Algorithm Analysis:

Green – Goal node

Yellow – Start node

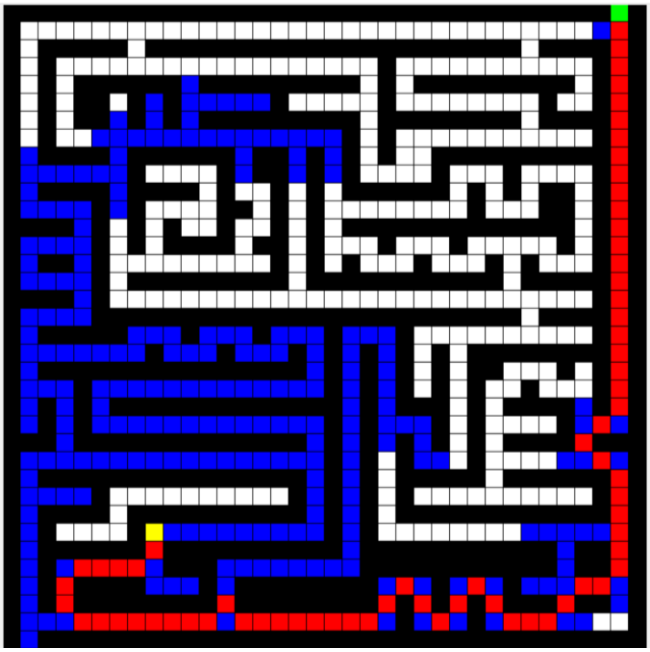
Blue – Expanded node

Red – Shortest path

Note:Followed 8 Neighbor approach

A* implementation:

Hard Maze



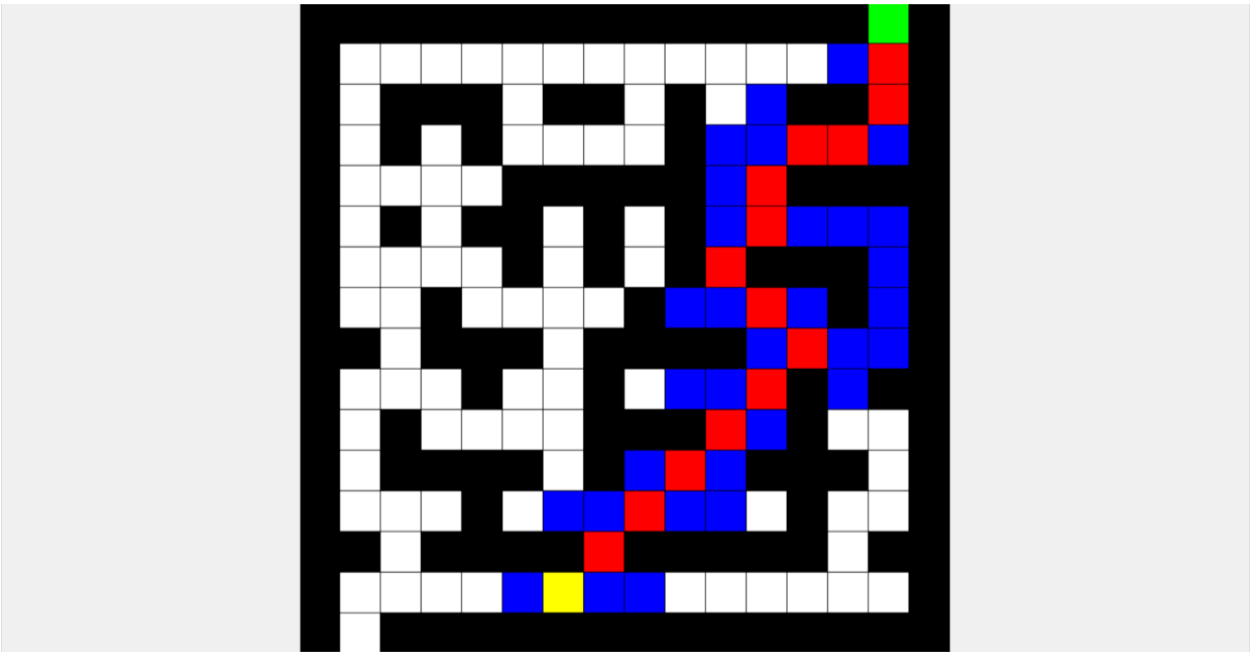
Path cost =70

Path:

