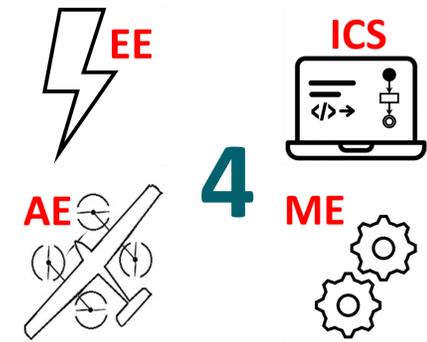


Autonomous Surveillance Drone for Detection and Net-Based Interception of UAVs

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Introduction

The widespread availability of commercial drones poses a growing risk to critical infrastructure and secure airspaces. Traditional detection methods are slow or prone to false alarms, and most interception techniques are either destructive or unreliable. Our project offers an autonomous, non-destructive solution that enhances airspace security through intelligent surveillance and net-based drone capture.

Problem Statement

This project aims to develop an autonomous drone system with a net-based capture mechanism to safely detect, track, and neutralize rogue UAVs, ensuring public safety and evidence preservation.

Project Impact

- Enhances airspace security by autonomously intercepting unauthorized drones.
- Reduces reliance on destructive or manual countermeasures.
- Supports safer, faster response in sensitive or high-risk areas.

Constraints & Specifications

Constraints

Flight Time : 1hr	Detection Range : 50m
Interception Range : 10m	Drone Speed : 10m/s

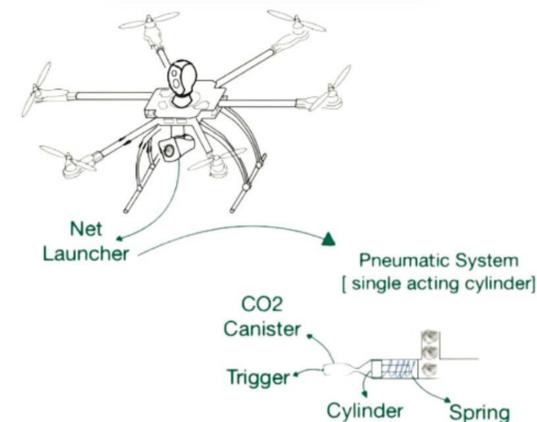
Specifications

Net Interception Time: 2s	Acceleration Stability: 10 m/s ²
Camera Detection Accuracy: 80%	Lidar Accuracy: 90%
Launcher Drag: Max 30% of Total Drag	Take off Weight: 8 kg
Dashboard Response: 1s	Data Transfer Range: 100 m

Intgrated Specifications

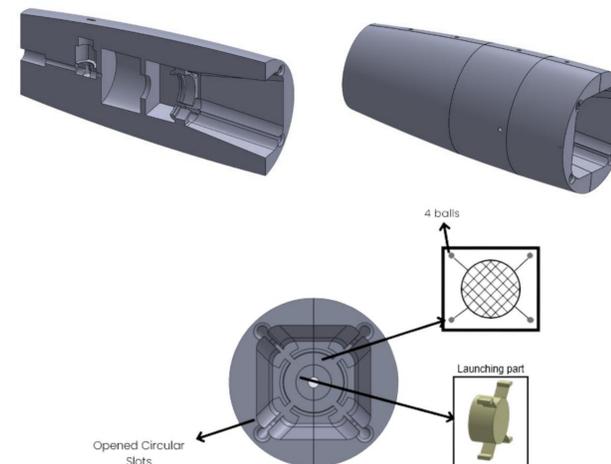
Automated: 60%	Full Operation Time : 8s
Interception Accuracy: 80%	

Concept Design

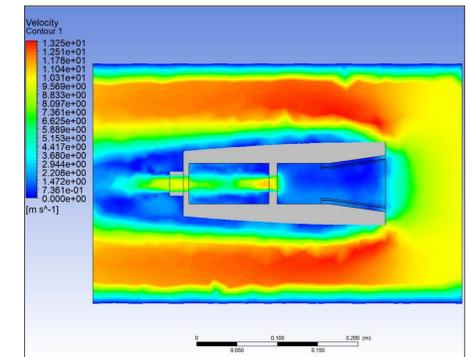
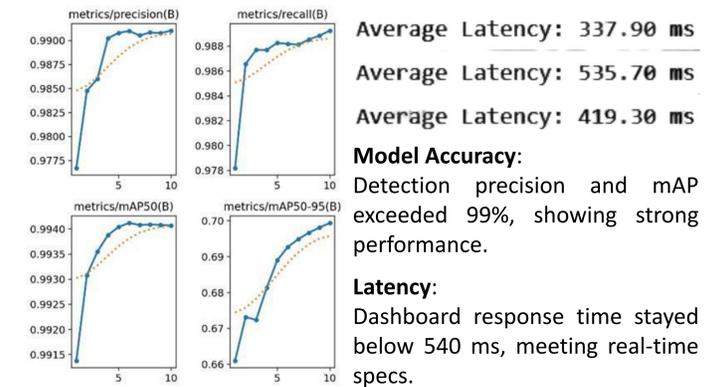


The drone features a net launcher driven by a pneumatic system using a CO₂ canister. A single-acting cylinder propels the net when triggered, assisted by a spring mechanism. This setup enables fast, safe, and reusable drone interception.

Prototype Design



Test & Validation



The launcher drag is 0.08697, contributing 13 percent to the total system drag of 0.68697. This meets the design requirement of keeping launcher drag below 30 percent.

Conclusion

The drone system achieved autonomous detection and safe net-based interception of UAVs, with high AI accuracy and acceptable drag performance. Future work includes increasing launcher capacity, adding a parachute, and enhancing full autonomy.