

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

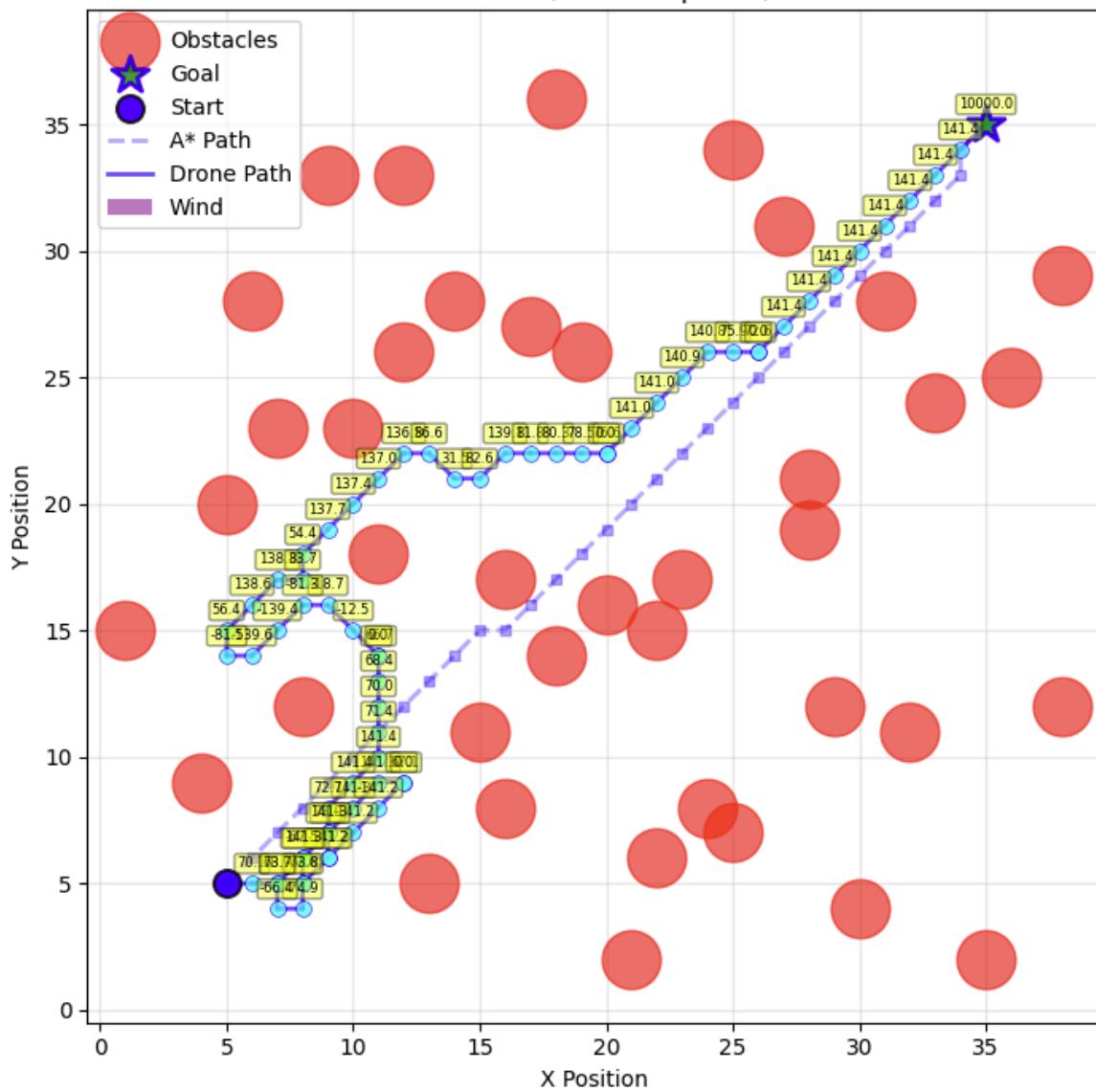
```
base_policy = RandomPolicy()
```

drone.py

```
Uncomment Euclidean Progress to Goal
```

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

Drone Path Visualization (Seed: 500)
Total Reward: 14101.22, Total Steps: 68, Time: 75.14s



