IJFEAT

INTERNATIONAL JOURNAL FOR ENGINEERING APPLICATIONS AND TECHNOLOGY

STUDY OF SMART TRAFFIC MANAGEMENT SYSTEM

Mr. P. S. Gawande[1], Sima Sheikh[2], Rakshanda Gupta[3]

[1]*Asst. Prof., Department of Civil Engineering ,J.D.I.E.T. Yavatmal, Maharashtra, India,*
pankaj_gawande@jdiet.ac.in
[2]*U.G. Student, Department of Civil Engineering ,J.D.I.E.T. Yavatmal, Maharashtra India,*
seemasheikh03@gmail.com
[3]*U.G. Student, Department of Civil Engineering, J.D.I.E.T. Yavatmal, Maharashtra, India,*
rakshanda789gupta@gmail.com

Abstract

It is a system which manages the road traffic in a city by combination of algorithms, equipment's and communication networks with out using of humanin intelligence. there are various types of conditions of road traffic that arise in a city. The main aim of this paper is traffic signaling at a crossing point by measuring traffic density in each road. also, vehicles that will violate signals at crossing points will be tracked by this system. sometimes, we observed that situations like road congestion and exceed of limit of maximum traffic capacity of a road will arise and this system can also take decisions automatically. Vehicles can never cross the speed limit under this system.Use of this new technology will lead to reduced traffic congestion along with other countries. Sometimes failure of signals, poor visibility,law enforcement and conflict between vehicle couse etc. That has lead to traffic congestion. One of the major problems with Indian city is that the existing infrastructure willnot be expanded more, and thus the only option available is better management of the traffic. Becouse of Traffic congestion it will create bad effect on economy, the environment and the overall quality of life. hence effectively manage the traffic congestion problem. there are some of the methods available for traffic management such as video data analysis, infrared sensors, inductive loop detection, wireless sensor network, etc. This methods are effective for advance traffic management. But the problem with these systems is that the cost of installation and maintanance is high. Hence a new technology introduced called Radio Frequency Identification (RFID) which can be coupled with the existing signaling system that can act as a key to smart traffic management in actual time. This new technology which will be required less time for installation with lesser costs as compared to other methods of traffic congestion management. use of this new technology will lead to decrease the traffic congestion. Bottlenecks detected this problem early and hence early preventive measures can be taken thus saving time and money of the driver.

Index Terms: *Traffic congestion, RFID, Infrared sensors, Wireless sensor*

---------- *** ----------

1. INTRODUCTION

One of the key components in smart cities of the future is the use of Advanced Traffic Management Systems (ATMS) and Advanced Traveler Information Systems (ATIS) for efficient management and control of traffic flows. The main purpose of the ATMS/ATIS is to improve the overall traffic system performance, e.g. it will reducing emissions, noise and travel times. In order to manage and control traffic flows, condition of the road traffic have to be captured. A city is a complex system which consists more then one interdependent subsystems where traffic system is one of its important subsystems. A study says; it is the cornerstone of the world's economy . Moreover, it is also declared as one of the major dimensions of the smart city With the rapid growth of the population of the world, the number of vehicles on roadways is increasing consequently, the rate of traffic jams is also increasing in the same manner Traffic jams are not just wasting time but in some cases, it is proof that criminal activities like at traffic signals

mobile snatching also happen in metropolitan cities . On the other hand, it is not only affecting ecosystem badly but the efficiency of industries is also being affected . It is therefore, realized that active traffic management is a necessity. In maximum cities traffic is managed through fixed time signals whereas, in large cities of some developed countries, traffic is managed through centrally controlled systems. The paradigm of the Internet of Thing (IoT) was been introduced by a systems of traffic management . To the best of our knowledge, it is identified that till date the current traffic management systems are centralized. In this situation networking issues, such systems may crash. In addition, there is less focus on fluctuations in traffic flow. Therefore, the proposed system manages the traffic on local and centralized servers by exploiting the concepts of (IoT) and Artificial Intelligence together. The representation of traffic data in statistical form can also be useful to authorities for present time controlling and managing traffic. Moreover, it may also be helpful for future planning.

