

# MDP - Single Agent

No Wind, 1 Velocity, 1 Acceleration

Easy Scattered Obstacles - Random Policy

Video Demo: <https://www.youtube.com/watch?v=FdEtx-JCdv0>

## **config.py**

```
DISCOUNT_FACTOR = 0.8  
ROLLOUT_NUM_ROLLOUTS = 20  
ROLLOUT_MAX_DEPTH = 20
```

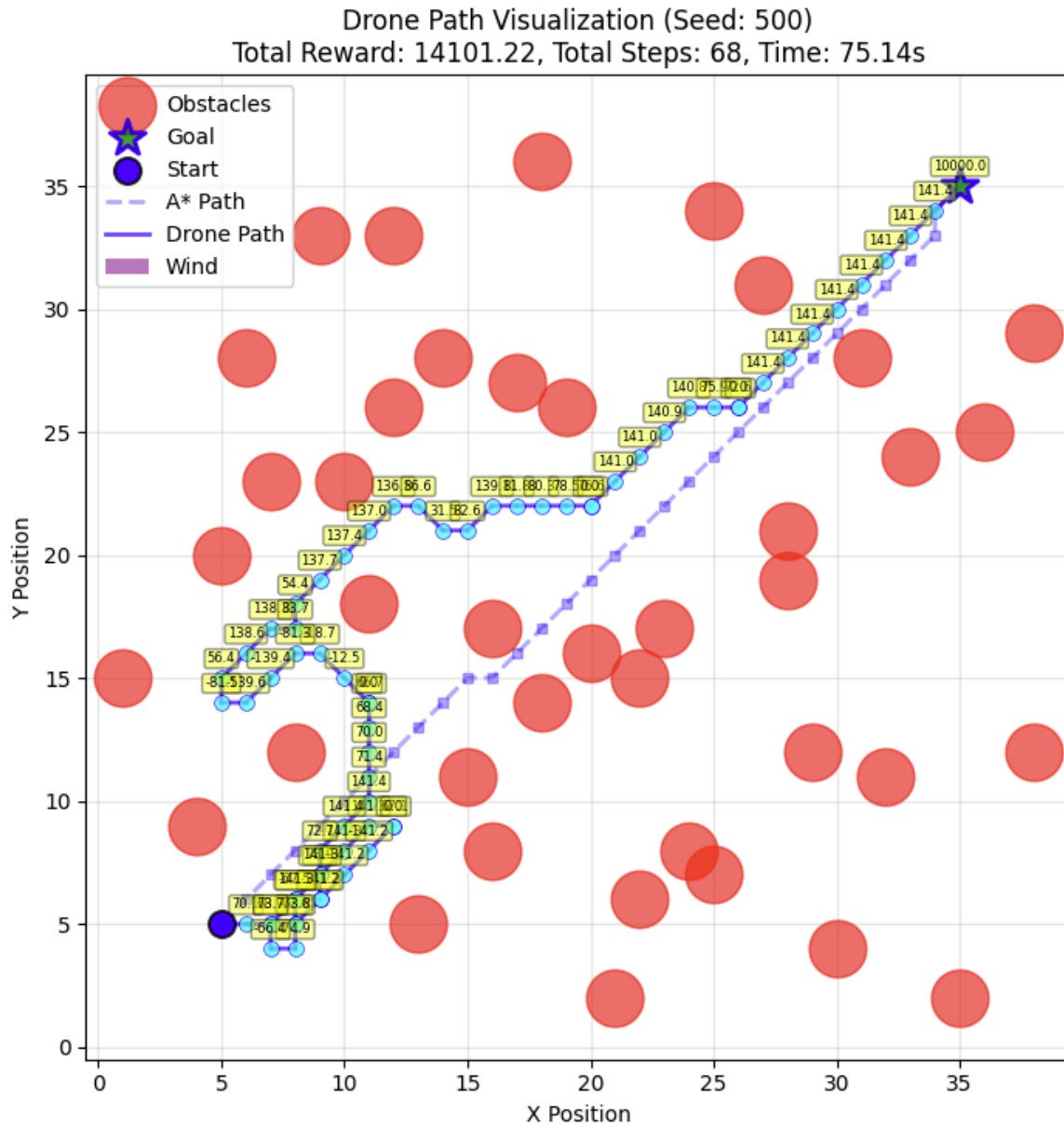
## **run.py**

```
base_policy = RandomPolicy()
```

## **drone.py**

Uncomment Euclidean Progress to Goal

```
python3 run_mdp_single_agent.py -t easy_scattered_obstacles -s 500 -v 1 -a 1
```



## Easy Scattered Obstacles - Greedy Policy

Video Demo: <https://www.youtube.com/watch?v=m8f4DP0zBzc>

### config.py

```
DISCOUNT_FACTOR = 0.8
ROLLOUT_NUM_ROLLOUTS = 1
ROLLOUT_MAX_DEPTH = 20
```

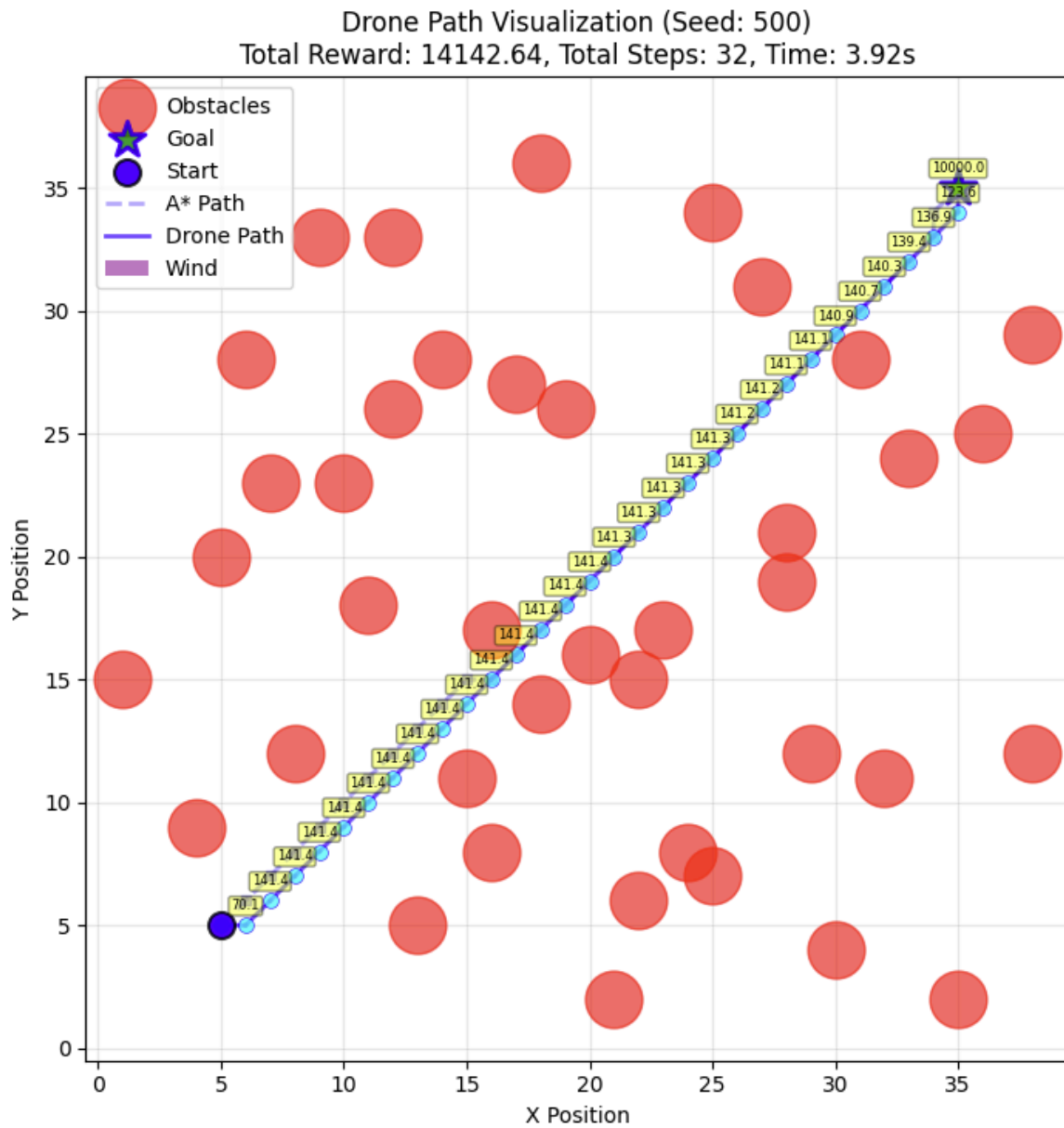
### run.py

```
base_policy = GreedyPolicy()
```

