Optimization of Traffic Signals at Road Intersections

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Abstract: Traffic congestion has been one of the major issues that most cities are facing now, even though Proper measures are being taken in order to mitigate and reduce its impact. In the recent years, traffic congestion is becoming one of the main challenge for engineers, which is a problem for pedestrians and other road users. There are many reasons behind this scenario. One of the main reasons is the existence of structures along the main roads of the city and other illegal possession of shops on footpaths, which attract a huge amount of visitors and they form a long queue in search of parking their vehicle. Rapid growth in vehicle ownership is the other reason for congestion which cannot be completely escaped. Decreased air quality and increased travel time are the impacts of congestion.

Keywords: Highway Capacity Software, Road, Signal, Traffic, Traffic Congestion, Traffic Signal

1.0 Introduction

The main focus of this paper is to understand the primary causes traffic congestion, measurement and suggesting mitigation strategies. Literature review on this problem reveals some interesting insights. There are so many definitions available for traffic congestion. In general, we can define congestion as the excess of demand for road travel. Many professionals and organizations have defined congestion in different ways based on variety of criteria. The attempts have been made for developing congestion measurement indices, in case of heavy traffic regions. In less motorized countries. On the other hand, there are fewer studies available on how to measure congestion in case of less traffic regions. Identification of traffic congestion threshold is an essential requirement for defining the congestion and suggesting appropriate mitigation measures.

2.0 Literature Review

The study named "A Traffic Congestion Assessment Method for Urban Road Networks Based on Speed Performance Index" in Beijing aimed to analyse traffic congestion in urban road networks. The speed performance index was used to calculate the existing road congestion. Then road segment and network congestion indexes were used to measure the congestion levels. This study has been successful to carry out a traffic congestion analysis for Beijing expressway network on the basis of speed performance. The speed performance data was collected from by Beijing Traffic Management Bureau.

The foreign countries are making use of software tools for analysis of traffic. For example, Transportation Institute at 'University of Florida' has developed its own software named 'Highway Capacity Software'. There is one more tool named Signalized and Unsignalised Intersection Design and Research Aid (SIDRA). It is an intersection-based program developed in Australia as a tool for capacity and performance analysis of intersections.

3.0 Materials And Methods

Traffic congestion is a condition on transport networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream, this results in some congestion. When vehicles are fully stopped for periods of time, this is known as a traffic jam or traffic snarl-up. Traffic congestion can lead to drivers becoming frustrated and engaging in road rage. Mathematically, congestion is usually looked at as the number of vehicles that pass through a point in a window of time, or a flow. Currently, there are number of software's used to analyze the traffic around the world. After identifying the root cause of traffic congestion, the analysis of traffic will be carried out with the help of any one software tool like Highway Capacity Software (HCS), Unsignalised Intersection Design and Research Aid (SIDRA), Signal Operations Analysis Package (SOAP) etc. so as to suggest a proper mitigation strategy, which will help in reducing the traffic congestion.

The most widely used computerized highway capacity method for signalized intersections is the Highway Capacity Software (HCS). It is a user-friendly procedure for estimating intersection capacity and level of service (LOS). As noted earlier, the HCS is a faithful implementation of the HCM. It performs the procedures in the manual, and no more.

The HCS allows the user to enter intersection configuration data, traffic flows, and signal phasing and timing data to compute stopped delay, volume-to-capacity ratio and LOS. The HCS does not perform timing design. The HCS application is limited to four-leg intersections, multiple turning lanes and pre-timed and actuated signal control, to the extent covered in the HCM.

Signalized and Unsignalised Intersection Design and Research Aid (SIDRA) is an intersection-based program developed in Australia. SIDRA is a very powerful analytical program for signalized intersections, roundabouts and controlled intersections having more than with eight different approaches.

4.0 Results And Discussion

The basic aim of the study is to provide an efficient, flexible and Un-interrupted traffic flow for the road users, which will not only reduce the total travel time but also reduce the noise pollution to some extent. The primary cause of traffic congestion is illegal parking on the streets. Although various steps have been taken by Indian Metropolitan Transport Authorities but still there have been problems relating to congestion of traffic in India. Knowing the causes of traffic problem in India, we need to take certain measures in order to maintain proper traffic system in India. The choice between a roundabout or a signal controlled

intersection should be made on the basis of extensive field studies and investigation in order to avoid any traffic congestion.

Acknowledgement

References

[1] 'Dr. Tripta Goyal, Dinesh Kataria', "Traffic Congestion on Roads", SSRG International Journal of Civil Engineering (SSRG-IJCE) – volume 2, Issue 5, May 2015.

[2] 'Jingfei YU, Li WANG, Xiuling', "GONG Study on the Status Evaluation of Urban Road Intersections Traffic Congestion Base on AHP-TOPSIS Modal", 13th COTA International Conference of Transportation Professionals 2013.

[3] 'Neema Davis, Harry Raymond Joseph, Gaurav Raina, Krishna Jagannathan', " Congestion costs incurred on Indian Roads: A case study for New Delhi"

[4] 'Shekhar K. Rahane, Prof. U. R. Saharkar', "Traffic Congestion - Causes And Solutions: A Study Of Talegaon Dabhade City" , Journal Of Information, Knowledge And Research In Civil Engineering, ,ISSN : 0975 – 6744| Nov 13 To Oct 14 | Volume 3, Issue 1, Pp: 160-163

[5] AkHelik, R. and M. Besley, "SIDRA 5, User Guide," January 1998.

[6] HCM Cinema User Guide, KLD Associates, Inc. and Polytechnic University, 1990.

[7] Jacks, C., P. Hill, W. Sampson, C.E. Wallace and others, "Highway Capacity Software, Release3," University of Florida Transportation Research Center, Gainesville, FL, 1991-present.