[(0, 34), (1, 34), (2, 34), (3, 34), (4, 34), (5, 34), (6, 34), (7, 34), (8, 34), (9, 34), (10, 34), (11, 34), (12, 34), (13, 34), (14, 34), (15, 34), (16, 34), (17, 34), (18, 34), (19, 34), (20, 34), (21, 34), (22, 34), (23, 33), (24, 32), (25, 33), (26, 34), (27, 34), (28, 34), (29, 34), (30, 34), (31, 34), (32, 33), (32, 32), (33, 31), (34, 30), (34, 29), (34, 28), (33, 27), (32, 26), (33, 25), (34, 24), (33, 23), (32, 22), (33, 21), (34, 20), (34, 19), (34, 18), (34, 17), (34, 16), (34, 15), (34, 14), (34, 13), (33, 12), (34, 11), (34, 10), (34, 9), (34, 8), (34, 7), (34, 6), (34, 5), (34, 4), (33, 3), (32, 3), (31, 4), (31, 5), (31, 6), (31, 7), (30, 8), (29, 8)]

Time taken: 0.28secs

Easy Maze:



Path cost:16

Path:

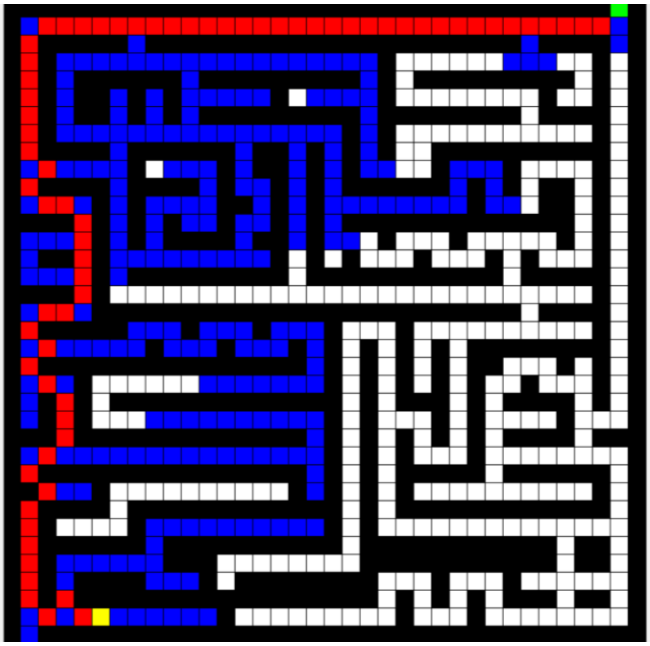
[(0, 14), (1, 14), (2, 14), (3, 13), (3, 12), (4, 11), (5, 11), (6, 10), (7, 11), (8, 12), (9, 11), (10, 10), (11, 9), (12, 8), (13, 7), (14, 6)]

Time taken:

0.00404 secs

New maze:

Have blocked some of the potential nodes which gave the shortest path.