**drone.py**

Uncomment Euclidean Progress to Goal

```
python3 run_mdp_single_agent.py -t easy_scattered_obstacles -s 500 -v 1 -a 1
```



## Wind, 5 Velocity, 2 Acceleration

### Easy Scattered Obstacles - Greedy Policy

Video Demo: <https://www.youtube.com/watch?v=D2SSJHfSABM>

#### **config.py**

```
DISCOUNT_FACTOR = 0.8  
ROLLOUT_NUM_ROLLOUTS = 1  
ROLLOUT_MAX_DEPTH = 20
```

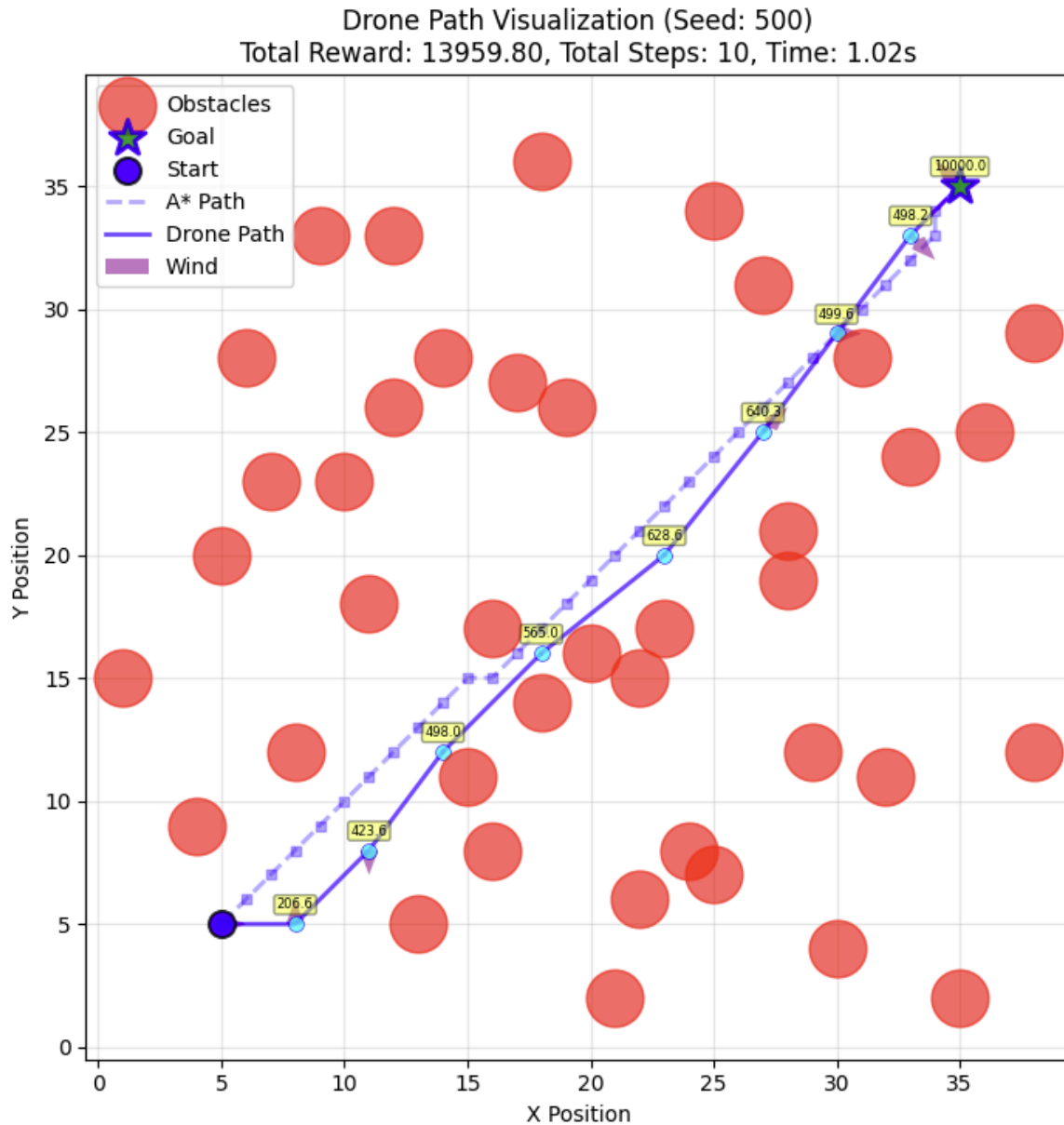
#### **run.py**

```
base_policy = GreedyPolicy()
```

#### **drone.py**

Uncomment Euclidean Progress to Goal

```
python3 run_mdp_single_agent.py -t easy_scattered_obstacles -s 500 -v 5 -a 2  
-w
```



