Fabs_all.Jsp%3Farnumberp.C3D260764

[10] Lanke, N., &Koul, S. (2013). Smart traffic management system. *International Journal of Computer Applications*, *75*(7).

[11] Hussain, T.M. ; Dept. of Electr. Eng., City Univ. of New York, NY, USA ; Saadawi, T.N. ; Ahmed, S.A.: Overhead infrared sensor for monitoring vehicular traffic:Vehicular Technology, IEEE Transactions on (Volume:42 , Issue: 4) 0018-9545

[12] http://www.Ieee.Org/approximately/era/rising/rfid.Pd f

[13] Bichlien Hoang,Ashley Caudill: EEE Emerging Technology portal, 2012 http://www.ieee.org/about/technologies/emerging/rfid.pdf

[14] http://en.wikipedia.org/wiki/Radiofrequency_identification

[15] Wang Hongjian ; Chongqing Special Equip. Quality Safe Inspection Center, Chongqing, China ; Tang Yuelin ; Li Zhi RFID Technology Applied in Highway Traffic Management 978-1-4244-8683-0. Optoelectronics and Image Processing (ICOIP), 2010 International Conference on (Volume: 2) http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5663108&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D5663108