

Agent based modeling for unordered traffic in Sri Lanka – An investigation into pedestrian behaviors

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Rising traffic congestion is an inescapable condition in large and growing metropolitan areas across the world. If we consider Sri Lanka, in the past it was largely limited to Colombo district but now it is spreading to the other areas as well. Major reasons to occur traffic congestion in Colombo and suburban is unordered traffic behaviors. Main entities of a traffic scenario are pedestrians and vehicles. Therefore, pedestrians too are contributing to the traffic congestions. For example, when the pedestrians walk on roads without using the pavements, vehicles get less space on roads leading to traffic congestions. Jaywalking too can be considered as an unordered behavior. Police makes different rules to control the traffic congestions like charging fine from people who offence traffic rules and opening both side of the road towards one direction in peak hours. From an infrastructure development perspective, authorities make actions to construct underground and overhead pedestrian bridges, fences along pavements, islands, etc. However, most of these initiatives end up with unexpected results, mostly since traffic congestion is an emerging macro-level pattern from complex micro-level behaviors of pedestrians and drivers. We propose Agent-Based Modeling and Simulation (ABMS) approach, which applies computational methods to study issues in complex systems. In this approach, individual vehicles and pedestrians are modeled as agents with a simple set of behavioral rules. When put together in a simulation environment, these software agents interact with each other similar to the way real world vehicles and pedestrians behave, letting us study traffic congestion emerging as a macro-level pattern. In these interactions, the software agents exhibit the types of behaviors similar to those in the real environment such as coordination, collaboration and negotiation. This helps us to get better insights on the causes of traffic congestion and test different control strategies on a computer before implementing in the real world. Prior research has focused on the impact of seepage behavior and lane changing behavior of drivers on traffic congestion. Extending that work, we propose to incorporate pedestrian behaviors to see the overall impact of behaviors of drivers and pedestrians to the congestion. We use the ABMS environment called *NetLogo* to develop the simulator and Kiribathgoda junction in Western Province, Sri Lanka as the testbed. The objective of this research is to come up with an effective traffic simulator for the unordered traffic conditions in Sri Lanka that could be used by policy makers to analyze different traffic congestion scenarios and test different solutions to reduce traffic.

Keywords: Agent-based modeling, Agent-based modeling and simulation, Computational intelligence, Un-ordered traffic