TU Clausthal

Kolloquiums-Reihe des Instituts für Informatik

Dienstag, den 16.07.2019, 09:00 Uhr,
Besprechungsraum 106, D3, Julius-Albert-Str. 4

Research Project:

"Conflict Detection Algorithm for Mixed Traffic Simulation"

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Shared space environments are emerging as a popular choice for modern city design. Heterogenous road users share the same space in a shared space environment and they interact with each other on a regular basis. Naturally, they are bound to engage in conflicts regularly. Therefore, conflict detection among different types of road users and conflict resolving is of utmost importance in a shared space simulation model.

Conflict is defined as an observational situation in which two or more road users approach each other in space and time to such an extent that a collision is imminent if their movements remain unchanged. A shared space simulation model aims to emulate road user's behaviours, their conflicts and conflict resolving strategies as accurately as possible to test its safety and scalability. For instance, the interaction between a car driving on road and a pedestrian waiting to cross is a classic example of a conflict.

Existing conflict detection algorithms detect a conflict by checking if a road user's predicted trajectory intersects with another road user's predicted trajectory. Then, the detected conflict is resolved using a suitable conflict resolving strategy (e.g. game theoretic decision or interactively). However, the conflict related information is not stored in an efficient manner. Conflict related information for example time to collision, closest conflict of a road user, urgent conflict of a road user, set of upcoming conflicts of a road user, etc can be highly useful for deciding upon a conflict resolving strategy. If we introduce a waiting period before resolving a conflict it can be advantageous in many use cases for example, a conflict might diminish on its own after a few time steps. In such a case, a road participant doesn't have to take any action. Furthermore, a road user dealing with multiple conflicts at the same time could decide conflict resolving strategy more efficiently with the help of conflict related information. For instance, the road participant could resolve multiple conflicts with a single action or at least can take an action that positively affects future conflicts.

In this research project, we propose to represent the conflict scenarios of shared space environments as connected graphs. In the graph, each road user is represented as a node containing their current state and conflict related information and each edge connects two competitive road users of any conflict situation. We analyse possible factors and information related to a conflict from a road user's perspective to choose which information we need to store in the graph. We choose graph database to store this information because our data is connected e.g. a conflict connects a set of road users. Afterwards, we formulate an efficient conflict detection algorithm which uses the database. Finally, we evaluate the performance of our algorithm by comparing with existing algorithms in terms of time complexity and efficiency in detecting interconnected conflicts.