STEVENS
INSTITUTE of TECHNOLOGY
THE INNOVATION UNIVERSITY®

The Owl Spy

ME322 Design VI

Group LA5
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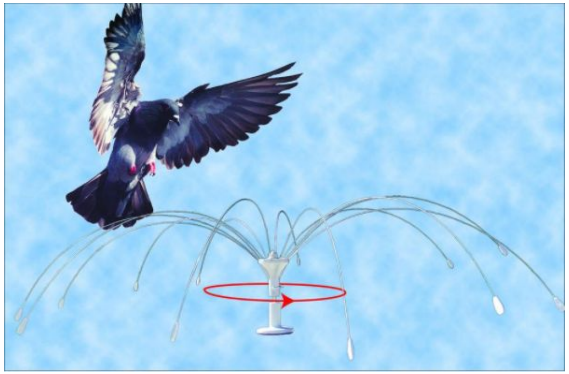
Problem Statement

- Garden Pests have caused issues since the dawn of humankind
- Current Products on the market are not effective, or are tailored to specific pests
- Introduce: The Owl Spy

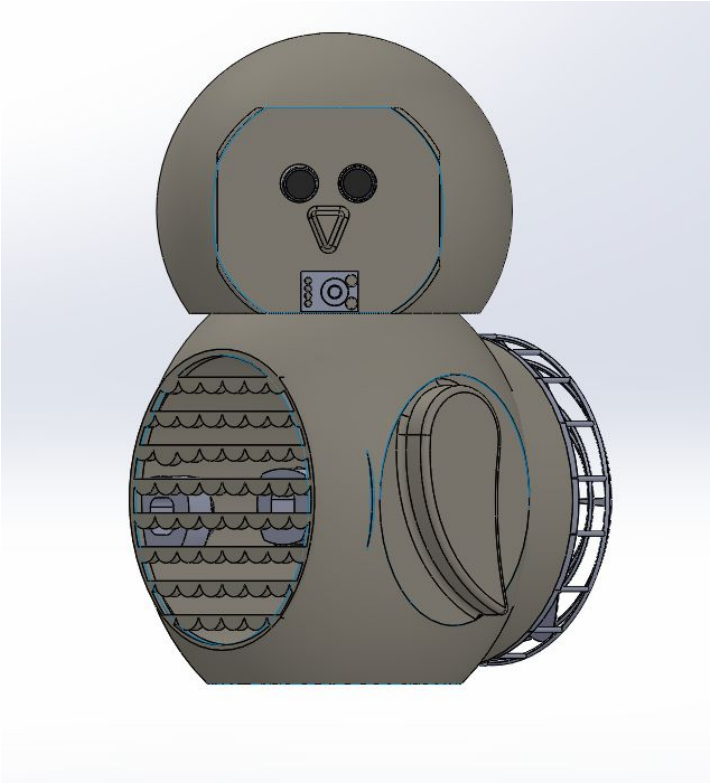


The Bird Spider

The Guardian

The Owl Spy

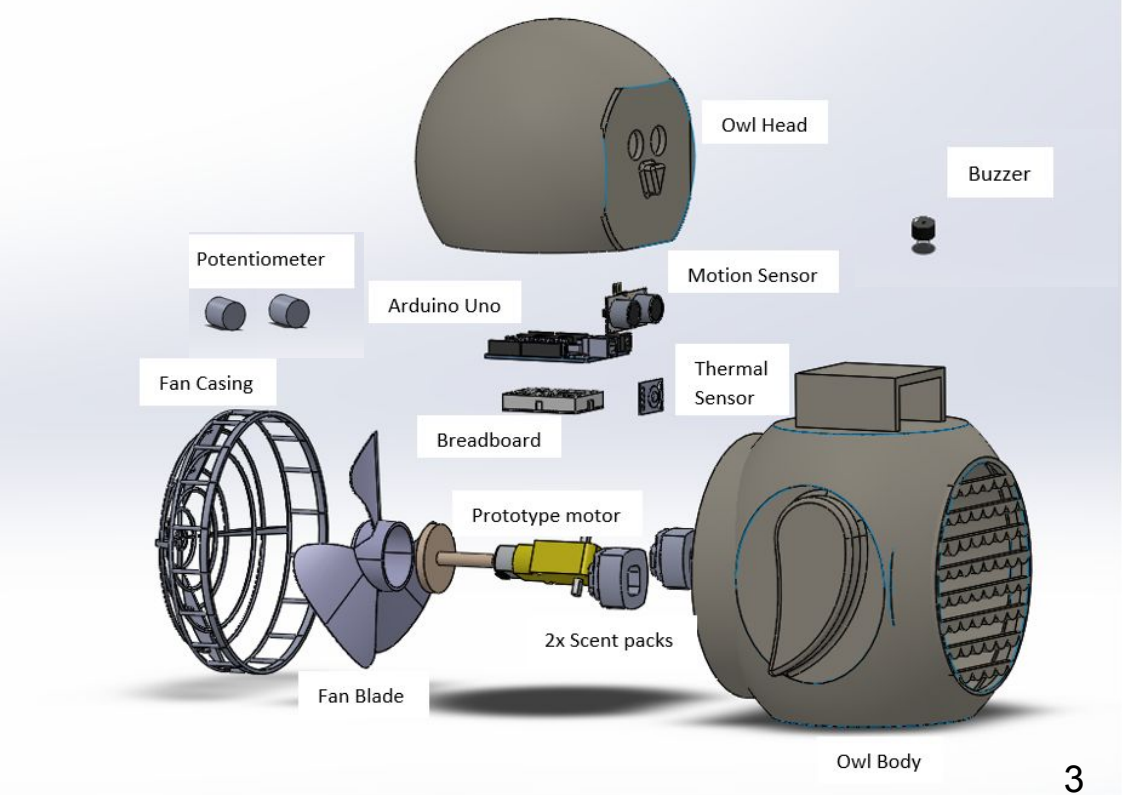
- Successfully wards off all types of pests due to unique combination of deterrents:
  - Shape of owl
  - Ultrasonic Sounds specific for user-inputted animal
  - 360 degree head rotation
  - Fan equipped with scent packs
  - Combines Motion and thermal sensors for Auto-detection (Once configured to the users garden needs, no human intervention needed)
- 100 % Humane



The Owl Spy

The Owl Spy Parts

- Engineered to withstand all types of weather using a 1 inch thick opaque polycarbonate plastic casing for the owl
  - Very Durable
  - Low thermal conductivity
  - Waterproof

