

Goose Chaperone

Senior Design Fall '19 Group 17

Client/Faculty Advisor: Dr. Randall Geiger

Alec Morris | Johnson Phan | Weston Berg | Woodrow Scott | Zhihao Cao

Motivation

- The Canadian Goose is a nuisance that plagues golf courses across the country
- There is currently no universally-agreed-upon, effective way to rid these animals from golf courses
- Over the last two semesters, our team has worked to develop an autonomous robot that can detect and deter geese

Design Requirements

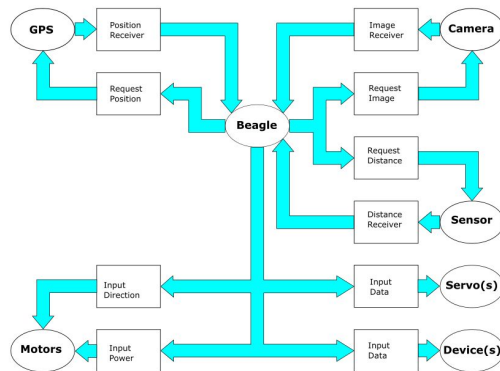
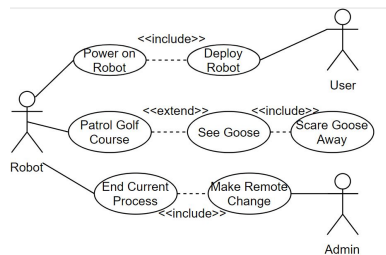
Functional/Non-Functional Requirements

- Autonomous robot able to operate in outside environment
- Image processing capable of recognizing geese
- Non-lethal deterrence tactics
- Clean, maintainable code

Engineering Constraints

- Limited budget - \$400 for entire robot
- Limited controller memory and processing power

Design Approach



Intended Users and Uses

- Golf course managers are the primary intended users
- Chasing geese away from specific areas is the use of the robot

Technical Details

Controller

- Beaglebone Black
 - Prototyping board with GPIO, USB header, and 10/100 Ethernet

Image Recognition

- Tensorflow
 - High speed classifications of geese, humans, and hazards
- OpenCV
 - Supplements Tensorflow to determine position of detected objects

Sensors

- GPS - Adafruit module, 10HZ refresh using WAAS positioning system
- Ultrasonic - Non-contact distance measurements from ~ 2cm to 5m
- Camera - Logitech C270 webcam connected over USB

Motors

- DC - Two 12V, brushed DC motors with dual motor driver
- Stepper - 5V stepper with motor driver

Component Tests

- Motor testing
- Ultrasonic Sensor testing
- Camera testing
- GPS testing
- Image Processing testing
- Scare Technique testing

Integration Tests

- Compatibility testing
- Microcontroller testing
- Data flow testing
- Navigation testing
- Robot movement testing
- Safety testing

Project Resources

- Low manpower effectiveness - team only had one microcontroller to test modules; this resulted in slow development time

Relevant Standards

- IEEE 1008-1987: Standard for Software Unit Testing
- IEEE 1625-2004: Standard for Rechargeable Batteries for Portable Computing