Quiz 2
Graded Quiz • 30 min

Due Jun 1, 12:29 PM IST

Congratulations! You passed!

TO PASS 80% or higher

Keep Learning

GRADE
80%

Quiz 2

LATEST SUBMISSION GRADE

80%

1. Consider a unicycle robot with dynamics

1 / 1 point

$$\dot{x} = v\cos\phi$$
$$\dot{y} = v\sin\phi$$
$$\dot{\phi} = \omega$$

If the two inputs (v, ω) are constant what will the robot do?

- (•) Drive along a circular arc with radius v/ω.
- ( ) Drive along an inward spiral.
- ( ) Drive along a circular arc with radius $v\omega$.
- ( ) Drive along an outward spiral.
- ( ) Drive along a circular arc with radius ω/v.

✓ **Correct**
Try to think of what the two inputs are doing. You can think of v as speed and ω as the amount you're turning. Then, you can reason through the options. Make sure you're answer is consistent with what should happen when either speed or change in angle is increased and decreased.

2. A differential-drive robot is equipped with a wheel encoder with 10 "ticks" per revolution, wheel radius of 0.1m, and the two wheels are 0.2m apart. The robot starts at the origin (position and orientation is 0) and, during a short time interval of 0.5s a total of 5 ticks were recorded for the right wheel and 3 ticks for the left. Where is the robot approximately located after 0.5s?

1 / 1 point

- ( ) Impossible to say -- not enough information provided.
- ( ) $x \approx 0,\ y \approx 0.3,\ \phi \approx 0.6$
- (•) $x \approx 0.3,\ y \approx 0,\ \phi \approx 0.6$
- ( ) $x \approx 0.3,\ y \approx 0.3,\ \phi \approx -0.6$
- ( ) $x \approx 0.3,\ y \approx 0.3,\ \phi \approx 0.6$

✓ **Correct**
This question can be solved using the odometry equations given in lecture.

3. Same question as Question 2, with the small difference that the time interval is now 5 minutes and the right tick count is 40 and the left tick count is 65.

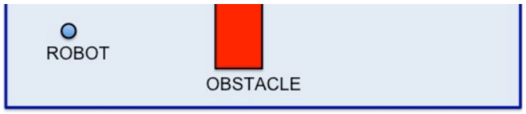
1 / 1 point

- ( ) $x \approx 3.3,\ y \approx 0,\ \phi \approx 1.6$
- ( ) $x \approx 3.3,\ y \approx 3.3,\ \phi \approx 1.6$
- (•) Impossible to say -- not enough information provided.
- ( ) $x \approx 0,\ y \approx 3.3,\ \phi \approx 1.6$
- ( ) $x \approx 3.3,\ y \approx 3.3,\ \phi \approx -1.6$

✓ **Correct**
Recall that the odometry equations assume the inputs v and w to be constant for short intervals of time, and hence, the equations assume that a robot has moved in a circular arc for that amount of time. This question wants you to think about what happens to the odometry equations over long time intervals.

4. Let the go-to-goal behavior drive a robot straight towards the goal location and the obstacle-avoidance behavior drive perpendicularly away from the closest obstacle point. Moreover, assume that the system blends the two behaviors in the following way: it uses only go-to-goal when the obstacle is far away and only obstacle-avoidance when the obstacle is really close. What would happen to this robot if it was to negotiate the environment shown below?

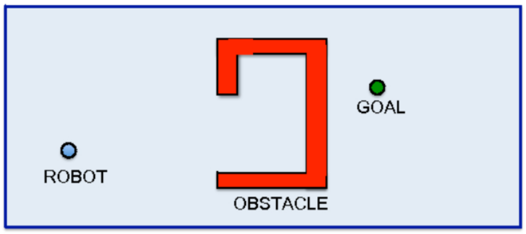
0 / 1 point



- ◯ The robot will successfully negotiate the obstacle by moving around it in a counter-clockwise fashion.
- ◯ The robot will never get close enough to the obstacle so the question is pointless.
- ◉ Impossible to say -- not enough information about the different behaviors is provided.
- ◯ The robot will get stuck and not be able to negotiate the obstacle.
- ◯ The robot will successfully negotiate the obstacle by moving around it in a clockwise fashion.

! **Incorrect**

5. Now, consider the labyrinth below. Assume the robot is indeed equipped with a well-designed go-to-goal behavior. Which of the following obstacle-avoidance behaviors would not be able to lead to a successful negotiation of the labyrinth? **1 / 1 point**



- ◉ Follow-Obstacle-In-Direction-That-Moves-Robot-Closer-To-Goal
- ◯ Follow-Obstacle-Clockwise
- ◯ Follow-Obstacle-Counter-Clockwise
- ◯ Always-Keep-Obstacle-To-The-Left-Of-Robot
- ◯ They all would do the trick

✓ **Correct**

Thinking through each behavior described below in the specific scenario outlined by the image, we can see which of the behaviors successfully complete the task (navigating autonomously to the green dot).