

Simulating Pedestrian Behavior

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Introduction

This project was done under the guidance and supervision of professor Christopher Peters. The goal of the project was to study and simulate pedestrian behavior. To limit the scope of the project, the simulation was done at the road crossing outside the KTH metro station and to understand the behaviors better the main focus was the road crossing. This meant that making sure that the pedestrians stopped when the traffic light was red and cross the road when green. To further limit the scope, cubes of different sizes and shapes were used to represent pedestrians. The KTH model in unity was kindly provided by [5].

The project was divided into several stages. The first step was to read an article [1] about behaviors to get an idea of which behaviors might be needed to accomplish the goal. The second goal was to implement a simple movement of pedestrians using UnitySteer. Third milestone was to implement the traffic lights, making the pedestrians stop when red. Lastly some “Decorations” were added in order to make the simulation more realistic.

Simulation

To achieve the basic movement of simulation, some struggles were faced. The first one being which behavior was best suited for this specific project. The first approach was to use path finding, thinking that this would allow the pedestrian to move along a specific path. This created problems since the moving object would have to pass through the path object. Then the second and final approach was used. In that the steering behavior of ‘Arrival’ was used, also called ‘GoForPoint’ in the UnitySteer library. To make sure to keep the pedestrian on the foot-path, obstacles were placed along the edges, making sure that the pedestrian won’t leave the foot-path. This can be seen in Fig. 1.

The second part of the simulation was to have a working traffic light that would stop the pedestrian when red. To achieve this two scripts were written, one that would let the traffic light behave as a normal traffic light and the other would allow the pedestrian to stop when they are at the traffic light and it is red, or else allow them to move. The traffic light model was provided by [2]. This can be seen in Fig. 2.

The third and last part was to add “decorations” to the simulation making it look more realistic. The decorations consisted of moving cars in the background, trees, dustbins and more traffic lights. The toughest part was to make the cars move and stop at traffic lights. The traffic lights for cars and pedestrians were connected in such a way that when the light was green for pedestrians it was red for the cars and vice versa. To make the cars move and stop at traffic lights, two scripts were written, one that made the traffic light work and one that made the car move. Car models were provided by [2][3][4]. The rest of the decorations were taken from the official Unity assets store. This can be seen in Fig. 3.

One of the main difficulties was that the pedestrian objects moved through each other. This was solved using Raycasting. Some of the other difficulties that were faced consisted of not being able to make the project compile, getting parts from other projects to work with this project in unity etc.



Fig 1. First simulation, single pedestrian with arrival and obstacles

https://www.dropbox.com/s/nyxhjekfil6yluk/20151126_120237.mp4?dl=0



Fig 2. Second simulation, more pedestrians and traffic light functionality added

https://www.dropbox.com/s/x7fsfxcmqf917d7/20151126_232400.mp4?dl=0



Fig 3. Final simulation, "decorations" added

https://www.dropbox.com/s/9le43nr8kmc159u/Simulation_final_with_skybox.mp4?dl=0

References

- [1] Steering Behavior for Autonomous Characters, Craig Reynolds <http://www.red3d.com/cwr/steer/>
- [2] The Intersection Traffic Simulation, Niklas Bångman & Mathias Anefelt, <https://trafficsimulation.wordpress.com/>
- [3] Tribestar Traffic simulation, Andreas Stjerndal, Kalle Sederblad & Måns Odstam, <https://tribestar.wordpress.com/category/traffic-simulation/>
- [4] <https://kth.app.box.com/s/k4jy6fqlrhegz1y6puf1sjjioakoxa7i>
- [5] Stockholm Facade Generator, Niklas Axelsson & Robert Amino, <http://sthlmfacadegenerator.tumblr.com/>