International Journal of Advanced Research in Engineering Technology & Sciences ISSN: 2394-2819
April-2016 Volume 3, Issue-4
Email: editor@ijarets.org www.ijarets.org

A CRITICAL REVIEW ON THE DEVELOPMENT OF INTELLIGENT TRAFFIC CONGESTION CONTROL SYSTEM

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ABSTRACT:
Development of Control System for Congestion Control is a Critical Research issue. Various app - roaches have been developed. In this review paper a brief introduction of various approaches like Petri net, Real time, Hybrid, Multi Agent system and more. Congestion at the intersection '+' is become a big problem in big cities. Our research based on totally different approach. .At intersection during the red light in conventional system timings of lights are fixed time, but the traffic density is different and sometime it becomes cause of traffic jam. So in this review paper we will discuss and give some ideas to get rid of this severe problem at the junction.

KEYWORDS -Petri nets, Multi Agent system, Real time data taking instrument

I. INTRODUCTION:

The development of control systems to deal with the congestion at the intersection in urban traffic is a critical research Issue. One of the major problems encountered in large cities is that of traffic congestion. There are different solution are used to tackle with the problem of traffic some of which are construction of flyovers, ring roads, bypass etc. But these are not good enough to overcome the problem of jam at the '+' intersection in the city cause wastage of time of people and fuel also. Recently the Delhi high court expressed concern over exponential growth in fuel loss due to idling traffic at intersections and jams from the 2005 figure of over rupees 990 crore and directed the Centre and city government to come out with a joint action plan to address the problem. In this paper we give are giving a solution to by developing intelligent traffic congestion control model. This system based on fuzzy logic as (asthana, 2012) in which we are varying the time duration of green light according to the density of traffic collected during the red light time. This system saves valuable working hours of people and also minimizes the problem of traffic jam. This paper is divided into five sections. In the first section we gave brief introduction about traffic control and management in urban area. And in the second section give a light on some related work and idea which is given earlier by some engineers. In third section we will describe about our idea and researches and whilethe fourth section describes some logics which will be used in future .This paper concentrates on reducing the problems of jam in developing countries like India.

II. LITERATURE REVIEW:

A distributed, knowledge-based system for real-time and traffic-adaptive control of traffic signals was described by Findler and et al (1997). The system was a learning system in two processes: the first process optimized the control of steady-state traffic at a single intersection and over a network of Streets while the second stage of learning dealt with predictive/reactive control in responding to sudden changes in traffic patterns.

An intelligent traffic light monitoring system using an adaptive associative memory was designed by Abdul Kareem and Jantan (2011) (kareem). The research was motivated by the need to reduce the

unnecessary long waiting times for vehicles at regular traffic lights in urban area with 'fixed cycle' protocol. To improve the traffic light configuration, the paper proposed monitoring system, which will be able to determine three street cases (empty street case, normal street case and crowded street case) by using small associative memory. The experiments presented promising results when the proposed approach was applied by using a program to monitor one intersection in Penang Island in Malaysia. The program could determine all street cases with different weather conditions depending on the stream of images, which are extracted from the streets video cameras. GI Young et al., (2001) believed that electro sensitive traffic lights had better efficiency than fixed pre-set traffic signal cycles because they were able to extend or shorten the signal cycle when the number of vehicles increases or decreases suddenly. Their work was centred on creating an optimal traffic signal using fuzzy control. Fuzzy membership function values between 0 and 1 were used to estimate the uncertain
Length of a vehicle, vehicle speed and width of a road and different kinds of conditions such as car type, speed, delay in starting time and the volume of cars in traffic were stored.
The model adopted inter-arrival time and inter-departure time to simulate the arrival and leaving number of cars on roads. Knowledge base system and rules were used by the model and RFID were deployed to collect road traffic data. This model was able to make decisions that were required to control traffic at intersections depending on the traffic light data collected by the RFID reader.

