Development of Decision Framework for Dynamic Signal Timing Design

Sudara Withana[1], Loshaka Perera[2]and Saman Bandara[3]

Abstract

The traditional fixed time traffic signal systems use a static signal timing or in other words, a pre designed signal timing developed based on past traffic data. The signal timing design assumes the traffic levels to be similar for a given time period, but the traffic levels are highly fluctuating and dynamic in reality. Therefore, the next step in traffic signal timing designs is the dynamic designs where the timing will be varied in real time. This type of signal time designs will be mainly used in Adaptive Traffic Signal Systems which are designed to operate using real time information. A dynamic signal timing design requires a decision framework for real time operations and information management. Therefore, this study is aimed at development of a decision framework to minimize the delay time and to maximize the traffic flow in an intersection under unsaturated conditions. Analyzing many parameters used in literature, two main parameters were considered in this study, namely, critical lane flow and stop delay. Impact from pedestrians are incorporated by using the pedestrian delay time. The behavioural patterns identified in the individual parameters, when releasing traffic during the green time period in an intersection, was used to develop the framework. The behaviours of individual parameters in real scenarios were shown deviated results from theoretical studies mainly due to mixed traffic conditions. Motorcycles have contributed significantly for such deviation and as well as the capacity of the intersection. The decision framework was developed by integrating the individual parameters and their limits to communicate among phases in the traffic cycle. The cycle time was kept as a variable in the decision framework. This decision framework was simulated using PTV VISSIM software to observe unsaturated conditions in Piliyandala- Maharagama bypass Junction as a case study. The simulation results were obtained for different unsaturated flow conditions. They were in line with the expected outcomes. The flow through the intersection was slightly increased and average delay time was reduced slightly

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Authors Details;

1. Graduate Research Student, Department of Civil Engineering, University of Moratuwa. sudaracw47@gmail.com

2. Senior Lecturer, Department of Civil Engineering, University of Moratuwa. loshakap@uom.lk

3. Senior Professor, Department of Civil Engineering, University of Moratuwa, bandara@uom.lk