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

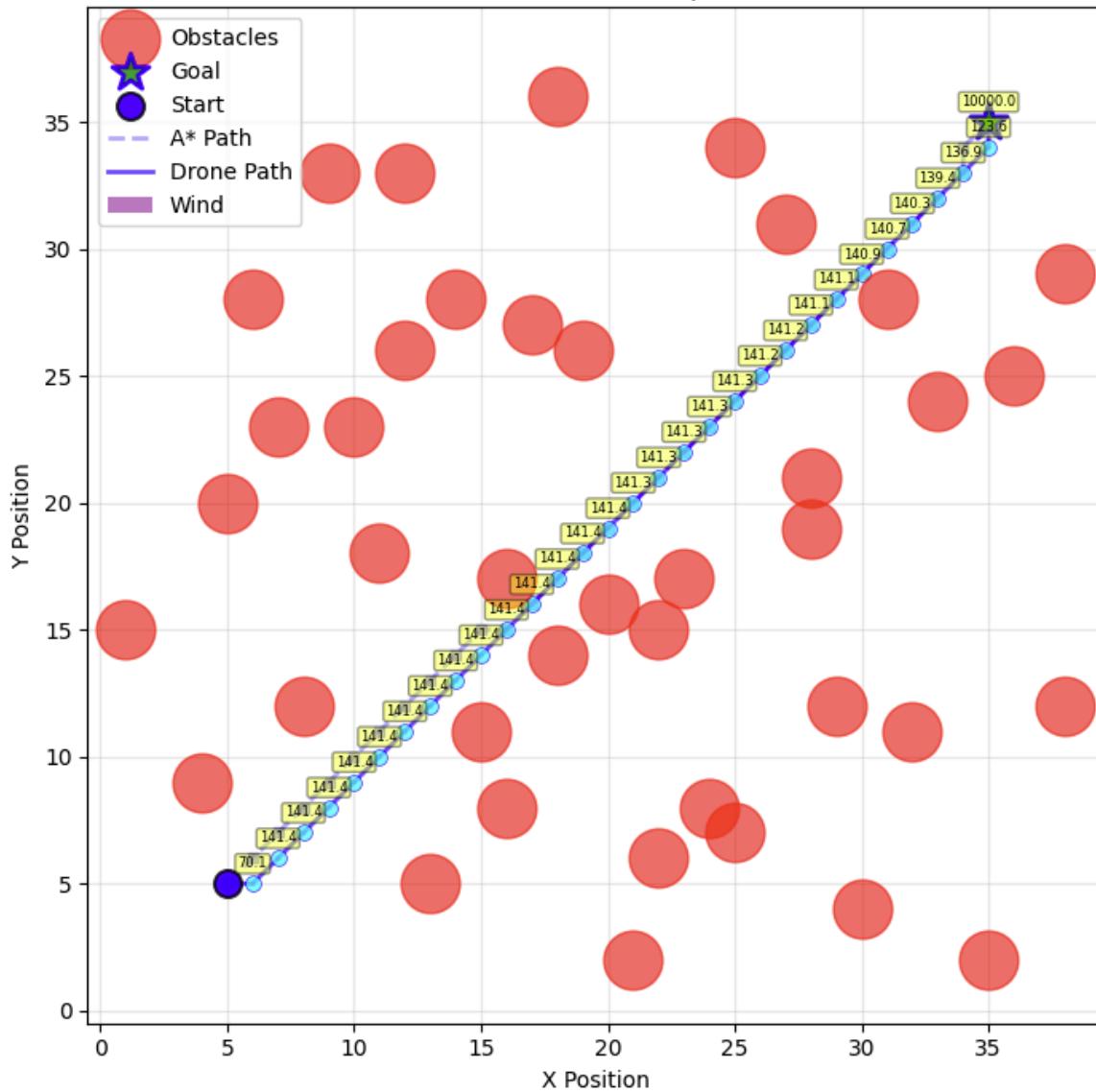
```
base_policy = GreedyPolicy()
```

drone.py

Uncomment Euclidean Progress to Goal

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

Drone Path Visualization (Seed: 500)
Total Reward: 14142.64, Total Steps: 32, Time: 3.92s



