IDENTIFICAION OF EFFECTIVE CONTROL STRATEGIES FOR SIGNALIZED INTERSECTIONS DURING PEAK HOURS

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa
Sri Lanka

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Thesis submitted in partial fulfilment of the requirements for the degree Master of Science in Civil Engineering

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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…… Date:……

Dr. GLDI De Silva

ABSTRACT

Traffic congestion during peak hours is one of the major issues in the Sri Lankan city centres. There are several identified reasons for the congestion. One of the major reasons for congestion is ineffective control strategy used at signalised intersections. In Sri Lanka during the peak hours most of the signalized intersections in city centres are controlled manually by traffic police officers. The objective of the study is to find out the effectiveness of the manual control by traffic police officers compare to traffic signals and the effectiveness of the traffic signal cycle time design for Sri Lankan conditions.

Four Junctions which are controlled by traffic police officers during the peak hours were selected for the analysis and data were collected. Traffic micro simulation software VISSIM has been used for the analysis and it has been calibrated and validated to local conditions before using it for the analysis. Junctions were modelled for three cases, existing posted signal time, updated traffic signal time, and traffic police phase arrangement and cycle time. For the updated signal case, signal times has been initially designed using Webster & Cobbe (1966) signal cycle time model and modified by simulating for several factorised cycle times to achieve optimum delay.

Out of the four junctions, three of them are not saturated and one junction is over saturated. When the junctions are not saturated, the signal times were updated and the updated signal times results lesser delays than the existing posted signal times. When the junctions controlled manually by traffic police the delays are lesser than the existing signal time case. But the updated signal times result lesser delay than the manual control when the junction is not saturated. When the junction is oversaturated, delays for manual control by traffic police result lesser delay than the existing signal times. Traffic police officers become effective when the junction is oversaturated as they allow risky merging movements to reduce the critical flows.

From the result it is evident that the delays for major road movements have no significant change for the two cases manual control and updated traffic signal design. But for minor road movements significant reduction of delay observed from manual control to traffic signal control. The maximum queue lengths on the minor roads also higher for the manual control than the updated signal control. Daily variation of traffic also affects the junction delays significantly as the fixed cycle time signals are used. Introducing vehicle actuated signals will be an effective solution for random arrivals of vehicles and daily variation of traffic than controlling the intersections manually.

Keywords: Cycle time; Phase; Delay; Queue Length.

DEDICATION

To my wife and Daughter

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