

Student Name: _____ Student ID # _____

UOSA Statement of Academic Integrity

On my honor I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.

Signature: _____ Date: _____

Question 1: Topological and Metric Path Planning (30 points)

The following are directions for how to get to the Thompson Conference Center at the University of Texas at Austin if you are traveling north from the Austin-Bergstrom International Airport on US Highway 183. These directions come from <http://www.utexas.edu/cee/tcc/directions.shtml>.

Take the Airport Blvd exit and continue north on Airport. Turn left on Manor Rd. and continue on Manor about 0.9 miles. Shortly after crossing Chestnut Street, the road curves to the right and becomes Dean Keeton/26th Street. Take the curve to the right and continue on in the left-hand lane. Just after going under IH 35, you will come to the intersection of Dean Keeton and Red River. Turn left at the intersection and immediately turn right into the first (Thompson Conference Center) parking lot driveway.

In these directions identify as many instances of the following types as you can and **explain** why these are instances of these types.

A. Artificial Landmarks

B. Natural Landmarks

C. Gateways

D. Metric Information

E. Local Control Strategies

F. Orientation Regions

Question 2: Metric Path Planning (10 points)

When we convert to a C-space representation for the purposes of metric path planning, we can grow the known obstacles by some small additional amount ϵ beyond what is strictly necessary shrink the robot to a point. What trade-off(s) would we be making by increasing or decreasing ϵ ? **Explain** your answer.

Question 3: Metric Path Planning (40 points)

Some metric map representations are more suited to the computation of minimal length paths while others are more suited to the computation of paths that follow the center of hallways, rooms, etc., which may help to keep the robot away from obstacles.

For the following four types of map representation, **explain** to which it is well suited. If it is well suited to both or neither, say so and **explain** why.

A. Generalized Voronoi Graph

B. Obstacle Vertices Lists

C. Uniform Grid

D. Quadtree

Question 4: Localization and Mapping (20 points)

Consider the three methods presented for filling in values in occupancy grids: Bayesian, Dempster-Shafer, and HIMM. Chose two of these three and list both methods below:

A. _____ B. _____

Compare the two you have listed as follows:

A. **Explain** one advantage of using A over B for mapping out the hallways in this building using a Pioneer 2AT robot with front and back sonar rings, a single forward-facing SICK LMS, and a Sony Vid 30 color camera on a forward-facing pan-tilt-zoom unit.

B. **Explain** one advantage of using B over A for the task given above in part A.