

Optimizing Vehicle Stoplight Trajectory

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Github1: <https://github.com/kjgilder/group7undergrad>

Github2: <https://github.com/kjgilder/group7undergradslx>

Goal: Creating a controller to optimize a vehicle's trajectory to a stoplight based on its distance to the stoplight and when the stoplight will turn from red to green. Ideally, this will avoid the car having to come to a complete stop and create a smooth, optimized trajectory through the light.

ASSUMPTIONS:

- **IMPORTANT!** We are assuming there is no LEAD vehicle in this simulation (and ignore any input from the lead vehicle in the .bag file AND ignore any output related to the lead vehicle)
- We are assuming that the stoplight is at a set distance from the vehicle AND is changing from red to green at a set time.

Simulation 1: Ego car initially travels at a constant speed of 15 m/s (roughly 34 mph), then enters controller mode due to being 100m away from the stoplight at ~57 seconds and gradually reduces speed so it never has to stop. The light turns green at ~83 seconds, so the vehicle returns to the given speed.

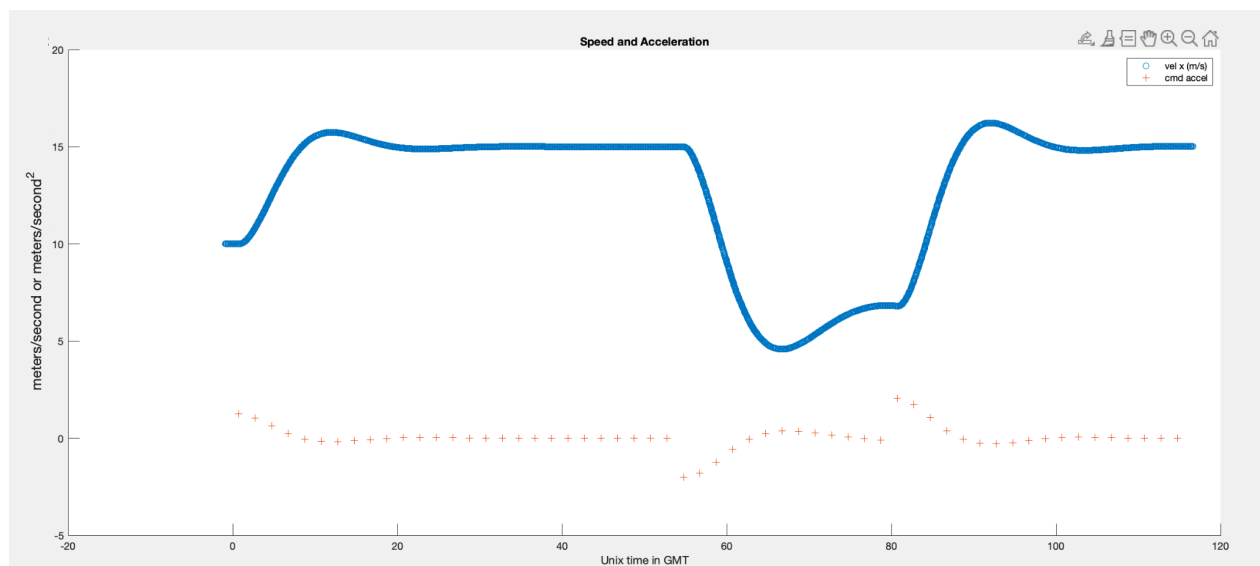


Figure 1: Simulation 1 Output

NOTE: Because we are assuming no lead vehicle, we are only interested in the vel_x and cmd_accel outputs

Simulation 2: Ego car initially gets to and travels at a constant speed of 15 m/s (roughly 34 mph), then enters controller mode due to being 100m away from the stoplight at ~16,462 seconds and gradually reduces speed so it never has to stop. The light turns green at ~16,495 seconds, so the vehicle returns to the given speed.

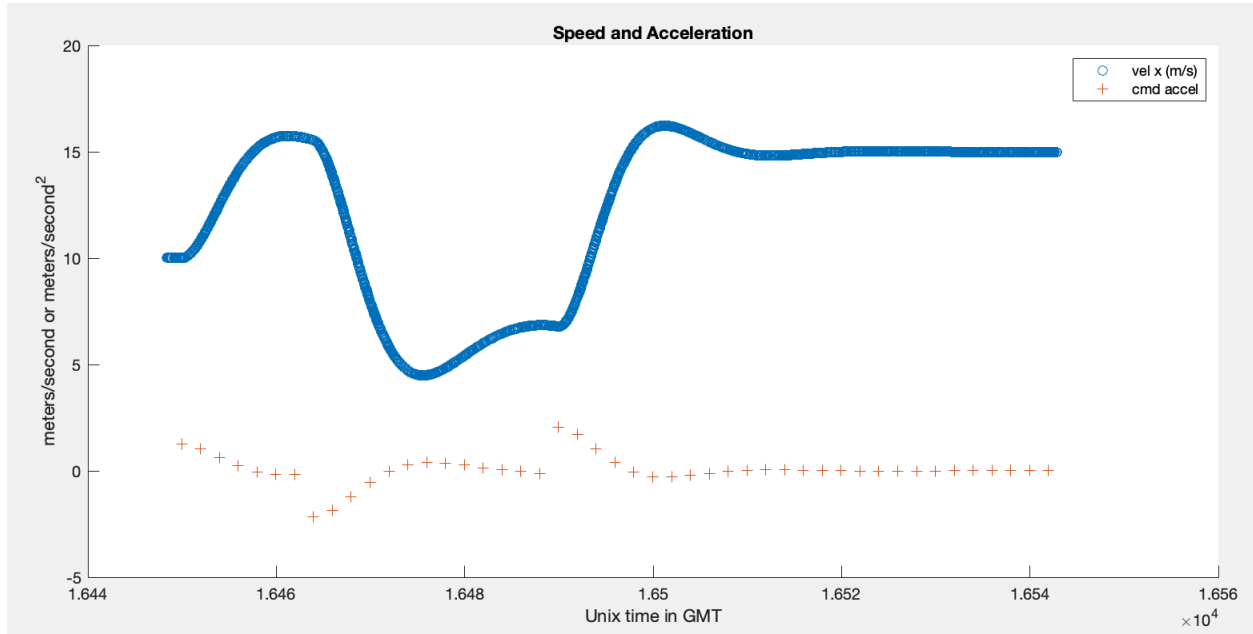


Figure 2: Simulation 2 Output

NOTE: Because we are assuming no lead vehicle, we are only interested in the vel_x and cmd_accel outputs