PhD project

Utilisation of Spatio-Temporal Data and Social Norms for Optimisation of Robot Navigation

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Abstract

Multi-Agent Path Finding (MAPF) is the problem of computing path solutions for a set of agents given their start and goal positions. Conflict Based Search (CBS) is an optimal solution for MAPF where all agents attempt to find a possible path to their goal respecting the map, but disregard all other agents in the environment. This will lead to collisions, which are then iteratively solved by CBS. Although CBS is an optimal solver it is NP-hard and is therefore not applicable to a real scenario. To avoid a multitude of initial collisions human defined highways were previously used [1]. In this project we propose the usage of previously collected data to produce machine generated highways which could be used for all subsequent missions. These include known issues occurring repeatedly before and extracted conflicts from CBS. Human habits will also be considered to address congestion in areas where individuals with no knowledge of robot behaviour are present (e.g. hospitals, malls). A temporal view on the situation is also explored, as situations could change drastically between different times of the day both for robots and humans.

[1] Cohen, L., Uras, T., Kumar, T. S., Xu, H., Ayanian, N., and Koenig, S. (2016). Improved solvers for bounded-suboptimal multi-agent path finding. In IJCAI, pages 3067–3074.