

Audibot Adaptive Cruise Control

Starting Point

This project uses two instances of the Audibot simulator that was used throughout the course, and the goal is to have one car follow the other and regulate its following distance. This simulation is very processor-intensive because of running two Audibot simulations in Gazebo, so it is recommended to use a native installation of Ubuntu and ROS to work on this. The following launch command starts the simulation:

```
roslaunch ugv_course_launch two_audibot_road_world.launch
```

This spawns the two Audibots in `road_world`, but doesn't apply any control. An example launch file that controls the two Audibots to drive around the outer ring of `road_world` is found in the `audibot_path_following` package:

```
roslaunch audibot_path_following two_audibot_path_following.launch
```

This sets both cars to travel at a constant speed, but the following vehicle will move faster, which results in a crash! It is your task to fix this.



Figure 1: Two Audibots following each other in `road_world`.

Level 1

- Use the `audibot_path_following` package to control the steering to follow the lane markings, but intercept the `Twist` command and insert your own speed in the `linear.x` field.
- Look up the states of the two cars' Gazebo models, extract their positions, and compute the distance between them.

- Use the computed distance as input to an algorithm that controls the speed of the following car such that it maintains a relative distance to the lead vehicle.

Level 2

- Add the 2D LIDAR that is used on Roundbot to the front of the following vehicle by modifying Audibot's URDF model.
- Process the LIDAR scan to detect the lead vehicle and compute its distance.
- Pass the computed LIDAR distance to the ACC controller from Level 1 to maintain a following distance.

Level 3

- Process the image from the following vehicle's camera to detect the lead vehicle.
- Use trigonometry and the known orientation of the camera to estimate the distance of the lead vehicle.
- Pass the computed camera distance to the ACC controller from Level 1.