Path cost = 71

Path:

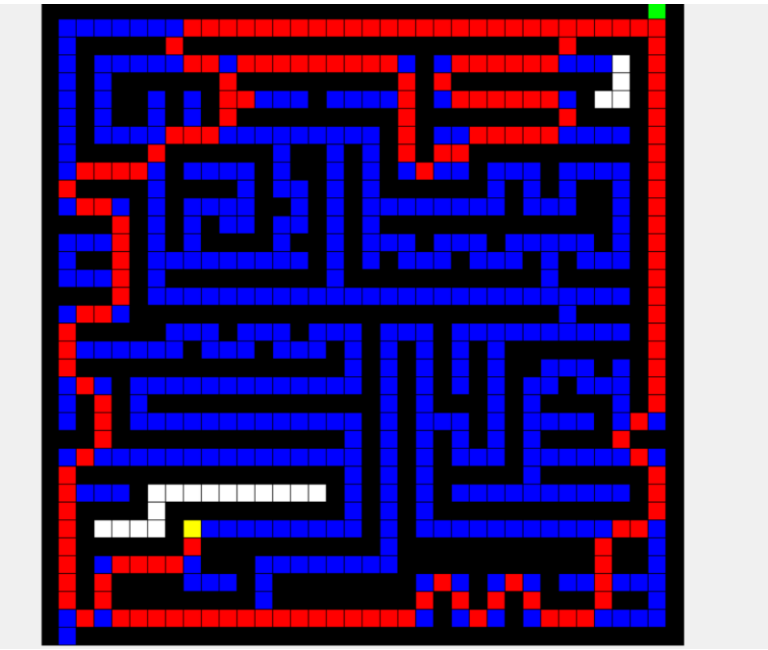
[(0, 34), (1, 33), (1, 32), (1, 31), (1, 30), (1, 29), (1, 28), (1, 27), (1, 26), (1, 25), (1, 24), (1, 23), (1, 22), (1, 21), (1, 20), (1, 19), (1, 18), (1, 17), (1, 16), (1, 15), (1, 14), (1, 13), (1, 12), (1, 11), (1, 10), (1, 9), (1, 8), (1, 7), (1, 6), (1, 5), (1, 4), (1, 3), (1, 2), (2, 1), (3, 1), (4, 1), (5, 1), (6, 1), (7, 1), (8, 1), (9, 2), (10, 1), (11, 2), (11, 3), (12, 4), (13, 4), (14, 4), (15, 4), (16, 4), (17, 3), (17, 2), (18, 1), (19, 2), (20, 1), (21, 2), (22, 3), (23, 3), (24, 3), (25, 2), (26, 1), (27, 2), (28, 1), (29, 1), (30, 1), (31, 1), (32, 1), (33, 1), (34, 2), (33, 3), (34, 4), (34, 5)]

Time taken:

0.395360133557

ANA * implementation:

Hard Maze:



Note: The time values specified are the time taken for the specific iteration and total time is reported at the last.

Number of path:3

Path1:

[(29, 8), (30, 8), (31, 7), (31, 6), (31, 5), (31, 4), (32, 3), (33, 3), (34, 2), (33, 1), (32, 1), (31, 1), (30, 1), (29, 1), (28, 1), (27, 1), (26, 1), (25, 2), (24, 3), (23, 3), (22, 3), (21, 2), (20, 1), (19, 1), (18, 1), (17, 2), (17, 3), (16, 4), (15, 4), (14, 4), (13, 4), (12, 4), (11, 3), (11, 2), (10, 1), (9, 2), (9, 3), (9, 4), (9, 5), (8, 6), (7, 7), (7, 8), (7, 9), (6, 10), (5, 10), (4, 10), (3, 11), (3, 12), (3, 13), (3, 14), (3, 15), (3, 16), (3, 17), (3, 18), (3, 19), (4, 20), (5, 20), (6, 20), (7, 20), (8, 20), (9, 21), (8, 22), (8, 23), (7, 24), (7, 25), (7, 26), (7, 27), (7, 28), (6, 29), (5, 28), (5, 27), (5, 26), (5, 25), (5, 24), (5, 23), (4, 22), (3, 23), (3, 24), (3, 25), (3, 26), (3, 27), (3, 28), (2, 29), (1, 30), (1, 31), (1, 32), (1, 33), (0, 34)]

