Two visual demonstrations of the inputs and outputs to the program are presented in the README in the form of gifs. Please scroll to the end of the README (https://github.com/s-m-asjad/path_planning/tree/main)

The results in this document are as follows.

1) **Result1:** JSON file with pre-existing start and end position.
2) **Result2:** JSON file with pre-existing start and end position, but path is invalid.
3) **Result3:** JSON file but start and end position is provided as input via terminal.
4) **Result4:** Random map
5) **Result5:** Random map but with 3 battle units.

RESULT 1

For this run, a JSON file (map1.json) was given as input. The json file had the start and goal position of the unit.

```
asjad@HFI-PC-Windows:~/path_planning/build$ ./PathPlanning
Using A* for Path Planning.
Enter the Local OR Global Path to the JSON file (Press Enter to Generate a Random Map): map1.json
Reading Map from map1.json...
asjad@HFI-PC-Windows:~/path_planning/build$
```

Figure 1 Input to Software

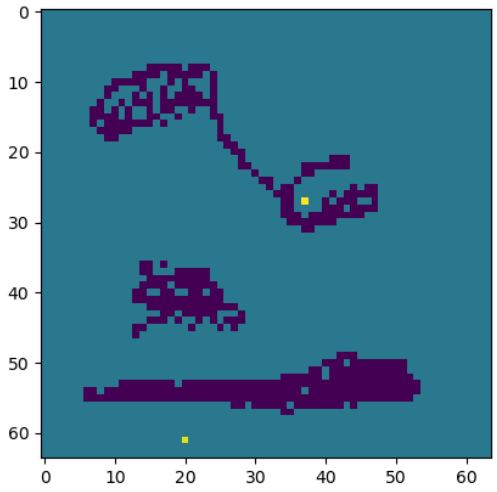

Figure 2 (a) Map with start and goal position.

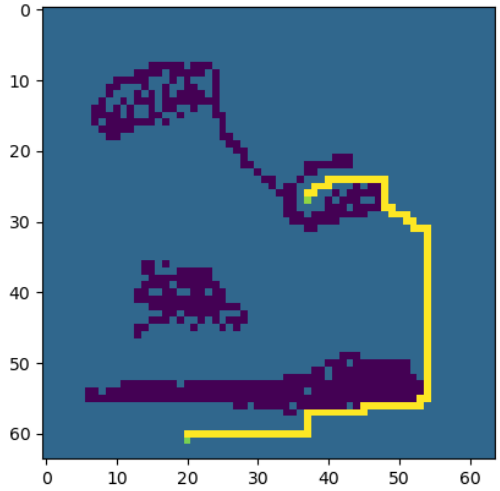

Figure 2(b) Map with the shortest path to goal

RESULT 2

For this run, a JSON file (map2.json) was given as input. The json file had the start and goal position of the unit. However, the goal position was unreachable.

```
asjad@HFI-PC-Windows:~/path_planning/build$ ./PathPlanning
Using A* for Path Planning.
Enter the Local OR Global Path to the JSON file (Press Enter to Generate a Random Map): map2.json
Reading Map from map2.json...
No Path Found for Agent 1
asjad@HFI-PC-Windows:~/path_planning/build$
```

Figure 3 Input to the Software

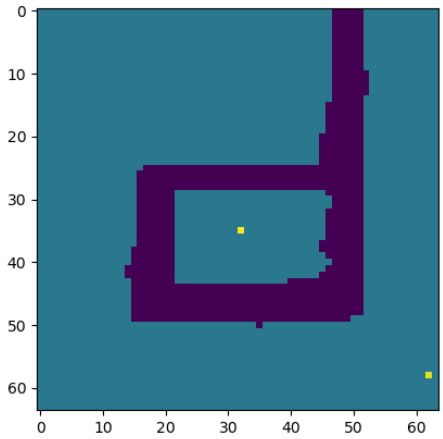

Figure 4 Map with start and goal position. Unreachable so the terminal printed "No Path Found"

RESULT 3

For this run, a JSON file (map3.json) was given as input. The start and goal position were given as input from the terminal.

```
asjad@HFI-PC-Windows:~/path_planning/build$ ./PathPlanning
Using A* for Path Planning.
Enter the Local OR Global Path to the JSON file (Press Enter to Generate a Random Map): map3.json
Reading Map from map3.json...
Enter the number of Battle Units: 1
Enter the starting x-co-ordinate of Battle Unit 1: 5
Enter the starting y-co-ordinate of Battle Unit 1: 5
Enter the goal x-co-ordinate of Battle Unit 1: 60
Enter the goal y-co-ordinate of Battle Unit 1: 5
asjad@HFI-PC-Windows:~/path_planning/build$
```

Figure 5 Input to the Software

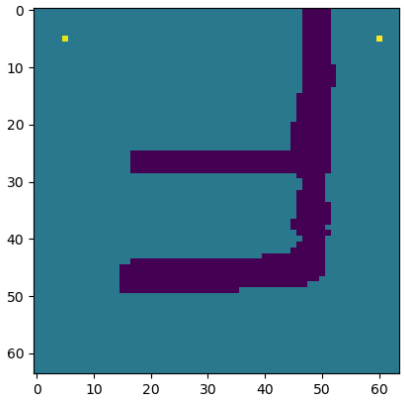

Figure 6(a) Map with start and goal position.

