Different Techniques Used in Traffic Control System:An Introduction

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Abstract— **Traffic jam turns out to be key crisis in these days. Traffic jam mainly occurs in urban areas. Due to traffic jam there are several problems arise such as increase in noise pollution, air pollution, accidents and delay in travel time etc. The present traffic signals deployed in all parts of the cities are not enough to solve above mentioned problems because these have specific pre-determined time for red and green signals. In this view various attempts were done for traffic lights to behave smartly based on density of vehicles on the road. Therefore many techniques have been used in traffic control systems. This paper summarizes different techniques of traffic control system that were used for the improvement of conventional traffic control system.**

Keywords—Manual traffic control; image processing; wireless technology; sensors; RF-transmitter and RF-receiver; IRIS

I. INTRODUCTION

With the development of technology, new vehicles that are more luxurious are emerging into the market. Everyone wishes to travel by these luxury vehicles for more console instead of public transportation. The ever-increasing demand of personal vehicles leads to crisis of more traffic on roads [1].

The fast increase in the vehicle ownership is one of the measures for financial development of country but indirect result of vehicle ownership is severe traffic jam. The development of new trends and technologies leads to rapid transportation of goods, machines and man power for different reasons. The aim of each one is to arrive at destination without wasting their time and money but resources provided by existing transportations are inadequate and are having poor performances. So the traffic management at intersection of the road is critical to diminish waiting and traveling times, save fuel and money [2]. The crisis of traffic jam encompass everywhere, but big cities are the ones that are most influenced by it. The continually growing nature of traffic makes it hard to determine the road traffic density in real time so as to make better traffic related judgments and manage the traffic more efficiently.

There are numerous reasons for this rapid flow in the traffic, in mega cities. The key reason can be assigned to increase in the population which in turn has caused increase in the number of vehicles on the road. Also there are several other reasons for congestion like indequate capability of roads, fixed time interval of red and green lights leads to unnecessary delay in travel time, incomplete information about traffic, inefficient transport management, uncontrolled demand etc. Insufficient capacity and uncontrolled demand are interconnected but signal delays are inflexible and do not depend on the quantity of traffic density. As a result there is a necessity to optimize traffic control system and make it more dynamic so as to accommodate the changing traffic density [3].

This paper gives brief introduction about different techniques used in different traffic control systems that are proposed by different t authors to automate and optimize the traffic flow. Some authors used man power to control the traffic flow but it is inefficient during heavy traffic jam. Some other author used automatic traffic control system. In this technique they have used fixed time interval for red and green signals. Therefore an intelligent traffic control system comes into exist. This system collects real time information and manages traffic flow efficiently.

Figure 1: Traffic congestion

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II. LITERATURE SURVEY

Title:An Efficient Algorithm for Detecting Traffic Congestion and a Framework for Smart Traffic Control System [6]

Author: Md. Rokebul Islam, Nafis Ibn Shahid, Dewan Tanzim ul Karim, Abdullah Al Mamun, Dr. Md. Khalilur Rhaman Publication: Jan. 31 ~ Feb. 3, 2016 Method: Video processing technique

In this paper author has proposed real time video processing technique based on measurement of traffic density on the road. The video sequences from a camera are analyzed using object detection to obtain the traffic density. The calculated vehicle density is compared with other lanes of the road in order to manage the traffic signal smartly. The system uses RFID sensors to ensure law enforcement. As a result, any vehicle which breaks the traffic terms and conditions can be easily caught. Therefore this paper tried to present a development in the existing manual traffic control system.

Title: An Intelligent Automatic Traffic Light Controller

using Embedded Systems [8]

Author: G.Monika, N.Kalpana, Dr.P.Gnanasundari
Publication: 20th & 21st March
Method: Wireless Technology

In this paper they have used density based traffic control system. It uses IR sensor as data collection device. These sensors detect number of vehicles on road and send this data to embedded system. Based on this data system calculates approximate amount of time for red and green signals. This paper also discussed about automatic traffic management system in which they have fixed timing for red and green signals.

Title: Intelligent Traffic Management System for Cross Section of Roads Using Computer Vision [7]
 Author: Tousif Osman, Shahreen Shahjahan Psyche, J. M. Shafi Ferdous, Hasan U. Zaman Publication: 2017

Method: Intelligent Traffic Management Technique based on Image Processing

This paper proposes design and implementation of an intelligent and automated traffic control system by using computer vision and image processing techniques. In this paper author has introduces two new techniques which has low processing cost. One of the method has been designed with the help of hardware and the other one is designed without any hardware support. It calculates the number of vehicles on each road by using computer vision and depending on the vehicles count on each road, this system sets optimized amount of time for red signal and running time for green signal. This system is a completely computerized system that can replace the existing pre-defined fixed-time based traffic system with a dynamically controlled traffic system. It can also identify vehicle condition on road and auto-adjust the system according to the changing road conditions which makes the system more intelligent.

