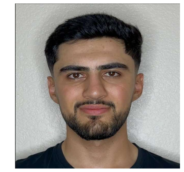
Team 32 Capstone Project: MADS

Ira A. Fulton Schools of Engineering
Arizona State University


Phillip Keller


Justin Harold


Ali Shaighan

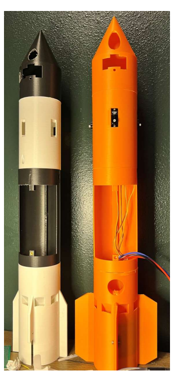

Asaad Asaad

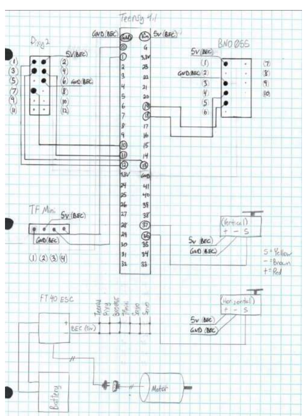
Introduction

Drone warfare has become a major factor in modern defense systems. Drones provide adversaries a cheap, easy means to cause great harm. With drone's increasing presence on and off the battlefield, countermeasures against drones have become increasingly important. Current countermeasures against drones can be expensive and/or complex, such as electronic warfare (signal jamming) or missiles. There is a need for cost-effective, accessible anti-drone defense methods.

Theory

A modular anti-drone system (MADS) will provide an automated method of defending against drone attacks. This method would utilize AI modeling in computer vision to detect and track the drone, processing the data in real time to guide the projectile to the drone, striking it down kinematically. The design of MADS can use inexpensive components and methods of construction to realize a cost-effective system to protect people and equipment from enemy drones.



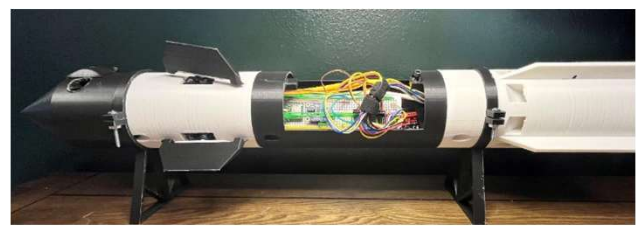


Results

The structure of the projectile was 3D printed and assembled successfully, with all the components fitted inside. The Teensy microcontroller facilitates communication between the Pixy2 camera and the servos controlling the guidance fins. The Teensy also successfully communicates with the ESC, controlling the speed and power delivered to the EDF motor.

The Pix2 camera was successfully trained to detect desired objects in frame, and real-time communication with the Teensy on the object's location and size in frame was successfully established.

While different power supplies were tested for powering the motor, the EDF couldn't provide enough thrust to maintain flight of the projectile.



Conclusion

The AI computer vision was implemented successfully, demonstrating it's capability to automate object detection and tracking for relatively low cost. The capability of the Teensy to control the speed and maneuverability of the projectile was also demonstrated. However, we found that significantly more power is required to fully realize flight capability for the projectile.