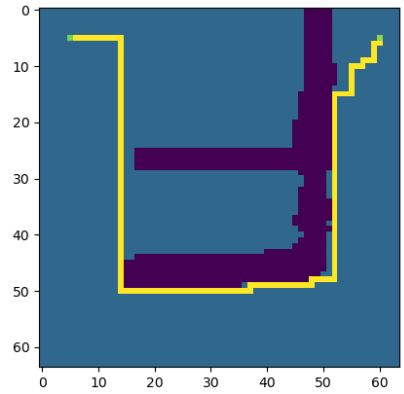

Figure 6(b) Map with the shortest path to goal

RESULT 4

For this run, a random map was generated. The start and goal position were given as input from the terminal.

```
asjad@HFI-PC-Windows:~/path_planning/build$ ./PathPlanning
Using A* for Path Planning.
Enter the Local OR Global Path to the JSON file (Press Enter to Generate a Random Map):
Generating Random Map...
Enter the number of Battle Units: 1
Enter the starting x-co-ordinate of Battle Unit 1: 34
Enter the starting y-co-ordinate of Battle Unit 1: 12
Enter the goal x-co-ordinate of Battle Unit 1: 58
Enter the goal y-co-ordinate of Battle Unit 1: 58
asjad@HFI-PC-Windows:~/path_planning/build$
```

Figure 7 Input to the Software

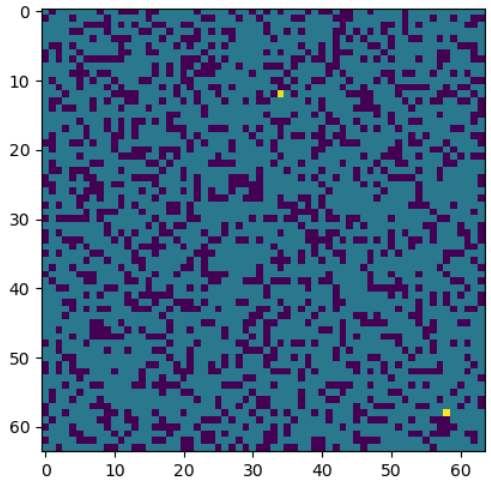

Figure 8(a) Map with start and goal position.

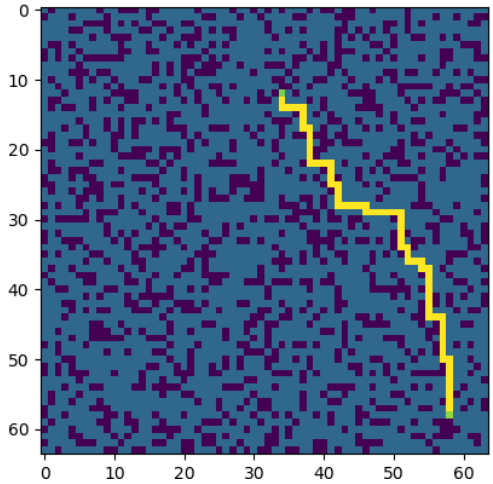

Figure 8(b) Map with the shortest path to goal

RESULT 5

For this run, a random map was generated. There were 3 agents. The input was given from the terminal for their desired start and goal position.

```
asjad@HFI-PC-Windows:~/path_planning/build$ ./PathPlanning
Using A* for Path Planning.
Enter the Local OR Global Path to the JSON file (Press Enter to Generate a Random Map):
Generating Random Map...
Enter the number of Battle Units: 3
Enter the starting x-co-ordinate of Battle Unit 1: 12
Enter the starting y-co-ordinate of Battle Unit 1: 8
Enter the goal x-co-ordinate of Battle Unit 1: 58
Enter the goal y-co-ordinate of Battle Unit 1: 32
Enter the starting x-co-ordinate of Battle Unit 2: 18
Enter the starting y-co-ordinate of Battle Unit 2: 28
Enter the goal x-co-ordinate of Battle Unit 2: 34
Enter the goal y-co-ordinate of Battle Unit 2: 34
Enter the starting x-co-ordinate of Battle Unit 3: 57
Enter the starting y-co-ordinate of Battle Unit 3: 9
Enter the goal x-co-ordinate of Battle Unit 3: 5
Enter the goal y-co-ordinate of Battle Unit 3: 50
asjad@HFI-PC-Windows:~/path_planning/build$
```

Figure 9 Input to the Software

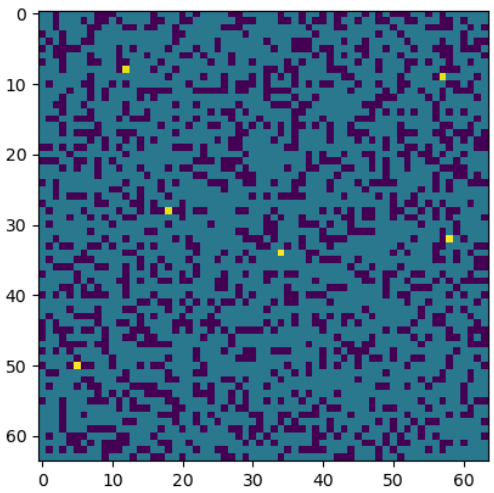

Figure 10(a) Map with start and goal position.

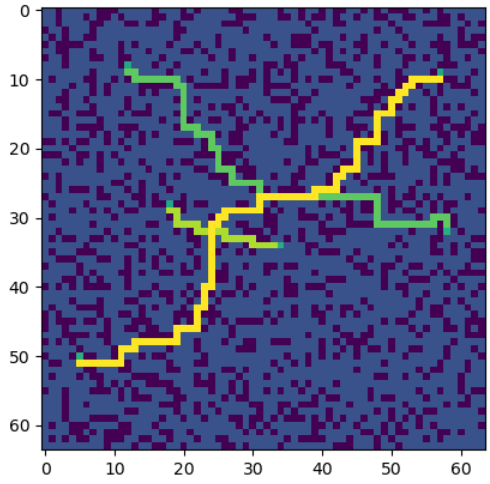

Figure 10(b) Map with the shortest path to goal