Path cost=118

Time taken=0.013178513094091543

Path2:

[(29, 8), (30, 8), (31, 7), (31, 6), (31, 5), (31, 4), (32, 3), (33, 3), (34, 2), (33, 1), (32, 1), (31, 1), (30, 1), (29, 1), (28, 1), (27, 1), (26, 1), (25, 2), (24, 3), (23, 3), (22, 3), (21, 2), (20, 1), (19, 1), (18, 1), (17, 2), (17, 3), (16, 4), (15, 4), (14, 4), (13, 4), (12, 4), (11, 3), (11, 2), (10, 1), (9, 2), (9, 3), (9, 4), (9, 5), (8, 6), (7, 7), (7, 8), (7, 9), (6, 10), (5, 11), (4, 10), (3, 9), (3, 8), (2, 7), (1, 8), (1, 9), (1, 10), (1, 11), (1, 12), (1, 13), (1, 14), (1, 15), (1, 16), (1, 17), (1, 18), (1, 19), (1, 20), (1, 21), (1, 22), (1, 23), (1, 24), (1, 25), (1, 26), (1, 27), (1, 28), (1, 29), (1, 30), (1, 31), (1, 32), (1, 33), (0, 34)]

Path cost=106

Time taken= 0.004381532869154631)

Path3

[(29, 8), (30, 8), (31, 7), (31, 6), (31, 5), (31, 4), (32, 3), (33, 3), (34, 4), (34, 5), (34, 6), (34, 7), (34, 8), (34, 9), (34, 10), (34, 11), (34, 12), (34, 13), (34, 14), (34, 15), (34, 16), (34, 17), (34, 18), (34, 19), (34, 20), (33, 21), (32, 22), (33, 23), (34, 24), (33, 25), (32, 26), (33, 27), (34, 28), (34, 29), (34, 30), (33, 31), (32, 31), (31, 31), (30, 31), (29, 32), (29, 33), (28, 34), (27, 34), (26, 34), (25, 33), (24, 32), (23, 33), (22, 34), (21, 34), (20, 34), (19, 34), (18, 34), (17, 34), (16, 34), (15, 34), (14, 34), (13, 34), (12, 34), (11, 34), (10, 34), (9, 34), (8, 34), (7, 34), (6, 34), (5, 34), (4, 34), (3, 34), (2, 34), (1, 34), (0, 34)]

