CSE435 – Robotics

Tutorial 2

Written Questions

1. List 3 types of wheeled robots and describe each one.
2. What is the common number of motors required for driving and steering across the different wheeled robot designs?
3. Describe one advantage and one disadvantage of a tracked robot compared to a wheeled robot.
4. Explain the relationship between the number of legs on a robot and its stability
5. Why does a bipedal (two-legged) robot require more complex balancing techniques than a six-legged robot?
6. Using the concept of **Braitenberg vehicles**, explain the difference in behavior when:
   a) The left sensor is connected to the left motor and the right sensor to the right motor.
   b) The left sensor is connected to the right motor and the right sensor to the left motor.

True / False

1. Modern mobile robots are controlled by large, heavy, and expensive computer systems that cannot be carried on-board.
2. Mobile robots are used in education for fields like Computer Science, Electrical Engineering, and Mechanical Engineering.
3. Solving problems with real-world robots is often easier than solving theoretical software problems because the "perfect world" of software applies.
4. All wheeled, tracked, and legged robot designs presented require only one motor for driving and steering.
5. A tracked robot can navigate more accurately over flat surfaces than a wheeled robot.
6. A six-legged robot can be statically stable by always having three legs on the ground, forming a supporting tripod.
7. In a Braitenberg vehicle, connecting the left light sensor to the right motor and the right sensor to the left motor can cause the robot to steer towards a light source.
8. The "EyeCon" embedded controller's main specification was to provide an interface for a digital camera.
9. Most embedded controllers commonly have built-in analog outputs with powerful amplifiers to directly drive actuators.
10. A bipedal robot generally requires fewer motors and is less complex than a six-legged robot.

Multiple Choice Questions (MCQ)

1. One disadvantage of ---------- is that they require a street or some sort of flat surface for driving
   a. Mobile robots
   b. Wheeled robots
   c. Legged robots
   d. Both a and b

2. The most commonly used mobile robot designs ---------- drive
   a. Differential
   b. Omni-direction
   c. Tracked
   d. Ackermann

3. Caster wheels are ---------- wheels
   a. Steered
   b. Driven
   c. Passive
   d. Tracked

4. Tracked robots need ---------- motors
   a. Three
   b. Two
   c. No
   d. Four

5. Most wheeled robot designs require ----------
   a. Three motors
   b. Two motors
   c. Two wheels
   d. Three wheels

6. They can navigate over rough terrain ----------
   a. Legged robot
   b. Tracked robot
   c. Mecanum robot
   d. Both a and b

7. It uses four driven wheels with a special wheel design ---------- drive
   a. Differential
   b. Omni-direction
   c. Tracked
   d. Ackermann

8. Legged robots require at least ---------- motor/s per leg
   a. Three
   b. One
   c. Two
   d. Four

9. Legged robot is a type of ---------- robot
   a. Gantry
   b. Mobile
   c. Arm
   d. Tracked

10. The simplest case of mobile robot is ---------- robot
    a. Wheeled
    b. Tracked
    c. Arm
    d. Legged

11. Can turn on the spot
    a. Ackermann steering
    b. Differential drive
    c. Tricycle drive
    d. All

12. A robot drive system with two passive caster wheels in the back is called ---------- drive
    a. Differential
    b. Tracked
    c. Single wheel
    d. Ackermann

Answer Keys

Written Questions

Refer back to the lecture for detailed explanations.

True / False Answers

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

MCQ Answers

1. **b. Wheeled robots**
2. **a. Differential**
3. **c. Passive**
4. **b. Two**
5. **b. Two motors**
6. **d. Both a and b**
7. **b. Omni-direction**
8. **c. Two**
9. **b. Mobile**
10. **a. Wheeled**
11. **b. Differential drive**
12. **c. Single wheel**