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

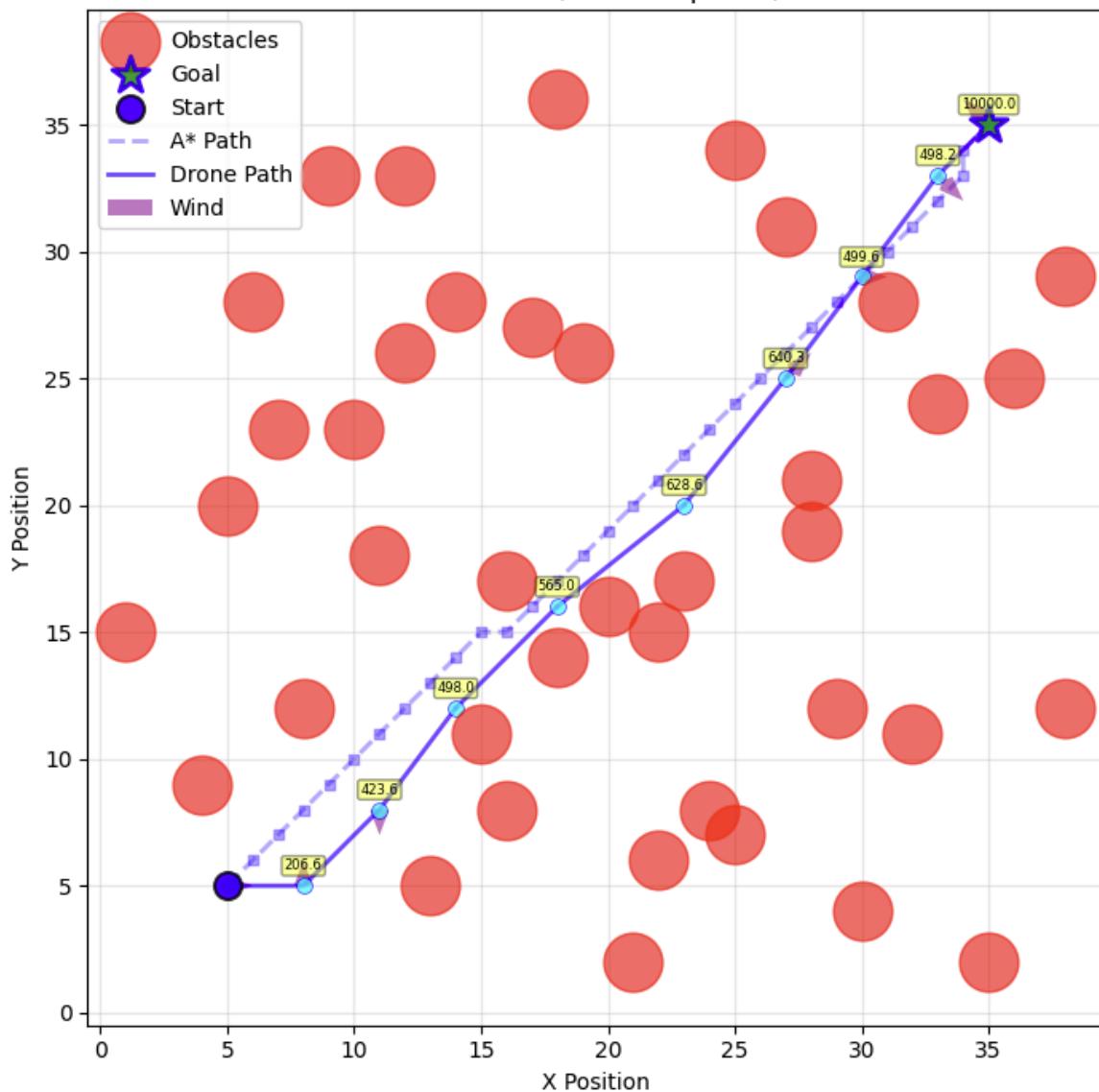
```
base_policy = GreedyPolicy()
```

drone.py

Uncomment Euclidean Progress to Goal

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

Drone Path Visualization (Seed: 500)
Total Reward: 13959.80, Total Steps: 10, Time: 1.02s



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

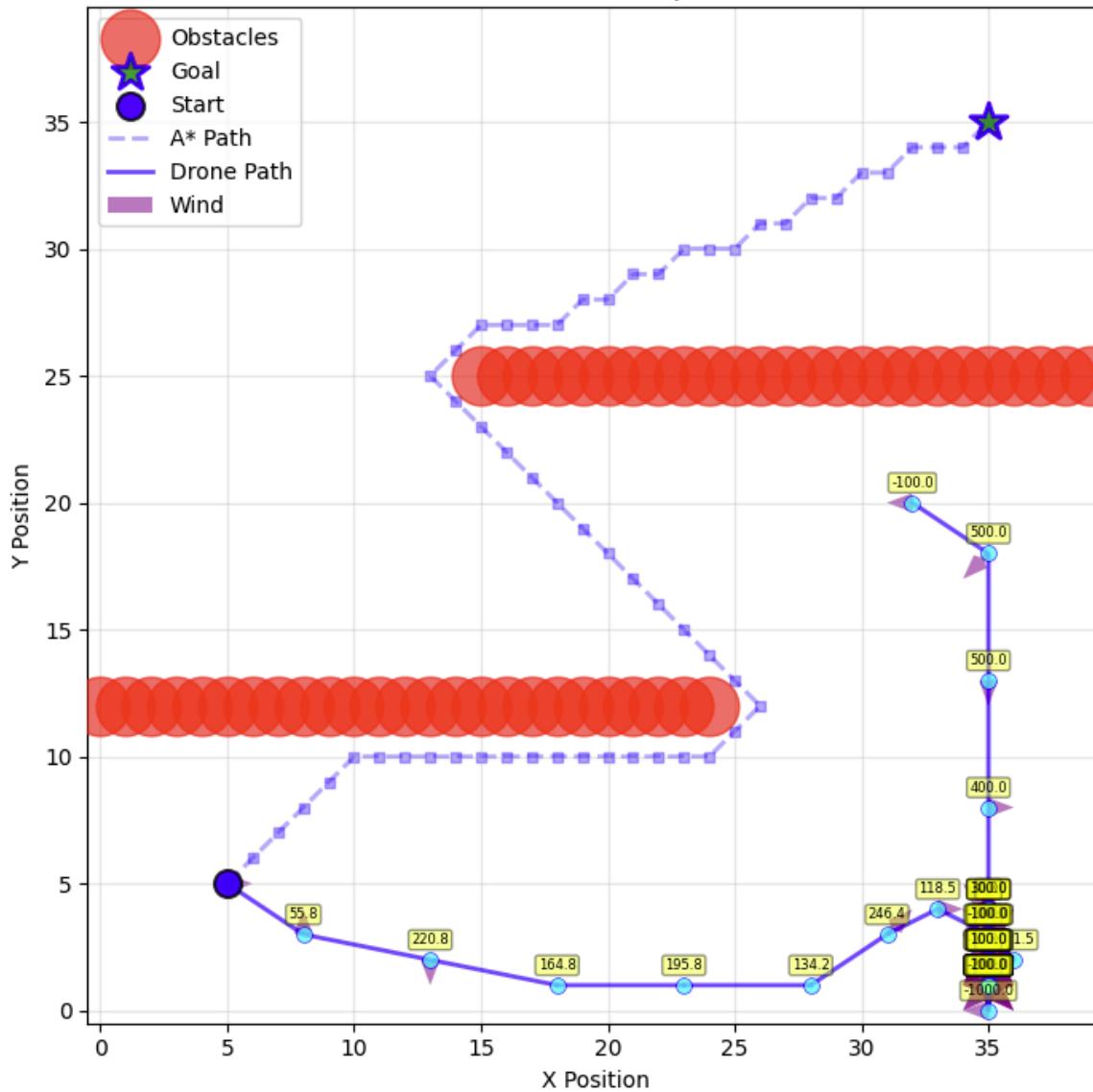
```
base_policy = GreedyPolicy()
```

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
```

Drone Path Visualization (Seed: 500)
Total Reward: 1542.64, Total Steps: 96, Time: 19.88s



Hard Two Line Maze - A* Path Policy

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

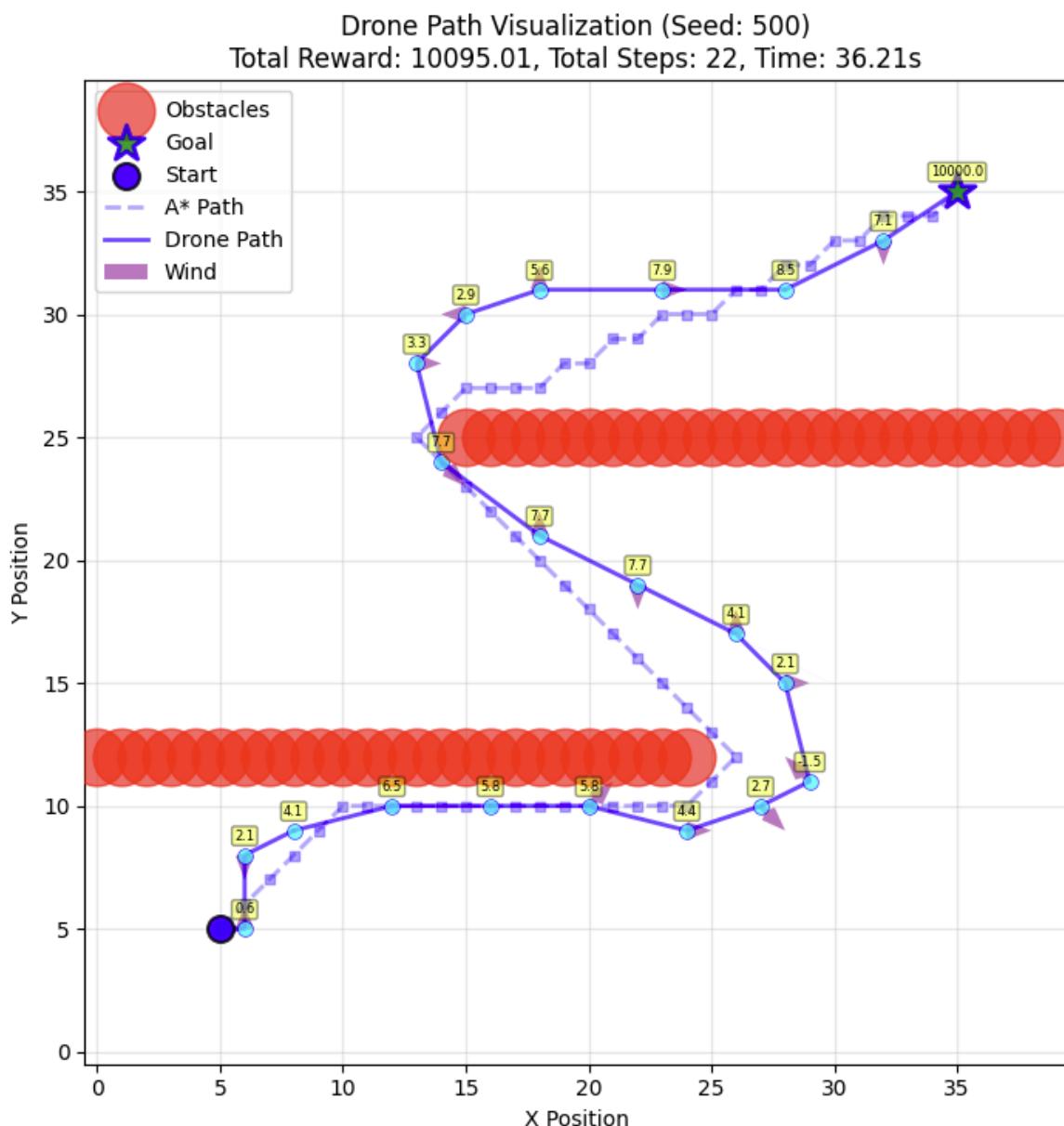
config.py

