CSE435 – Robotics

Tutorial 1

Written Questions

1. List four main activities of mobile robots.
2. What is the key advantage a **gantry robot** has over a mobile robot in terms of navigation and not losing its bearings?
3. Explain the concept of **negative feedback**.
4. How is negative feedback applied in the behavior of a **wall-following robot**?
5. Define **subsumption** in the context of robot behavior using an example.
6. What is **distributed processing** in robotics? Provide one reason why it might be used instead of a single controller.
7. Explain how random activity and trial and error can be used by a robot to learn how to solve a maze.

True / False

1. All mobile robots require variable speed control for basic movement.
2. Pulsed light sources can help solve problems caused by ambient room lighting or sunlight for robot sensors.
3. A light sensor used for proximity detection works by emitting light and measuring the intensity of the light reflected back from an object.
4. The usual response for a robot after contacting an obstacle with its bumper is to immediately shut down all systems.
5. Line following is considered one of the most unreliable techniques for guiding a robot from one place to another.
6. Gantry robots are prone to losing their bearings in a defined work area because they cannot track their coordinates.
7. Negative feedback in a system, like a wall-following robot, helps to produce stability.
8. If the motor outputs of a wall-following robot are swapped, it can lead to positive feedback and instability.
9. Random behavior in a robot is typically achieved using a true random number generator that is completely unpredictable.
10. Distributed processing involves using a single controller to manage all of a robot's tasks simultaneously.

Multiple Choice Questions (MCQ)

1. ---------- is easier to program for applications that require precise navigation.
   a. Gantry Robot
   b. Arm Robot
   c. Mobile Robot
   d. None

2. Avoidance behavior is a type of ----------
   a. Mobile Robot
   b. Subsumption
   c. Positive Feedback
   d. Negative Feedback

3. 3-D printer is a type of ---------- robot
   a. Arm
   b. Mobile
   c. Gantry
   d. Automatic

4. ---------- causes instability, which is avoided in robot behavior
   a. Random Action
   b. Subsumption
   c. Positive Feedback
   d. Negative Feedback

5. Limit switches are a type of ----------
   a. Subsumption
   b. Robot
   c. Actuator
   d. Feedback

6. Usually results in staying in more or less the same place ----------
   a. Monte Carlo Walk
   b. Subsumption
   c. Positive Feedback
   d. Negative Feedback

7. Monte Carlo Walk is a ---------- technique used for localization
   a. Positive Feedback
   b. Negative Feedback
   c. Subsumption
   d. Random

Answer Keys

Written Questions

Refer back to the lecture for detailed answers.

True / False Answers

1. False
2. True
3. True
4. False
5. False
6. False
7. True
8. True
9. False
10. False

MCQ Answers

1. **a. Gantry Robot**
2. **b. Subsumption**
3. **c. Gantry**
4. **c. Positive Feedback**
5. **d. Feedback**
6. **d. Negative Feedback**
7. **d. Random**