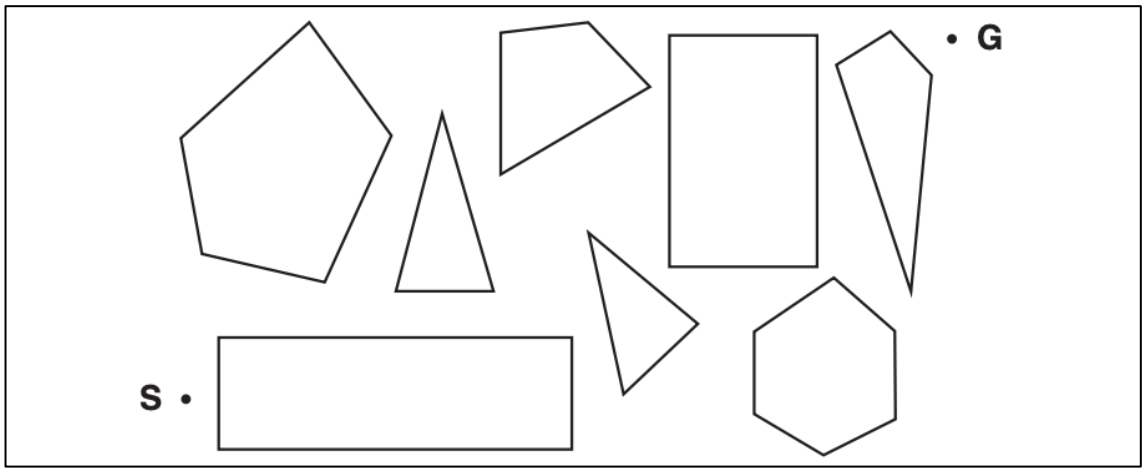
Artificial Intelligence

Written Problems (3 points)

Finding shortest path

Consider the problem of finding the shortest path between two points on a plane that has convex polygonal obstacles, as shown below. S and G are the start and goal states. This is an idealization of the problem that a robot has to solve to navigate in a crowded environment.

1. Suppose the state space consists of all positions (x, y) in the plane. How many states are there? How many paths are there to the goal?
2. Explain briefly why the shortest path from one polygon vertex to any other in the scene must consist of straight-line segments joining some of the vertices of the polygons. Define a good state space now. How large is this state space?
3. Define the necessary functions to implement the search problem, including an ACTIONS function that takes a vertex as input and returns a set of vectors, each of which maps the current vertex to one of the vertices that can be reached in a straight line. (Do not forget the neighbors on the same polygon.) Use the straight-line distance for the heuristic function.



Submit

All homework for this course must be submitted electronically using Blackboard. Do not e-mail your assignment to a TA or Instructor! If you are having difficulty with your Blackboard account, you are responsible for resolving these problems with a TA, an instructor, or someone from IRT, before the assignment is due.

For this assignment, you must submit a PDF document with your answers to the "Written problems" (please do NOT submit a Microsoft Word, OpenOffice document, Pages, or any other format that is not a PDF, points will be deducted if you do so!).