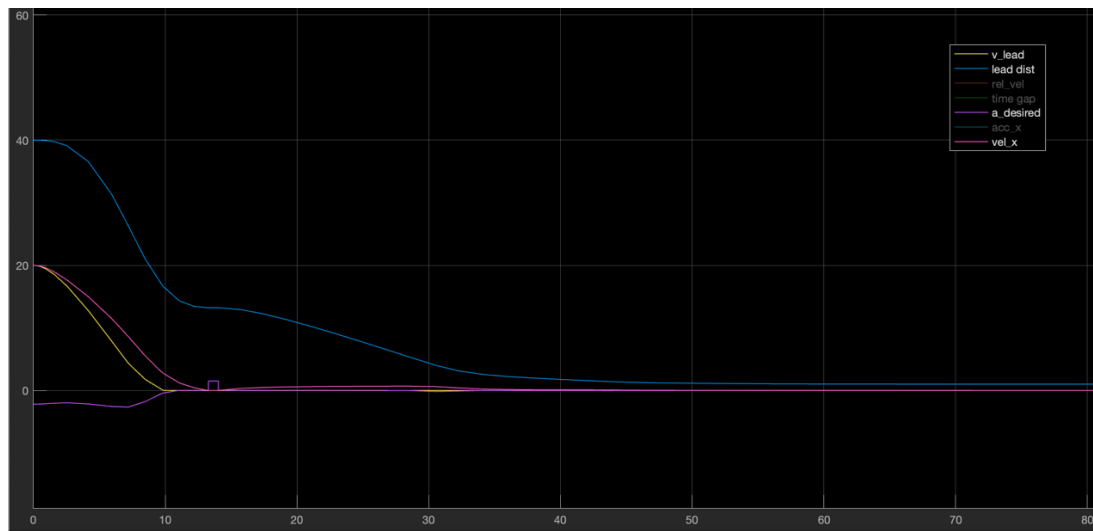**Group Name: I5**
Project Title: Double Velocity Error Controller

Scenario 1: Lead Car Braking

- Initial Distance: 40 meters
- Lead Car Initial Velocity: 20 m/s
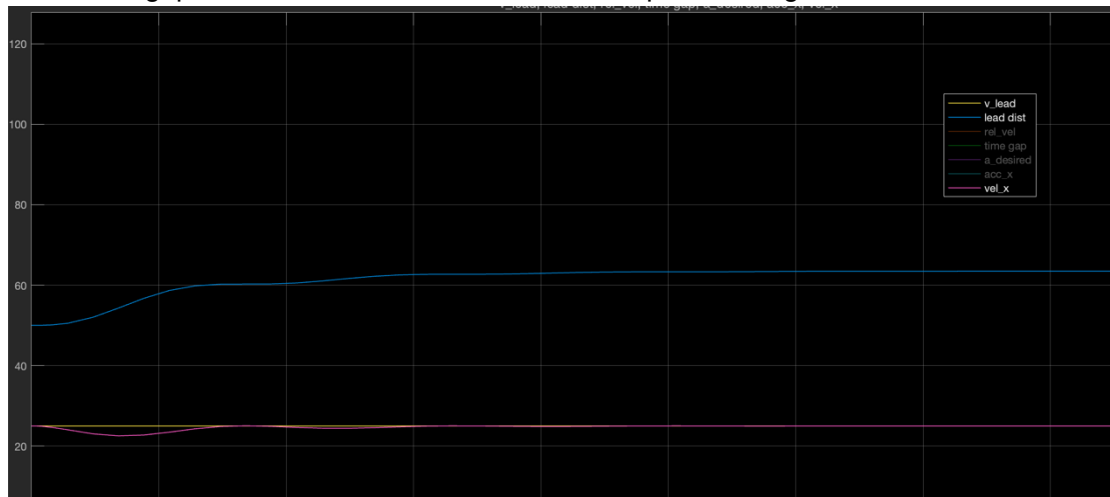- Lead Car Target Velocity: 0 m/s
- Ego Car Initial Velocity: 20 m/s

Description: This scenario assesses the ego car's ability to safely decelerate in response to the lead car's braking from 20 m/s to a complete stop.