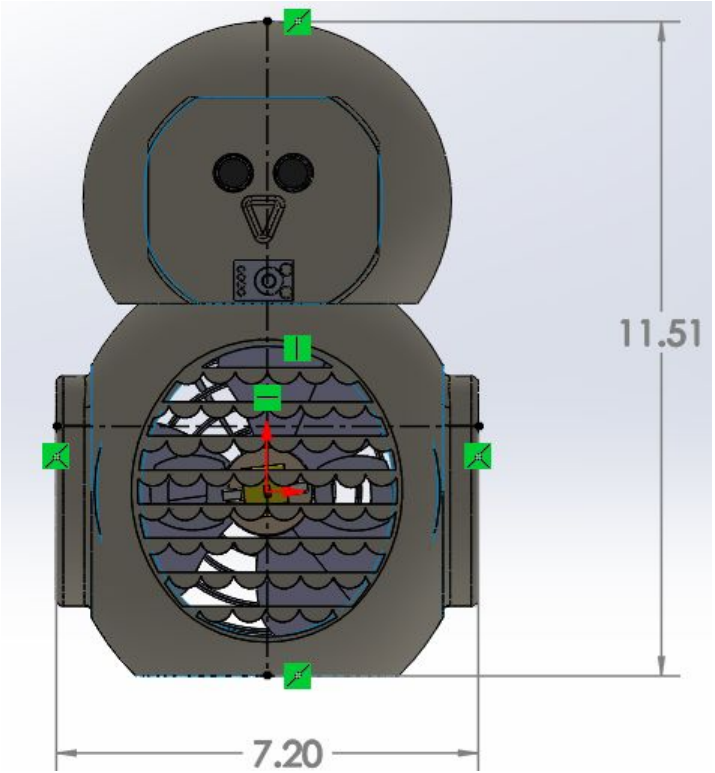


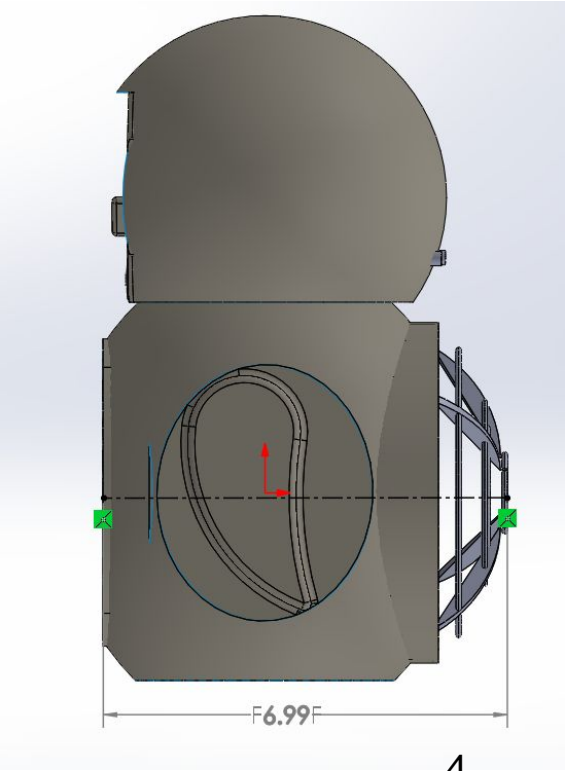
Dimensions and Weight

- Density:
  0.043 lb.in^3
- Total Mass including casing, fan, and all other components:
  ~ 9 lbs
- Small and light enough to fit within a 12x12x12 box an be shipped easily

Mass properties of complete
Configuration: Default
Coordinate system: -- default --

