MICHIGAN STATE UNIVERSITY

Project Plan

ERP Air Force: Conservation Threat Detection

The Capstone Experience

Team Evolutio

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From Students…
…to Professionals

Functional Specifications

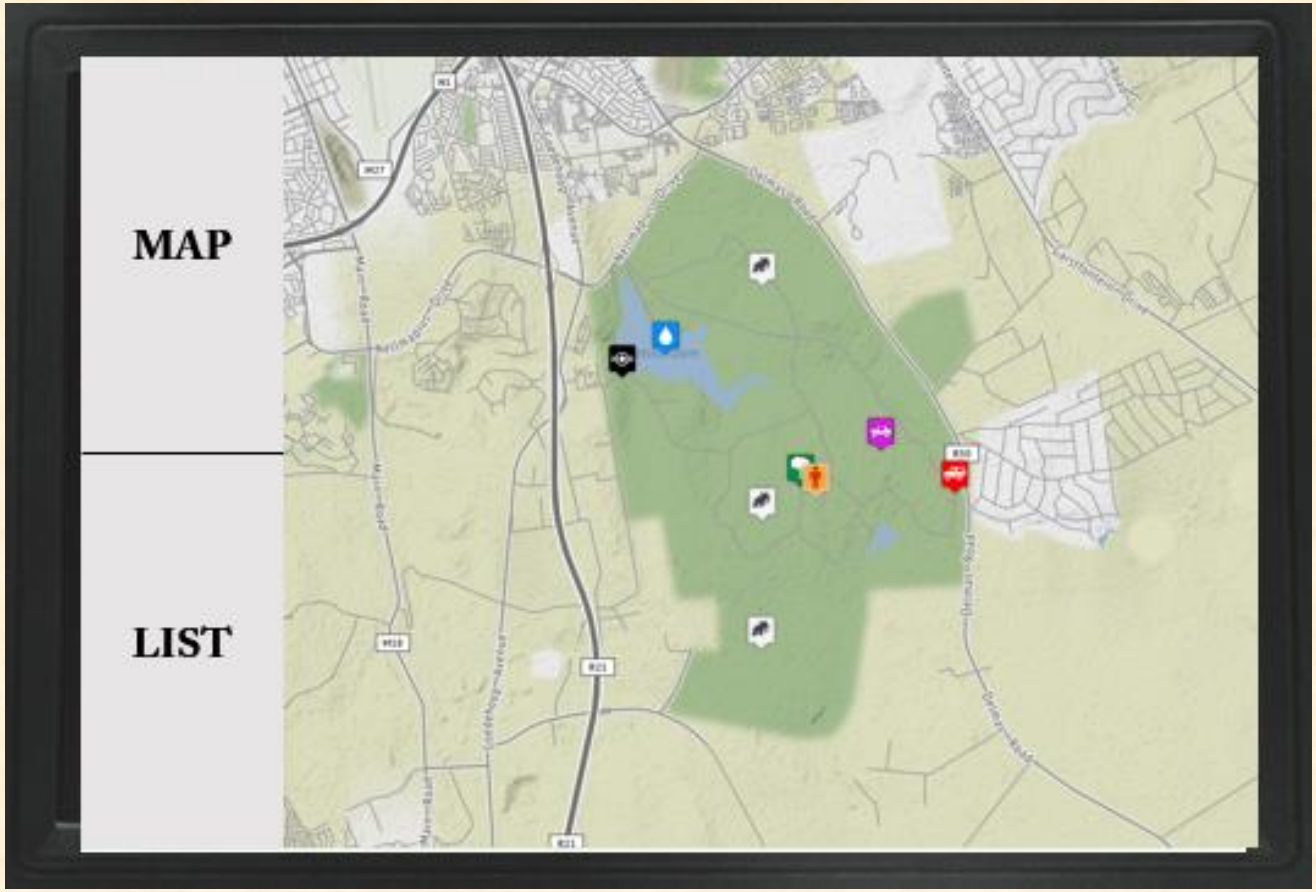
- Protect wildlife in Southern Africa
- Identify and classify threats using drones
- Monitor sudden changes in landscape
- Clearly communicate threats through visual interface
- Silently convey information to Ranger without use of visual display
- All as close to real-time as possible

Design Specifications

- User interface organizes relevant information about threats and allows the user to interact with the system
- Displays location of perceived threats in relation to ranger
- Small vibration motors in the shoulders and back of the vest can alert rangers of direction and distance of nearby threats