```
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

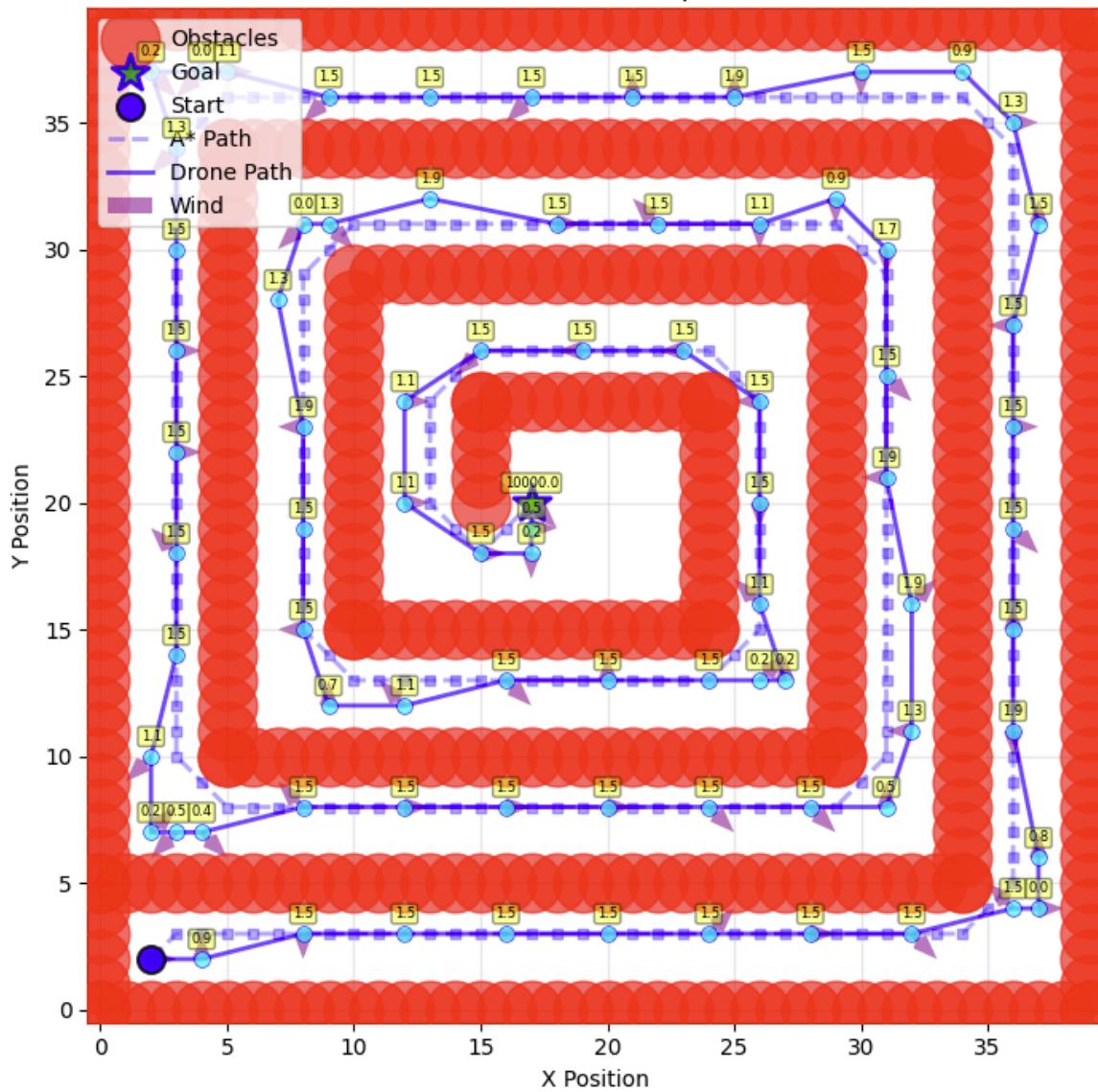
```
base_policy = AStarPolicy()
```

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
```

Drone Path Visualization (Seed: 500)
Total Reward: 10099.62, Total Steps: 81, Time: 65.76s



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

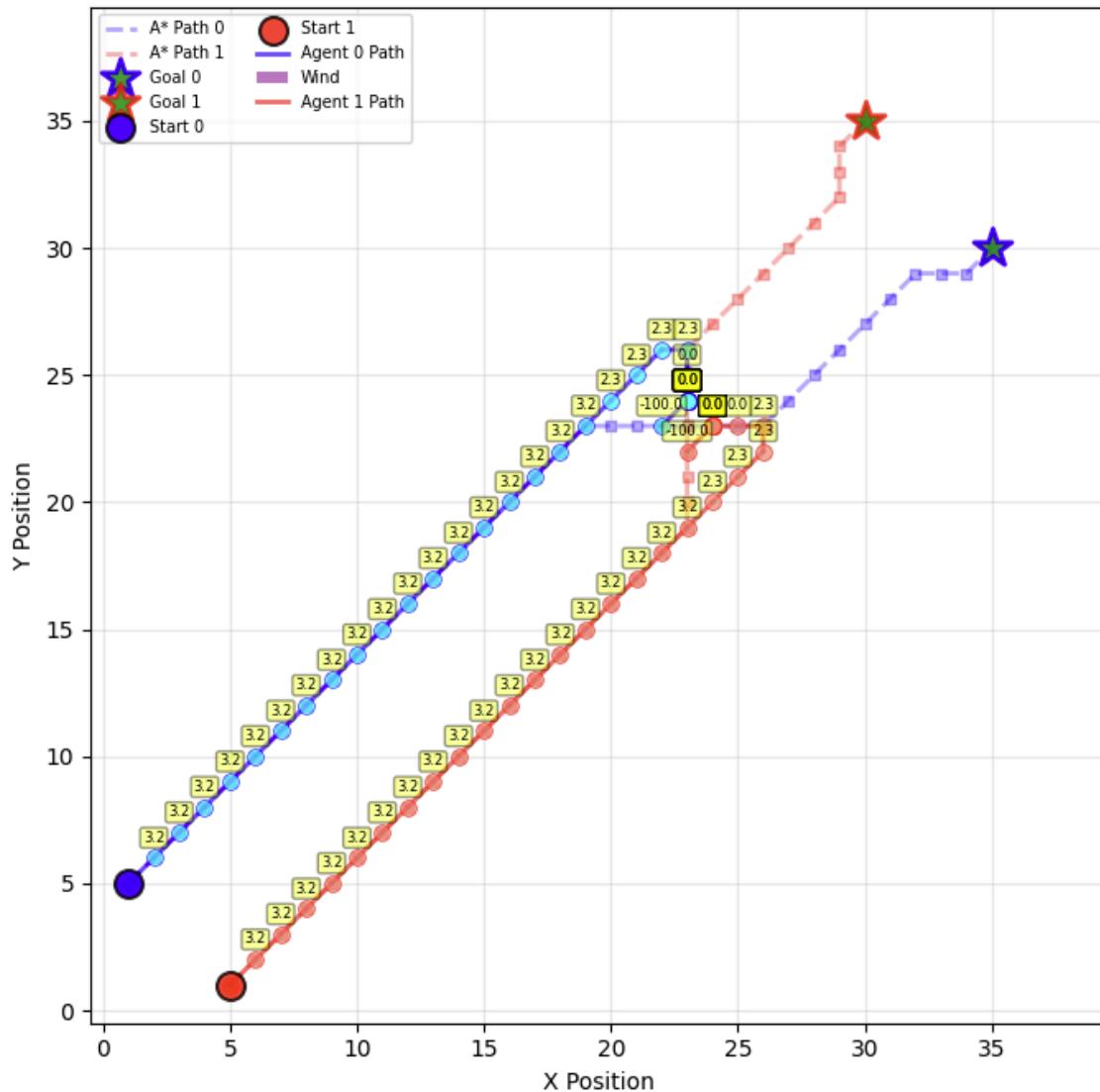
```
DISCOUNT_FACTOR = 0.8  
ROLLOUT_NUM_ROLLOUTS = 1  
ROLLOUT_MAX_DEPTH = 20
```