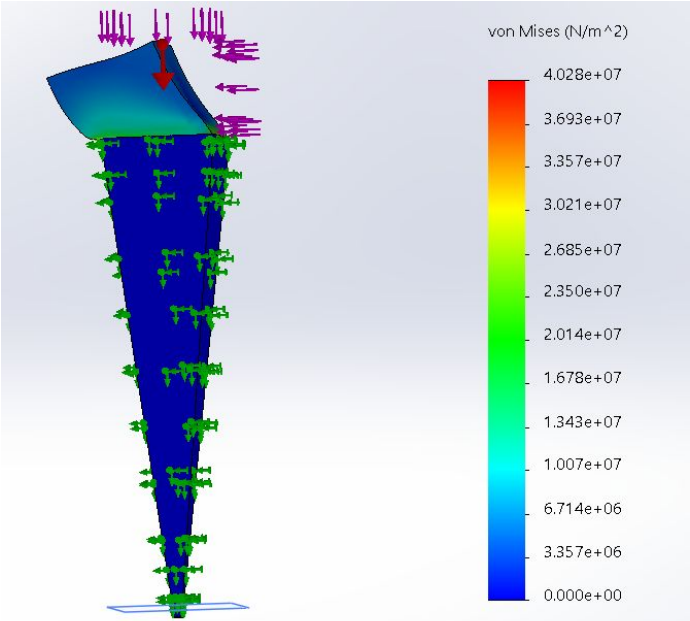
Mass = 8.66 pounds

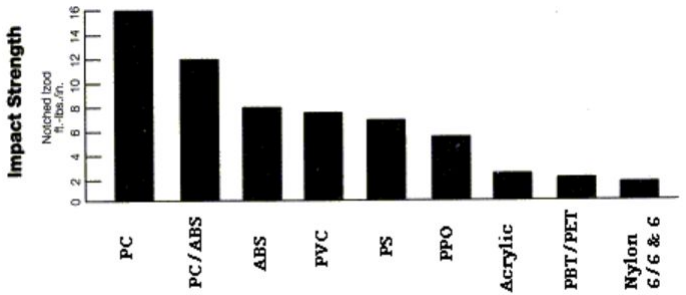


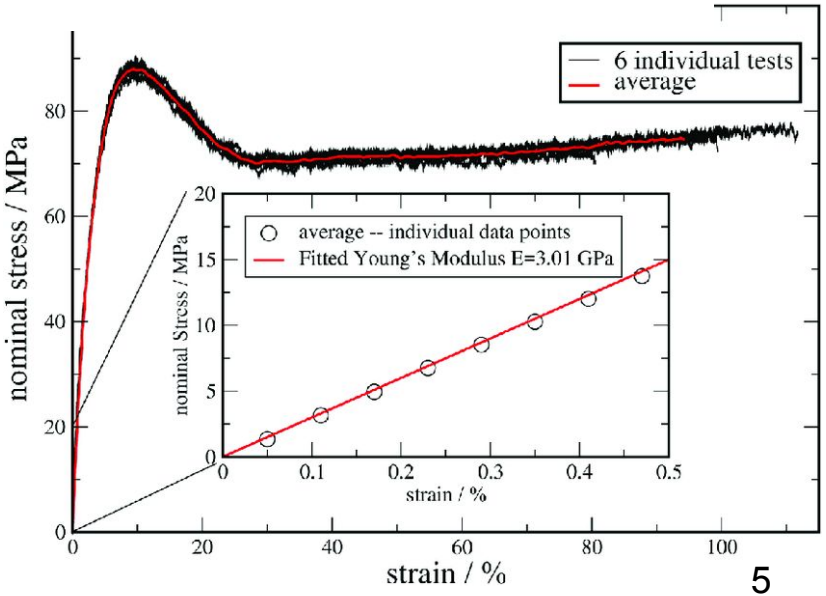


Casing Material Properties

- Inclusion of a stake to accommodate gardeners who want to guarantee our product will stay put

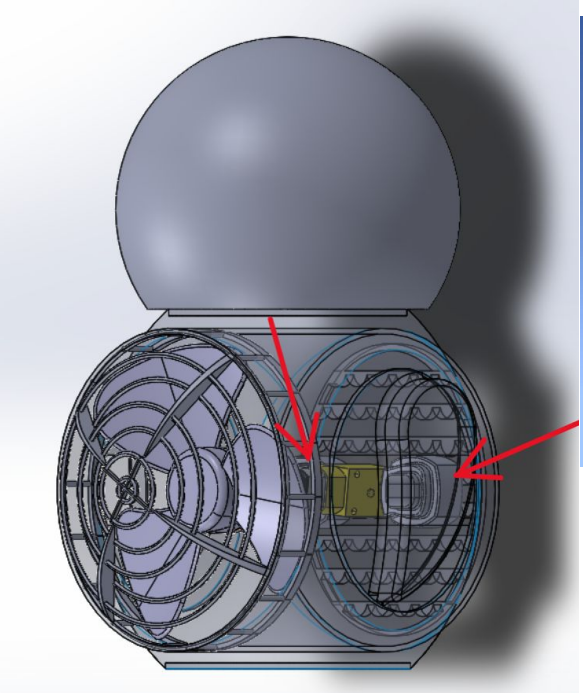






The Scent Packs

- Uses Essential Oils of your choice (recommend lavender, peppermint, citronella ect,)
- When Clip Snaps onto owls stomach, small holes get punctured into oil pack to allow oils to soaks into a porous material
- Fan will suction in air from front of owl which will pass through these packs and spread the scent around the garden
- Refill once a month



Location of Scent Packs

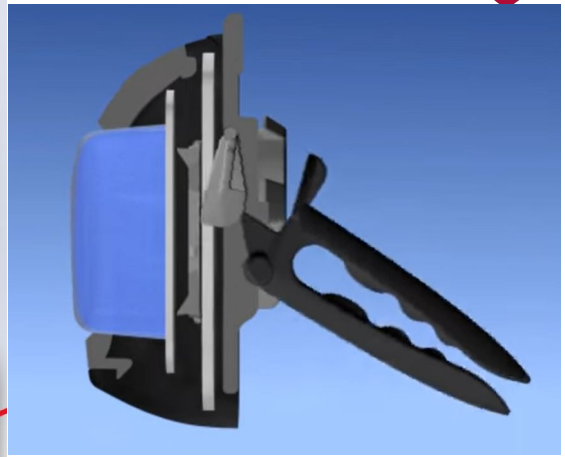
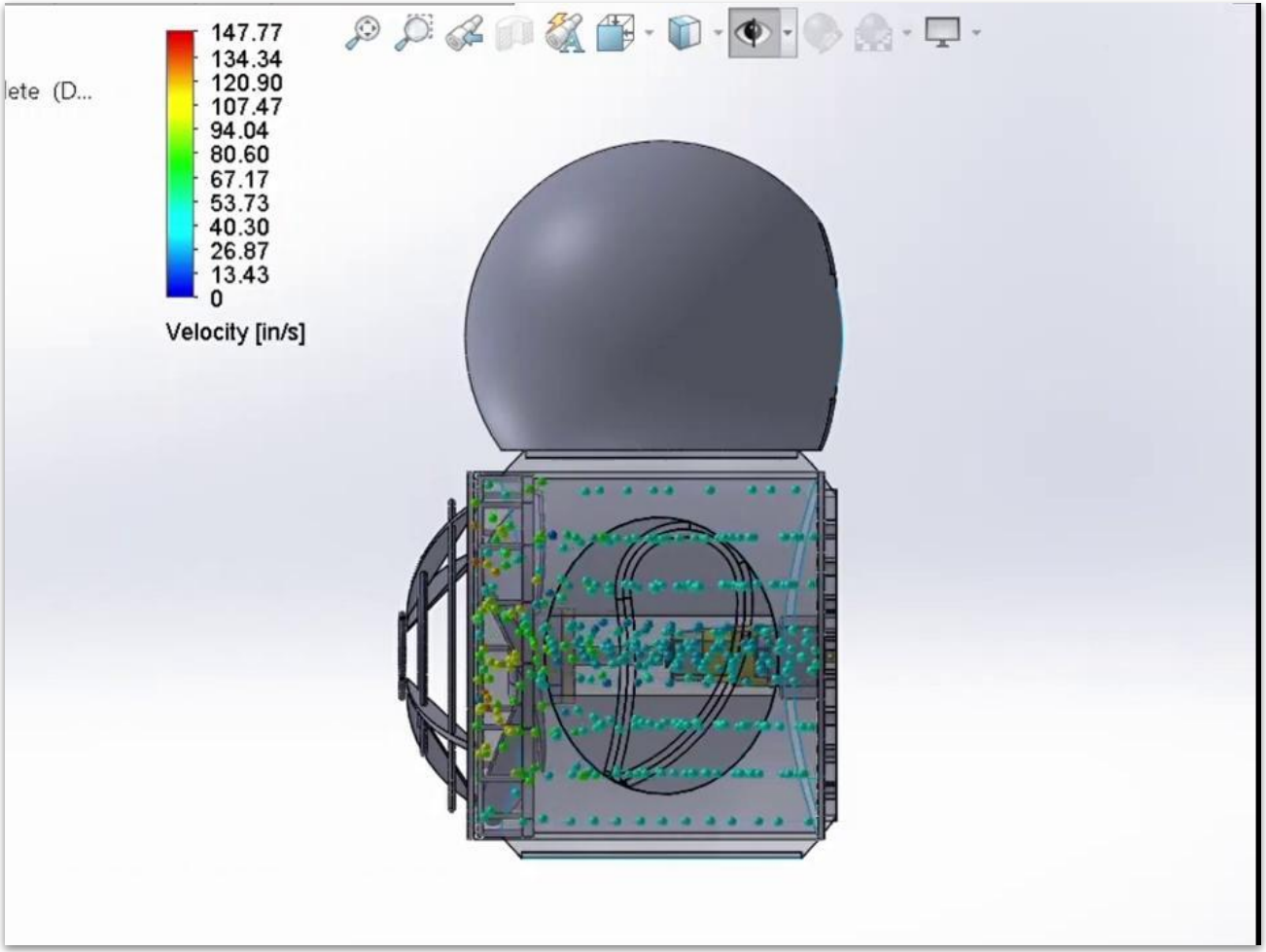


Illustration of how scent packs work taken from *Febreze Car Air Freshener for Odor Elimination* which use the same technology


lete (D...
147.77
134.34
120.90
107.47
94.04
80.60
67.17
53.73
40.30
26.87
13.43
0
Velocity [in/s]

