Creating a Simulation of an Intersection of Self-Driving Cars Without Traffic Lights

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The purpose of this project was to create a computer simulation of an intersection with no traffic controls (stop signs or traffic lights), and develop artificial intelligence capable of making decisions autonomously, so that self-driving cars can regulate their speed and pass through the intersection without crashing into each other. This intersection would be more efficient in terms of letting more cars through the intersection per minute, and also by eliminating the stop-and-go traffic flow of a normal, controlled intersection. This simulation was created in the Microsoft Visual Studio 2017 IDE using C#, an object oriented programming language created by Microsoft geared towards game design, and leveraged the MonoGame framework, an improvement to Microsoft's XNA. The physics and mathematical details of the simulation were created by the experimenter specifically for this simulation. Acceleration and deceleration physics were derived from data from real world tests on the Tesla Model S. Due to the amount of time necessary to make the computer simulation fully functional and realistic, less time was available to fine-tune the artificial intelligence of the self-driving cars. For example, due to time constraints, the cars only go straight through the intersection, although they still possess the ability to turn. Collision prediction and avoidance involving turning will be addressed in a future project. Based on hours of testing, running, debugging, and revising the simulation, the observed results support the hypothesis. The cars noticeably detect future collisions and make decisions either to stop, slow down, or speed up, such that collisions are avoided.

Awards Won: