

# Artificial Intelligence: Homework #1

Assigned on 9/27/2022 (Tuesday); Due at 12:00 pm on 10/12/2022 (Wednesday)

## Description:

A\* is an informed search algorithm, or a best-first search, for weighted graphs. When searching a path from one node to another, it selects the path that minimizes the cost function  $f(n) = g(n) + h(n)$  where  $n$  is the next node on the path,  $g(n)$  is the cost of the path from the start node  $S$  to  $n$ , and  $h(n)$  is a heuristic function that estimates the minimum cost of the path from  $n$  to the goal of a given end node  $E$ .

Please use the A\* algorithm to find the best path (i.e., minimum cost) between the start node  $S$  and the end node  $E$  in the following  $6 \times 6$  map.

	0	1	2	3	4	5
0	S	◦	◦	◦	◦	◦
1	◦	◦	◦	◦	#	#
2	◦	◦	◦	◦	◦	◦
3	#	#	#	#	◦	◦
4	#	◦	◦	◦	◦	#
5	◦	◦	E	◦	◦	#

## The Rules of the Game:

1. The dot symbol ( ◦ ) in white tile represents the path that can be walked.
2. The dial symbol (#) in black tile represents obstacle that cannot be walked or crossed.
3. Each action can only move one square.
4.  $g(n)$ : It costs 1 for moving either vertically (up and down) or horizontally (left and right), and 1.4 for moving diagonally.
5.  $h(n)$ : Please use Euclidean distance to estimate the distance  $d$  between node  $i$  to node  $j$  where  $d(i, j) = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}$ .

## The Output Format:

- Print out the path you found from your code using coordinates (row, column) starting from S and ending with E.
- For example, “(0, 0) (1, 2) (1, 3) ...”.

### **Submission Requirements:**

- You can use any programming language to implement this homework.
- Please zip your source code along with a simple report (in pdf) to explain how you represent the given map and how you derive your answer.
- Please name your zipped file in the format “{Student ID}\_{Name}.zip”, and name your report in the format “{Student ID}\_{Name}.pdf”.
- Honor code: This is an individual homework. DO NOT copy others’ work. We will use the Turnitin system to check for plagiarism. Both the plagiarist and the victim will get a 0 in this homework.