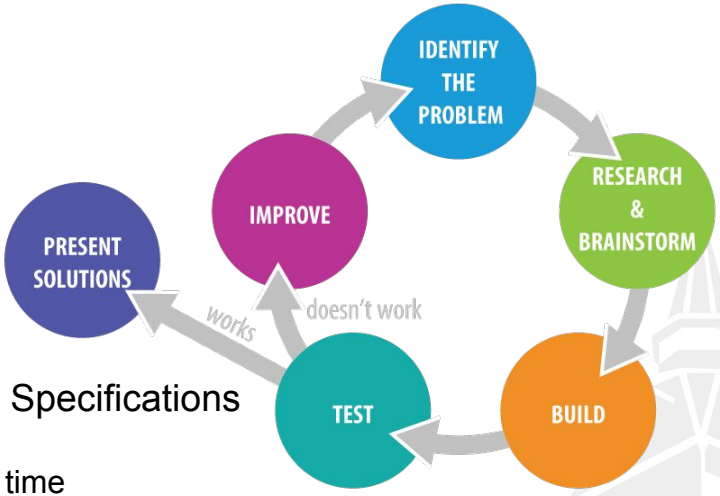
Power Consumption

4 Double A Batteries For Operation

Component	Max Voltage	Current Draw	Power Consumption
Arduino Uno	5V	40mA (each pin) (9)	(5)(40)(9)= 1800mW
Hobby Geared Motor	4.5V	190mA	(4.5)(190)= 855mW
Distance Sensor	5V	15mA	(5)(15)= 75mW
Piezoelectric Buzzer	5V	35mA	(5)(35)= 175mW
Temperature Sensor	3.3V	1mA	(3.3)(1)= 3.3mW
Servo Motor	5V	10mA-500mA (dependent on load	(5)(500)=2500mW
Total			5.408W

Values Taken From SparkFUN Website

Progression of Design



Conflicts & Redesigns to Meet Consumer Needs & Specifications

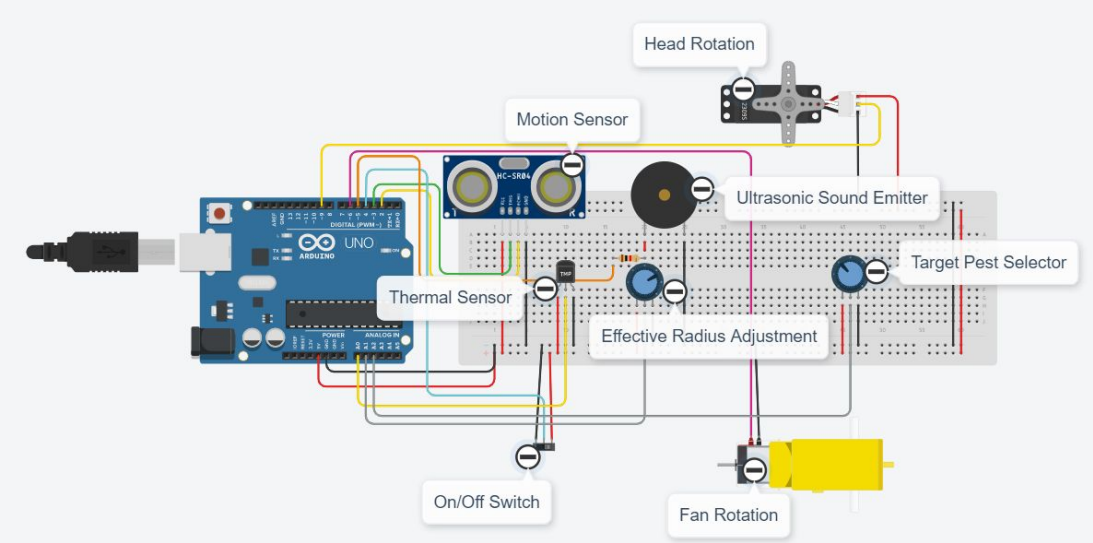
- Problem: Ultrasonic sound becomes ineffective over time
  - Solution: Design product shell in shape of a predator; pests associate sound with predator
- Problem: Sensor cannot decipher between different animals
  - Solution: User selects pest target for product to emit appropriate ultrasonic frequency
- Problem: Product Setup is obstructive to garden aesthetic
  - Setup: Product sits on a pole stand placed next to garden OR is attached to the top of a fence
  - Solution: Design product shell in shape of an owl, rather than a plain unattractive box