Title: Smart Traffic Management System for Congestion Control and Warnings Using Internet of Things (IoT) [5].

Author: Chandana K K, Dr. S. Meenakshi Sundaram, Cyana D'sa, Meghana N Swamy, Navya K
Publication: May, 2017
Method: Intelligent Traffic Management system using Wireless Technologies

This paper mainly suggests priority to emergency vehicle like ambulance, Fire Bridge, VIP car etc. All these vehicles are equipped with RF-transmitter and RF-receiver is mounted on signal pole. This transmitter send signal to receiver during emergency and green signal will turn on to this lane where vehicle is passing. Red light is glowing to the remaining lane except emergency vehicle's lane. A real-time traffic data will be collected. In this paper the author has used load cells for collecting traffic data.

III. DIFFERENT TECHNIQUES OF TRAFFIC MANAGEMENT SYSTEM

In real world there are many traffic management schemes established already. They have used different techniques to control the traffic flow. These techniques are described below.

A. *Manual traffic control management*

This is the simplest form of traffic management, which mainly includes human in the method. In this method, a traffic police man is standing on each and every cross-section of roads and controls flow of traffic by using sign board as shown in figure 2.

Figure 2: Traffic police is managing traffic at intersection

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If density of traffic is more on the road then traffic police gives signal to the vehicle driver whether to drive or stop. She /he can also recognize emergency vehicles on the road and give first priority to the lane on which emergency vehicle is passing. But in case of multiple emergencies she/he will get confused and becomes unable to manage the traffic flow. This method is most efficient than any other method but as it includes human as a part of system this scheme is inefficient. Lack of trained traffic police officers makes this problem worse in many cities. Since the traffic vehicle pressure is not same at every road at the same time, traffic lights should be controlled by an adaptive system which will detect the traffic conditions and use traffic signals accordingly. Effectiveness of system depends on experience and capacity of the person [1].

B. Automatic Traffic Management Technique

In order to eliminate most weakness of the manual traffic control system, an automatic traffic management method is recommended. This system includes simple three color traffic signal those are red, green and yellow as shown in figure 3.

Figure 3: Traffic signal

Usually for each lane 120 seconds of green light is on [4] but in some areas of the city where traffic is less; in that intersection green light timing is less than 120 seconds. Totally it depends on traffic density in that area of the city. Before green light, yellow light glow for 20 seconds; indicating to start your vehicle and be ready to move. For all the time red light is on, indicating each vehicle to stop. This system cannot identify emergency vehicles like ambulance, VIP car etc. It treats all vehicles and emergency vehicles in the same way. Because they have fixed the timings for red and green signals and these signals are changing sequentially, but at the night time both red and green signals are manually switched off and only yellow signal will be switched on. So there is probability of delay in emergency services in peak hours. Therefore this technique is also inefficient in some times.

C. Intelligent Traffic Management Technique based on Image Processing

This technique includes cameras, which are used to capture image of the traffic density on road. These are placed on a high pole so they can envelop long distance. Image captured by camera is analyzed by a computer chip in order to detect vehicles on road [4]. Then computer will calculate the timings for red and green signals in order to control the traffic density and it sends this data to traffic signals ; according to this information red and green signal will dynamically changing their timings. Sometimes this technique is not efficient because camera cannot cover long distances during heavy traffic jam and during heavy rain image captured by camera is not clear.

D. Traffic Management system using Wireless Technologies

In this technique emergency vehicle is equipped with RF-transmitter and RF-receiver is mounted on the signal pole. When emergency vehicle is coming near to the intersection, it will send signal to the RF- receiver and this receiver sends to main control system. Then control system will calculate the approximate amount of time for green signal where emergency vehicle is moving and keeping red light to remaining lane. Then vehicle will pass easily [5]. This technique controls traffic flow in an efficient way and also gives solutions for emergency vehicles. It uses sensors, load cells etc for collecting vehicle density on road.

E. IRIS (Intelligent Roadway Information System)

It is an open-source Advanced Traffic Management System (ATMS) software project developed by the Minnesota Department of Transportation. It is used by transportation agencies to monitor and manage interstate and highway traffic.

In former techniques the system did not give any traffic information and was used only to monitor the traffic congestion but IRIS will provide real-time information on highway conditions to detect traffic incidents, manage the

flow of traffic, and broadcast traveler information [1]. IRIS uses the GPL license, Advanced Traffic Management System (ATMS) software tool. ATMS helps to reduce traveling times, maximize highway ability, and generally afford safer travelling directions. ATMS is made up of several proprietary software solutions that are expensive to buy. The recurring maintenance costs have also been increasing.

IV. CONCLUSION

This paper gives brief introduction about various traffic management techniques based on input methods. The study of traffic management technique concludes that different techniques are having their own pros and cons.

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This paper shows that traffic management using IRIS system is appropriate for present traffic related problems but this method also has some drawbacks that can be defeat by including some other features.

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