The results of Robotics 1

Question 1: R1: Which statement is correct with regards to an ideal data structure for environment mapping?

You got this question incorrect, you selected answer 2, when the correct answer is 1

1) a) It minimises the amount of nonhomogeneous or ambiguous space.

2) b) It stores complex shapes with a large number of data structure elements.

3) c) It relies on the assumption that the environment is true to square.

4) d) It can only handle local or global maps, one at a time.

Question 2: R1: The Artificial Potential Field (APF) Method is a local navigation method that

You got this question correct

1) a) can only fail, if it is implemented in conjunction with the brushfire algorithm,

2) b) cannot fail, because the artificial field always provides a route around any type of obstacle,

3) c) can fail, because it is a fastest descent method and, thus, can get stuck in local minima,

4) d) can only reach the goal if there is no obstacle between robot and goal.

Question 3: R1: A 6-DOF manipulator is to move from a start to an end point via a via-point. What is correct?

1) e) One cubic polynomial with 3 coefficients is needed.

2) f) If cubic polynomials are used, 48 parameters need to be computed.

3) g) This problem cannot be solved in finite time (curse of dimensionality).

4) h) For each DOF, 3 cubics need to be computed, since there are 3 points (start, via and end).

Question 4: R1: A polynomial can be used to generate a smooth trajectory. Which statement is correct?

1) a) At least a cubic polynomial with 3 coefficients is needed.

2) b) At least a quintic polynomial with 5 coefficients is needed.

3) c) At least a cubic polynomial with 4 coefficients is needed.

4) d) At least a quadratic polynomial with 1 coefficient is needed.

Question 5: R1: The Tangent Bug is a navigation algorithm. Which statement is correct?

1) a) The Tangent Bug uses three main behaviours: obstacle avoidance, start tracking, tangent bugging.

2) b) The Tangent Bug can get stuck in local minima.

3) c) The Tangent Bug assumes a finite range sensor with infinite angular resolution.

4) d) The Tangent Bug surrounds an obstacle fully before deciding on how to proceed.

Question 6: R1: Bug 1 and Bug 2 are navigation algorithms. Which statement is correct?

1) a) A path found by the Bug 1 algorithm is always shorter than a path found by the Bug 2 algorithm.

2) b) The Bug 2 algorithm is such a greedy algorithm that afterwards all obstacles are consumed.

3) c) The Bug 1 algorithm will always make the robot follow the entire obstacle boundary at least once.

4) d) One disadvantage of the Bug 1 & 2 algorithms is that they only work with polygonal obstacles.

Question 7: R1:The breadth-first search algorithm (BFSA) can find a path in a graph. Which statement is correct?

1) a) The BFSA finds a path if one exists along the fewest number of nodes between start and goal.

2) b) The BFSA is identical to the depth-first search algorithm.

3) c) The BFSA is a local navigation algorithm that can get stuck in local minima.

4) d) The BFSA searches first (and only) for non-point-like robots with an appropriate breadth.

Question 8: R1: What can be said about resolution complete in the context of approx. cell decomposition methods?

1) a) Resolution complete path planners do not resolve the issue of obstacle avoidance.

2) b) Resolution complete path planners even find a path, if an

exact cell decomposition method fails.

3) c) Resolution complete path planners do not guarantee to find a
path even if a path exists.

4) d) Resolution complete path planners only work in two
dimensions (e.g. Quadtree).

Question 9: R1: This question concerns the brushfire algorithm (BA) that can be used to create a Voronoi Diagram

You got this question incorrect, you selected answer 4, when the correct answer is 1

1) a) The BA can generate a map whose cell values represent
distances to nearest obstacles.

2) b) The BA is the only path planner that finds a path from start
to goal even if no such path exists.

3) c) The brushfire algorithm only works on robots with 3 DOF
(degrees of freedom).

4) d) The BA creates a map that has path segments that follow the
edges of polygonal obstacles.

Question 10: R1: What are the main advantages of the Visibility Graph?

You got this question incorrect, you selected answer 3, when the correct answer is 2

1) a) It maximises the distance between obstacles and robot; it can
be applied to non-polygonal spaces.

2) b) It creates a road map connecting vertices of polygons and is
able to find the shortest path.

3) c) It is a mapping technique that creates paths between robot
and visible obstacles only.

4) d) It generates curved paths only – useful for rotary robots.

Question 11: R1: What is meant by the curse of dimensionality in the context of C-space-based path planning?

1) a) The curse of dimensionality can befall a roboticist when entering a higher dimension.

2) b) High DOF robots have a high dimensional C-space which can be time consuming to build.

3) c) A high DOF of a robot leads to an exponential decrease in the dimensionality of the C-space.

4) d) It is simply the course the robot has to follow, once a path has been planned in the C-space.

Question 12: R1: Ultrasonic transducers are used to measure distances. One DISADVANTAGE of this approach is that

1) a) it only works correctly, if most received sound waves are those bouncing of multiple obstacles,

2) b) the ultrasonic beam becomes narrower the further away from the transducer,

3) c) the returning sound wave usually destroys the transducer after a few hundred range measurements,

4) d) the speed of sound varies with air pressure changes and cannot always be accurately determined.

Question 13: R1: Shaft encoders can be used for mobile robot odometry. Which statement is correct?

1) a) Shaft encoders commonly use an LED, a photo detector and a disk with slots attached to an axle.

2) b) Shaft encoders can be used to encode the path segments in a path planning algorithm.

3) c) A disadvantage of shaft encoders is that they can only determine the wheel acceleration.

4) d) Shaft encoders attached to the axle of a wheel are independent of wheel slip.

Question 14: R1: Which of the following statements is correct?

You got this question incorrect, you selected answer 1, when the correct answer is 2

1) The C-space is a set of non-reachable areas constructed from knowledge of the world and the robot.

2) In C-space, the robot has the size of a point; each DOF is represented by an axis in the C-space.

3) In C-space, the robot has the size of a point, and each DOF is enlarged by the robot's dimensions.

4) The configuration space works only for robots with a high degree of freedom.

Question 15: R1: The Subsumption Architecture

You got this question correct

1) was developed by Oussama Khatib,

2) defines the designs for modern robots,

3) assumes that obstacles in the workspace of a robot are treated as intermediate targets,

4) decomposes a mobile robot control system based on task achieving behaviours.

Result Summary
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