Intro to AI
Homework Assignment 1

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1 Implementation Details

1.1 A Star Algorithm

The code submitted to the assignment is an implementation of Agent that uses A* algorithm to find best path to the goal. The implementation uses Dijkstra's algorithm to traverse the map, the heuristic function is implemented as Manhattan distance between the current position and the keymaker position. Only heuristic function is used to estimate the cost of the path to the goal. This is the only modification of the A* algorithm that was made to the implementation.

1.2 Backtracking Algorithm

The code submitted to the assignment is an implementation of Agent that uses backtracking algorithm to find best path to the goal. The implementation uses BFS to traverse the map considering known threats, and whenever new information is available on dangers on built path, the agent backtracks to the last known safe position and rebuilds the path to the goal. No significant modifications were made to the backtracking algorithm.

1.3 Code

Link to the code repository

2 Evaluation results

The agents were evaluated on 1000 randomly generated maps below is the summary of the results:

As can be seen from the table, algorithm do not have big statistical difference in terms of mean moves and win fraction. However, the execution time of the A* algorithm implementation provided is significantly lower than the execution time of the backtracking algorithm.

Metric	A* Algorithm	Backtracking Algorithm
Mean Execution Time (s)	0.00022995710372924804	0.0048852698802948
Std Execution Time (s)	0.0007183165074499156	0.011766218056042806
Var Execution Time (s^2)	5.159786048750448e-07	0.00013844388734234774
Mean Moves	10.298	10.48
Std Moves	6.413204815067112	6.161623162771317
Var Moves	41.12919599999999	37.9656
Win Fraction	0.91	0.915

Table 1: Evaluation results of A* and Backtracking algorithms

3 Conclusion

This assignment solution provides two implementations of the agent that can solve the problem of path finding. Some modifications were made to the A* algorithm to make it work with the problem. The backtracking algorithm was implemented without any modifications. The evaluation results show that the A* algorithm has slightly better performance in terms of execution time, but both algorithms show approximately the same performance in terms of mean moves and win fraction.