- Problem: User may be allergic to repellent scent
  - Solution: Make repellent scent interchangeable
    - Scent packs
    - User personalization
- Problem: How can we ensure the whole garden is protected?
  - Solution: Sensors are in owl's head, and the head rotates - almost - 360

Software

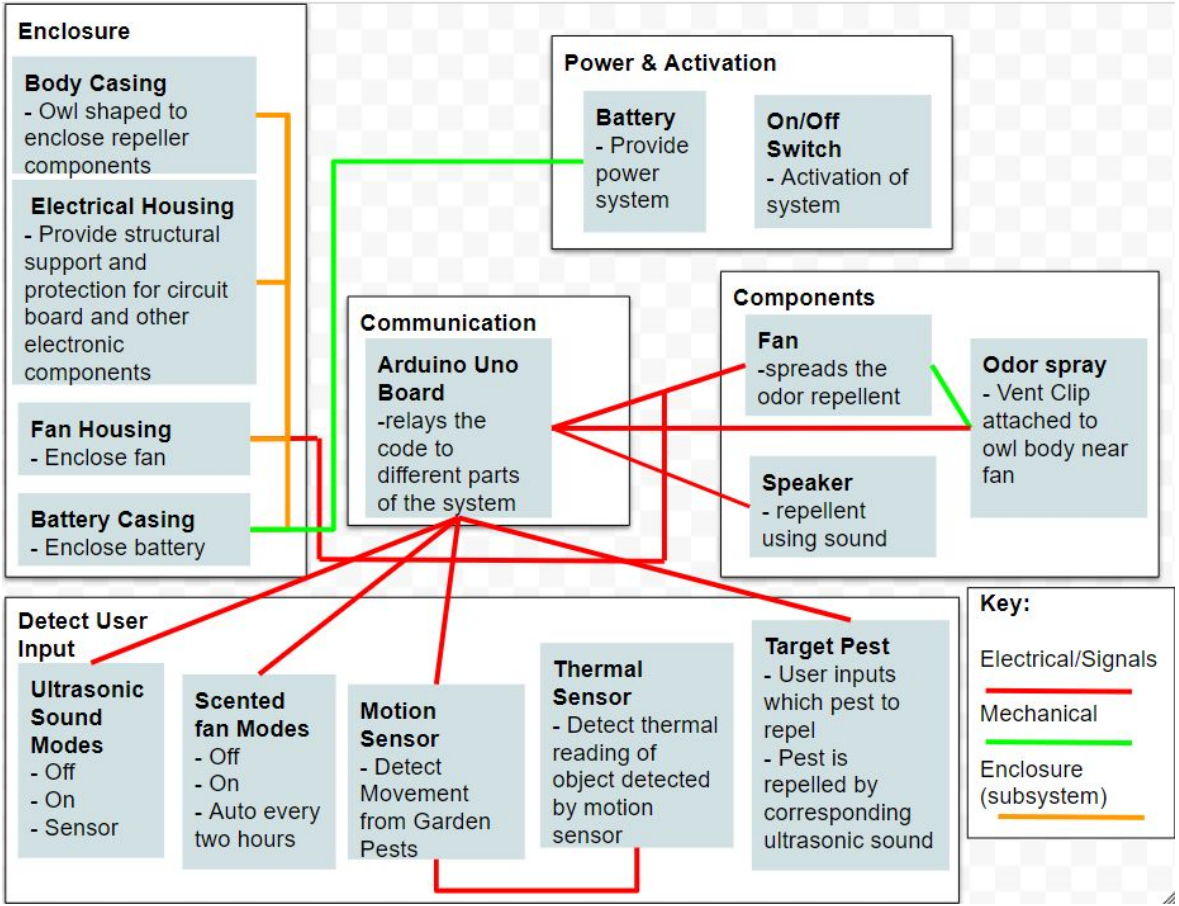
Meeting Additional Needs & Specifications

- Keeping multiple pests away
  - Adjustable ultrasonic sound
  - Adjustable repellent scent
- Easy to use
  - One-time user input necessary
    - Effective radius
    - Frequency selection for pest type
- Product is effective within an adjustable area
  - Rotate knob to adjust effective radius
- Automatic activation
  - Motion sensor detects moving object
  - Thermal sensor deciphers if object is an animal or inanimate
  - If animal is detected, repellent system automatically activates
- Manual Override
  - On/Off switch