```
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

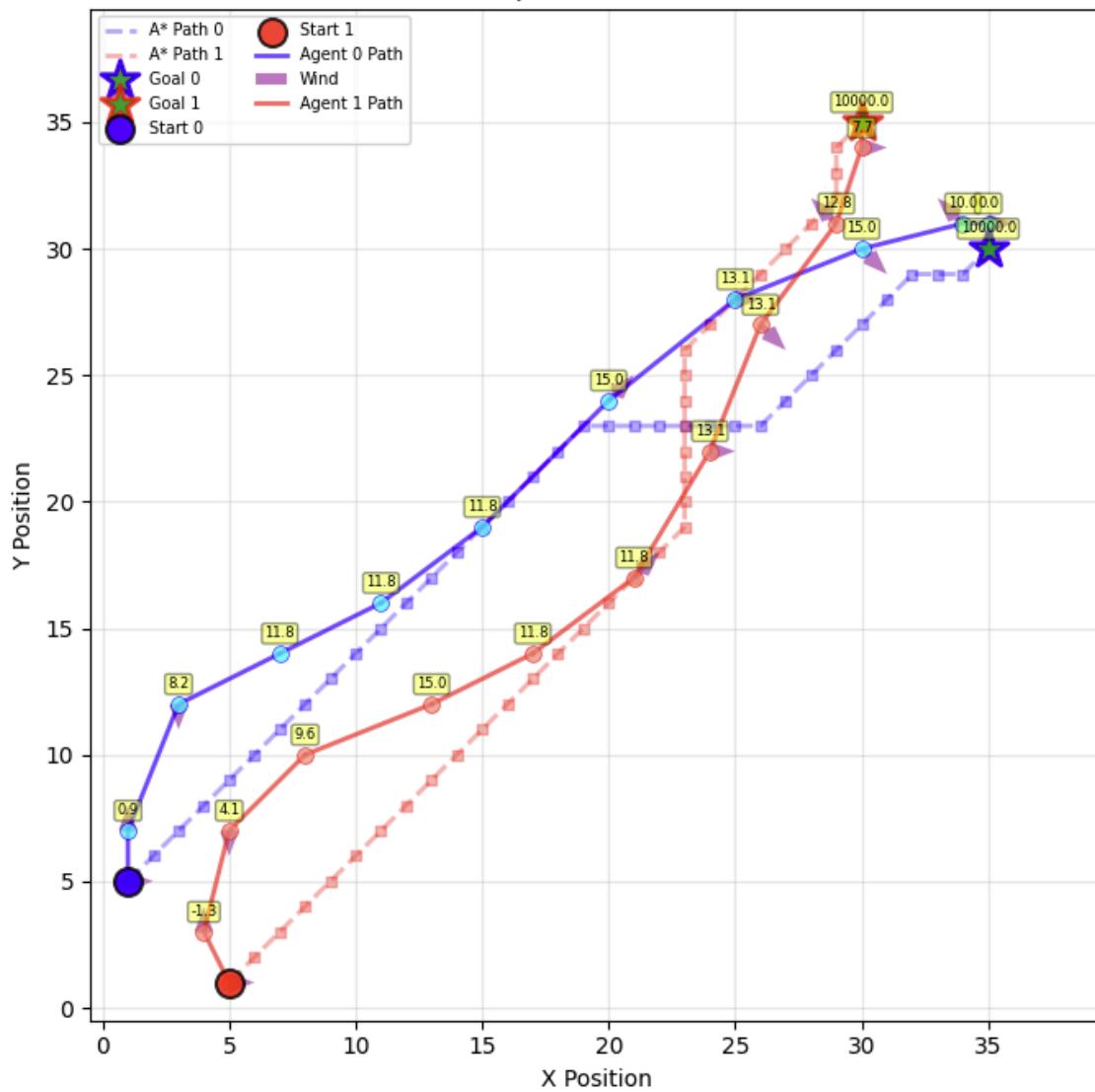
```
base_policy = AStarPolicy()
```

drone.py

Uncomment A* Path Progress to Goal

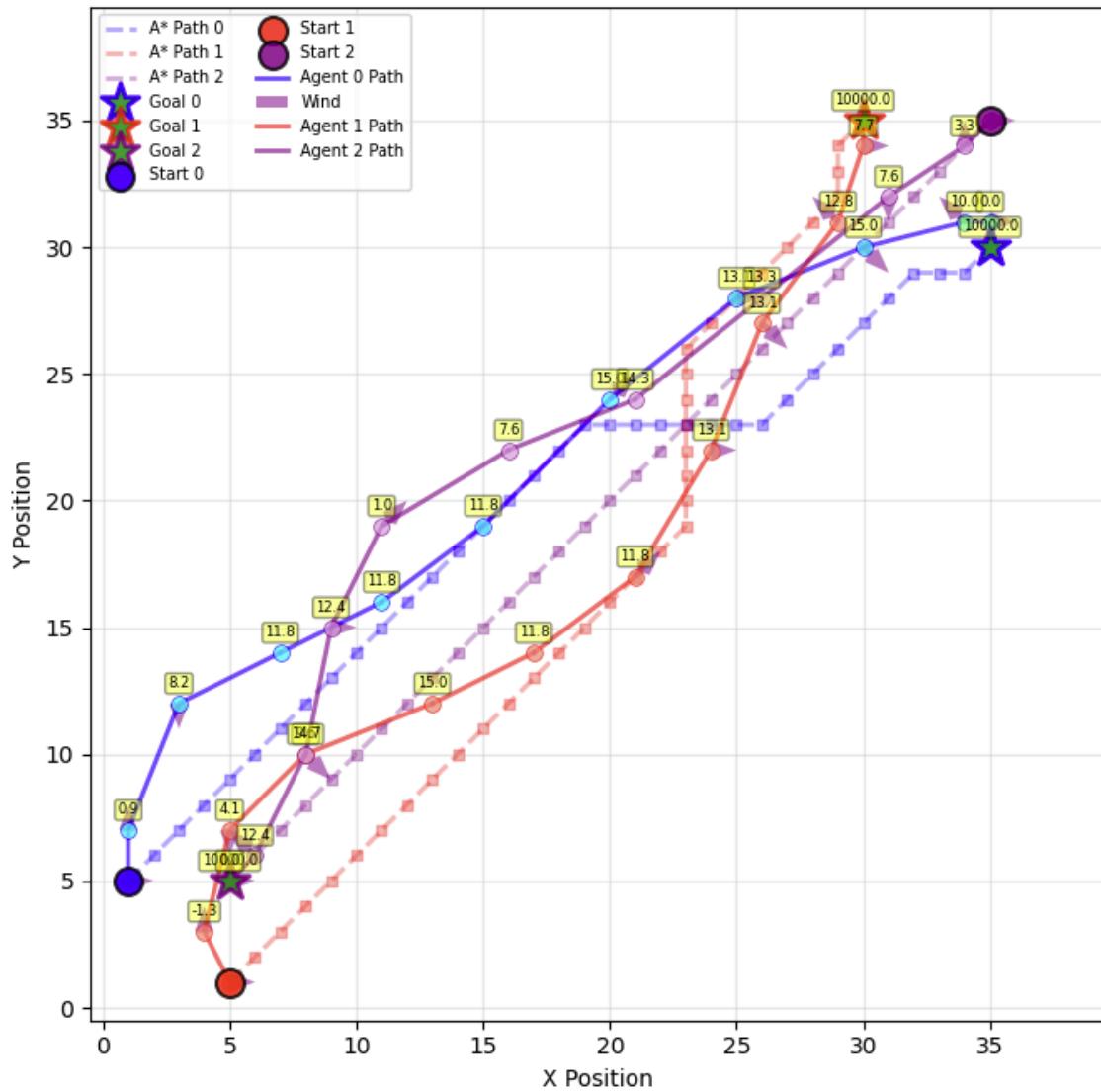
```
python3 run_mdp_multi_agent.py -t easy_empty_field_3_agents -s 500 -v 5 -a 2  
-w
```

