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

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Abstract

Rising traffic congestion is an inescapable condition in large and growing metropolitan areas across the world. Main entities of a traffic scenario are pedestrians and vehicles. Police make different rules to control the traffic congestions and from an infrastructure development perspective, authorities take 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 of complex micro-level behaviors of pedestrians and drivers. The study proposes Agent-Based Modeling and Simulation (ABMS) approach, which applies computational methods to study the issues in complex systems. When considering a simulation environment, software agents interact with each other similar to the way real world vehicles and pedestrians behave. This lets us study traffic congestion emerging as a macro-level pattern. Identifying the overall impact of behaviors of drivers and pedestrians to the congestion by extending the previous work, is the aim of this research. The research uses ABMS environment called NetLogo to develop the simulator and Kiribathgoda junction in Western Province, Sri Lanka as the testbed. Coming up with an effective traffic simulator for the unordered traffic conditions in Sri Lanka, which could be used by policy makers to analyze different traffic congestion scenarios and test different solutions to reduce traffic, is the main objective of this research.

Keywords: Agent-based modeling and Simulation, Unordered traffic

Introduction

Rising traffic congestion is an inescapable condition in large and growing metropolitan areas across the world. Peak-hour traffic congestion is an inherent result of the way modern societies operate. It stems from the widespread desires of people to pursue certain goals that inevitably overload existing roads and transit systems every day. Major reason is the unordered traffic behaviors. Since vehicles and pedestrians are the major elements act in a traffic scenario, their behaviors mainly affect to cause a traffic congestion (Banos et al., 2014). Although, the police make different rules to control the traffic congestions, since there is no way to test the result of those rules before processing, most of them have become useless. Successive governments have indicated plans of taking corrective measures but only a few had been done to take control of the present road traffic. According to latest statistics, there are 130 vehicles per 1,000 people, out of which 66 percent would be motorcycles while three-wheelers and four-wheelers (small and large) make up 45 vehicles per 1,000 people (Pilapitiya, 2016). Although there are some solutions to address this issue such as increasing the capacity of the roads, those are the most expensive solutions. However, most of them are ended up with unexpected results, because it is a macro level emerging condition which cannot be predicted.

Traffic simulation is a very cost effective and efficient way which can be used to find reasons to traffic congestions. Using these simulators, real world scenarios could be