NORTHROP GRUMMAN

Drone Disabling Device Virtual Design Review 4

Ryan Cziko
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Taylor Stamm

Team 518

Team Introduction

Trevor Stade

Project Manager

Mechanical Engineering

Quentin Lewis

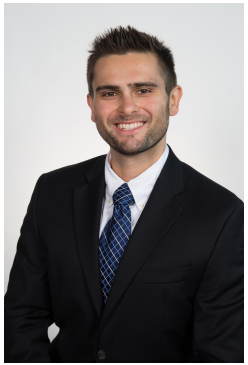
Sensor Interface Engineer

Computer Engineering

Ryan Cziko

Test Engineer

Mechanical Engineering



Taylor Stamm

Systems Integration Engineer

Electrical Engineering

Dylan Macaulay

Design Engineer

Mechanical Engineering

Objective

[2]

Develop a device to secure specified air space from unmanned flight vehicles. There needs to be an improvement upon functionality, size, and overall use.

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Key Goals

[3]

- Improve speed and accuracy of drone-detecting functionality
- Reduce size of drone disabling apparatus to the size of a rifle
- Increase range of device functionality to a 50 ft dome
- Adhere to all safety, legal, and environmental regulations

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Project Scope

Stakeholders

Tameika Hollis

- Executive at Northrop Grumman

Shayne McConomy

- Senior Design Professor; FAMU-FSU College of Engineering

Jonathan Clark

- Associate Professor; FAMU-FSU College of Engineering

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Intended Markets

- **Primary Market:**
  - Government
  - Military operatives
  - Law Enforcement
- **Secondary Market:**
  - Contractors,
  - Private security
  - Defense companies

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Assumptions

- Device primarily used in defense and security operations
- Not intended for civilian use
- Intended target is unauthorized civilian drones

Targets

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Targets

Target Values						
Target No.	Need	Metric	Importance	Units	Marginal Value	Ideal Value
1	2, 10	Assembly & Disassembly Time	5	min	60	5
2	10	Weight of Device	5	lbs	30	10
3	4,5,10	Disabling Range	3	ft3	30	50
4	10	Target Acquisition Speed	4	s	20	5
5	10	Battery Life	3	h	2	3
6	3,5,10	Frequencies Jammed	3	GHz	2.4	2.4 and 5
7	2,10	Device reload speed	1	min	5	2
8	10	Target max drone wingspan	3	in	25	30
9	10	Target max drone Weight	3	lbs	4	6
10	1-9	Project Cost	5	$	5000	2500

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Highlighted Device Targets

Metric	Marginal Value	Ideal Value	Units
Assembly & Disassembly Time	60	5	Minutes
Weight of Device	30	10	Lbs
Project Cost	5000	2500	$
Target Acquisition Speed	20	5	Seconds

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Design Progress

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Detection System

Overview

- Array of video cameras used for 360 degree field of view
- Distinguishes between drone and other flying objects
- Provides general location of detected drone
- Live video feed with detection boxes on computer system

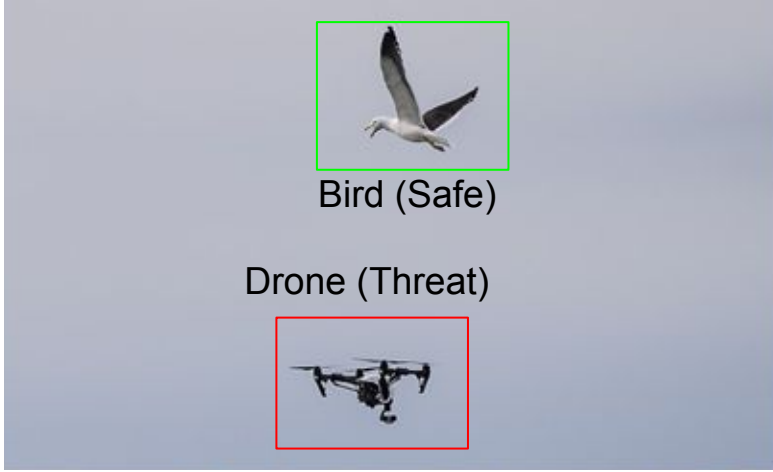

Figure x: Video Detection of Drone and Bird [x]

Figure x: SJCAM SJ4000 Action Camera [x]

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Detection System - Old Design

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Detection System - Old Design Issues

- Substantially low frame rate: Only about 0.5 fps
- Inaccurate object detection
- Slow detection
- Need optimized training algorithm
- Need more advanced deep learning hardware

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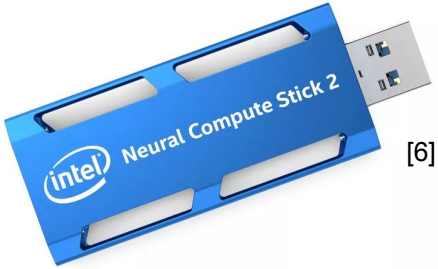
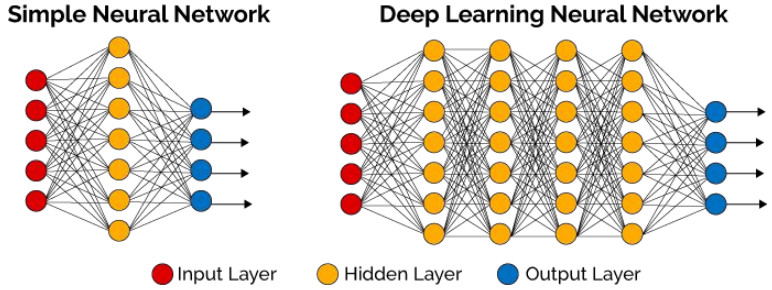
Detection System - Proposed Improvements

