

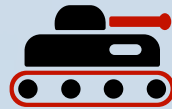
Academic collaboration for more security

AI enhanced counter UAV for airport protection



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Militärausbildung

Major der Reserve
Btl Kdr, Pioniertruppe



Technisches Hilfswerk

Leiter Einsatzreferat HH/SH/MV



Wissenschaftlich

Promotion 2003
Akademischer Direktor/Laborleitung
SP: Sensorik/Datenanalyse, UAV





HELMUT SCHMIDT
UNIVERSITÄT

Universität der Bundeswehr Hamburg



History

- 1972 Foundation of the Universities of the Federal Armed Forces
- 1973 Universities Opened to Students
- 1979 Right to grant Doctoral Degrees and Lecturer Qualifications
- 2001 Female Students; Access for Civilian Scholarship Holders
- 2003 Renamed: Helmut-Schmidt-Universität
- 2007 Introduction of New Degrees: Bachelor and Master

Courses

- Business Administration
- Civil Engineering
- Economics
- Educational Science
- **Electrical Engineering**
- General Engineering Science
- History
- Industrial Engineering
- Law for Public Administration
- Mechanical Engineering
- Political Science
- Psychology

- Computational Engineering
- Communication Technology
- Energy Management
- Renewable Energy and Smart Grids

Features

- Studies in Trimesters
- Successful Graduation (Master) in 4 Years
- Interdisciplinary Study Elements
- Campus University
- Small Group Principle
- Excellent Equipment
- Military Education
- Senior Officers to provide Support & Guidance

Students (Academic Year 2019/2020)

■ Business Administration	513
■ Civil Engineering	23
■ Economics	149
■ Educational Science	474
■ Electrical Engineering	86
■ Engineering Science	58
■ History	266
■ Industrial Engineering	88
■ Law for Public Administration	25
■ Mechanical Engineering	226
■ Political Science	307
■ Psychology	247
Total	2.462

Personnel

Faculty	427
■ Professors	104
■ Assistants	323
Service Personnel	447
■ Departments	105
■ Military Staff	132
■ Central Facilities	75
■ Administration	109
■ Presidential Staff	25
Third Party Funded	179
■ Faculty	150
■ Support	29