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

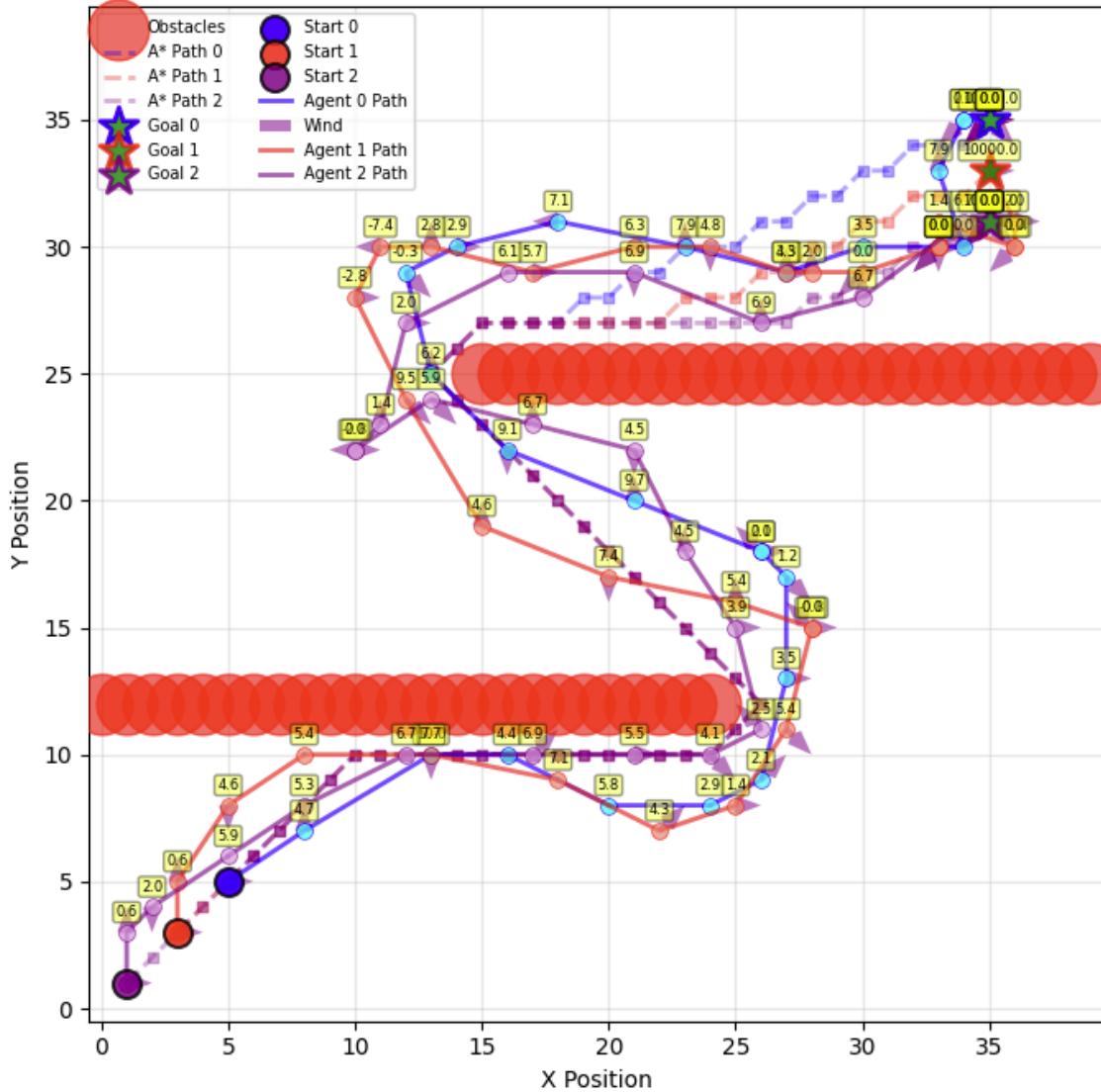
```
base_policy = AStarPolicy()
```

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

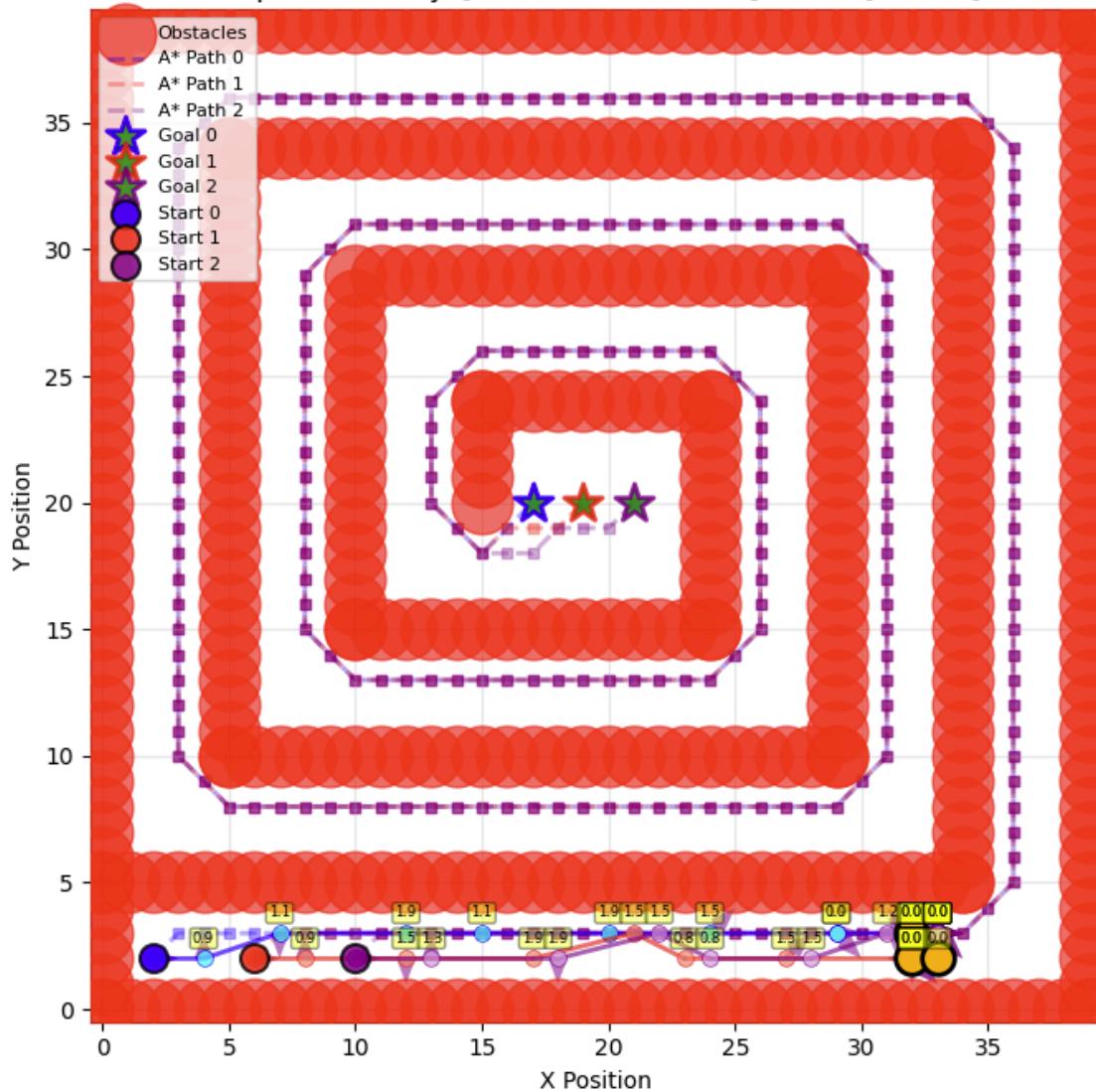
```
Uncomment A* Path Progress to Goal
```

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

Live Multi-Agent Drone Paths (Seed: 500), Time: 52.32s

Reward: 0.00, Cumulative Reward: 30.70

Step: 19, Battery: [A0:76, A1:76, A2:76], Wind: [0.0,0.0]



