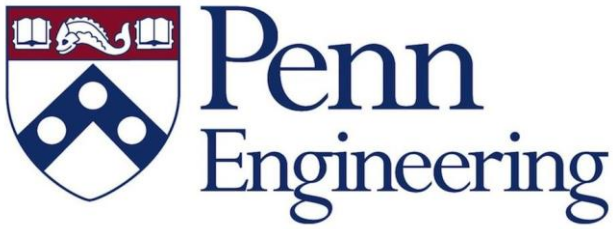


A* Applications in 8-Puzzle Game & Multiple Goals Maze Search

CIS 521 Term Project

Yue Yang & Xinyi Tang

8-Puzzle Game

- Admissible Heuristic – Total Manhattan Distance (Number of moves from desired locations of each tile)
- Maximum simultaneous online robots: (5 - 6), need to disconnect and reconnect

Pseudocode

```
function find_path(start, goal, scene) returns path, distance
    nodes_visited ← empty set
    path ← list beginning with start
    X ← collection of possible movements
    while queue is not empty:
        node ← pop(frontier)
        if current_position is goal:
            return path, distance            //path found
        if current_position not in nodes_visited:
            add to nodes_visited
            for each_movement in X:
                update next_position
                if next_position possible:
                    node ← next_position
                    update queue with new node(COST, PATH,NEW_STATE)
```

```
function r2d2_action(path, robots) returns robot commands
    path = (robot_id, move direction)
        if robots(robot_id) not connect:
            disconnect one online robot
            connect current robot
            action(robot_id, move_direction)
        else:
            action(robot_id, move_direction)
```

8-Puzzle Game

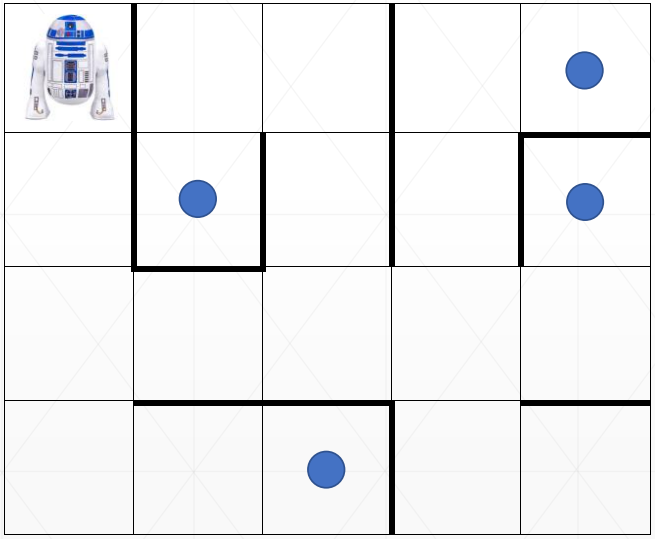
Video link

Multiple Goals Maze Search

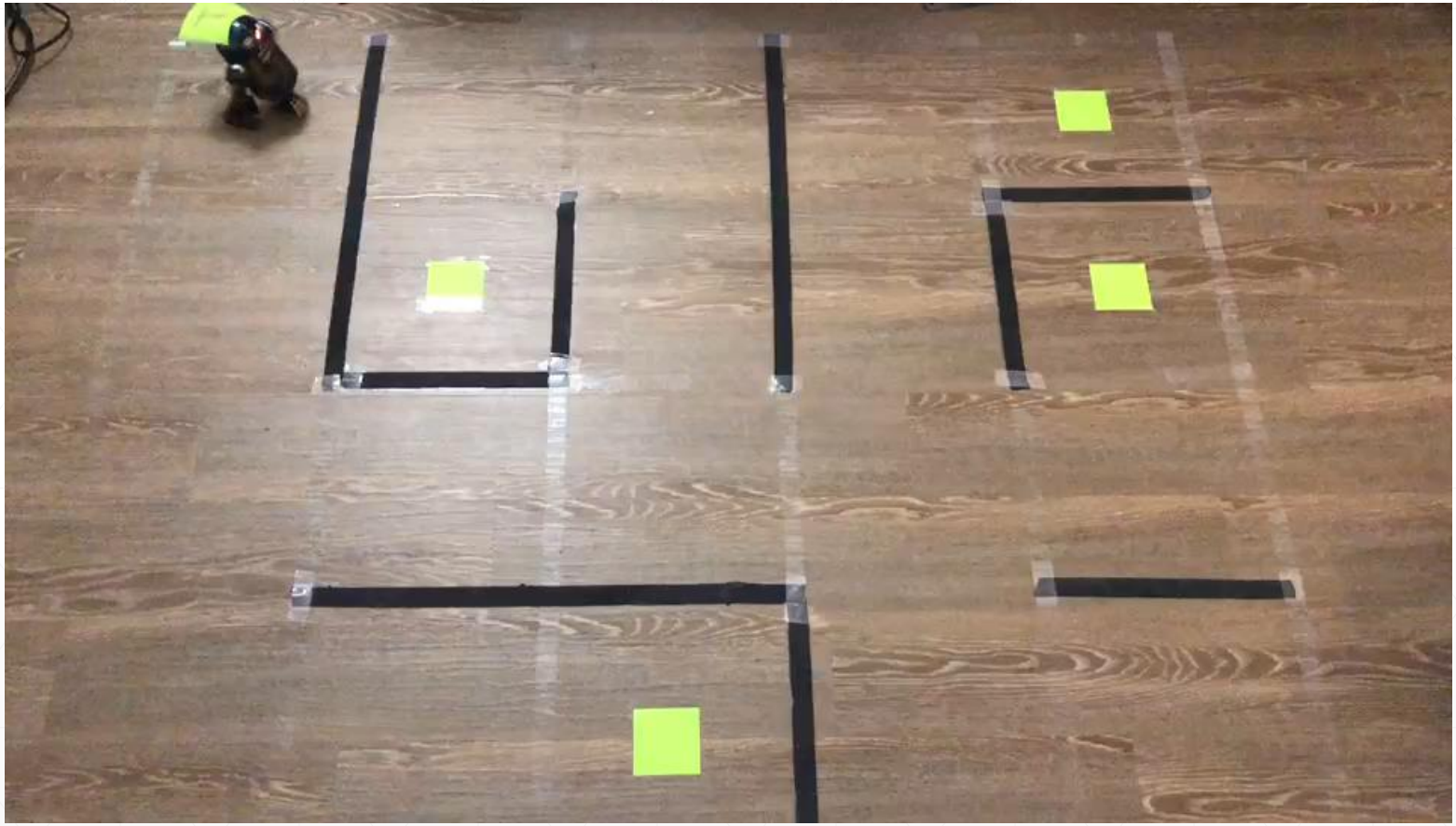
- Traveling Salesman Algorithm: Simple small-scale solution using permutations.
- For example, start = (0, 0) , Goals = ((2, 2), (3, 1), (4, 3), ……).
- Calculate the distance of each pairs, ((0, 0), (2, 2)), ((2, 2), (3, 1)), etc.
- Find the optimal order that makes the total distance shortest.

Pseudocode

```
function tsp(goals) returns path, minimum_distance
    minimum_distance = 0
    path = None
    for permutation in ALL_PERMUTSTIONS_OF_GOALS:
        path ← list of positions(from start to goals to start)
        calculate Euclidean_distance
        if current_distance < minimum_distance
            update path, minimum_distance          //path found
    return path,minimum_distance
```



Multiple Goals Maze Search



Video link

Thank you!