Traffic Signal Design - Review

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Abstract -Easier control of traffic is only possible by signals/traffic signals. Traffic signals have three main light components in which red light use for stop, yellow light use for ready to go/stop and green light for go. All road users must obey the signal information for smooth transportation/effective transportation. This dissertation one signal selected for study after that try to find out how we make more effective/easy/comfortable to users. Signals have better way to control the traffic without interruption of transportation.

1.INTRODUCTION

As human population grows rapidly in urban areas, vehicular traffic volume has also increased proportionally following increased mobility and the geometric increase in the rate of automobile ownership. This accounts for the intense traffic congestion that is associated with urban areas which affects their livability in terms of congestion, pollution, high travel cost, delay, etc. Traffic congestions are usually caused by excessive delays at intersections in most cases. Because the capacity of an intersection is usually lower than that of other sections of the street, bottleneck effects are bound to be experienced at intersections. Where an intersection cannot efficiently discharge demanding traffic entering into it, there is bound to be congestion. The inability of road intersections to efficiently discharge approaching traffic creates many negative effects on mobility and the environment, including excessive delay with associated increase in travel time; increased air pollutant emissions and high level of noise pollution due to vehicles slowing, idling and acceleration; increased energy consumption and increased vehicle wear and tear caused by stop-and-go movement of traffic; increased rate of accidents, and reduced capacity of the network. To achieve optimal performance of intersections, movements into intersections need to be regulated and/or controlled. There are a variety of ways for controlling traffic at intersections such as the use of 'Stop' signs or 'Yield' signs; intersection channelization, pavement markings and the use of traffic signals . Traffic signals are standardized devices for the regulation and control of vehicular traffic, pedestrians and pedal cyclists which are used at signalised intersections, signalised pedestrian and cyclist crossings, railway crossings and at locations where control of traffic flow is required . It is widely reported that traffic signals are the most efficient International Research Journal of Engineering and Technology. These intersections are not signalised. The only existing method of control is the use of traffic wardens mostly during peak periods. This method of control is outdated and not effective as queues are experienced at some of the intersections especially during peak periods. These queues are increasingly getting longer as the volume of traffic in the town is growing very rapidly. Besides, Traffic wardens are not usually available to control traffic during periods intersections to replace traffic wardens for safe and efficient traffic control at intersections; this is so in spite of the numerous limitations associated with traffic wardens. However, as the traffic situation continues to cry out for attention, there is the likelihood that subsequent regimes may accord the much needed attention to traffic control in the town that will finally see the replacement of traffic wardens with traffic signals at intersections, hence the need for this study. The aim of this study was to design a fixed-timed traffic signal for 4-leg, two-way signal-controlled intersections. The intersections considered are namely the 'SRS' and 'B Division' junctions in using Webster's model. Specific objectives of the study were; to access traffic demand at the two candidate intersections; to design a fixed-timed traffic signal control system for the intersections and to assess performance of the designed system over time.

2. LITERATURE REVIEW

Many research works done on design of signals and reviewed some of important/relevant reviews are as under:

1. Raghavendra S. Sanganaikar et al., (1990) [3] Studied that 16 people die and 58 are injured every hour in India due to road accidents – the death rate, in fact, is equivalent to wiping out about 40 percent of the population of a small nation like the Maldives in a year. Passenger Car Equivalent (PCE) or Passenger car unit (PCU) is thus a metric used to assess traffic-flow rate on a highway. Passenger Car Unit (PCU) is the metric used to convert heterogenic traffic in to homogenous traffic. The worst accident hotspots are near flyovers and junctions without signals. The increasing of traffic volume at the intersection has been on the rise which has resulted in many problems like road accidents, conflicts, and congestions. The Design of traffic signal is done according to the Indian Road congress (IRC 93) method of signal design by adopting maximum average Passenger count unit (PCU) on the intersection in each direction. The first traffic signal was fixed in London in 1868, which was a semaphore- arm type signal. In this paper, we have taken kundalahalli junction, which is surrounded by 2 shopping malls, restaurants, corporate offices, etc.

2. Ekinhan Eriskin et al., (1995) [3] suggested a new method for designing traffic signal timing at oversaturated intersections was expressed "the elimination pairing system". An object function with vehicle delay and stop-start numbers has been generated. Total cost value has been calculated according to the object function. Obtained results were compared with Webster as a traditional traffic signal timing design method and Transyt 14 signal timing software. While Webster gives exaggerated results, Transit 14 and Elimination Pairing Systems provided better results. As a result of that study, the elimination pairing system could be used for optimizing the traffic signal timings.

3. Huajun Chai et al., (1998) [2] captured the interaction between travelers' route choice and traffic signal control in a coherent framework. They tested their algorithm and control strategy by simulation in Om Net++ (A network communication simulator) and SUMO (Simulation of Urban Mobility) under several scenarios. The simulation results shown that with the proposed dynamic routing, the overall travel cost significantly decreases. It was also shown that the proposed adaptive signal control reduced the average delay effectively, as well as reduced the fluctuation of the average speed within the whole network.

4. Ishant Sharma and Dr. Pardeep K. Gupta ., (2002) [4] proposed to replace existed traffic signals with a system that are monitored the traffic flow automatically in traffic signal and sensors are fixed in which so the time feed are made dynamic and automatic by processed the live detection.