**Fähigkeit des Abfangens von in gesperrte
Lufträume eindringenden
Kleinfluggeräten durch zivile Einsatzmittel**



Bundesministerium
für Verkehr und
digitale Infrastruktur



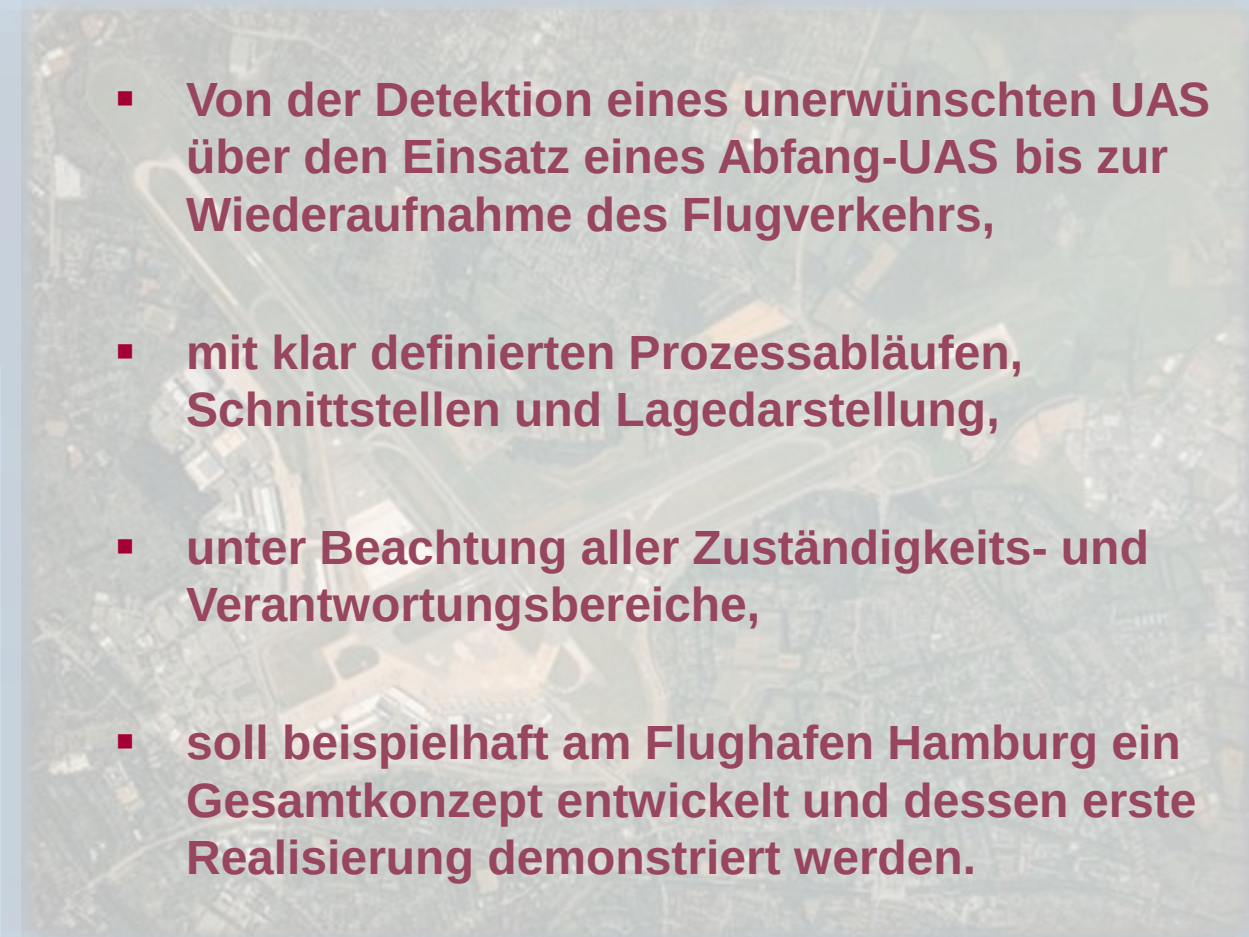
BUNDESPOLIZEI



Ausgangslage

- 
- Gesellschaftliche Aspekte
 - Zuständigkeiten
 - Kommunikation
 - Rechtslage
 - Anforderungen

Projektziel

- 
- Von der Detektion eines unerwünschten UAS über den Einsatz eines Abfang-UAS bis zur Wiederaufnahme des Flugverkehrs,
 - mit klar definierten Prozessabläufen, Schnittstellen und Lagedarstellung,
 - unter Beachtung aller Zuständigkeits- und Verantwortungsbereiche,
 - soll beispielhaft am Flughafen Hamburg ein Gesamtkonzept entwickelt und dessen erste Realisierung demonstriert werden.

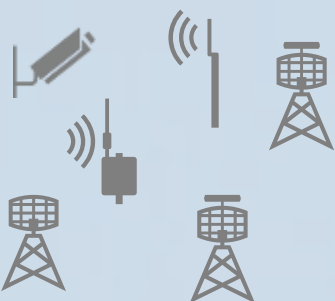
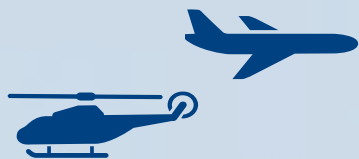
Umsetzung



Umsetzung



Umsetzung



DFS Deutsche Flugsicherung



Lufthansa Hamburg Airport



Lufthansa Technik

BUNDESPOLIZEI

Umsetzung

Common Situation Report/Picture

Sensor Data Processing



Airborne Interceptor System

Flight Information
Management System

Networked Reporting Chains & Workflow

Air Traffic
Control

Tower

Airlines

Airport

BOS



DFS Deutsche Flugsicherung



Lufthansa
Lufthansa Technik

Hamburg Airport



BUNDESPOLIZEI

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Common Situation Report/Picture

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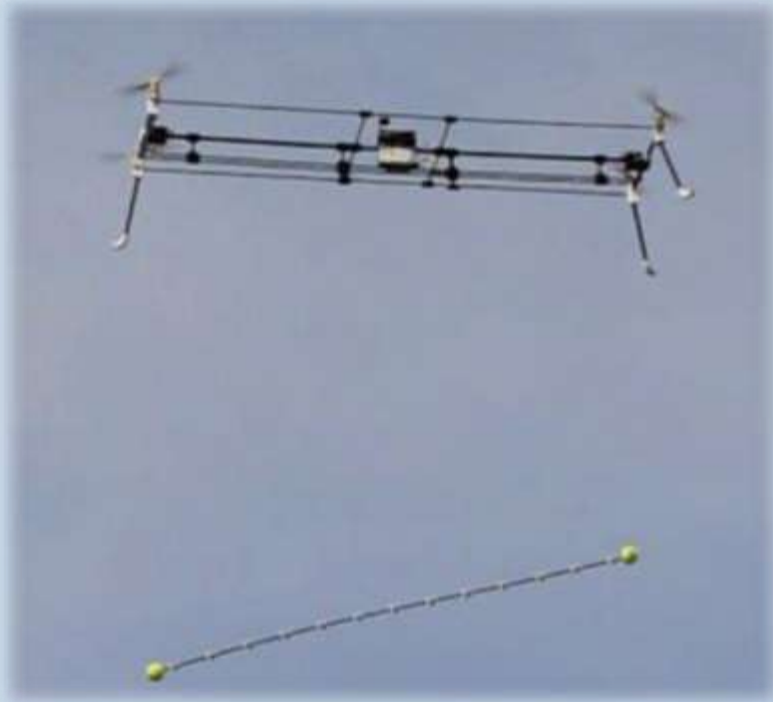
Tower

