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INTELLIGENT DRIVER AGENT MODEL FOR
AUTONOMOUS NAVIGATION IN A COMPUTER
SIMULATED VEHICULAR TRAFFIC NETWORK

A thesis presented in total
fulfillment of the requirements
for the degree of

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Abstract

The purpose of this study was to investigate the possibilities of automating vehicular traffic and decrease traffic congestion by developing an intelligent driver agent model that autonomously navigates through a computer simulated traffic network. The aim was to examine various pathfinding algorithms and cost evaluation functions through different traffic conditions so that a basic intelligent driver agent model is designed using the best combination of algorithms and cost functions found.

A computer simulation of vehicular traffic has been implemented to study different agent models. The intelligent driver agents developed act as independent entities with their own emergent properties and individual behaviours. Each simulated vehicle was navigated through the traffic network to its destination using a user defined algorithm and cost function. The case studies conducted focused on measuring the travel times of each driver agent from the starting to the destination point.

The results indicated that the agents traveled at higher average speeds under low density traffic conditions, while lowering their average speed as the traffic density increased. It was also discovered that hybrid cost evaluation functions (designed by combining two or more basic cost functions) perform better in low and medium density traffic, while basic cost functions perform better under high density traffic conditions. Finally, the results revealed that Dijkstra pathfinding using a hybrid combination of time and length cost functions should be used under low and medium density traffic conditions and D* pathfinding using congestion cost evaluation function under high density traffic conditions.

The conclusion was that the intelligent driver agent model implemented is suitable to be used as a navigation model for self-driving vehicles in traffic simulation software, but also given the right technology and social acceptance it is suitable to be implemented as a navigation model for robot vehicles and deployed in real world traffic situations.

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