Creation of a Traffic Signal Simulation and Proposal of a Throughput Optimization Strategy

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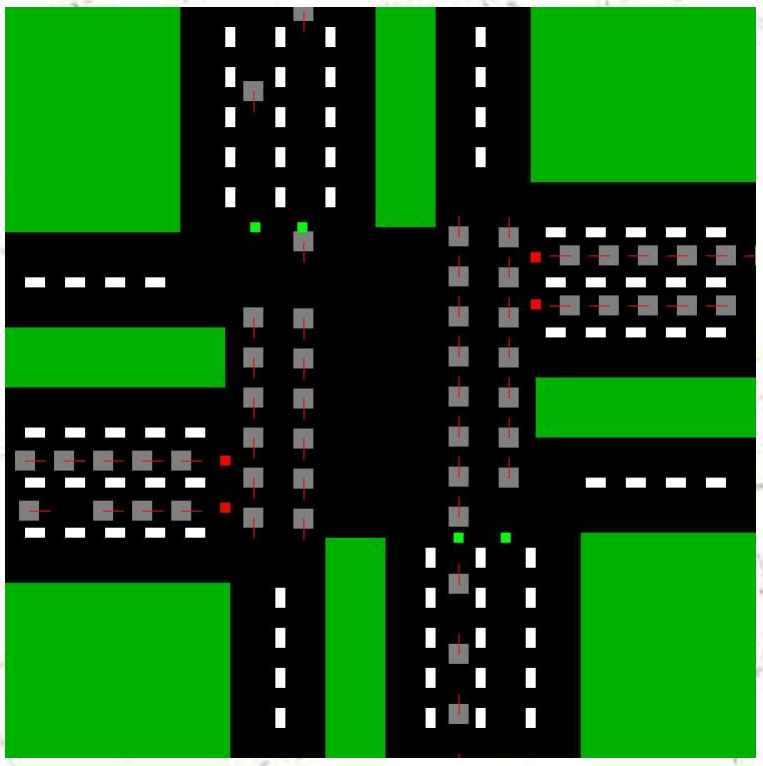
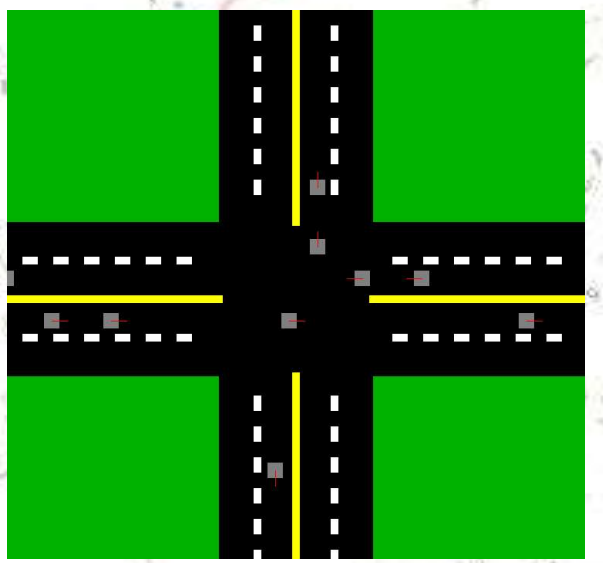
Traffic problems are a major issue in many cities throughout the United States. Optimizing traffic signals at intersections would help this situation. One way to create an optimization algorithm for a traffic signal is to create a computer model of an intersection. Traffic signal light changing algorithms can then be created and tested on the model in order to create an algorithm that will maximize the traffic flow through the intersection. In this project, a simulation was created on which could be tested signal optimization algorithms. Also included is a proposal of an optimization strategy that could be used to maximize the signal's throughput.



The traffic control strategy used in this simulation is actuated signal control. The actuated control strategy utilizes sensors to tell where cars are at the intersection. It then uses what it learns from the sensors to figure out how long it should wait before changing the light colors. The AI uses reinforcement learning. In reinforcement learning, an agent receives information from the environment and decides what it must do to reach a goal state based on information it has already learned. If the agent gets an undesired result, a negative value is assigned to that action.

If the result is desirable, it assigns a positive value to the action. The weight of how positive or how negative the reinforcement is depends on when the agent performed the action. If a recent action denies the goal state, it receives a heavy penalty. Earlier actions leading to the undesirable state receive smaller penalties. This program could apply reinforcement in an effort to minimize the total wait time at the intersection. If the sum wait of all the cars at the intersection increases, a penalty is assessed, and vice versa.



An Early Version