Software

Systems Diagram



Manufacturing Plan

For Estimating Manufacturing Cost:

1. Component costs

2. Assembly costs
- Estimated assembly time multiplied by labor rate
- Injection molding, 3D printing

3. Overhead costs
- Supporting costs for power, handling, shipping, purchasing, etc
- Indirect costs such as security
- Typically tough to estimate
- Base on historical figures

Component	Amount	Material/product name	Manufacture Type	Manufacture cost
Owl Casing (polycarbonate)	1	3D Print Polycarbonate	3-D print	$5.60
Arduino	1	Arduino Uno R3	Manufacturing Plant (PIC microcontroller)	$5
Bread board	1	Breadboard - (White)	Assembly (alloy spring clips & perforated plastic)	Not Used
Resistors (10k)	3	294-22-RC	Assembly within engineering tolerance (Carbon Film)	$0.30
Motor	1	Hobby Gearmotor	Assembly of electric motor and gearbox	$3.50
Distance Sensor	1	Ultrasonic Distance Sensor - HC-SR04	Assembly of two ultrasonic transducers	$2.60
Speaker	1	Piezoelectric Buzzer	Circuit assembly of transducer buzzer and external driver circuit	$2.00
Temperature Sensor	1	HiLetgo GY-906 MLX90614ESF	Assembly of IR sensitive thermopile detector chip and signal conditioning ASIC which are integrated in a TO-39 can.	$6.20
Scent Packet	2	Febreze Car Vent Clip (plastic casing)	3-D Print, Injection Molding	$3.00
Fan	1	3" Plastic 3 Blade CW Fan Blade, 1/8" Bore	3-D Print	$0.60
Fan Casing	1	3D Print Polycarbonate	3-D Print	$1.00
Switch	1	Mini Power Switch	Assembly of pins and actuator	$0.90

Manufacturing Plan

- *Total Unit Cost* = [(*Setup Costs* + *Tooling Costs*) / *Volume*] + *Variable Cost*
- Total Cost = $30.70

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Viability Of Product

- Yes, product is commercially viable
- Satisfies stakeholder needs
- Small enough cheap enough light enough
- Meets users needs & specifications
- Affordable

Demonstration

Serial Monitor:

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Set Radius: 102 cm
Target Pest: Racoons
Servo position: 135 deg
Distance: 45 cm
Motion detected!
Temperature: 74.71*C
Animal Present!
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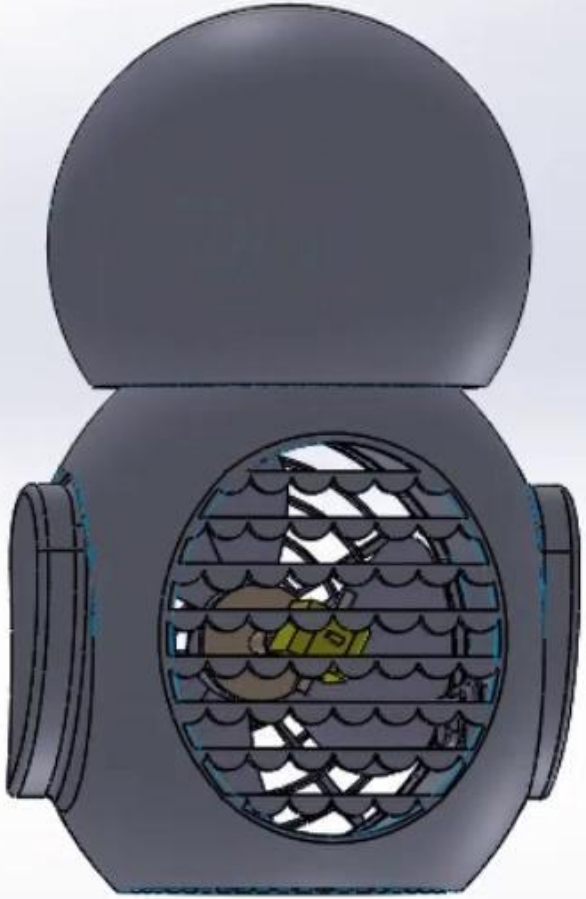

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Thank You!

Questions?