2.Methodology

2.1 Inductive Loop Detection

Inductive loop detection works on the principle that one or more turns of insulated wire are placed in a shallow cutout in the roadway, a lead in wire runs from road side pull-box to the controller and the electronic unit located in the controller cabinet. When a vehicle passes over the loop or stops, the induction of the wire is changed. Becouse of this change in induction,there is change in the frequency. This change in thefrequency causes the electronic unit to send a signal to the controller; indicating presence of the vehicle. Inductive loop detection is very useful in knowing the vehicle presence, passage, occupancy and even the number of vehicles passing through this particular area. But there are few problems with this system. All These include very low reliability due to improper connections made in the pull boxes and due to application of sealant over the Cutout of the road. If this given system is implemented in poor pavement or where digging of the roads is frequent then the problem of reliability is aggravated.

2.2 Video Analysis

In Video analysis consists of a smart camera placed which consists of sensors, a processing unit and a communication. The traffic is regularly monitored using a smart camera And video captured is then compressed so as to reduce the transmission bandwidth. In this video analysis abstracts scene description from the raw video data. These description then used to compute traffic statistics. This statistic will include frequency of the vehicles, average speed of the vehicles as well as the lane occupancy .The problems associated with video analysis are – (a) the total cost of the system is quite high (b) this system gets affected in case of heavy fog or rains. (c) night time surveillance requires proper street lighting.

2.3 Infrared Sensors

Infrared sensors are used to detect energy emitted from vehicles, road surfaces and other objects. this system energy capture with the use of these infrared sensors will focused onto an infrared sensitive material using an optical system which then converts the energy into the electric signals. A signals are mountedoverhead to view the traffic. Infrared sensors are sometimes used for signal control, detection of pedestrians in crosswalks and transmission of traffic information. The one of the basic disadvantages of infrared sensors are that the operation of the system may be affected due to fog; also installation and maintenance of the system is tedious.

3. SMART TRAFFIC MANAGEMENT SYSTEM

3.1 Background

A Radio Frequency Identification (RFID) system consists of RFID controller and RFID tag.

1) RFID Controller:

The RFID controller mainly consist of RFID interrogator. This interrogator is used for the communication with the RFID tag. The RFID controller is then gets the signals/data received by the interrogator. Messaging interference is used to send commands and data messages from the controller components. Controller core is present inside the RFID controller. The controller core listens to the interrogators and it will depending upon the configuration; the controller core can perform read/write operations upon the RFID tag or can do both listening and performing operations.The RFID controller will have serial interface through which external GSM/GPRS devices can be interfaced with it to

make a dual radio device.

2) RFID Tag:

RFID-Tag are wireless devices which make use of radio frequency electromagnetic fields to transfer data, which is used for identifying and tracking of the objects. RFID tags primarily consist of two types: Active and Passive . Active RFID has a battery installed, which the passive RFID doesn't have.Passive RFID has to depend on external source for working. Tags information can be stored in a non-volatile memory. Tag consists of a Radio Frequency transmitter and receiver. Each tag can be assigned a unique serial number .

3.2 Relevant Algorithm

Input:-Max_red denotes the maximum time for which the signal can be red.Max_green denotes the maximum time for which the signal can be green.Min_freq_count denotes the minimum frequency of vehicles passing per second stored serially statistically in controllers.Act_freq_count denotes the actual frequency of the vehicles passing per second = ∑vehicles/second Timer denotes the actual timer count.

Algorithm:

1. When the signal turn green.

While (Timer<Max_green and Timer is not 0) do

If (Act_freq_count>Min_freq_count) Keep the signal green.

Decrement timer count by 1.

Else if (Act_freq_count<=Min_freq_count)

Goto 2.

