Started on	Monday, 6 June 2022, 3:01 PM
State	Finished
Completed on	Monday, 6 June 2022, 5:05 PM
Time taken	2 hours 3 mins
Grade	**5.87** out of 10.00 (**59**%)

Question **1**

Partially correct

Mark 0.67 out of 2.00

Select all the statements that are TRUE.

Select one or more:

- [x] a. It can be useful to combine path planning with multiple optimal controllers.✔
- [ ] b. If you have multiple robots navigating around a warehouse, a PRM is a better choice than an RRT.
- [ ] c. You could model the problem of a robot folding your laundry as a path planning problem.
- [ ] d. It is useful to plan in configuration space because there are no obstacles.
- [ ] e. Voronoi segmentation is particularly useful when there are dynamic obstacles.
- [ ] f. Approximate cell decomposition is a better choice than exact cell decomposition when you have large open areas in your map.

Your answer is partially correct.

You have correctly selected 1.
The correct answers are: If you have multiple robots navigating around a warehouse, a PRM is a better choice than an RRT., It can be useful to combine path planning with multiple optimal controllers., You could model the problem of a robot folding your laundry as a path planning problem.

Question **2**

Correct

Mark 2.00 out of 2.00

A mobile robot is navigating through a room with a point obstacle and a point goal, using a potential function. The positions are defined as follows:

- Robot start: (1, 1)
- Goal q_{goal}: (5, 6)
- Obstacle q_{obs}: (3, 3)

The attractive potential is $U_g(q) = (q - q_{goal})^2$, and the repulsive potential is $U_{obs}(q) = 1/(q - q_{obs})^2$. The total potential is given by $U(q) = U_g(q) + U_{obs}(q)$.

If the robot can move a distance of 1 in any direction, where would it be after taking one step using the potential function?

Select one:

- a. (9.5, 11.5)
- b. (8.5, 10.5)
- c. (1.23, 1.77)
- d. (1.75, 1.6)
- e. (1.5, 1)
- f. (1, 1.5)
- g. (1.43, 1.43)
- h. (1.63, 1.78)✔

Your answer is correct.

The correct answer is: (1.63, 1.78)

Question **3**

Correct

Mark 2.00 out of 2.00

A robotic ship is scanning the bottom of the ocean for sunken treasure. To do so, it needs to measure the distance x to the sea floor. The ship takes multiple readings to try and determine the distance to the bottom. Assume vertical motion of the ship due to waves is negligible, and so $x_t = x_{t+1}$. The noisy readings of the distance are given by $z_t = x_t + \delta_t$, where the noise is described by the process $\delta_t \sim N(0; 5)$. The first three readings are $z_0 = 57m$, $z_1 = 73m$, and $z_2 = 67m$. Using a Kalman filter, obtain the mean and variance of the ship's estimate to the sea floor after the last reading. Use $x_0 = 57$ and $P_0 = 1$.

Select one:

- a. $x_2 = 60.72$ and $P_2 = 0.71$ ✔
- b. $x_2 = 65.67$ and $P_2 = 0.33$
- c. $x_2 = 62.13$ and $P_2 = 0.91$
- d. $x_2 = 59.67$ and $P_2 = 0.83$
- e. $x_2 = 67$ and $P_2 = 0.33$
- f. $x_2 = 57$ and $P_2 = 1$
- g. $x_2 = 0.17$ and $P_2 = 0.14$

Your answer is correct.

The correct answer is: $x_2 = 60.72$ and $P_2 = 0.71$

Question **4**

Partially correct

Mark 1.20 out of 2.00

For each scenario, what is the most appropriate kind of filter to use?

Using GPS to track a delivery truck moving goods between various warehouses.	Particle filter ✖
Tracking different people moving through a crowded space on a video feed.	Particle filter ✔
A robotic crane measuring the distance to a crate it is trying to lift.	Kalman filter ✔
A line-following robot (that has a downward-pointing light sensor to tell when it is positioned over a line) attempting to trace its way out of a previously-mapped maze marked on the ground.	Kalman filter ✖
Determining where you are in the world by looking at nearby types of plants.	Particle filter ✔

Your answer is partially correct.

You have correctly selected 3.
The correct answer is: Using GPS to track a delivery truck moving goods between various warehouses. → Kalman filter, Tracking different people moving through a crowded space on a video feed. → Particle filter, A robotic crane measuring the distance to a crate it is trying to lift. → Kalman filter, A line-following robot (that has a downward-pointing light sensor to tell when it is positioned over a line) attempting to trace its way out of a previously-mapped maze marked on the ground. → Particle filter, Determining where you are in the world by looking at nearby types of plants. → Particle filter

Question **5**

Incorrect

Mark 0.00 out of 2.00

Particle filters are a good way of keeping track of a set of hypotheses when performing [SLAM](). With regards to the FastSLAM algorithm discussed in the video, select all the true statements in the following set.

Select one or more:

- [ ] a. Particles do not keep a hypothesis of the variance in the robot's positon
- [ ] b. Particles do not keep a hypothesis of the variance in landmark positions
- [x] c. Each particle must keep a hypothesis of the path followed by the robot ✖
- [x] d. Each particle must keep a hypothesis of the positions of landmarks ✔
- [x] e. Each particle must keep a hypothesis of the position of the robot ✔
- [x] f. Particles do not keep a hypothesis of the robot's sensor model ✔
- [x] g. Each particle must keep a hypothesis of the robot's observations ✖
- [x] h. Each particle must keep a hypothesis of the noise in the motion model ✖

Your answer is incorrect.

The correct answers are: Each particle must keep a hypothesis of the position of the robot, Each particle must keep a hypothesis of the positions of landmarks, Particles do not keep a hypothesis of the robot's sensor model, Particles do not keep a hypothesis of the variance in the robot's positon

◄ Quiz 2 - Control

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