

P545 Lab 3 Obstacle Avoidance I

Bryce Himebaugh

October 16, 2008

1 Introduction

In this lab, you will be utilizing your GPS follower from Lab 2 to avoid obstacles. The obstacle will be a cone at a location that will be known and static. Your task is to design a driver component that can both avoid the cone and stay within the GPS course.

Figure 1 provides an illustration of a course segment with an obstacle.

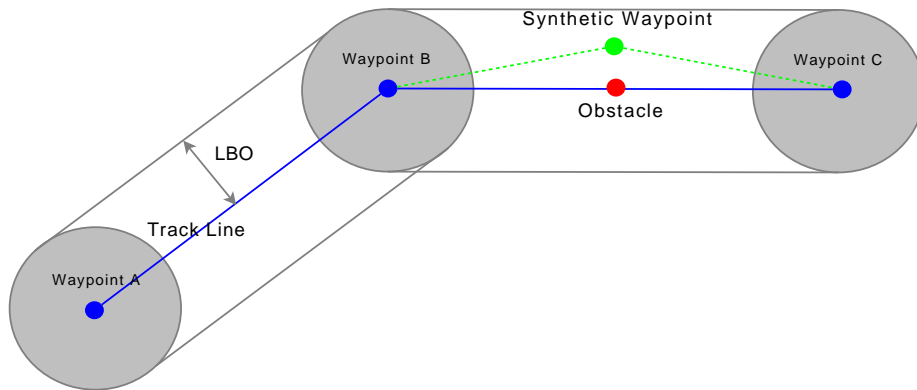


Figure 1: Route Example

To avoid the obstacle a synthetic waypoint is generated that is beside the obstacle. The cart then drives toward the new synthetic point(s) which avoids the obstacle.

2 GPS Course

To allow for an expanded LBO, a new base GPS track has been designed. The new course is shown in Figure 2. It has a 4 meter LBO with similar features to the course from Lab 2. The expanded LBO will not only provide maneuvering space for the obstacle avoidance labs, but will also provide opportunities to try other path planning optimizations.

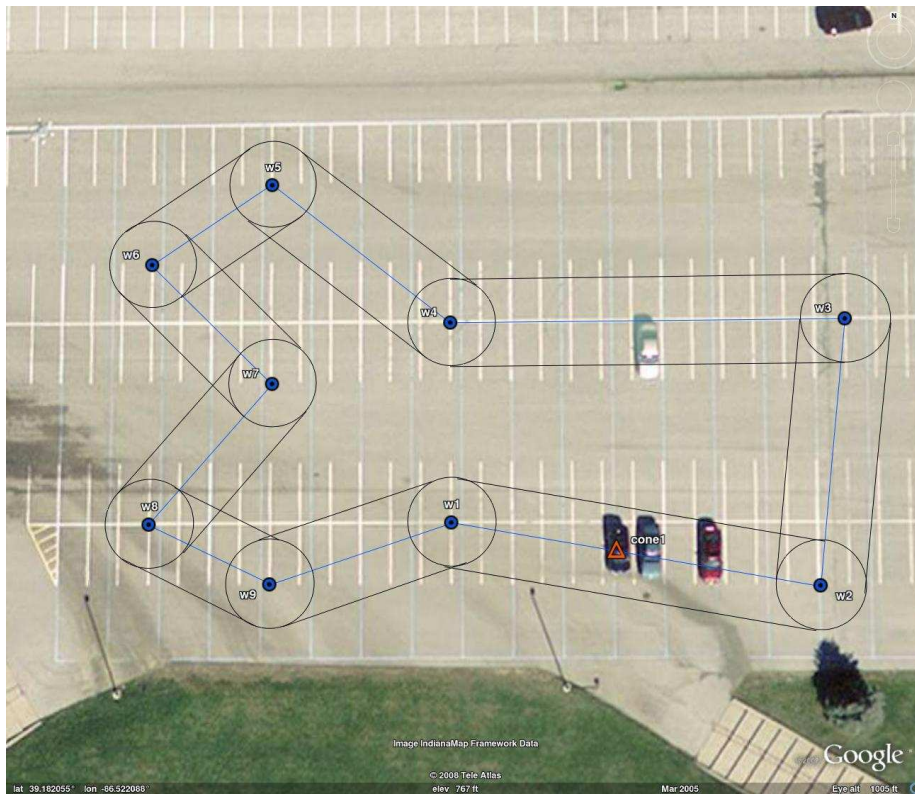


Figure 2: Route Path

```
waypoint_list = [[1,39.181956,-86.522103,4.0,5.0],\
                 [2,39.181904,-86.521720,4.0,5.0],\
                 [3,39.182119,-86.521690,4.0,5.0],\
                 [4,39.182119,-86.522102,4.0,5.0],\
                 [5,39.182235,-86.522292,4.0,5.0],\
                 [6,39.182169,-86.522420,4.0,5.0],\
                 [7,39.182070,-86.522292,4.0,5.0],\
                 [8,39.181956,-86.522421,4.0,5.0],\
                 [9,39.181907,-86.522294,4.0,5.0]]
```

3 Obstacle

For this lab, our obstacle is a single cone. The cone is positioned on the track line between waypoint 1 and waypoint 2:

```
obstacle = [[1,39.181933 -86.521931,0.25]]
```

For our obstacle avoidance labs, the format of an obstacle will be obstacle number, latitude, longitude, and the radius of a circle that fully contains the obstacle. So for this cone, the radius of the obstacle is 0.25 meters centered at (39.181933,-86.521931).

4 Planning for Future Labs

In following labs, you will start to generalize your driver's ability to plan around obstacles. Lab 4 will involve receiving obstacles from a cartfs component that is synthesizing the obstacles based in the cart's current GPS location. Lab 5 will involve receiving the obstacles from a laser sensor.

While in each case, the driver will be presented with an obstacle in the format described above, as we move forward, the obstacles will arrive later and will be more dynamic in their location. For example, as the cart changes heading to avoid an obstacle, it will possible pass out the sensor's view at some point in the avoidance maneuver.

5 What to turn in

Write a concise summary of the testing that was performed and the results. Using collected gps data, include a plot of the path that the cart took as it traversed the course for at least two laps on the same graph with a plot of the straight line course showing the obstacle.

Post this code to your svn lab directory for lab 3. Drop me an email when this is complete. This should be complete by 10/17/08.