

# Optimal feasible green light assignment to a traffic intersection using graph theory

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In metropolitan Colombo, Sri Lanka, traffic management is an issue despite traffic light signalling systems in place. The present study attempted to develop a mathematical model to find an optimal and feasible green light assignment which reduces waiting time improving the volume of traffic flow simultaneously, using graph theory. We used the similarity between the concepts, maximal independent vertex set of a graph and the set of intersecting traffic flows of an intersection, to build up an algorithm which classifies the traffic streams into traffic phases by maximizing the number of traffic streams to be included in a traffic phase. Then the build-up set of constraints related to the minimum green light time that should be allocated for a traffic stream, cycle length and the total red-light time of the cycle, can be solved via linear programming as an optimization exercise to obtain the green light time of a set of traffic phases and minimized red light time of the cycle. The developed mathematical model has been applied to Borella junction and Kanatta junction in Colombo city, and it gave a reduced red-light time as compared to the existing value for the two junctions.

**Keywords:** traffic flow, cycle time, maximal independent vertex set, optimization problem