5.Rekha & Karthika., (2005) [6] presented a combination of inductive loop sensors and fuzzy logic technology in which inductive loop sensors were responsible for real-time traffic data and fuzzy logic technology was responsible for the allotment of green time to the traffic to clear off the intersection efficiently. This method was proved to be very effective in handling the traffic.

6. Vidhya & Banu., (2007) [5] designed a project to develop a density based dynamic traffic signal system. The project consisted processing of image captured in the traffic signal and then it was converted to grayscale image and after that to calculate the number of vehicles contours was drawn to have its threshold. Calculation of number of vehicles gave the density which was further used for allocating green time to the traffic on the approach lane by using the Raspberry pi as a microcontroller.

7. Ishant Sharma., (2008) [4] Analyse the automatic traffic signal system for Chandigarh. The increasing number of vehicles on our road intersections has given rise to the problems like road accidents, congestions, conflicts and bottlenecks. These problems can now only be solved by providing an efficient traffic control at intersections and that can be achieved by provision of automated volume based traffic signal system at intersections for continuous and efficient movement of vehicles through the intersection Chandigarh – the city beautiful – though a modern and well planned city is also facing the same traffic problems. Here, the present traffic signals are based on the static feed of time without considering the actual available traffic. In present study, firstly, Traffic field studies is used to have the traffic volume and speed data of the Transport Chowk Intersection which are used as input for the redesign of pretimed traffic signals by Webster's and IRC method and also for the design of automatic traffic signals.

8. Sumit Mishra et al., (2012) [2] Design of Traffic signal, Traffic jams can be avoided by controlling traffic signals according to quickly building congestion with steep gradients on short temporal and small spatial scales. With the rising standards of computational technology, single-board computers, software packages, platforms, and APIs (Application Program Interfaces), it has become relatively easy for developers to create systems for controlling signals and informative systems. The system proposed is fail-safe against temporal communication failure. Along with a case study for examining congestion levels, generic information processing for the cycle time decision and status delivery system was tested and confirmed to be viable and quick for a restricted prototype model. The information required was delivered correctly over sustained trials, with an average time delay of 1.5s and a maximum of 3s.

9. Hamant Gulati, Dr.Devinder Sharma, Er.Neeraj Kumar .,(2016) **[2]** based on research India is a developing country and safety of roads is still in a premature stage. Accident severity is increasing due to increasing in vehicle population. The road accident situation in India is alarming. Records show that there is one death at every 4 minutes because of road accidents. Road Safety is necessary to reduce accident involving both human and vehicles there by making the road more safe and user friendly to traffic.

3. METHODOLOGY

Traffic Signal are one of the more familiar types of intersection control. Using either a fixed or adapative schedule **,** traffic signals allow certain parts of the intersection to move while forcing other parts to wait, delivering instructions to driver through a set of colourful lights (generally,of the standard red- yellow (amber)-green format).
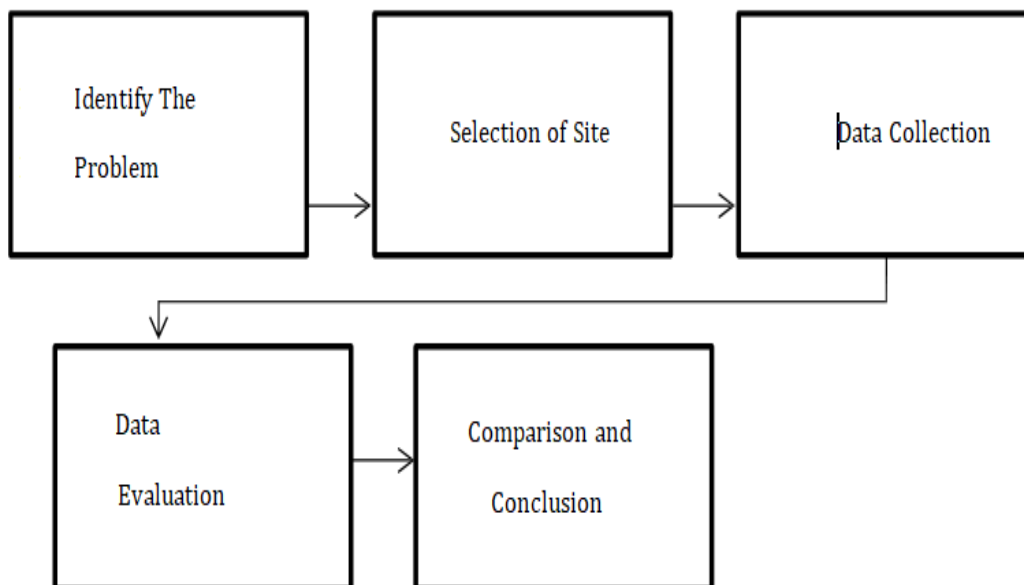
1.1. Flow diagram

OBJECTIVES

The Objectives of this study are as follows:

➢ The Objective behind the proposal of traffic signal designing is to limit the stoppage time and also to regulate the traffic flow by means of the introduction of the sensors at the junctions.

➢ Signal control can be used to promote the objectives of urban traffic management and control in many different ways including both tactical considerations and more strategic ones. The general purpose of tactical traffic management includes ensuring good operation of the junction and network with current and expected arrivals of traffic.

➢ To quantify the traffic problems at study area and identify the necessary actions to improve those traffic problems.

➢ To conduct necessary traffic studies on the selected stretches of' the road in order to know existing traffic condition.

➢ To suggest some effective measures to prevent traffic problems on Road in future.

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