End

2. Make the signal red. Turn the adjacent signal green. Goto 1.

Desired Output: Effective congestion management

3.3 System Overview

In this,Each vehicle can be installed with a RFID tag. This RFID tag will be store all the information regarding the vehicle such as the vehicle number, etc. RFID tags will be useful in identifying each vehicle

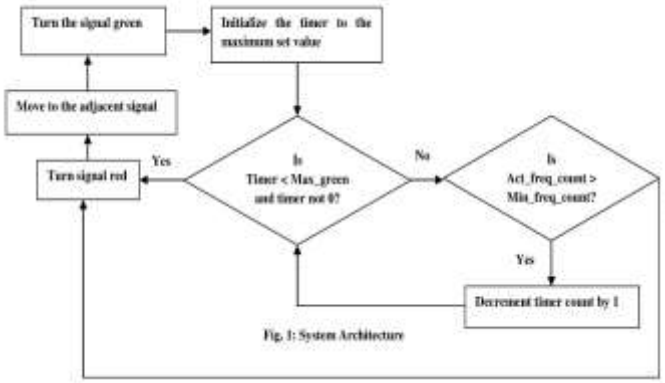

Fig. 1: System Architecture

uniquely and also help the driver to receive some in traffic manegement.The existing signaling system can be coupled with the RFID controller. As described in figure(1), each signal can have the information regarding every vehicle that passes by it. The vehicle passes by a signal, the signal can automatically keep it count of the vehicles passing by it, and help in detection of the traffic congestion. Each this signal will be stored with a value for which it should be red and green colour. All this depending upon the frequency of the vehicles passing by the signal per second, the timer can be automatically or dynamically controlled.In this Each controller of the signal should be stored with a value of lesser or minimum frequency of the vehicles passing by the signal. Because of this minimum frequency is reached,it will send a command to the signal to turn red colour.Thus the signal is controlled randamly, like for example, suppose for a signal, maximum time for which a signal can be red colour is set to be 30 seconds and maximum time for which the signal can be green colour is set as 20 seconds. The controller was store with the value of minimum frequency of vehicles which passing by per second as 5. Now suppose we assume the signal turns green, the timer starts with a maximum value of 20. Initially it is considered that the frequency of the

vehicles passing the signal per second is 10, after 10 seconds this frequency reduces to 5, and then automatically the RFID controller sends a command to the signal to turning to colour red. Thus the signal turns red colour and its adjacent signal in that junction turning to colour green. It will continuously occer in a cycle. Thus,The dynamic controlling system of the signal helps in minimizing the wastage of time. This also helps in avoiding traffic congestion as priority is given to a high rate of vehicular traffic road. This system very helpfull in detection of traffic congestion. If the frequency of the vehicles passing the signal per second remains greater than the value set even thoughthe maximum value of the timer is reaches,then the congestion was occurred at that point. Congestion becomes detected the RFID controller can send a message to its preceding signal's controller notifying it to temporarily stop traffic along that stretch. After all this the message was received coming from its successor signal the RFID controller can be put ON the red colour signal for that stretch towards that congested crossing point for a predefined time period. Suppose, when the congestion is then released at the crossing, the respective signal's controller will be send another message to its earlier controller indicating to resume the traffic flow again in that direction. Accepting this all message the controller of the preceding signal put the red colour light OFF and green colour signal ON and restart the signal cycle as before.

4. APPLICATIONS

4.1 Detection and Management of traffic Congestion

In addition of this earlier method of traffic congestion detection, one more method can be used. A server will be maintained which can receive certain crucial data which calculated by the Controller of the signals. The main purpose is to implement a system that would trace the travel time of individual cars as they pass the roadside controllers and compute an average trip time using a rule-based system to it will decide whether the area is congested or uncongested. Sometime if congestion is sensed then system would control traffic signals generate automatic re-routing messages to selected approaching vehicles.