III. MEDHODOLOGY:

The methodology we going to use in this paper is based on the time variation of green light. At the intersection it is not necessary that the traffic arrive during the red light duration is same. Sometimes traffic collected during red light is more than normal and sometime very high. Sometime during red light traffic becomes very high so that the person, who is in the last of traffic, when comes near to the intersection the signal again turns to red. So that person suffers from extra one cycle time of traffic lights. This happens in the current traffic control system in which duration of lights is fixed and not depends on which side how much traffic is.

In our methodology we setup three levels of traffic vehicle collected during the red light.

1. Normal traffic
2. High traffic
3. Very high traffic

NORMAL TRAFFIC –when the vehicle collection reached to the point 1 which shown in the fig. during the red light it falls in normal traffic category.

HIGH TRAFFIC – when the vehicle collection reached to point 2 which shown in fig. during red light it come under the high traffic region

VERY HIGH TRAFFIC – this occurs when the collection reached beyond the point 3 which is shown in fig. and is the very high traffic region.

BLUE LIGHT CONCEPT –The blue light concept very innovative concept which provides information that there is very high traffic at the intersection and you can use the subway if you are going left from intersection. This will depends on the subways available at that route this will minimize the traffic congestion at the intersections.

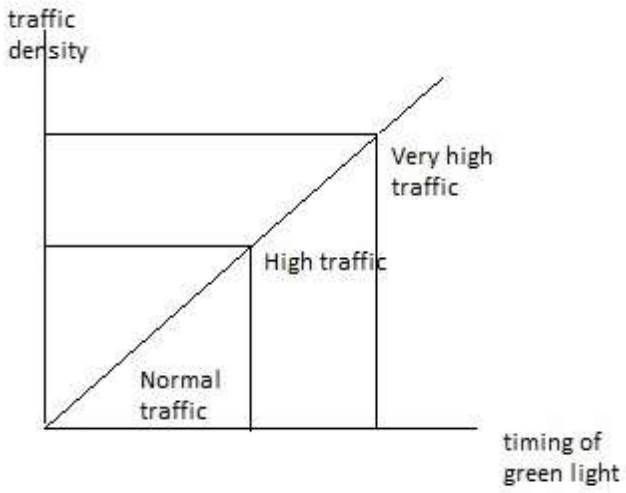

Fig no. 1 Traffic density vs green light timing graph

IV. WORKING:

This system is controlled by microcontroller and we can also use PLC to control the traffic lights. The points 1 2 and 3 as shown in fig. are actually the places where sensors are to be placed. The sensors detect the presence of vehicle during the yellow light. At that time the vehicles are stand still. Now when only the sensors place on position 1 sends the signal to the controller that vehicle is present then the time duration of green light is normal and this is the normal traffic level. And when sensors 1 and 2 both send the presence signal to the controller then this is the high traffic level the green light duration is increase. Now when all the three sensors i.e. 1 2 and 3 give presence signal then it show very high traffic level and the green light timing increases much and also green light turns on which indicates to use of subway.

