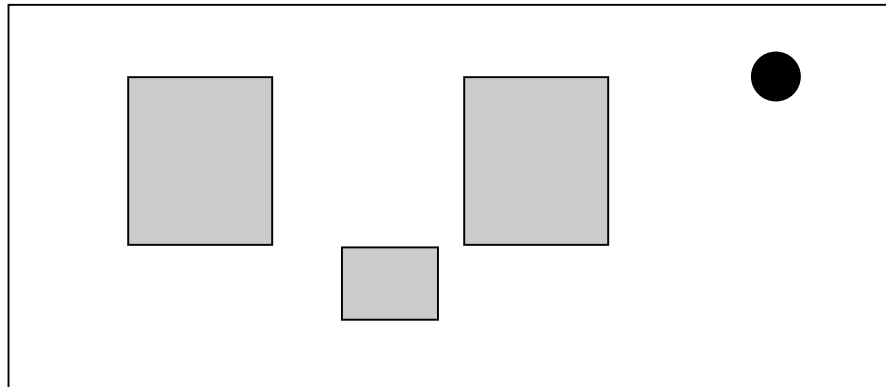


Computer Science 336 – Algorithms for Sensor-Based Robotics Midterm Exam Example Questions

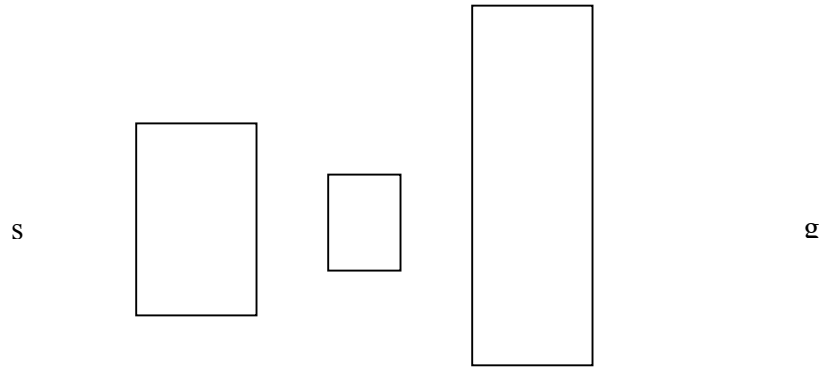
1. What type of terms appear in the kinematic equations of a nonholonomic robot but not in a holonomic robot?
2. How many degrees of freedom are there for rigid body motion in \mathbb{R}^3 ?
3. Define a homeomorphism.
4. What is the term for a potential field that has only isolated (non-degenerate) critical points?
5. What is the topology of the configuration space for a 5 link manipulator with 5 revolute joints and one prismatic joint at the end?

Medium Answer (10 pts each)

1. Draw the CSpace of the given circular robot operating in the workspace shown below by outlining the boundaries of the CSpace obstacles.



2. Consider the polygonal world below where “s” is the start and “g” is the goal.



- a) Draw the visibility graph for this world (including s and g as vertices).
- b) Circle four arcs that would not be present in the reduced visibility graph.

3. Given the world below, draw the path that would be taken by the Bug2 algorithm.

