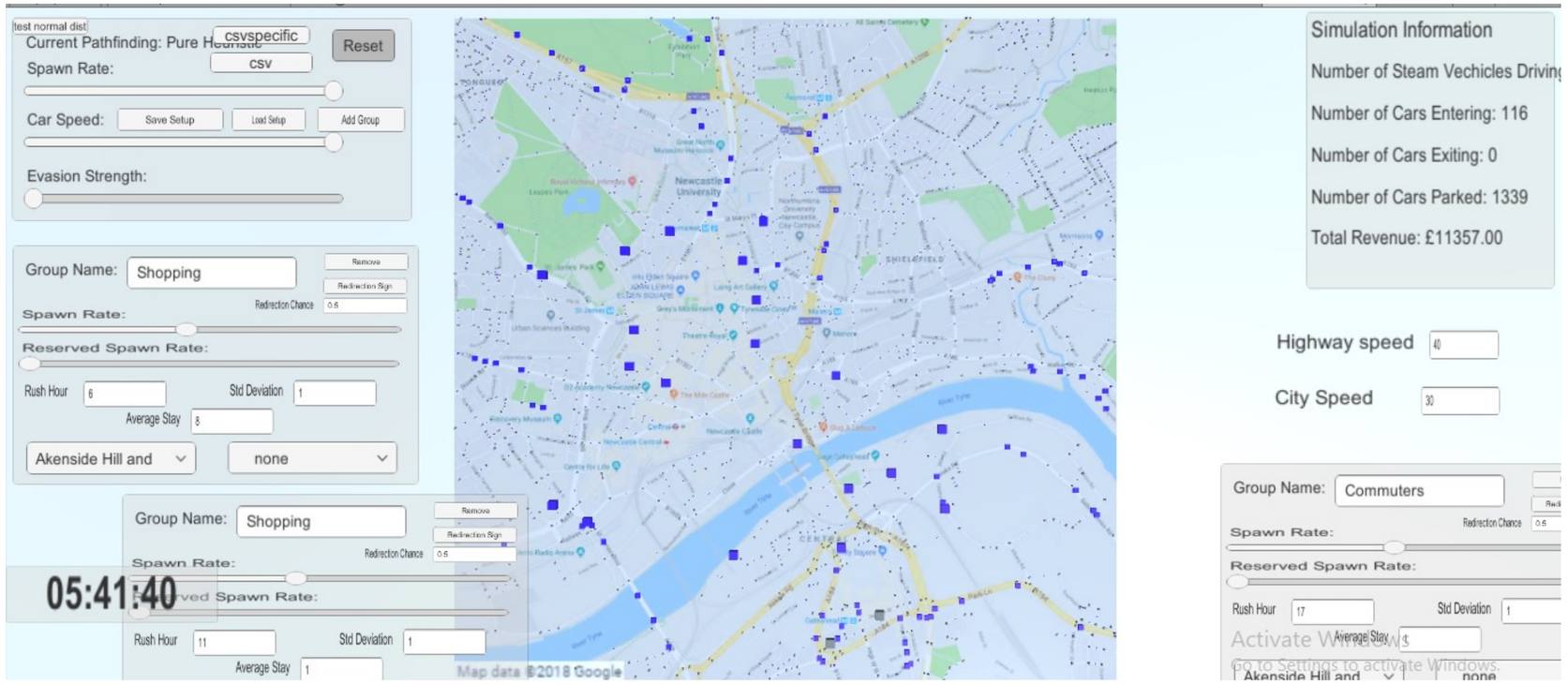
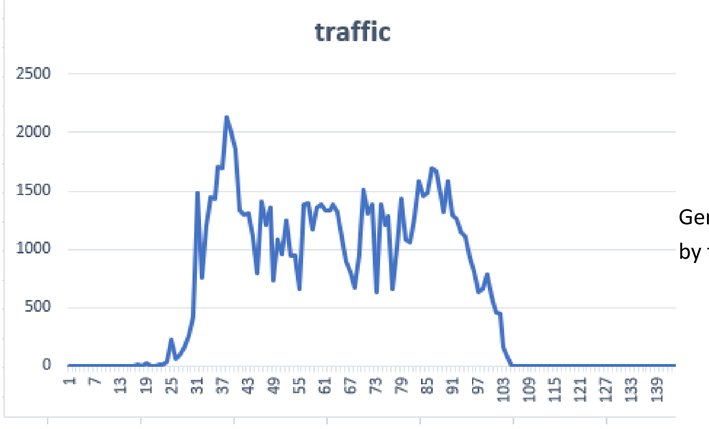
Autonomous Vehicle Navigation with Collaborative Diffusion for City Congestion Control



Simulation Screen

The simulated traffic was also benchmarked against the real-life traffic data in Newcastle. The data proved to be in the same domain as real-life data. Injection groups can be tweaked to simulate more accurate results.



Generated traffic data by the simulation

In recent years traffic control is becoming a world-wide problem. Many old fashion solutions include building smarter roads, and bigger parking spaces, but in recent years the growing field of autonomous vehicles presents many new opportunities for improving traffic. This paper focuses on method to control traffic and decrease the average journey times by implementing collaborative diffusion. Collaborative diffusion is method in which agents, autonomous vehicles, communicate between each other their next goal destinations and make decisions so as to minimise their average journey time for reaching their end locations. The technique is implemented and explored in a simulated environment which is based on the densely populated traffic network of the Newcastle upon Tyne city network.

Another algorithm (shortest path) is then used to generate the same traffic metrics in real-life, which is later compared with the previous algorithm. The Collaborative diffusion algorithm for traffic control is shown to be substantially more efficient.

The project as a whole has been a success, as the objective of creating a collaborative diffusion based simulation over a map of Newcastle was achieved. The agents used in the simulation can be seen taking different routes around the city to reduce congestion.

Test 1	Pythagoras A*	Greedy Best First Search A*	Dijkstra	Collaborative Diffusion
Nodes in Path	38	38	38	38
Path Distance (m)	523.259	523.259	523.259	523.259
Nodes Searched	37	37	1580	37
Time Taken (ms)	24.271	5.947	2969.490	5.737

Test 2	Pythagoras A*	Greedy Best First Search A*	Dijkstra	Collaborative Diffusion
Nodes in Path	38	38	38	38
Path Distance (m)	523.259	523.259	523.259	523.259
Nodes Searched	37	37	1580	37
Time Taken (ms)	25.529	6.326	2968.912	5.633

Benchmark tests against other algorithms