## Hard Two Line Maze - Greedy Policy

Video Demo: <https://www.youtube.com/watch?v=0ldevjribio>

### config.py

```
DISCOUNT_FACTOR = 0.8
ROLLOUT_NUM_ROLLOUTS = 1
ROLLOUT_MAX_DEPTH = 20
```

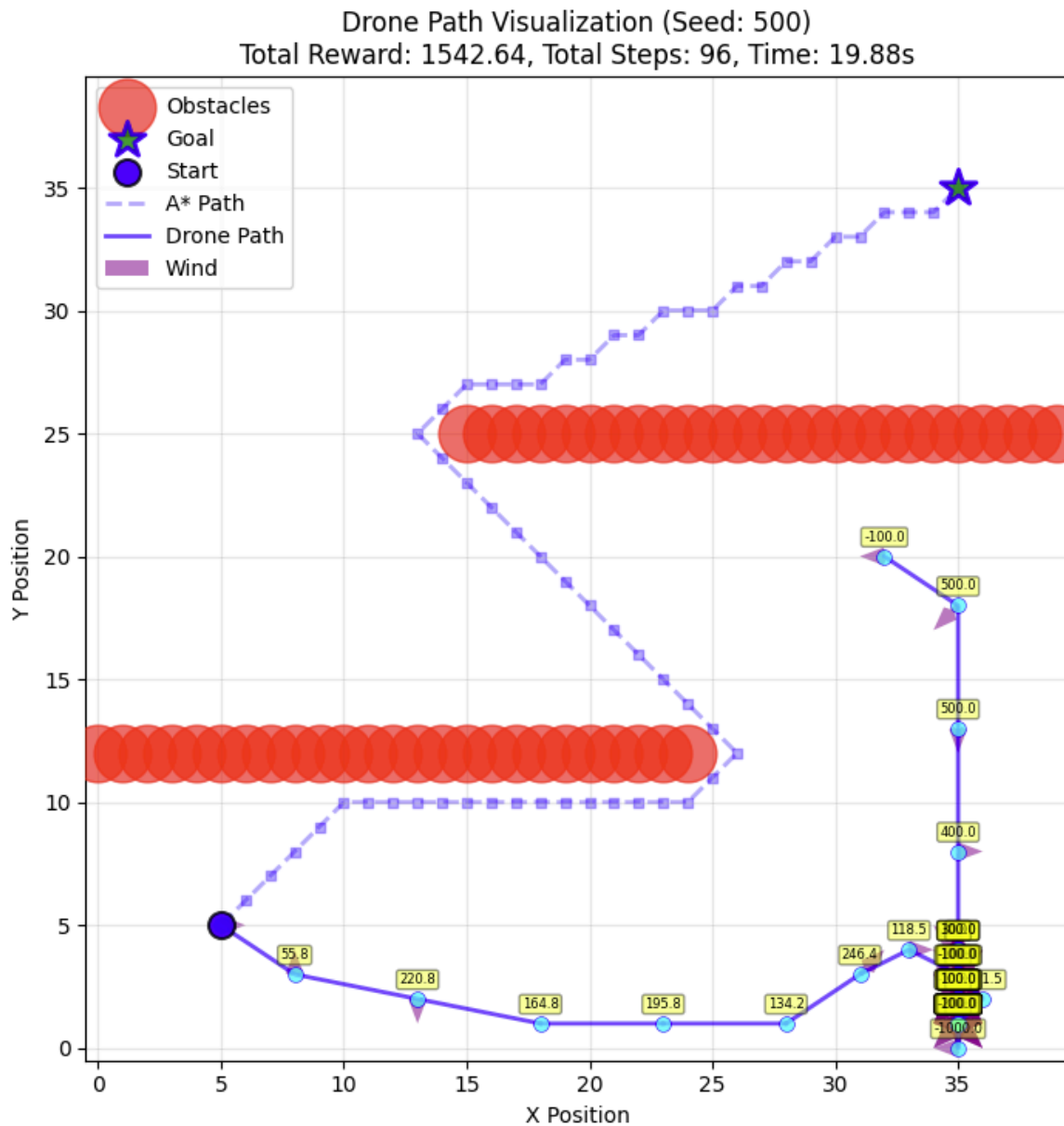
### run.py

```
base_policy = GreedyPolicy()
```

**drone.py**

Uncomment Euclidean Progress to Goal

```
python3 run_mdp_single_agent.py -t hard_two_line_maze -s 500 -v 5 -a 2 -w
```



Hard Two Line Maze - A\* Path Policy

Video Demo: <https://www.youtube.com/watch?v=pxu3MfNes84>

**config.py**

```
DISCOUNT_FACTOR = 0.8
ROLLOUT_NUM_ROLLOUTS = 1
ROLLOUT_MAX_DEPTH = 20
```

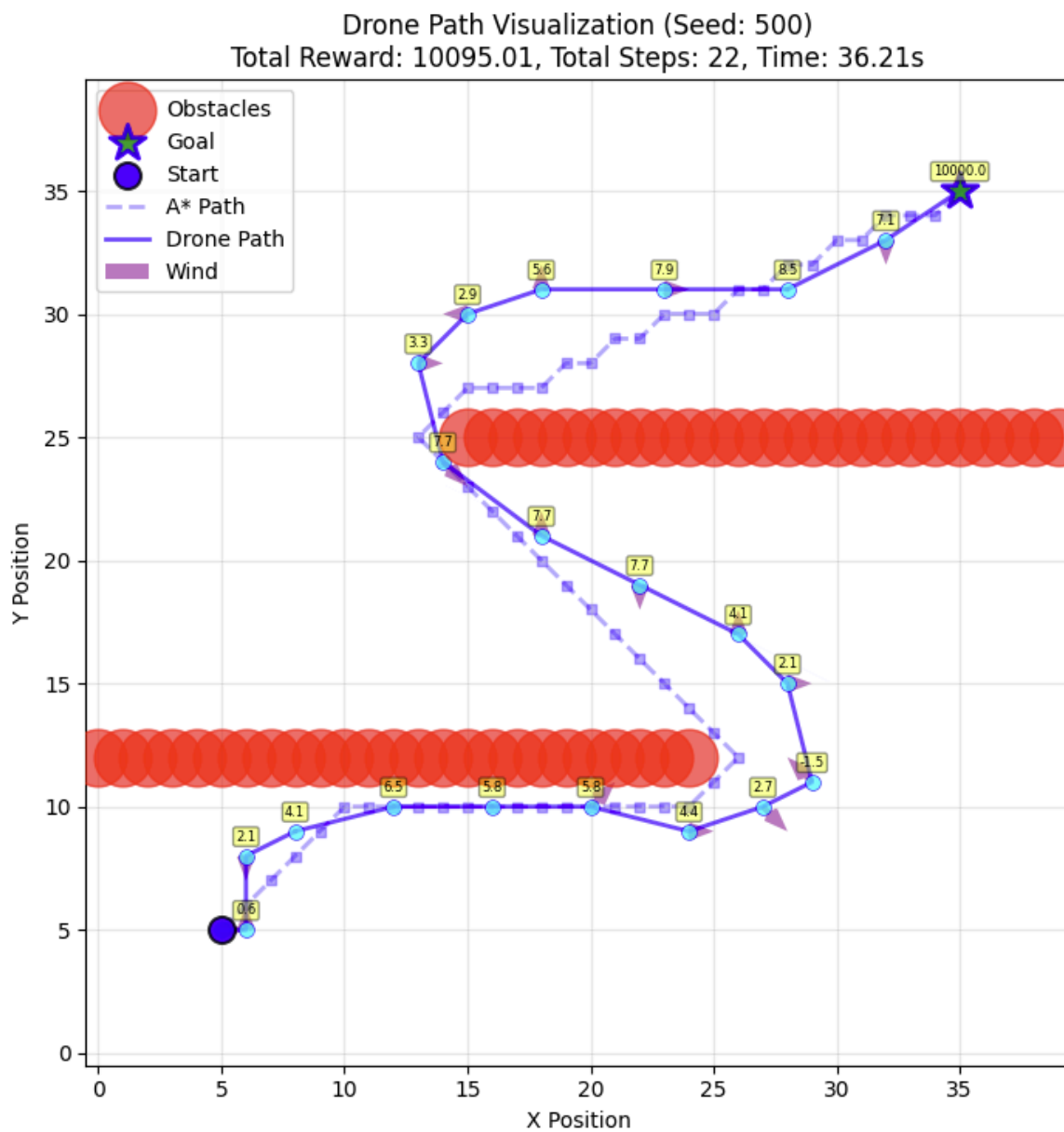
**run.py**

```
base_policy = AStarPolicy()
```