Scenario 2: Steady Highway Cruise

- Initial Distance: 50 meters
- Lead Car Initial Velocity: 25 m/s
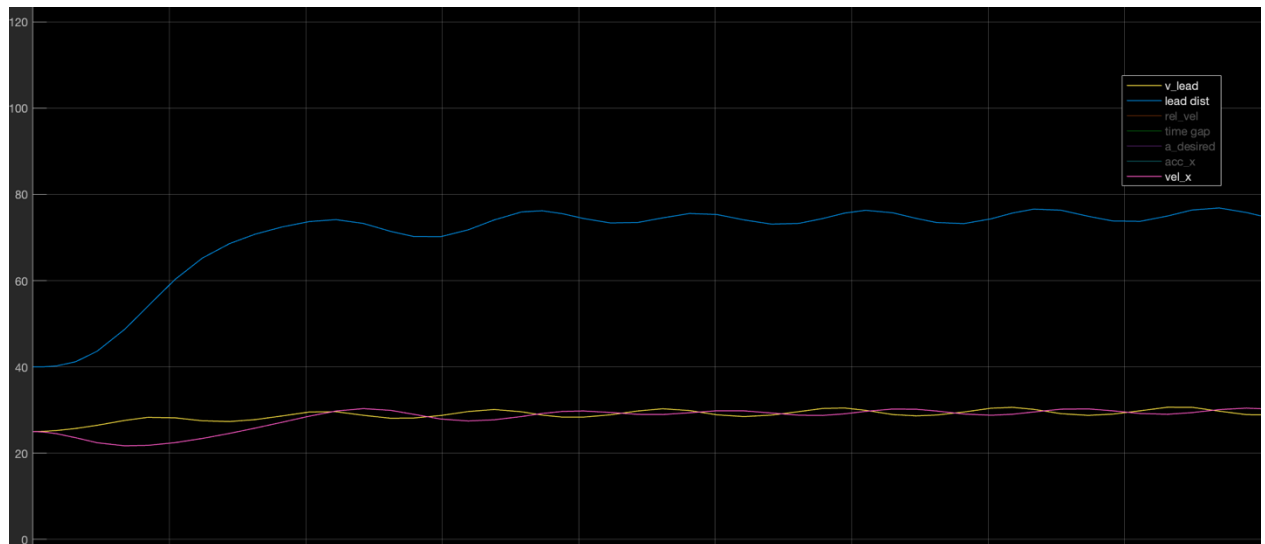- Lead Car Target Velocity: 25 m/s
- Ego Car Initial Velocity: 25 m/s

Description: The vehicles travel on an open highway segment, maintaining a steady speed of 25 m/s. This test checks the effectiveness of the ego car's cruise control in maintaining a constant gap of 50 meters under ideal, constant-speed driving conditions.

Scenario 3: Variable Speed Adaptation

- Initial Distance: 40 meters
- Lead Car Initial Velocity: 25 m/s
- Lead Car Target Velocity: Fluctuates around 30 m/s
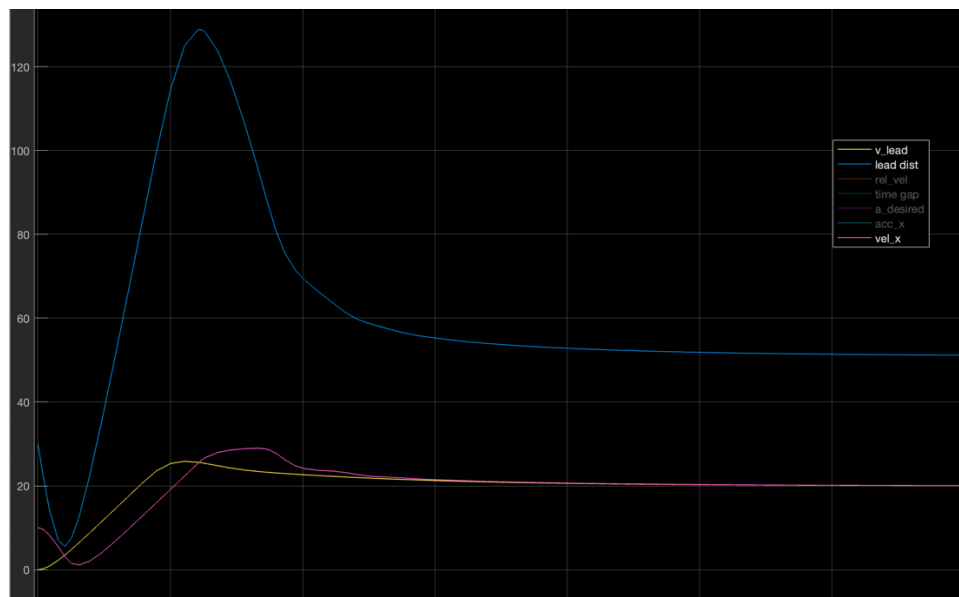- Ego Car Initial Velocity: 25 m/s

Description: In this test, the ego car must dynamically adjust its speed to match the lead car's variable speed, which oscillates between around 30 m/s. This scenario evaluates the adaptability of the vehicle's cruise control system to changing speeds.

Scenario 4: Gradual Acceleration from Standstill

- Initial Distance: 30 meters
- Lead Car Initial Velocity: 0 m/s
- Lead Car Target Velocity: 20 m/s
- Ego Car Initial Velocity: 10 m/s

Description: Simulating a green light scenario, this test challenges the ego car to accelerate from 10 m/s to match the lead car's smooth acceleration from 0 to 20 m/s. This scenario tests the vehicle's ability to adjust its acceleration.

Scenario 5: Start and Deceleration Synchronization

- Initial Distance: 5 meters
- Lead Car Initial Velocity: 20 m/s
- Lead Car Target Velocity: 10 m/s
- Ego Car Initial Velocity: 0 m/s

Description: This setup challenges the ego car's ability to safely manage its acceleration and braking systems from a standstill to catch up and then adapt to the lead car's decreasing speed.