Screen Mockup: Raspberry Pi Screen

Main Screen/Map



Screen Mockup: Raspberry Pi Screen

LIST

Screen Mockup: Raspberry Pi Screen

New Threat

Screen Mockup: Raspberry Pi Screen

Responded Threat

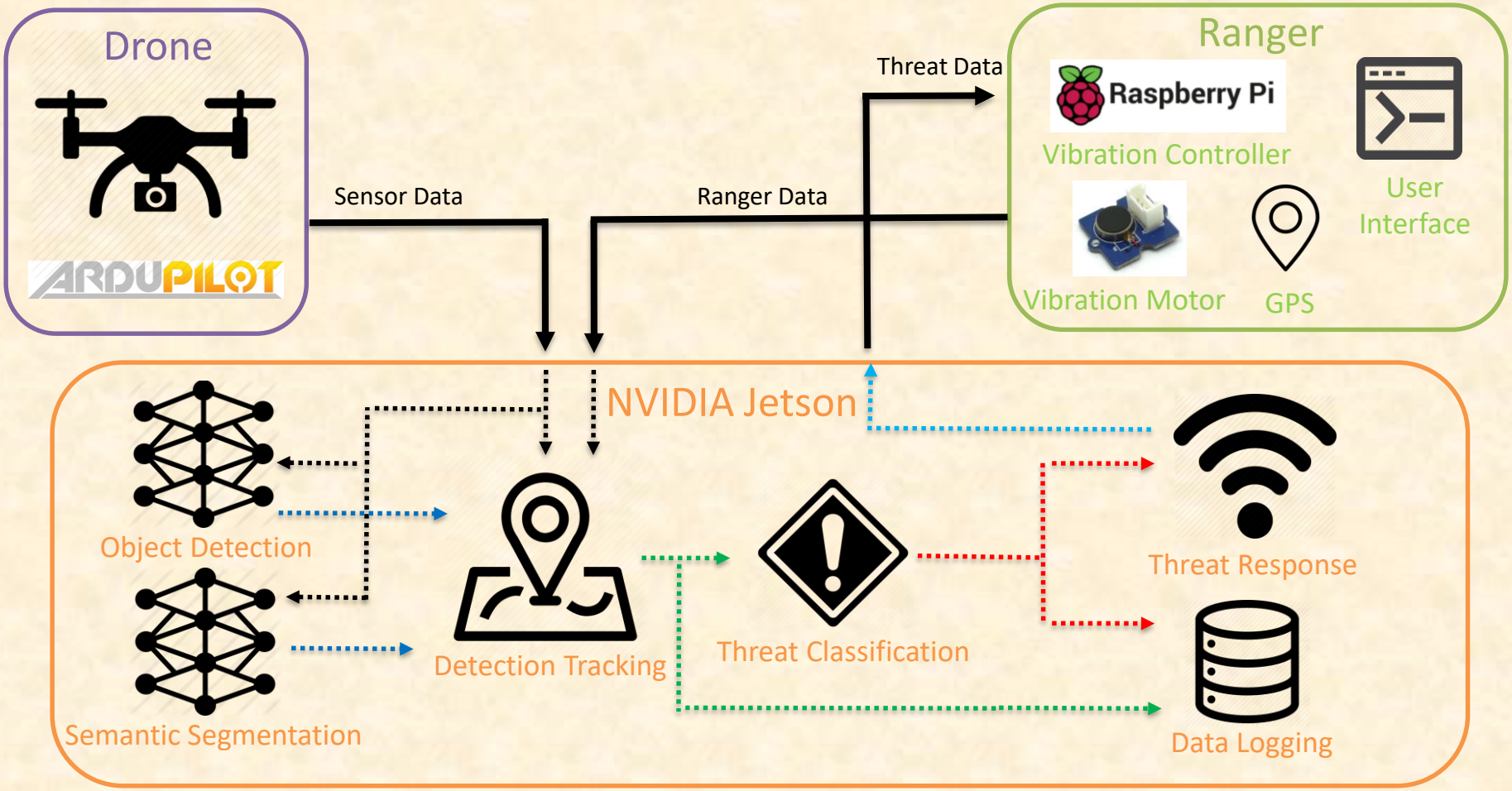
Screen Mockup: Raspberry Pi Screen

Direction/Respond

Technical Specifications

- Perception
  - Object Detection
  - Semantic Segmentation
- Mapping
  - Detection Tracking
  - Threat classification
  - Logging
- Action
  - Threat Response
  - Vibration Vest Alert
  - HMI Alert

System Architecture



System Components

- Hardware Platforms
  - Drone
  - NVIDIA Jetson
  - Raspberry Pi
  - Grove Vibration Motor
- Software Platforms / Technologies
  - Ardupilot
  - Darknet / YOLO
  - Tensorflow
  - Tkinter

Risks

- Detect Changes in Environment
  - Identifying sudden changes in landscape; ie fires, floods
  - Mitigation: Semantic Segmentation
- Wearable technology for threat directions
  - Alert rangers to the location of the threat without them having to look at a device
  - Mitigation: Device with vibration sensors on vest
- Ranger/drone/sensor connection
  - Rural environment with unreliable internet service
  - Mitigation: Use a wi-fi enabled device for the UI
- Amount of available training data
  - Most of the footage is of elephants, limited footage of vehicles and people
  - Mitigation: Finding images and footage online that will satisfy our training needs

Questions?