CISC 204 Modelling Project Report

Group 12: Michael Cassidy, Kieran Green, Cooper Moses, Mike Stefan

**Project Summary**

Our project aims to solve the possible different routes a vehicle could take to get to a destination given a grid of intersections which is randomly generated with red-lights, one-way roads, two-way roads, and busy pedestrian traffic. The grid of intersections will be given the number of rows and columns and the number of one-way roads per row and column. This number is easily changeable and will make it easy to test wildly different test cases. The one-way roads will randomly be given a direction based on a bool value given to them. For one-way roads going north and south, 1 will mean that vehicles can only travel north and 0 means that vehicles can only travel south. For one-way roads going east and west, 1 will mean that vehicles can only travel east and 0 means that vehicles can only travel west.

The rest of the roads will be assumed to be two-way roads. An 2D-array will then be made to fit the size of the grid. This will serve as the map the car will drive through. Each index in the array will serve as an intersection which has generated rules based on the roads that cross there. Some examples of these rules are a light blocking traffic going either North/South or East/West, as well if the intersection is at the edge of the grid the car will also not be able to go off the map.

**Propositions:**

* Mx, y: where x and y correspond to the grid location that car is at.
* Gx, y: position of the goal the car must get to.
* L: the car turns left at the intersection
* R: the car turns right at the intersection
* S: the car goes straight at the intersection
* E: the car has reached a dead end
* W: the car has reached the goal
* C: the light is red in front of the car
* Di: Where i is the direction the car is facing (N, E, S, W)

**Constraints:**

* (G2, 2 M2, 2) W
  + If the car is at the goal, then the car has reached the goal.
* (~C  **~** ((DN Mk,2) (DS Mk,0)( DE M2, k)( DW M0, k))) S
  + The car goes straight if the light is not red, and the direction of the car is not pointed off the map. K represents any value that correlates to the map. The example takes place in 3x3 grid with the bottom left corner being (0, 0) and the top left corner being (2,2), so k is a integer between 0 and 2. If it is at the bottom of the map then it’s position is Mk, 0 and if it is direction is DS (South). That means if it goes straight, it will go off the map so it is not allowed to go straight.
* (~S ~L ~R) E
  + If the car cannot move then it has reached a dead end.

**Model Exploration**

* How we made our projects and the steps we took

**First-Order Extension**

* What we want to improve on.

**Requested Feedback:**