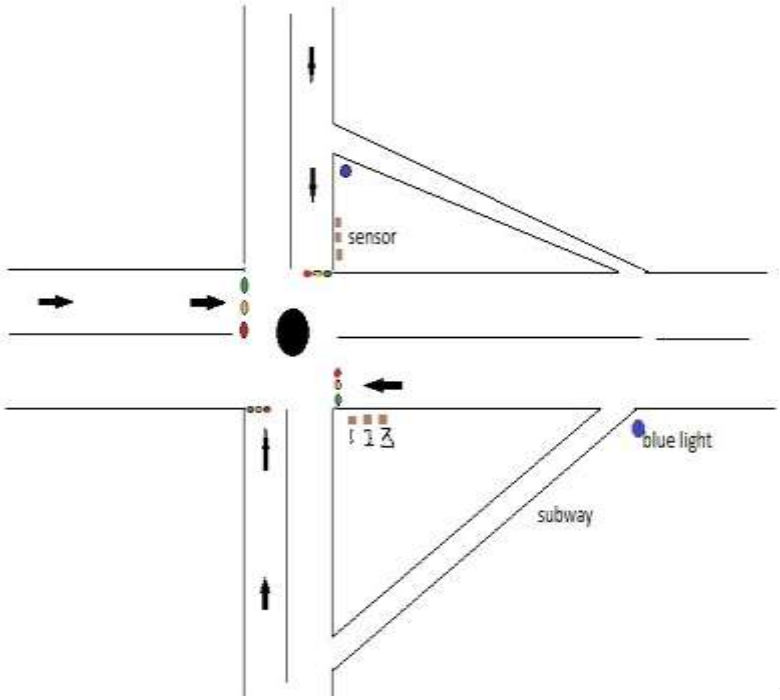

Fig 2 Real time approach

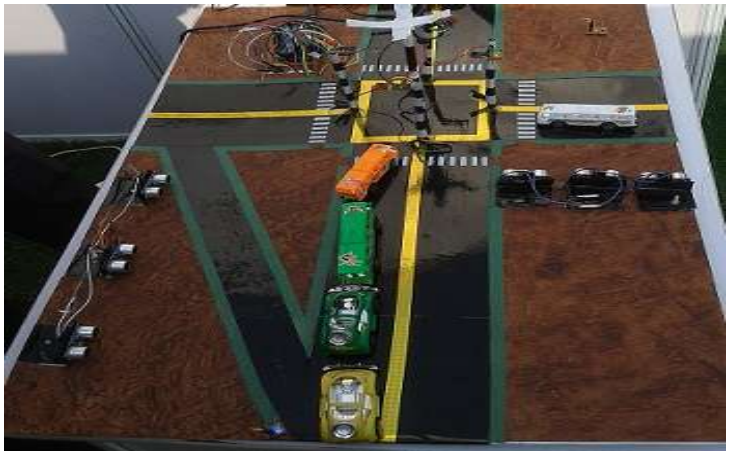

Fig.3 Project Model

SURVEY WORK:

Urban transportation system consists of surface-way networks, freeway networks, and ramps with a mixed traffic flow of vehicles, bicycles, and pedestrians. In a survey has been carried out for control and management of recurrent and non-recurrent congestion in traffic network using computational intelligence techniques.

Here the system is designed for one cross; this may be designed for whole city with the help of 'cloud computing' & IOT (Internet of things)

V. PETRI NET MODEL BASED APPROACHES:

Petri Nets are also known as a place/Transition Net or P/T net. It is the mathematical modelling language for the description of Discrete Event Systems (DES). PN theory is developed in 1939 by Carie Asam Petri. These are highly applicable in graphical modelling, Mathematical modelling, simulation and real time control by the use of places and transitions. Different variations of the Petri Nets are applied in the modelling and control of traffic systems. A Coloured Timed Petri net (CTPN) model has been used for validating an Urban Traffic Network.

Coloured petri net (CTPN) is modified version of Petri net. A Coloured Timed Petri net (CTPN) model has been used for validating an Urban Traffic Networks.

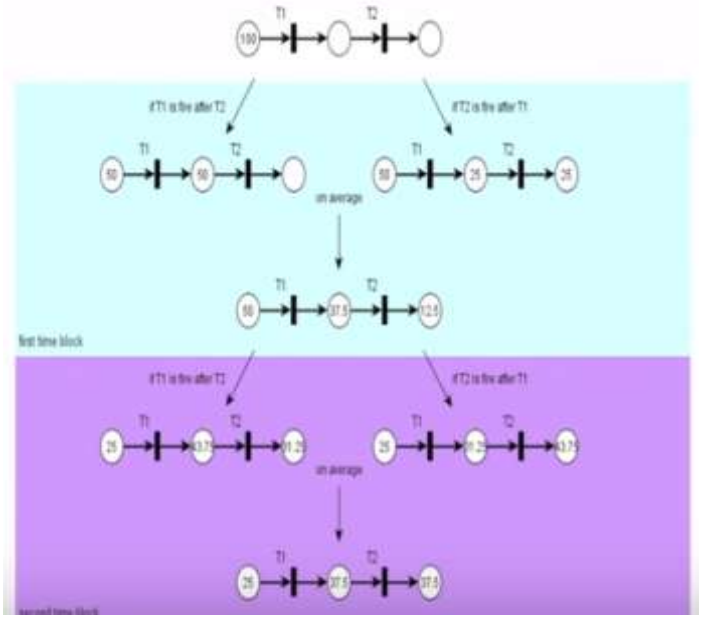

Fig.4 Petri net (Node &Tokens)

