ERP Air Force: Drone Elephant Recognition and Tracking

The Capstone Experience

Team Evolutio

Tyler Lawson
Rei Doko
Jeremy Arsenault
Nic Wiggins
Kunyu Chen

Department of Computer Science and Engineering
Michigan State University
Fall 2019
Functional Specifications

• Problem: Preserve and protect South African wild Elephants
  ▪ Current efforts are expensive and labor intensive

• Solution: Automate tracking and identification of Elephants
  ▪ Identify moments in video where Elephants are in the frame
  ▪ Inform rangers where to search for Elephants
Design Specifications

• Create machine learning models for detection, auto-identification, and location prediction of elephants
• Build an API for high level access to each model
• Build a dashboard for user-friendly interaction with the API
Screen Mockup: Dashboard Home (Light Theme)
Screen Mockup: Dashboard Home (dark theme)
Screen Mockup: Elephant Similarity

Elephant Similarity: 100%
Screen Mockup: Detection

Elephant Detection
Technical Specifications

• Detection
  ▪ YOLOv3

• Identification
  ▪ Multi-layered neural network for developing a similarity metric for Elephants

• Tracking
  ▪ Two separate RNNs for longitude and latitude
  ▪ Trained with historical GPS, elevation, and vegetation data
System Architecture

Footage → YOLOv3 → Detection → NN → Recognition

GPS Database → Python + Flask API → VueJs UI

GPS Location → Feature Extractor → RNN → GPS Prediction
System Components

• Hardware Platforms
  ▪ HPCC for training models
  ▪ Project run and hosted locally

• Software Platforms / Technologies
  ▪ UI: Vuejs
  ▪ API: Python Flask
  ▪ Machine Learning: YOLOv3 & Tensorflow
Risks

• Drone Footage not fit for model
  ▪ Resolution limits ability to label and detect elephants
  ▪ Request closer drone footage

• Lack of Verification Data
  ▪ Unable to verify an identified elephant is truly the same elephant
  ▪ Use famous elephants to develop similarity metrics

• Quantity of GPS data
  ▪ Need GPS data from a long period of time to accurately predict movement
  ▪ Use data from other sources

• Elephants Indistinguishable from above
  ▪ Elephant image recognition is not necessarily possible from a drone
  ▪ Focus more on trail cam footage and GPS prediction
Questions?