**drone.py**

Uncomment A\* Path Progress to Goal

```
python3 run_mdp_single_agent.py -t hard_two_line_maze -s 500 -v 5 -a 2 -w
```



## Hard Tight Spiral Maze - A\* Path Policy

Video Demo: <https://www.youtube.com/watch?v=79N2mNHASmw>

### **config.py**

```
DISCOUNT_FACTOR = 0.8  
ROLLOUT_NUM_ROLLOUTS = 1  
ROLLOUT_MAX_DEPTH = 20
```

### **run.py**

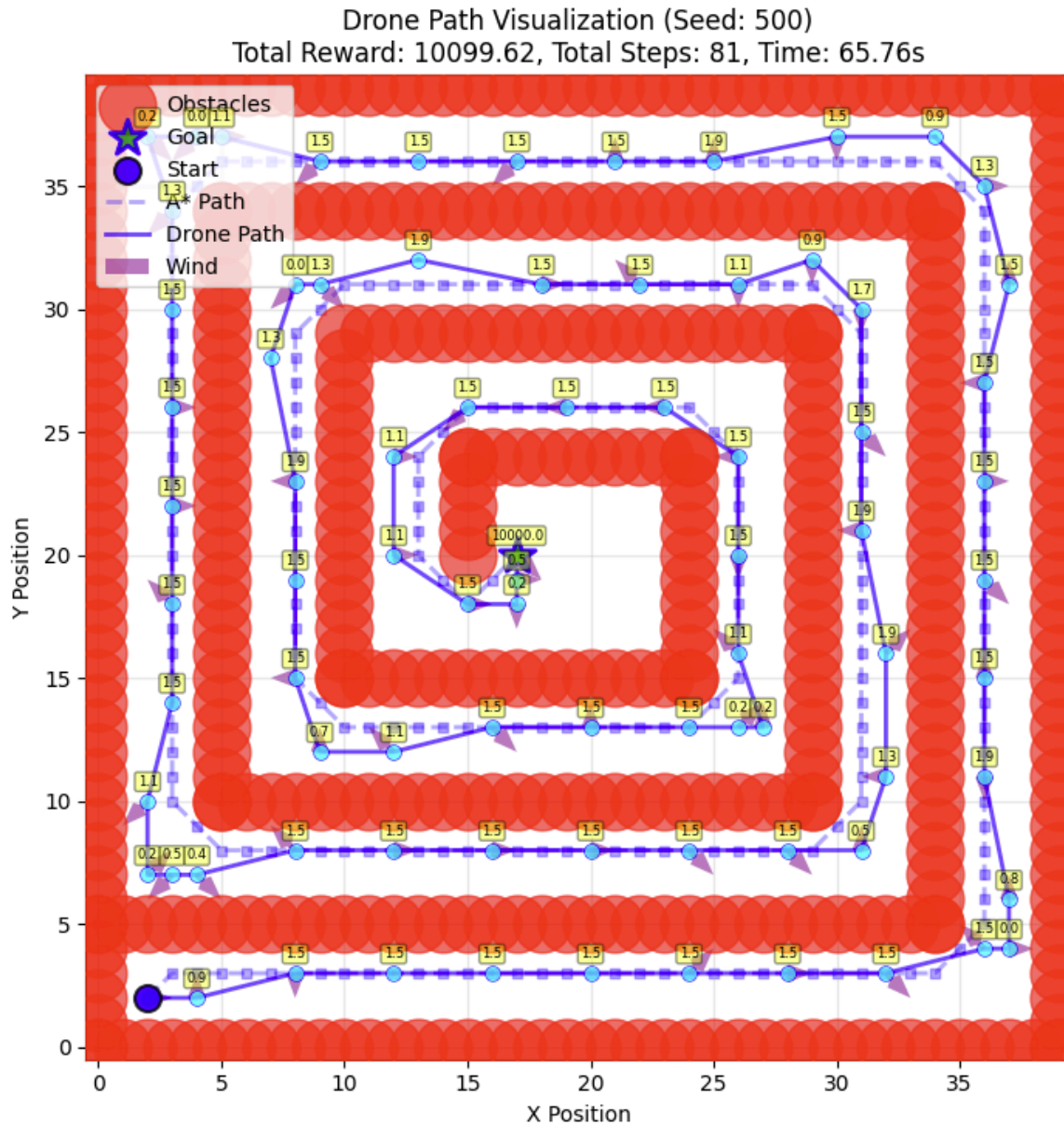
```
base_policy = AStarPolicy()
```

### **drone.py**

Uncomment A\* Path Progress to Goal

```
python3 run_mdp_single_agent.py -t hard_spiral_maze -s 500 -v 5 -a 2 -w
```