- Install Intel Neural Compute Stick 2 to Raspberry Pi
  - Substantial increase in deep learning processing speed
- “Train” object detection through a Neural Network
- Create Python/Matlab script to graph and process testing
- Expected frame rate increase of up to 56x greater!
- Expected processing speed increase of up to 56x greater!



[6]



[7]

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Detection System – Example of Detection

[8]

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Net Launcher and Backpack

Overview

Net Launcher:

- Launch net 50ft and capture a stationary drone.
- Allow easy addition of a frequency jammer.

Backpack

- Support detection system, compressed air, and computer components with minimal hindrance to wearer.

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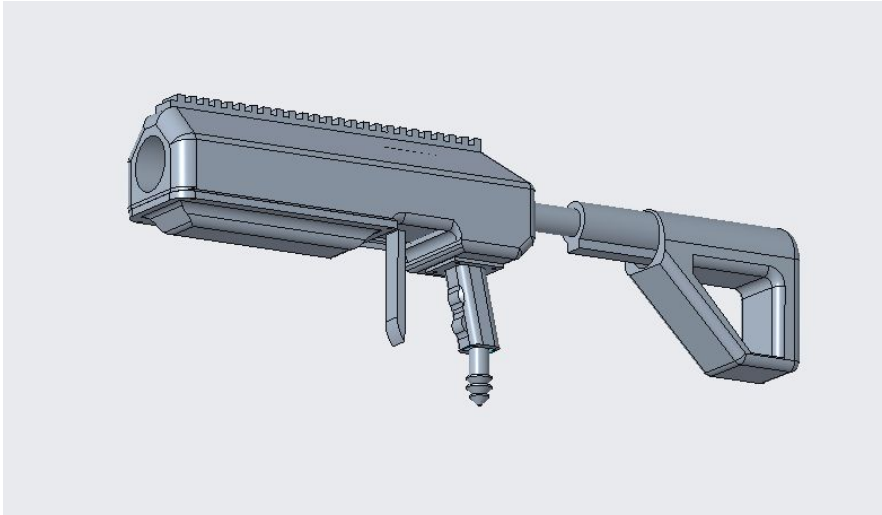
Improvements: Net Launcher

- Slimmed down design
- Mounting rail for frequency jammer
- Single barrel firing method



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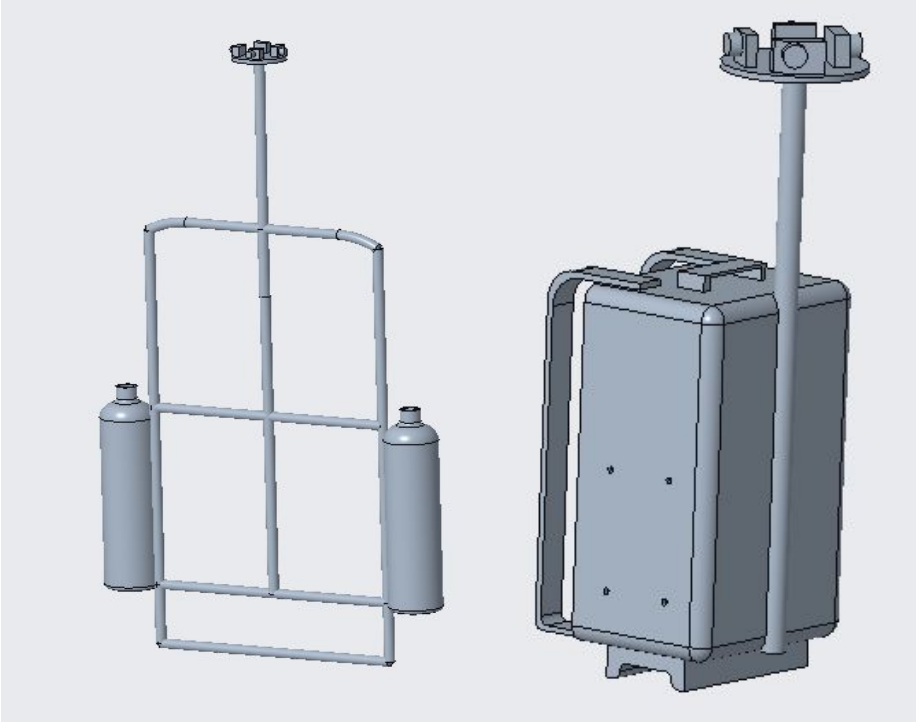
Improvements: Backpack

- Detection System mounted to backpack
- Compressed air can mounted to side of backpack



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References

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[8] https://youtu.be/AfNZviiJYaA

Questions?