

## Autonomous Vehicle Design, Fall 2020

### Homework 1, 60 points

1. A two-wheeled differential drive steered robot is to turn to the left with a radius of curvature specified by user input, at 1 meter per second. The robot's width is user specified input. Calculate and print the left-side and right-side velocities. (10 points)

General program flow:

```
input robot width
while user chooses to continue
input radius of curvature
display left and right velocities
```

2. Develop a simulation of a two-wheeled differential drive robot at various time intervals.

Assume that the width from wheel to wheel is 0.70 meters. Simulate for straight-line motion, left turn motion, and right turn motion. An example of left turn behavior might be making the right-side velocity 10% greater than the average speed and the left velocity 10% less than the average speed  $(\text{right speed} + \text{left speed})/2$ .

Simulate several seconds of motion. The sampling time interval is 0.1 seconds. Plot  $x$  versus  $t$ ,  $y$  versus  $t$ , heading versus  $t$ , and  $y$  versus  $x$ . Assume the initial pose for each behavior is  $(0,0,0)$ .

Assume constant velocity, zero acceleration. (50 points)