## MDP - Multi Agent

No Wind, 1 Velocity, 1 Acceleration

Easy Empty Field - 2 Agents, A\* Policy

Video Demo: <https://www.youtube.com/watch?v=47qglmcx3h4>

config.py

```
DISCOUNT_FACTOR = 0.8
ROLLOUT_NUM_ROLLOUTS = 1
ROLLOUT_MAX_DEPTH = 20
```

**run.py**

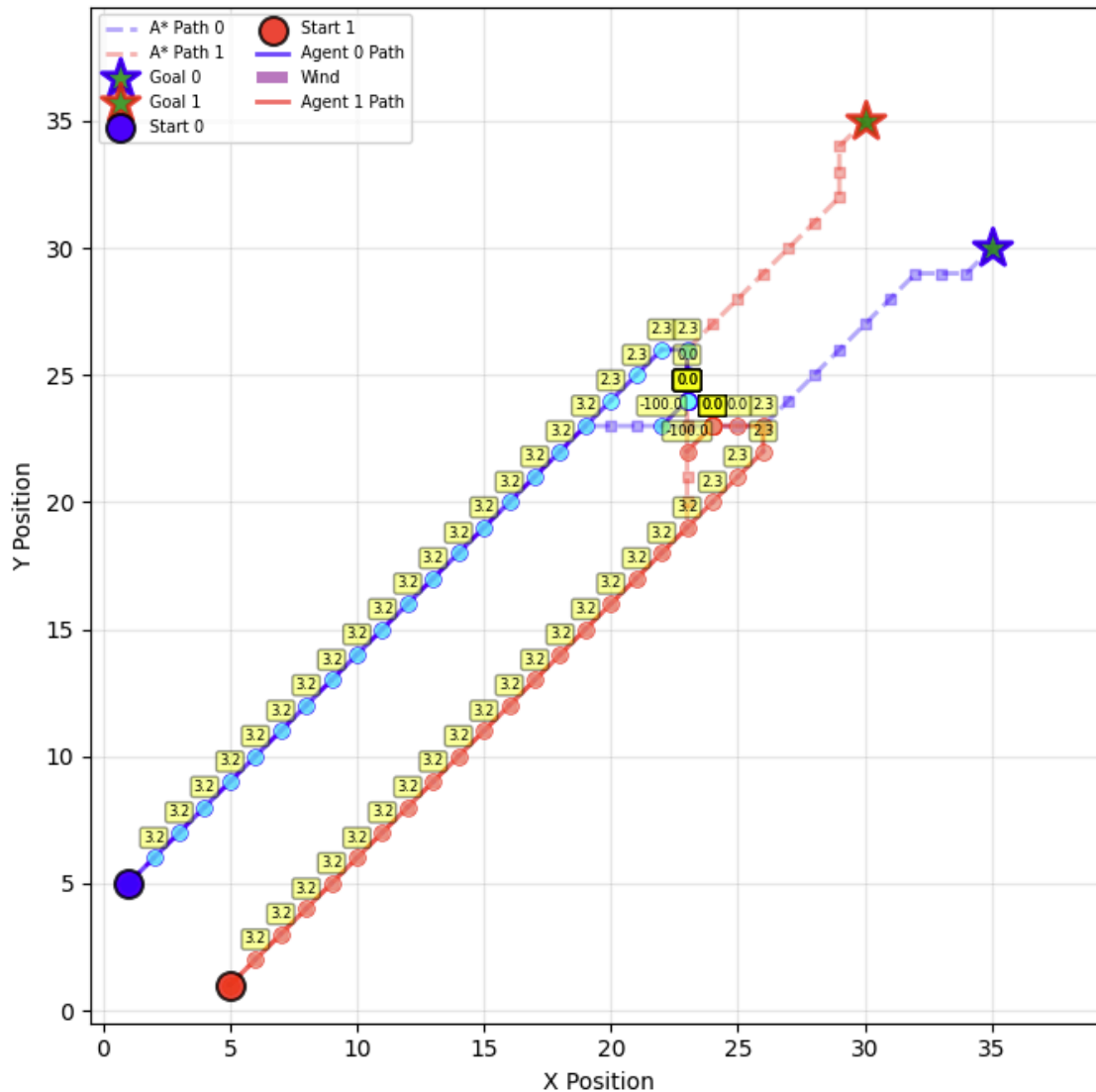
```
base_policy = AStarPolicy()
```

**drone.py**

Uncomment A\* Path Progress to Goal

```
python3 run_mdp_multi_agent.py -t easy_empty_field_2_agents -s 500 -v 1 -a 1
```

Multi-Agent Drone Path Visualization (Seed: 500)  
Agent Rewards: [A0:-33.6, A1:-33.6], System Total: -67.18  
Total Steps: 96, Time: 22.65s



## Wind, 5 Velocity, 2 Acceleration

### Easy Empty Field - 2 Agents and 3 Agents, A\* Policy

Video Demo: <https://www.youtube.com/watch?v=AFmpr7dRBAk> (3 Agents)