VI. MULTI AGENT SYSTEMS:

A multi-agent system (MAS) is a system consists of multiple interacting intelligent agents. This system can be used to solve problems that are possible to be difficult or impossible for an individual agent or a monolithic system to solve. Intelligence may include few functional, procedural and algorithmic searching, finding and processing techniques. A multi agent system approach to develop distributed unsupervised traffic responsive signal control models each agent in the system is a local traffic signal controller for one intersection in the traffic network. The first multi agent system is identified using hybrid soft computing techniques. Each agent employs a multi stage online learning process to update and adapt its knowledge base and decision-making procedure. The second multi agent system is produced by integrating the simultaneous perturbation stochastic approximation theorem in fuzzy extended neural networks

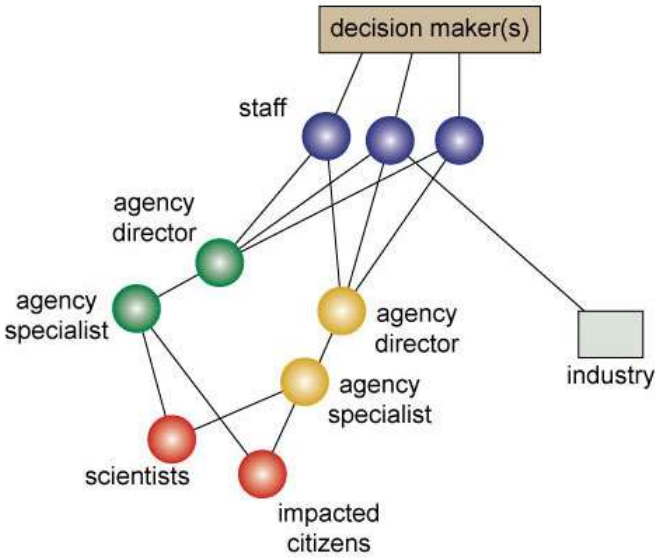

Fig:-5 Multi Agent system

Multi-agent systems consist of agents and their environment. Typically multi-agent systems research refers to software agents. However, the agents in a multi-agent system could equally well be robots humans or human teams. A multi-agent system may contain combined human-agent teams. Agents can be divided into different types ranging from simple to complex. Some categories suggested to define these types include:

- **Passive agents** or agent without goals (like obstacle, apple or key in any simple simulation)
- **Active agents** with simple goals (like birds in flocking, or wolf–sheep in prey-predator model)
- Cognitive agents (which contain complex calculations)

Agent environments can be divided into:

- Virtual Environment
- Discrete Environment
- Continuous Environment

Agent environments can also be organized according to various properties like: accessibility (depending on if it is possible to gather complete information about the environment), determinism (if an action performed in the environment causes a definite effect), dynamics (how many entities influence the environment in the moment), discreteness (whether the number of possible actions in the environment is finite), periodicity (whether agent actions in certain time periods influence other periods), and dimensionality (whether spatial characteristics are important factors of the environment and the agent considers space in its decision making). Agent actions in the environment are typically mediated via an

appropriate middleware. This middleware offers a first-class design abstraction for multi-agent systems, providing means to govern resource access and agent coordination.

VII. CONCLUSION:

Now days cities are getting smart so there are need to develop intelligent traffic congestion control system .Several problems and research issues have been identified in this field. To deal with these issues, several approaches and models have been proposed and implemented using Fuzzy Logic, Neural Network, Petri Net, etc. These approaches have been reviewed in this paper. And we focus on real time approach with the help of this approach traffic can be handled efficiently and the problem of traffic jam can be minimised.

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