EE/SE 492: sdmay24-08
Path Planning of Aerial Robots with Reinforcement Learning
Bi-Weekly Report 7
1/29/24 - 2/9/24
Client: Amir Niaraki
Advisor: Ali Janessari

Team:
Akash Setti
Andrew Sailer
Cody Draper
Jesse Gillingham

Past Week Accomplishments:
- Line Follower Model Training - Andrew
    - New map created
    - Successfully ran training algorithm
    - Resolved location resetting issue for each simulation
    - Trained 3 different models, the 3rd of which successfully followed the line
- Improvements to Complete Coverage - Akash and Cody
    - Developed ways to segment the areas of the image to run the CC algorithm
    - Now able to run CC algorithm vertically and horizontally

Pending Issues:
- Reevaluate cost and wind function, make sure math still makes sense and drone behaves as expected
- 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

Individual Contributions:

Member	Contribution	2-Week Hours	Cumulative Hours
Akash Setti	Refinement and improvements to the Complete Coverage Algorithm	10	45
Andrew Sailer	Started training models and resolving environment issues	15	75
Cody Draper	Refinement, abstraction, and improvements to the Complete Coverage Algorithm and Environment	10	50
Jesse Gillingham	Management and RL training ideas	12	60

Plans for Next Week:
- Reinforcement Learning
    - Add termination condition to simulation (80% of rewards collected)
    - Use A2C
    - Randomize Location for each new simulation
    - Set height range to 80-400ft
    - Add constant to movement cost to represent hover
    - 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
    - Complete the change of design for the complete coverage algorithm to handle vertical bias searching as well as the currently implemented horizontal bias search method.
    - Alter the current design that operates under the assumption of one polygonal area to search to work with multiple polygonal areas.
    - Design a way for the agent in complete coverage to traverse from polygonal area to polygonal area in a way that adequately matches a realistic model.
    - Alter the environment to start the simulation in a varied location depending on the polygonal search area while optimizing the maximum searched area per move.