#### **config.py**

```
DISCOUNT_FACTOR = 0.8  
ROLLOUT_NUM_ROLLOUTS = 1  
ROLLOUT_MAX_DEPTH = 20
```

#### **run.py**

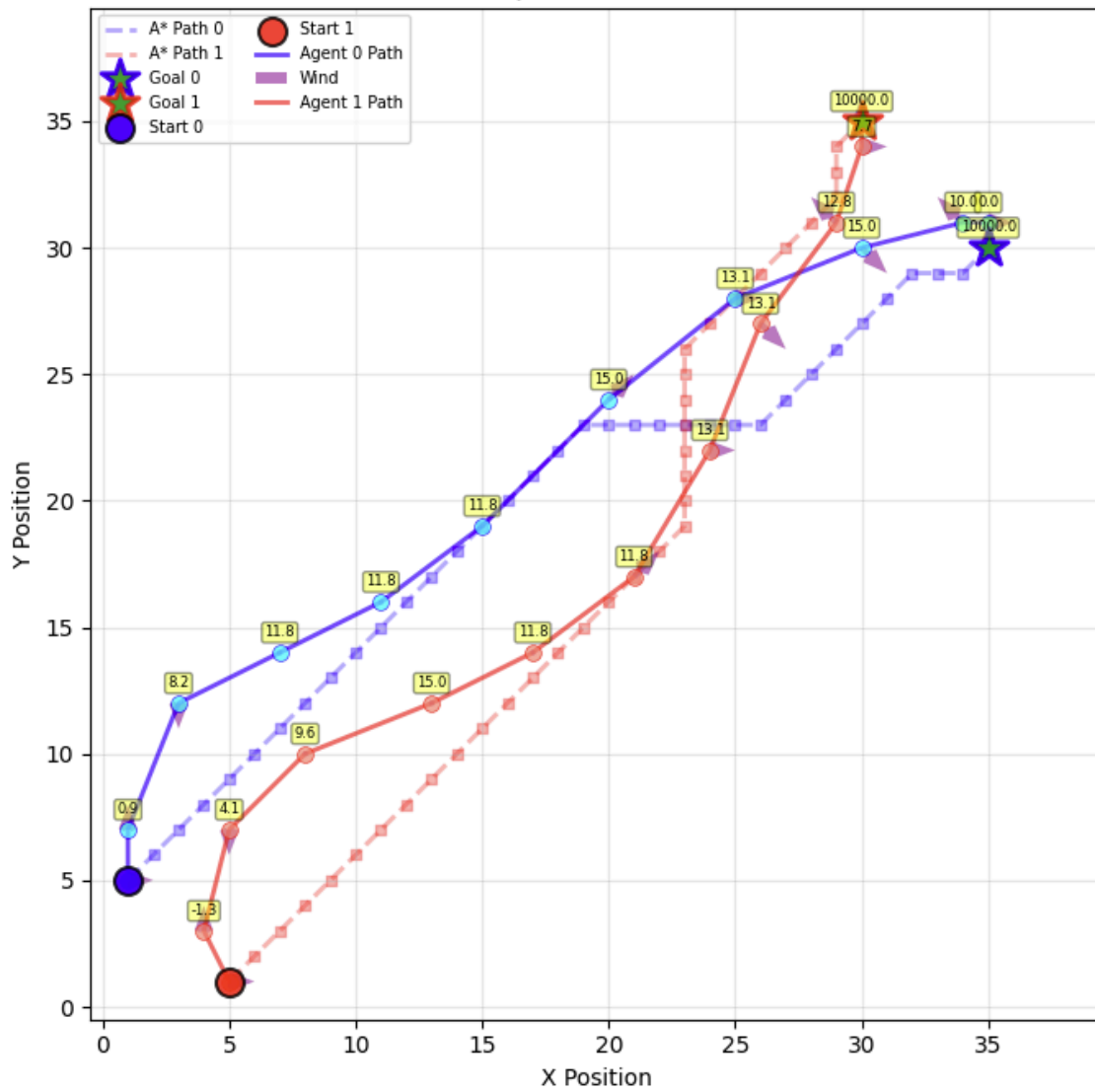
```
base_policy = AStarPolicy()
```

#### **drone.py**

Uncomment A\* Path Progress to Goal

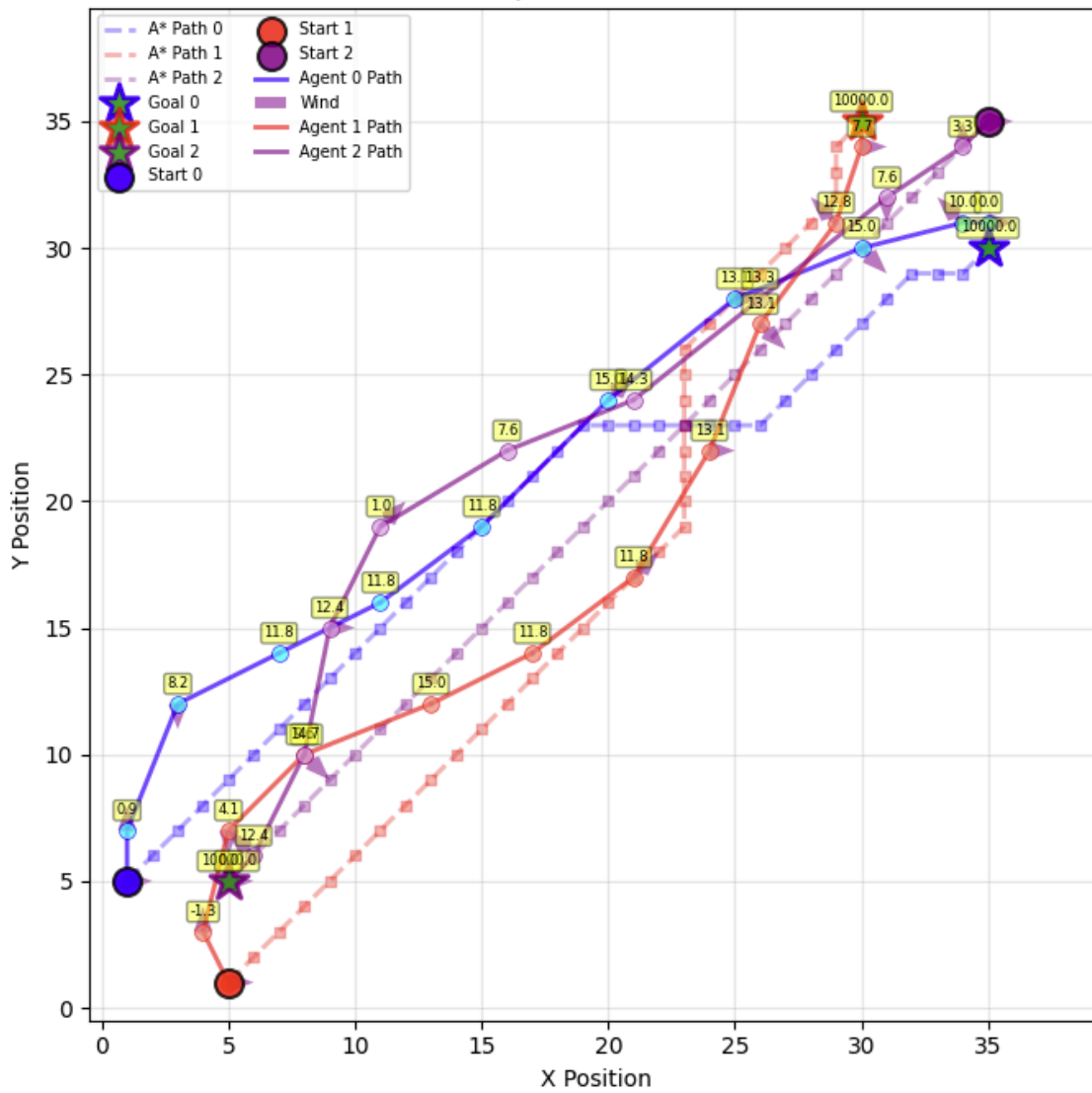
```
python3 run_mdp_multi_agent.py -t easy_empty_field_3_agents -s 500 -v 5 -a 2  
-w
```

Multi-Agent Drone Path Visualization (Seed: 500)  
 Agent Rewards: [A0:10097.7, A1:10097.7], System Total: 20195.49  
 Total Steps: 12, Time: 12.47s



```
python3 run_mdp_multi_agent.py -t easy_empty_field_3_agents -s 500 -v 5 -a 2
-w
```

Multi-Agent Drone Path Visualization (Seed: 500)  
 Agent Rewards: [A0:10097.7, A1:10097.7, A2:10086.7], System Total: 30282.16  
 Total Steps: 12, Time: 20.40s



Hard Two Line Maze - 3 Agents, A\* Policy

Video Demo: <https://www.youtube.com/watch?v=7FsYvwiUQiM>

**config.py**

```
DISCOUNT_FACTOR = 0.8
ROLLOUT_NUM_ROLLOUTS = 1
ROLLOUT_MAX_DEPTH = 20
```

**run.py**

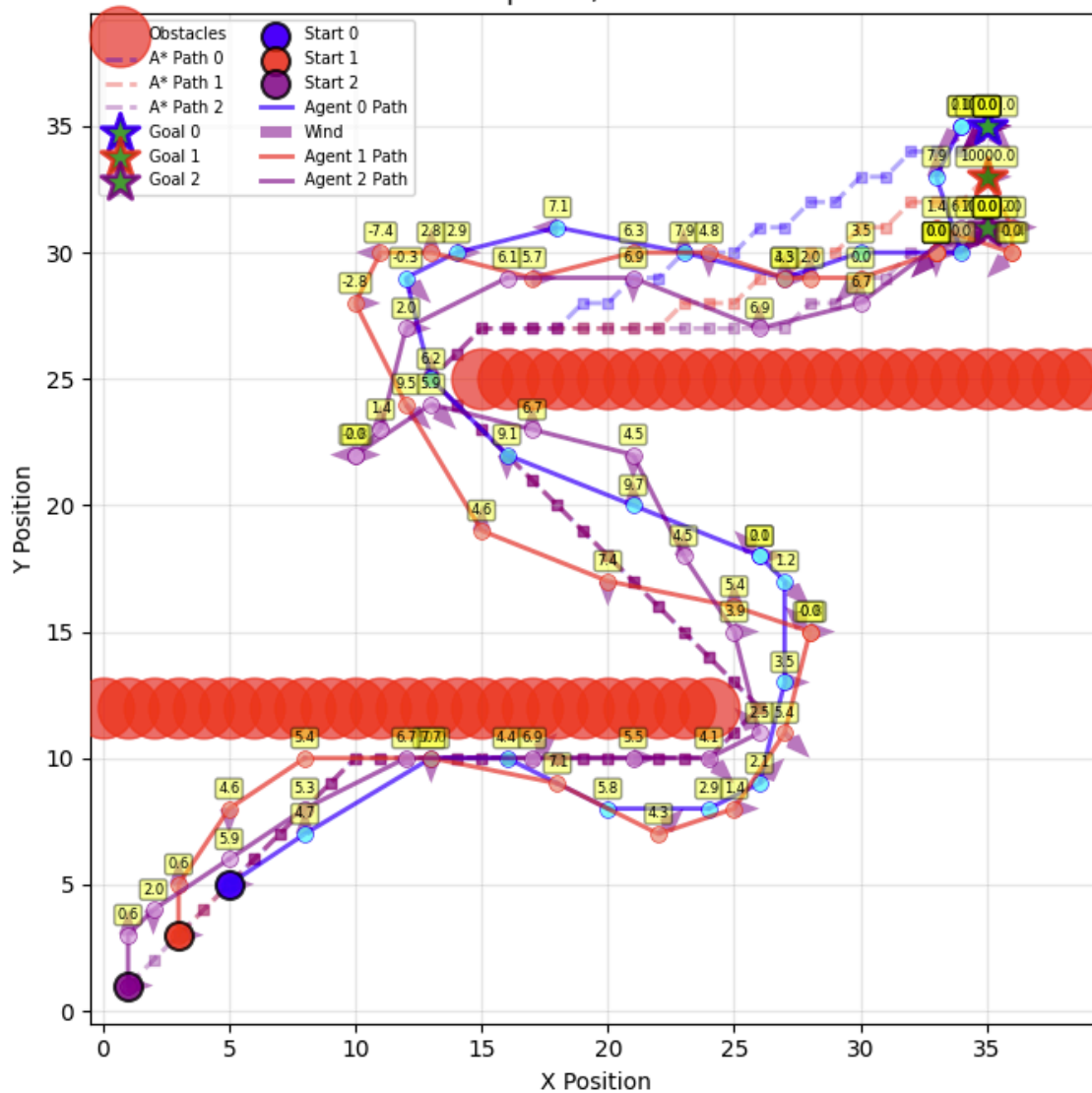
```
base_policy = AStarPolicy()
```

**drone.py**

Uncomment A\* Path Progress to Goal

```
python3 run_mdp_multi_agent.py -t hard_two_line_maze -s 500 -v 5 -a 2 -w
```

