OSD Modeling and Simulation

Alexander Hung, Sydney Kim, Grayson Levy, Jerome Wasserman

Project Sponsor: Nicholas Iorio, Gloria Choo, Department of Defense (DoD)

INFORMATION & COMPUTER SCIENCES
UNIVERSITY of HAWAIʻI at MĀNOA

NATIONAL SECURITY INNOVATION NETWORK

Spring 2024
ICS 496

Introduction

Background Information

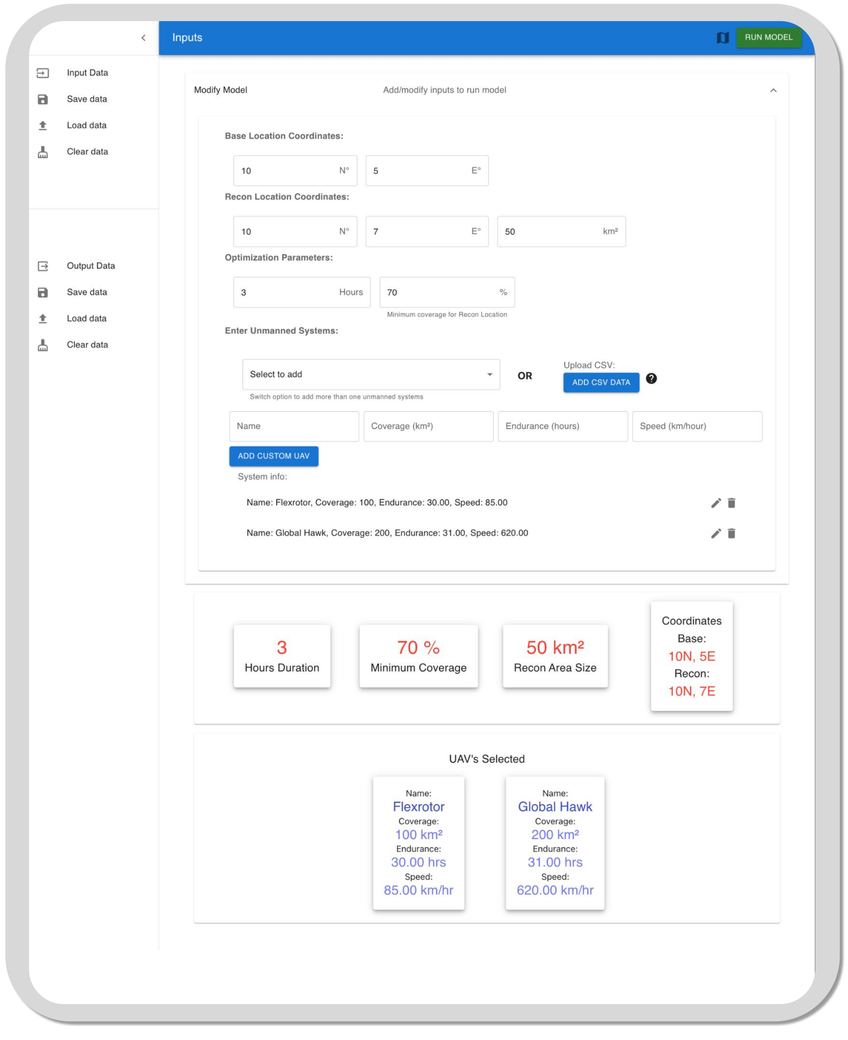
The U.S. government is interested in exploring models to inform optimization planning for the use of unmanned systems employment.

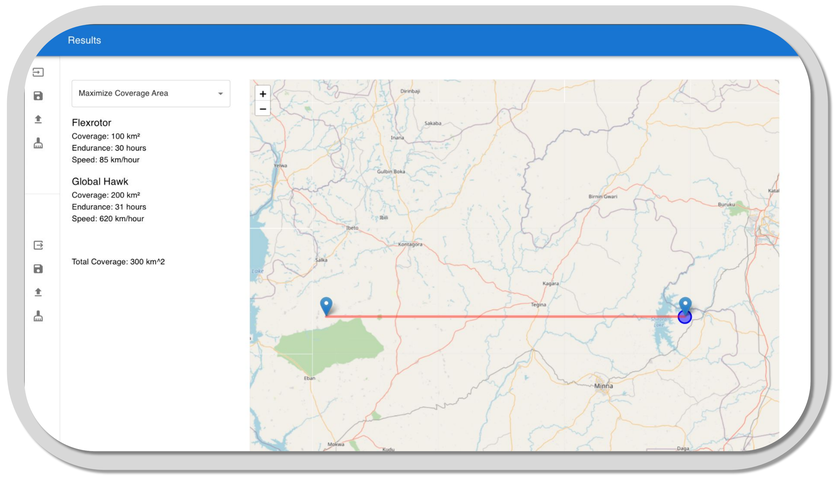
Methodology

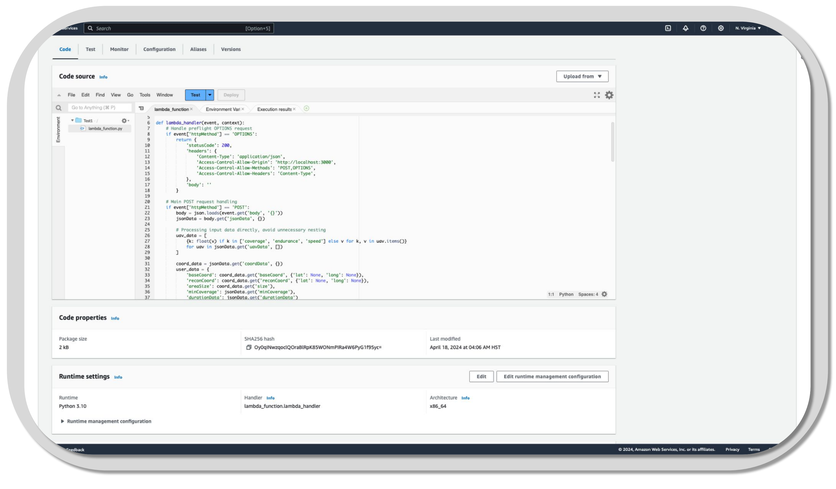
- Project Management:
  - Regular sponsor meetings, 2x weekly internal team meetings
  - Independent model research + UI integration
- Tech Stack:
  - Python, PULP, Pyomo, ReactJS, AWS

Model Optimization

We designed a web application that combines a simple, easy to use user interface with an optimization model defined by user inputs to select the ideal combination of unmanned autonomous vehicles and display results.







Solution

Tasks Accomplished

- Created model that selects the optimal autonomous vehicles for user-defined criteria including mission duration, base point, and range and implemented model using AWS API.
  - Used Halversine algorithm.
  - Allow user to upload autonomous vehicle data from CSV file or manual input through UI.
  - Objectives: Maximize coverage area, maximize time at recon point, minimize drones used
- Interactive UI with backend support.
  - Inputs & Result pages: Coordinates, Drones & optimization parameters.
  - Map displays base and recon locations in the map using markers & Geodesic lines/circle.

Learnings

- Exposure to different Python-based modeling languages.
- Defining and designing an optimization model.
- Utilizing AWS API to connect front end and back end.
- Practice with ReactJS.

Challenges

- New tech stack: optimization languages and AWS API.
- Balancing simplicity and model customization.
- Designing a working model with use of the AWS API.
- Managing client needs/implementation.