

Laboratory Exercise: Implementation of an Emergency Braking System Based on Radar in the CARLA Simulator

Objectives:

- Understand the use of radar sensors in autonomous vehicles.
 - Implement an emergency braking system using the CARLA simulator.
 - Develop an algorithm that uses radar data to detect obstacles and activate automatic braking.
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Exercise Description:

In this exercise, you are required to implement an emergency braking system on a vehicle in the CARLA simulator using a radar sensor. The vehicle must be able to:

- Detect obstacles or vehicles ahead using the radar.
 - Calculate the Time to Collision (TTC) based on the relative speed and distance of the obstacle.
 - Activate emergency braking if the TTC falls below a predefined threshold to avoid a collision.
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Requirements:

1. Radar Sensor Configuration:

- Add a radar sensor to the vehicle in the simulator.
- Configure the sensor to collect relevant data (distance, relative speed, angle).

2. Radar Data Processing:

- Write an algorithm to process radar data in real-time.
- Identify relevant obstacles ahead of the vehicle.
- Calculate the TTC for each obstacle.

3. Implementation of the Braking System:

- Define a TTC threshold to activate braking.
- Implement a control that applies emergency braking when necessary.

4. Testing and Validation:

- Create test scenarios in the simulator to verify the system's functionality.
- Document the results, including cases where braking successfully prevents a collision.

Instructions:

- Use Python and the CARLA API for the implementation.
- Ensure that the code is well-commented and organized.