4.2 Automatic detection of speed limit Violation

We can use this technique to calculate the speed of a motorist and to detect if he violates the prescribed a set speed limit. If the motorist violates the rule, a warning message will sent to the motorist via audio and/or video interface and penalty will be calculated in the server and billed monthly to the vehicle owner.

4.3 Automatic process of billing of Core Area / Toll Charges

Automatic toll collection and automatic "core area charge" collections this two thing also done using the same frame work. In this controller unit placed at toll-booth and along the motor able roads around the core area which definitely detect each individual vehicle uniquely within its zone using this capturing their device will keep records of the time during which the vehicle was seen by those Controllers within its reading zone. This information they will sent to a main server. According to this the main server will mathematically calculate the charges and raise bills against the vehicle ids.

5. CONCLUSION AND FUTURE WORK

The proposed work was focused on Smart Traffic management System using RFID which will eliminate the drawbacks of the existing system such as high implementation cost, dependency on the environmental conditions, etc. The proposed system main aim is at effective management of traffic congestion. It is also

cost effective or ecomomical than the existing system. Furthermore, the study presents the problems in metropolitan areas all over the world caused by congestions and the related sources. In this congestions developed to a problem, which affects economies worldwide. Presently developed,metropolitan areas are worst hit under these conditions. Congestions have negative impact on the financial situation of a country, on the environment and hence the overall quality of life. This proposed system can be enhance with the use of any other powerful communication network other than GSM.

6. REFERENCES

[1]. 21st 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.htm

[2]. William Beaty. Jan 1998. Traffic Waves ―Sometimes one driver can vastly improve traffic‖.http://www.amasci.com/amateur/traffic/traffic1.html

[3]. Dipak K Dash, TNN May 31, 2012. ―India loses Rs 60,000 crore due to traffic congestion: Study‖. Times Of India. http://articles.timesofindia.indiatimes.com/2012-05-31/india/31920307_1_toll-plazas-road-space-stoppage

[4]. Azeem Uddin, Draft, 23 March 2009. Traffic congestion in Indian cities: Challenges of a Rising power.http://www.visionwebsite.eu/UserFiles/File/filedascaricare/Scientifci%20Partners,Papers%28Kyoto%29/Draft_koc_Azeem%20Uddin.pdf

[5]. FHWA-HRT-06-108. October 2006. Traffic Detector
Handbook: Third Edition—Volume I.
http://www.fhwa.dot.gov/publications/research/operations/its/06108/

[6]. US7245220 B2. Jul 17, 2007. Radio frequency identification(RFID)controller.http://www.google.com/patents/US7245220

[7]. Ali, S.S.M.Indian Inst. of Technol. Madras, Chennai,
India, George, B.; Vanajakshi L.: A simple multiple loop sensor configuration for vehicle detection in an undisciplined traffic Sensing Technology (ICST), 2011 Fifth International Conference21568065.
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?tp=&arnumber=6137062&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D6137062

[8]. FHWA-RD-96-100. July 1995. Detection Technology: IVHSVolume1.http://ntl.bts.gov/DOCS/96100/index.html

[9]. Bing-Fei Wu. Dept of Electr. And control eng, Nat. Chiao Tung Univ, Hsinchu, Taiwan. A new Approach to Video-based Traffic surveillance using fuzzy hybrid Information Inference Mechanism.March 2013.IEEE IntelligentTraffic Society.
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6264098

[10]. Xianbin Cao ; Sch. of Electron. & Inf. Eng., Beihang
Univ., Beijing, China ; Changxia Wu ; Jinhe Lan ; Pingkun Yan : Vehicle Detection and Motion Analysis in
Low-Altitude Airborne Video Under Urban Environment
Circuits and Systems for Video Technology, IEEE Transactions on (Volume:21 , Issue: 10) 1051-8215http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5955106&url=http%3A%2F%2Fieeexplore.ieee.org

%2Fxpls%2Fabs_all.jsp%3Farnumber%3D5955106

[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