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Maze Solving

Consider a grid with 'n' rows and 'm' columns. The agent will start at a particular cell and its job will be to move to a goal cell. The agent will have the following actions available to it:

I.   Move down, the cost of this action is 1
II.   Move up, the cost of this actions is 2
III. Move Right, the cost of this action is 3
IV.   Move Left, the cost of this action is 4

The agent wants to find a path between the starting cell and the goal cell.

1 represents wall

Action: move left, right, up, down

Goal test: reach to end position from start

Environment Type: single agent, fully observable, deterministic, static, Discrete

PEAS Description:

1.Performance measure:

   Move down, the cost of this action is 1

   Move up, the cost of this actions is 2

   Move Right, the cost of this action is 3

   Move Left, the cost of this action is 4

2.Environment:

   Grid environment(mxn)

   Start state 'S', goal state 'G', occupied cells 'B' and Free cells
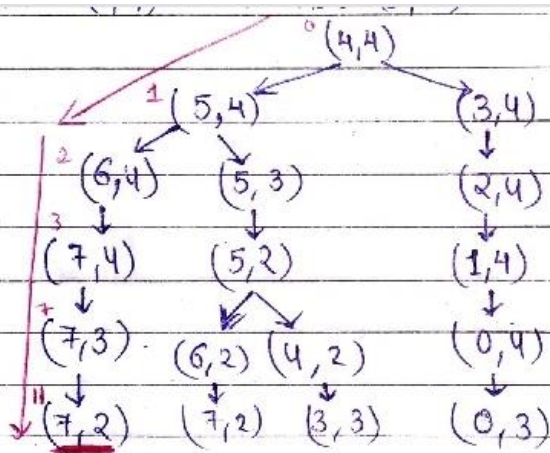
3.Actuators:

   left, right, up, down

4.Sensors:

   Sensor to detect wall, goal

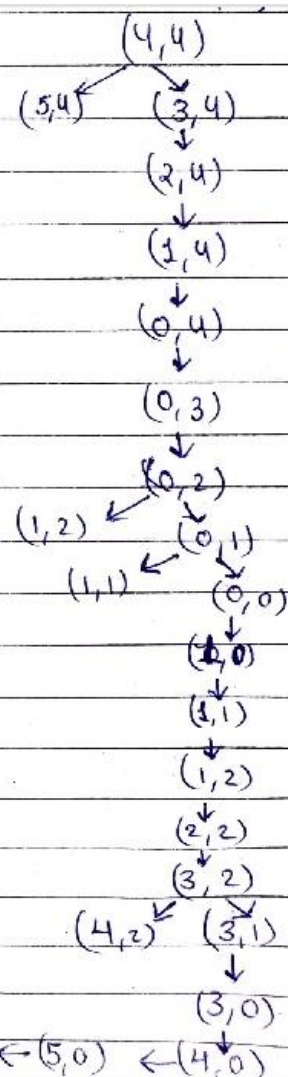| #	Attribute	Description
1	$g(n)$	cost of the path from the start node to n.
2	$h(n)$	heuristic function that estimates the cost of the cheapest path from n to the goal.(Manhattan Distance Heuristic)
3	$f(n)$	Represent the summation of g and h and is the best estimate of the cost for the path going through the source node. f = g + h.

(0,0)	(0,1)	(0,2)	(0,3)	(0,4)		**0**	0	0	0 0
(1,0)	(1,1)	(1,2)		(1,4)		0	0	0	1 0
		(2,2)		(2,4)		1	1	0	1 0
(3,0)	(3,1)	(3,2)		(3,4)		0	0	0	1 0
(4,0)		(4,2)		(4,4) →S		0	1	0	1 0
(5,0)		(5,2)	(5,3)	(5,4)		0	1	0	0 0
(6,0)		(6,2)		(6,4)		0	1	0	1 0
(7,0)	(7,1)	(7,2)	(7,3)	(7,4)		0	0	0	0 0

F

BFS:

(4,4)⁰
↙ ↘
(5,4)¹   (3,4)
↙ ↓   ↓
(6,4)² (5,3)   (2,4)
↓   ↓   ↓
(7,4)³ (5,2)   (1,4)
↓   ↙ ↘   ↓
(7,3)⁷ (6,2) (4,2) (0,4)
↓   ↓   ↓   ↓
(7,2)¹¹ (7,2) (3,3) (0,3)

BFS:

DFS:

(4,4)
↙ ↘
(5,4) (3,4)
↓
(2,4)
↓
(1,4)
↓
(0,4)
↓
(0,3)
↓
(0,2)
↙ ↘
(1,2) (0,1)
↙ ↘
(1,1) (0,0)
↓
(1,0)
↓
(1,1)
↓
(1,2)
↓
(2,2)
↓
(3,2)
↙ ↘
(4,2) (3,1)
↓
(3,0)

(7,2) ← (7,1) ← (7,0) ← (6,0) ← (5,0) ← (4,0)

UCS:

(4,4.)
- ¹(5,4) ²(3,4)
- ²(6,4) ⁵(5,3) ⁴(2,4)
- ³(7,4) ⁹(5,2) ⁶(1,4)
- ⁷(7,3) ¹⁰(6,2)(4,2)⁸ (0,4)⁸
- ¹¹(7,2) (7,2)¹¹ (3,2)¹⁰ (0,3)¹²
- ¹²(2,2) (3,1)¹⁴

Greedy:

(4,4)
- ¹⁰(5,4) (3,4)¹²
- ⁹(6,4) (5,3)⁶
- (5,2)²
- (6,2)¹ (4,2)²
- (7,2)⁰

A*:

(4,4)
- ¹¹(5,4) (3,4)¹⁴
- ¹¹(6,4) (5,3)¹¹
- ¹¹(7,4) (5,2)¹¹
- ¹¹(7,3) (6,2) (4,2)¹¹
- ¹¹(7,2) (7,2)¹¹ (3,2)¹⁴