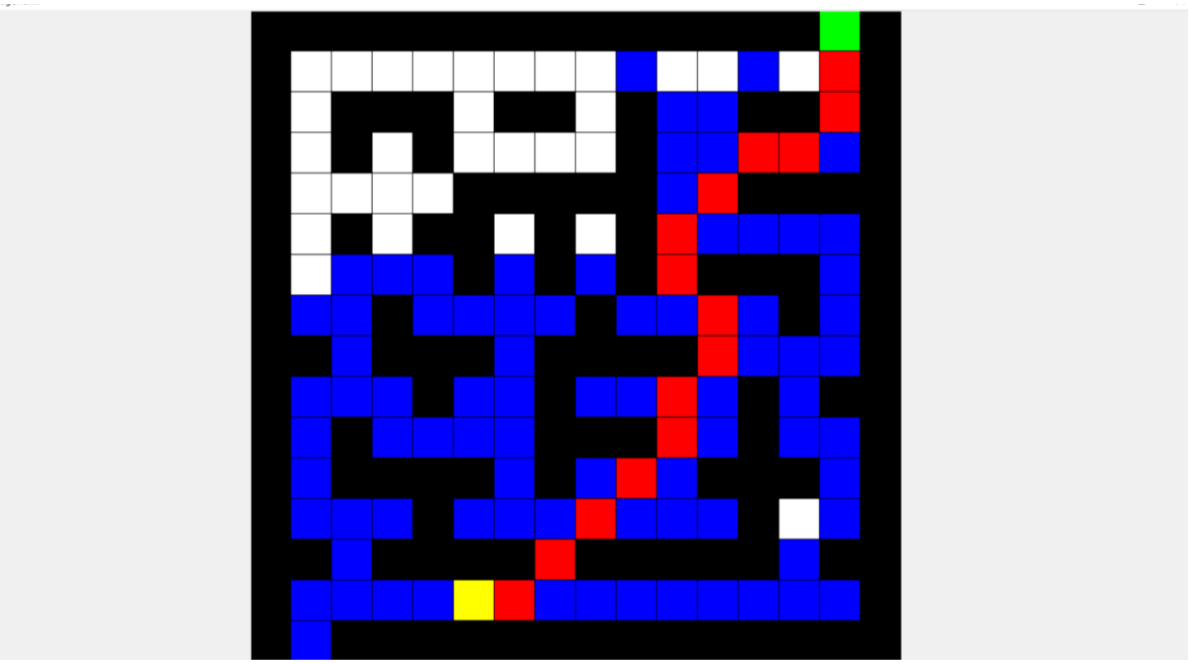
Path cost =70

70

Time taken = 0.0002738685963158613

Total Time taken for ANA star=0.0514964129048633

Easy Maze:



Number of paths:1

Path cost =17

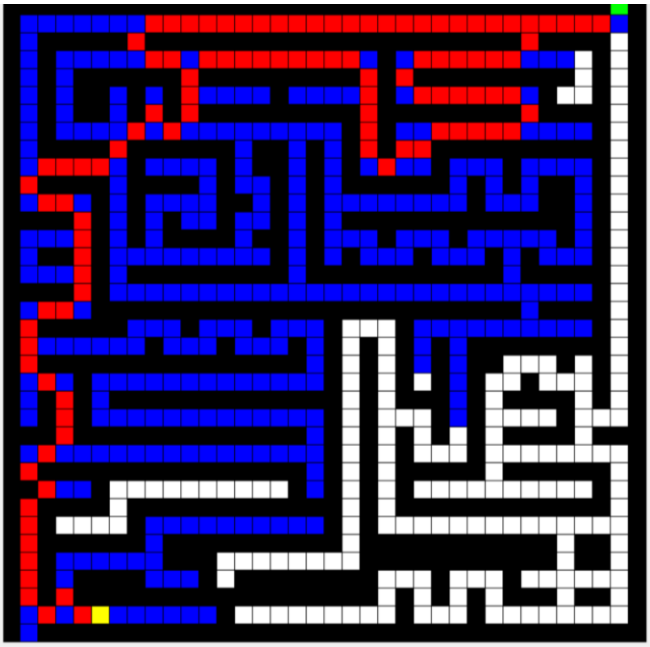
Path:

[(14, 5), (14, 6), (13, 7), (12, 8), (11, 9), (10, 10), (9, 10), (8, 11), (7, 11), (6, 10), (5, 10), (4, 11), (3, 12), (3, 13), (2, 14), (1, 14), (0, 14)]

Time taken for ANA star= 0.00467801112322227

New Maze:

Have blocked some of the potential nodes which gave the shortest path.



Number of paths reported: 2

Path1:

Path cost = 83

Path:

[(34, 5), (34, 4), (33, 3), (34, 2), (33, 1), (32, 1), (31, 1), (30, 1), (29, 1), (28, 1), (27, 2), (26, 1), (25, 2), (24, 3), (23, 3), (22, 3), (21, 2), (20, 1), (19, 1), (18, 1), (17, 2), (17, 3), (16, 4), (15, 4), (14, 4), (13, 4), (12, 4), (11, 3), (11, 2), (10, 1), (9, 2), (9, 3), (9, 4), (9, 5), (8, 6), (7, 7), (6, 8), (7, 9), (6, 10), (5, 10), (4, 10), (3, 11), (3, 12), (3, 13), (3, 14), (3, 15), (3, 16), (3, 17), (3, 18), (3, 19), (4, 20), (5, 20), (6, 20), (7, 20), (8, 20), (9, 21), (8, 22), (8, 23), (7, 24), (7, 25), (7, 26), (7, 27), (7, 28), (6, 29), (5, 28), (5, 27), (5, 26), (5, 25), (5, 24), (5, 23), (4, 22), (3, 23), (3, 24), (3, 25), (3, 26), (3, 27), (3, 28), (2, 29), (1, 30), (1, 31), (1, 32), (1, 33), (0, 34)]

Time taken = 0.018

Path2:

Path cost =71

[(34, 5), (34, 4), (33, 3), (34, 2), (33, 1), (32, 1), (31, 1), (30, 1), (29, 1), (28, 1), (27, 2), (26, 1), (25, 2), (24, 3), (23, 3), (22, 3), (21, 2), (20, 1), (19, 1), (18, 1), (17, 2), (17, 3), (16, 4), (15, 4), (14, 4), (13, 4), (12, 4), (11, 3), (11, 2), (10, 1), (9, 2), (9, 3), (9, 4), (9, 5), (8, 6), (7, 7), (6, 8), (7, 9), (6, 10), (5, 10), (4, 10), (3, 9), (3, 8), (2, 7), (1, 8), (1, 9), (1, 10), (1, 11), (1, 12), (1, 13), (1, 14), (1, 15), (1, 16), (1, 17), (1, 18), (1, 19), (1,

20), (1, 21), (1, 22), (1, 23), (1, 24), (1, 25), (1, 26), (1, 27), (1, 28), (1, 29), (1, 30), (1, 31), (1, 32), (1, 33), (0, 34)]

Time taken =0.0007

Total time taken =0.019

Performance analysis:

ANA star:

For hard Maze:

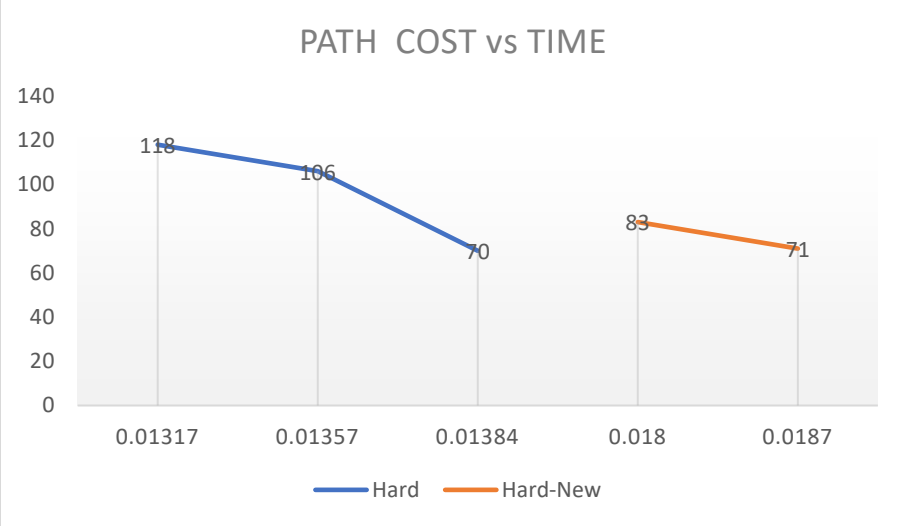
Time	Solution cost
0.01317	118
0.01357	106
0.01384	70

For new maze:

Time	Solution cost
0.018	83
0.0187	71

Performance analysis:

It's clear from the graph that when the time increases, the algorithm returns a better path and path cost drops. The path is compared with the A star to show that it returs the shortest path.



Note: refer the github for the code and the readme file:

https://github.com/gokul-gokz/Motion_Planning_algorithms