Multi-Agent Drone Path Visualization (Seed: 500)  
Agent Rewards: [A0:10098.5, A1:10087.2, A2:10098.6], System Total: 30284.32  
Total Steps: 33, Time: 178.83s



Hard Spiral Maze - 3 Agents, A\* Policy

**config.py**

DISCOUNT\_FACTOR = 0.8

ROLLOUT\_NUM\_ROLLOUTS = 1

ROLLOUT\_MAX\_DEPTH = 5

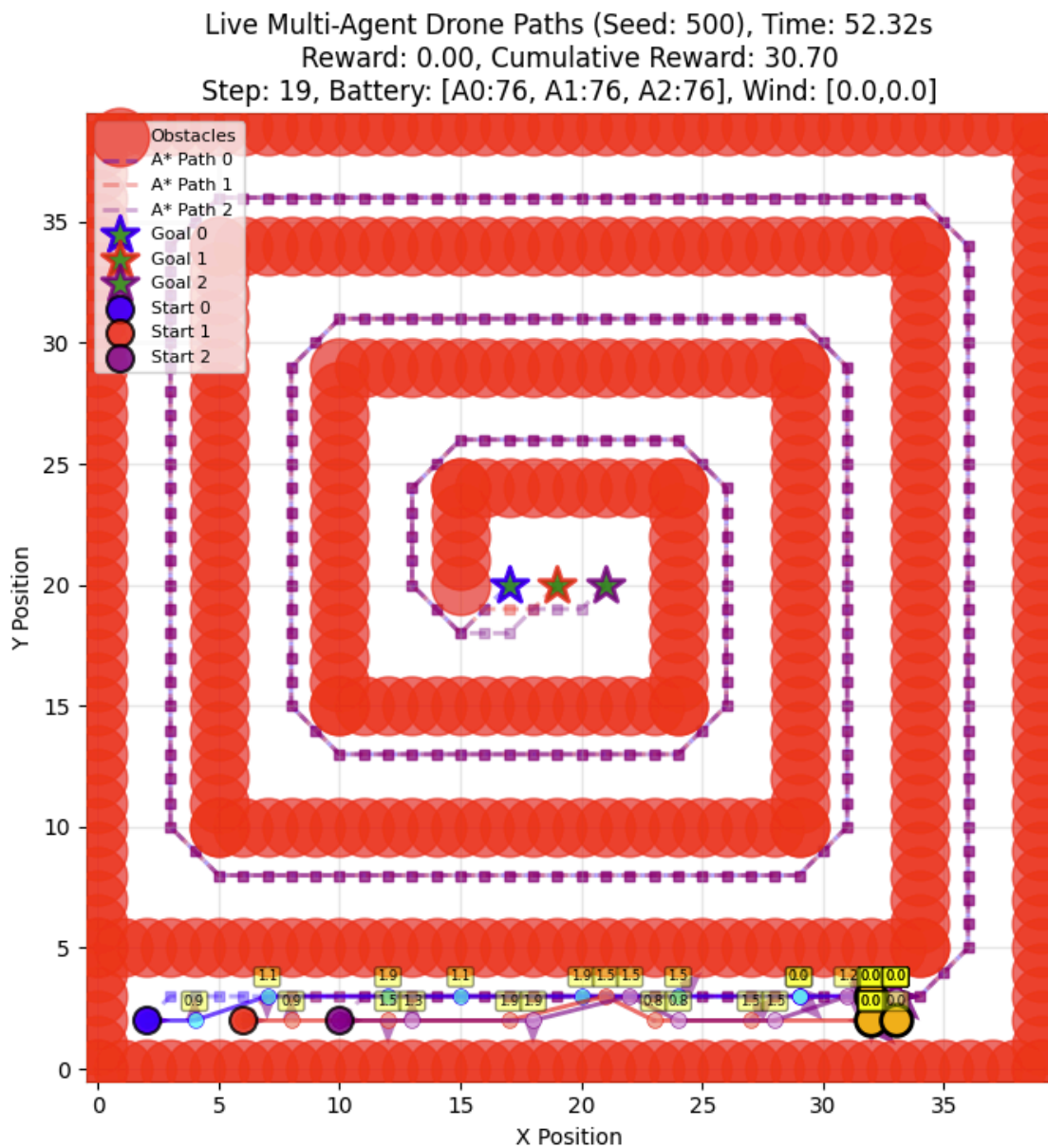
**run.py**

base\_policy = AStarPolicy()

