Experience in Calibrating the VISSIM Microscopic Simulation Model for a Signalized Intersection

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Abstract

Traffic microsimulation software is a traffic management tool which is currently being used in various countries to provide traffic management solutions. For developing countries like Sri Lanka, it is possible to observe a mixed heterogeneous traffic condition which includes lack of lane discipline, lack of lane marking, etc. The calibration process should be done before using the microsimulation software for local conditions in those countries to make the model results reliable and accurate and after the validation process, it is possible in simulating traffic management solutions. The main objective of this research study is to calibrate the VISSIM software for heterogeneous local traffic condition as the software is originally developed for homogeneous traffic conditions. VISSIM models which were calibrated previously for Sri Lankan traffic conditions are available and initially, the validity of some those models was tested. However, the simulated results of those models did not give the actual traffic characteristics in the study area. Also, in the VISSIM models calibrated previously in Sri Lanka, the driver behaviour parameter values were randomly selected and tested them on the VISSIM, but in this study, the calibration of driver behaviour parameters was done minimizing the simulation error percentage using a Genetic Algorithm (GA). The GA was used rather than randomly selecting the parameter values as it will provide with higher accuracy of the optimum values of the driver behaviour parameters and also it is fast compared to selecting the parameters randomly. The calibration was done in a signalized intersection focusing the driver behaviour parameters. Ten most sensitive driver behaviour parameters were identified through literature survey which is looking ahead distance, look back distance, average standstill distance, additive part of safety distance, multiplicative part of safety distance, distance driving, distance standing, minimum headway, waiting time before diffusion and safety distance reduction factor. The model was done for the Malabe three-legged signalized intersection and the average queue length was considered as the Measure of Effectiveness (MOE). Queue lengths were measured by using 5m marking tapes which were placed at 5m intervals in all the legs of the intersection. The data were input to the VISSIM software including the road geometry, and the signal timings related variables which measured at the intersection. The traffic volume and vehicle composition at each leg was recorded using video cameras and the videos were analyzed manually to gather the required data. The intersection was modelled in VISSIM software and the mean absolute percentage error (MAPE) for the

intersection was calculated by using the observed average queue length and the simulated queue length. For that GA optimization was done using the MATLAB GA Toolbox for the fitness function developed based on the percentage error, between the observed and simulated average queue length, under different driver behaviour parameters. The maximum value for MAPE was considered as 15% as recommended by literature. In future, the calibrated parameter set will be validated with similar intersections and it will be used for simulations of traffic in the area.

***Keywords**: Heterogeneous traffic simulation, Signalized intersections*

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