

EE/SE 492: sdmay24-08

Path Planning of Aerial Robots with Reinforcement Learning

Bi-Weekly Report 9

2/26/24 - 3/29/24

Client: Amir Niaraki

Advisor: Ali Janessari

**Team:**

Akash Setti

Andrew Sailer

Cody Draper

Jesse Gillingham

**Past Week Accomplishments:**

- Midterm project presentation video - Everyone
- Training drone to search field sparsely populated with rewards - Andrew & Jesse
  - Added new complexity to reward function in effort to learn new exploration behavior. Was not very effective.
  - Running experiments to figure out model's hyperparameters
  - Resolved a anomaly reward collection issues
  - Modifications to observation space
- Improvements to Complete Coverage - Akash and Cody
  - Changed the image processor to handle .tif files
  - Changed the image processor to handle very large images
    - Resizes the image, records points, resizes the points to the original image size, and applies a mask to the original image.

**Pending Issues:**

- Need new approaches to setting up model's reward function, and the model's parameters
- Optimization of Complete Coverage algorithm to follow state-of-the-art examples in industry by changing search pathing based on searched polygon.
- Implement parallel training of learning model to decrease time overhead of training
- Debug image processor
- Integrate image processor into complete coverage

**Individual Contributions:**

Member	Contribution	2-Week Hours	Cumulative Hours
Akash Setti	Changes to complete coverage	5	58
Andrew Sailer	Added exploration functionality to the environment. Ran more training sims.	5	95

Cody Draper	Edited the midterm video and fixed the environment to work with complete coverage again	8	72
Jesse Gillingham	Worked with Andrew to think of new ways to change the reward algorithm to better train the agent	4	72

### Plans for Next Week:

- Reinforcement Learning (Andrew & Jesse)
  - Do some independent research of RL experiments related to exploration
  - Lots of training experiments to optimize model hyperparameters
  - Output list of locations when demoing (testing)
  - Explore options to run training simulations in parallel to decrease time overhead
    - Explore ways to average model outputs for different training data in parallel
- Complete Coverage and Environment
  - Integrate image processor into complete coverage
  - Alter complete coverage to accept arguments
    - “-p” flag to process image
    - “Image” argument to signify cc to not randomly generate a world but use the one provided.

### Peer Feedback:

#### Summary

- High-level design was well-done and easy to understand
- Concern on comparison of RL and complete coverage design
- RL search algorithm needs development

#### Surprising Feedback

- The reviewers were impressed with the demo, which was surprising seeing as the RL model didn't fully work at this point.
- We hadn't spent much time nailing down exactly how to compare each model's performance, but it's a question we need to start asking ourselves as we run out of time in the semester.

#### Resulting Changes

- Will be adding functionality to visual analyze each models' generated path. This should allow for easier comparison between the two
- Discuss with our client and advisor how to best compare each models' performance in terms of battery, time, anomalies found...