Mixed-traffic agent-based simulation based on Bezier curve

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Abstract

In recent years, the rapid development of infrastructure and means of transportation has required scientists to provide a systematic framework to analyze their impacts. Various works have been dedicated to the understand of vehicles movement patterns through cellular automaton models, with some notable works includes car-following model, lane-changing model, and gap acceptance model. However, while many agent-based models have been developed for cities' structured traffic patterns, many challenges still exist in modeling practical situations where different vehicle types do not always follow by lanes. Here, we introduce a new approach for mixed-traffic simulation using agent-based modeling, which comes with three novel developments: (1) naturalistic representation of stochastic collision at junctions, which could potentially be used to study the rate of traffic accidents in the mixed-lane traffic setting. (2) integration of Bezier curve into GAMA agent-based platform to improve the accuracy in modeling autonomous vehicles trajectories. (3) a pipeline to integrate our model with GIS data and real-time traffic information, which could be combined with other combinatoric optimization frameworks for logistics applications.