POMDP - Single Agent

No Wind, 1 Velocity, 1 Acceleration

Easy Scattered Obstacles - A* Policy

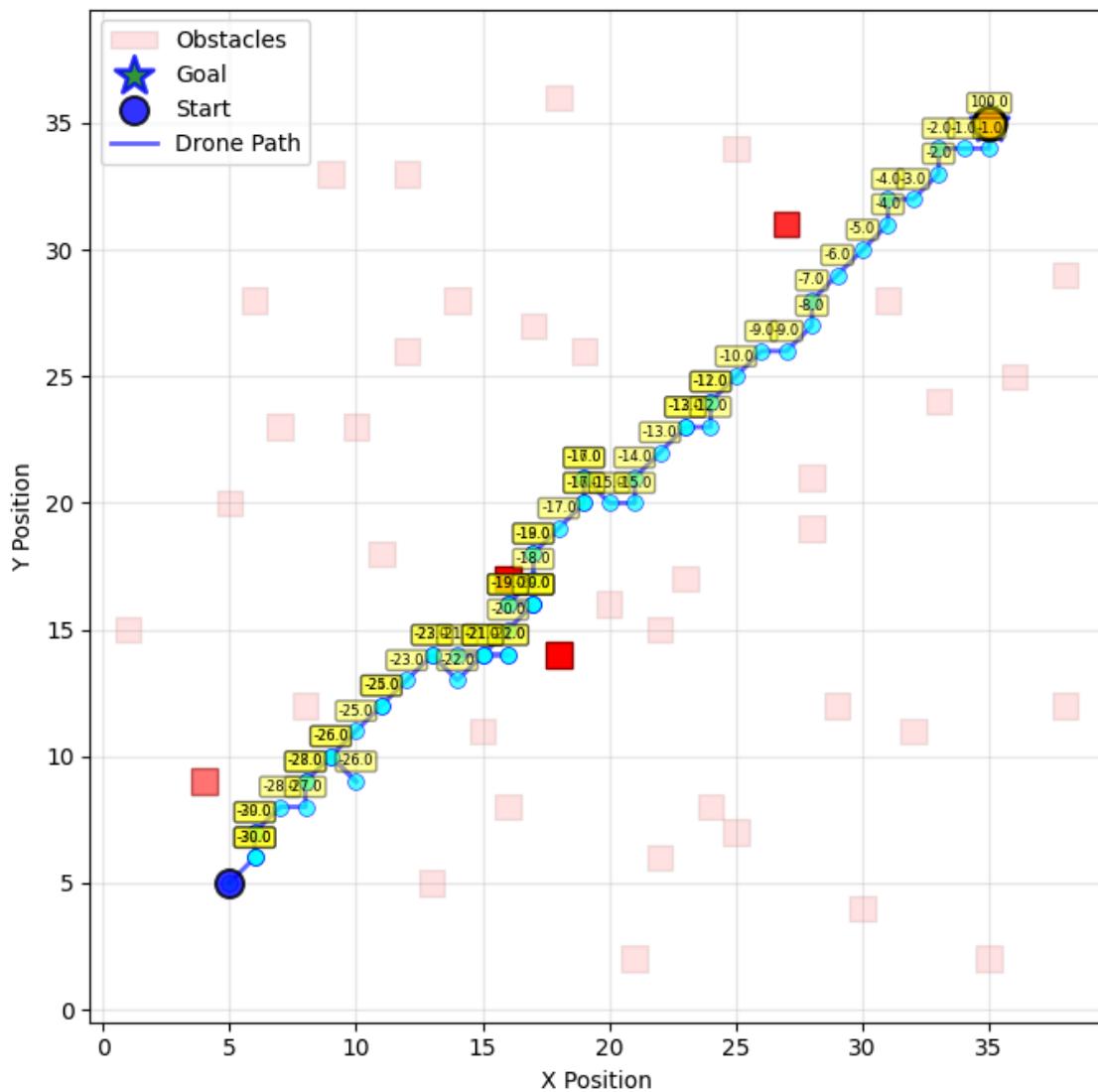
Video Demo: <https://www.youtube.com/watch?v=1vNXZmxR95g>

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

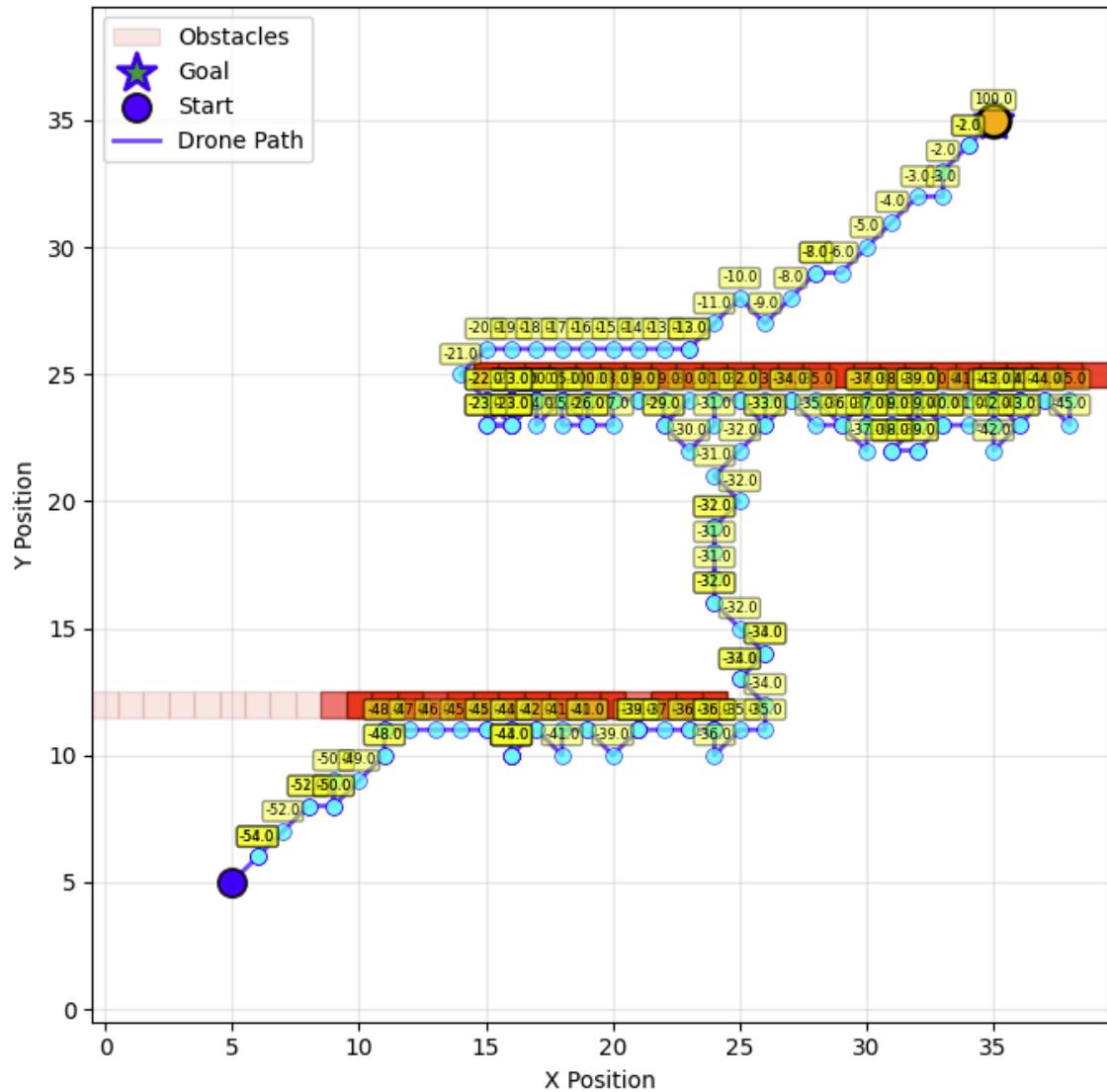
Video Demo: <https://www.youtube.com/watch?v=Q2VZL-Q9e3k>

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