**drone.py**

Uncomment A\* Path Progress to Goal

python3 run\_mdp\_single\_agent.py -t hard\_two\_line\_maze -s 500 -v 5 -a 2 -w



# POMDP - Single Agent

No Wind, 1 Velocity, 1 Acceleration

Easy Scattered Obstacles - A\* Policy

Video Demo: <https://www.youtube.com/watch?v=1vNXZmxR95g>

**config.py**

OBSTACLE\_THRESHOLD = 0.5

DISCOUNT\_FACTOR = 0.8

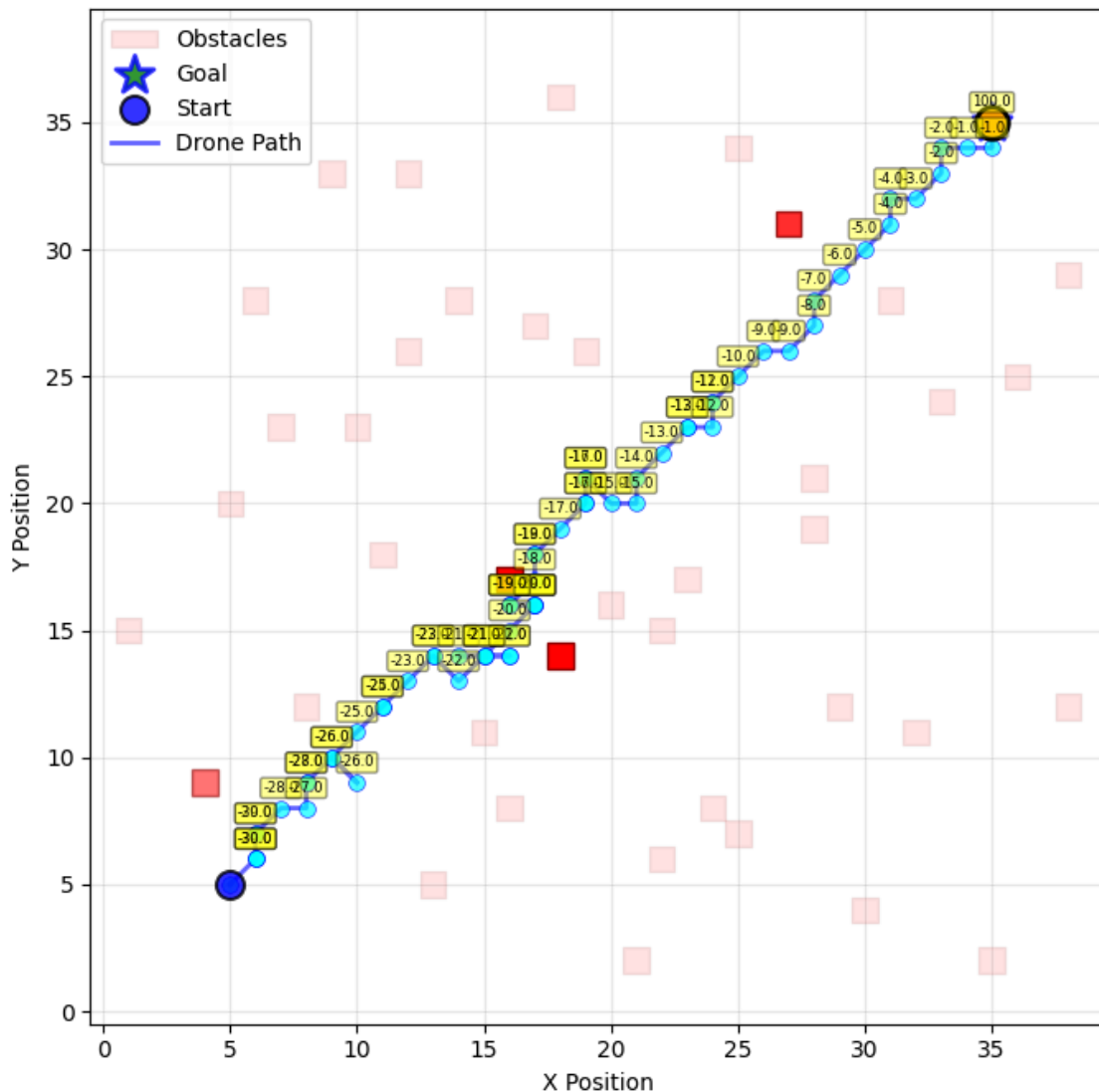
ROLLOUT\_NUM\_ROLLOUTS = 1

ROLLOUT\_MAX\_DEPTH = 20

```
python3 run_pomdp_single_agent.py -t easy_scattered_obstacles -s 500
```



POMDP Drone Path Visualization, Time: 75.34s  
Step: 65, Action: north, Reward: 100.00, Total Reward: -1007.00  
Position: (35, 35), Distance to Goal: 0.00



## Hard Two Line Maze - A\* Policy

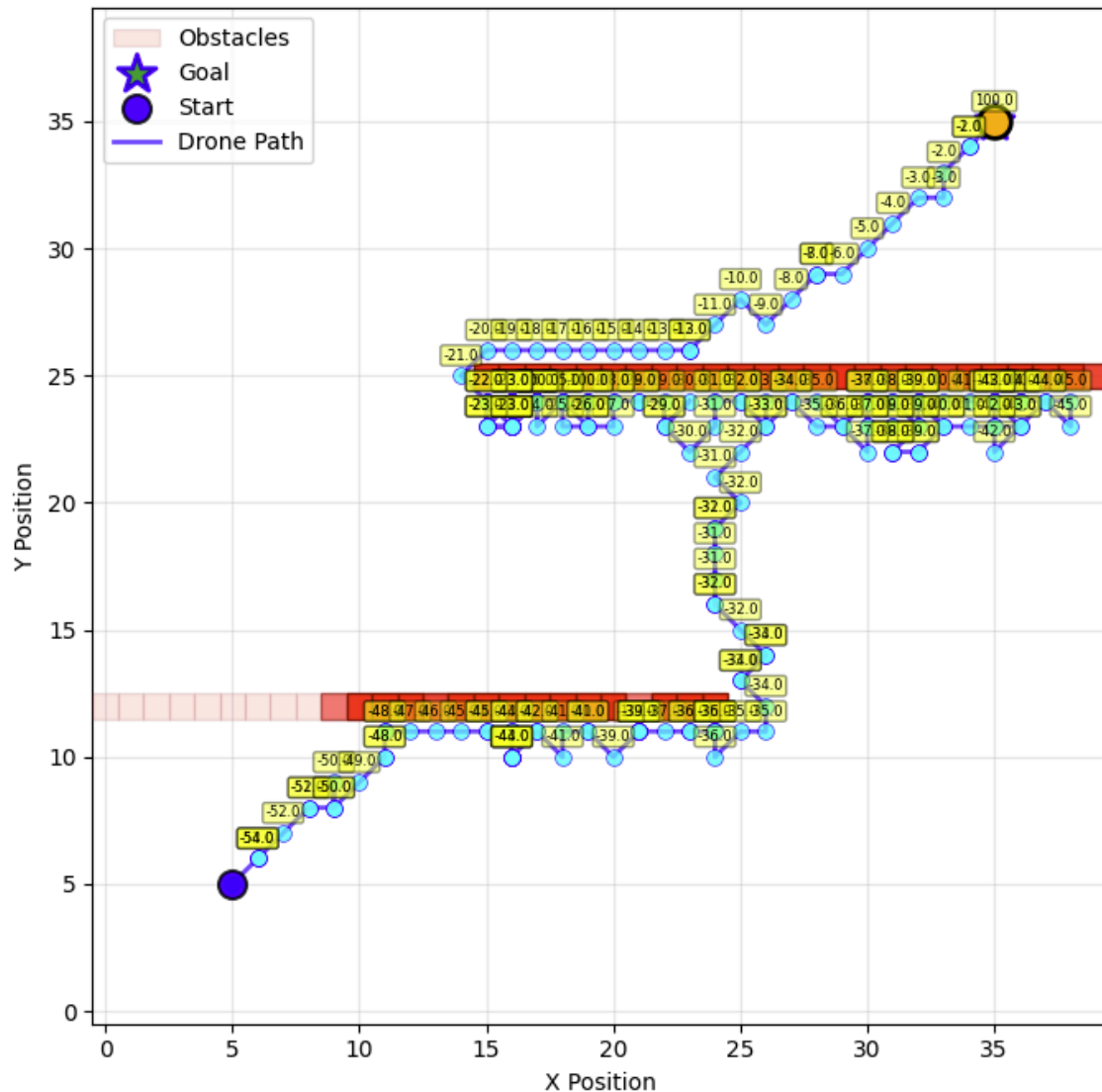
Video Demo: <https://www.youtube.com/watch?v=Q2VZL-Q9e3k>

### config.py

```
OBSTACLE_THRESHOLD = 0.5  
DISCOUNT_FACTOR = 0.8  
ROLLOUT_NUM_ROLLOUTS = 1  
ROLLOUT_MAX_DEPTH = 20
```

```
python3 run_pomdp_single_agent.py -t hard_two_line_maze -s 500
```

POMDP Drone Path Visualization, Time: 417.27s  
 Step: 197, Action: northeast, Reward: 100.00, Total Reward: -6664.00  
 Position: (35, 35), Distance to Goal: 0.00



## Hard C Inside Out - A\* Policy

### config.py

```
OBSTACLE_THRESHOLD = 0.5
DISCOUNT_FACTOR = 0.8
ROLLOUT_NUM_ROLLOUTS = 1
ROLLOUT_MAX_DEPTH = 20
```

```
python3 run_pomdp_single_agent.py -t hard_c_inside_out -s 500
```

POMDP Drone Path Visualization, Time: 1478.23s  
Step: 381, Action: west, Reward: 100.00, Total Reward: -17216.00  
Position: (2, 20), Distance to Goal: 0.00