Airlines

Airport

BOS

HSU- Expertise



Counter-UAS with a curtain of threads, catching area: 80 m²+

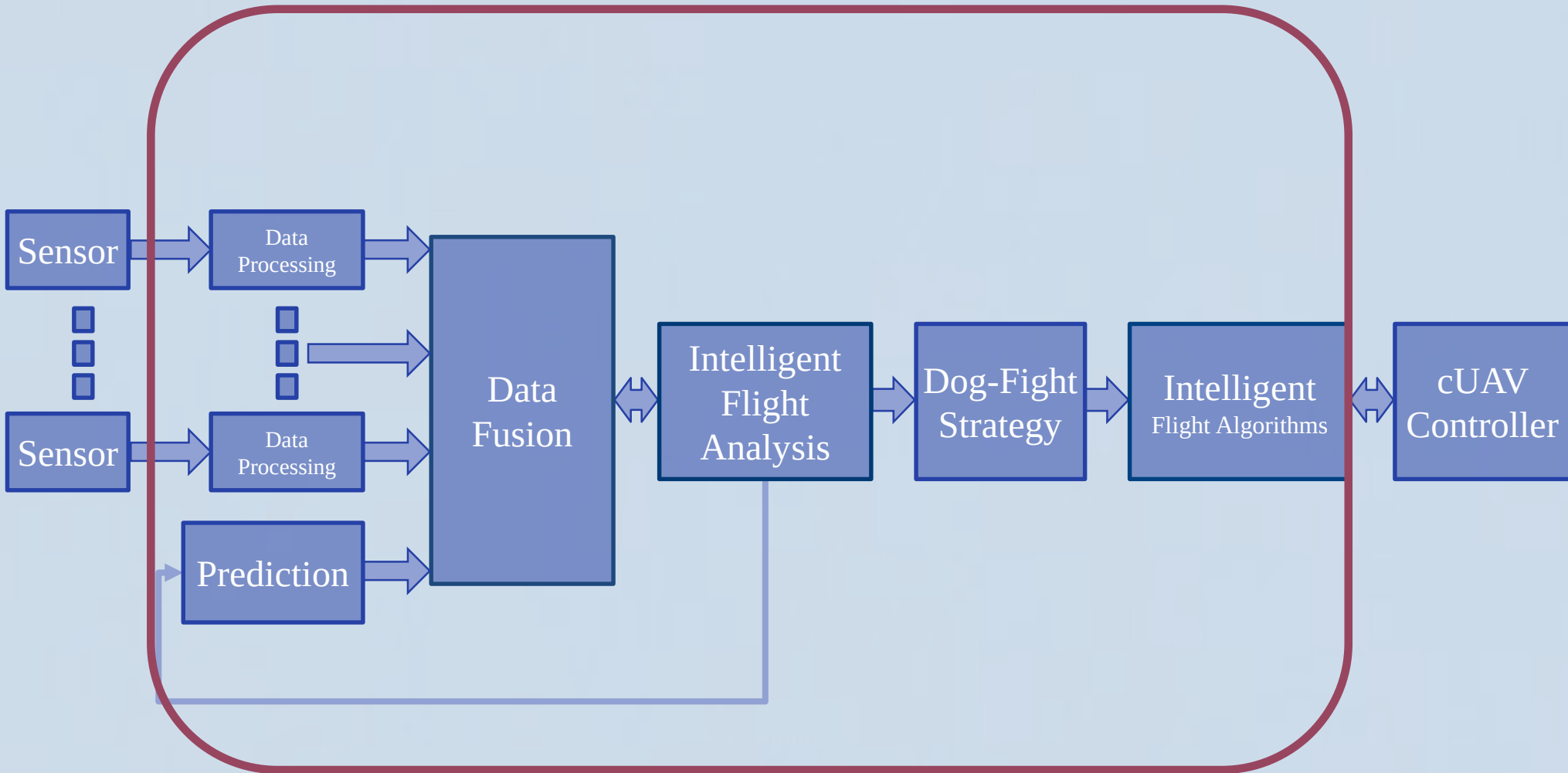
Patent filed: Catching Drones with Thread/Tuft Structures

Artificial
Intelligence

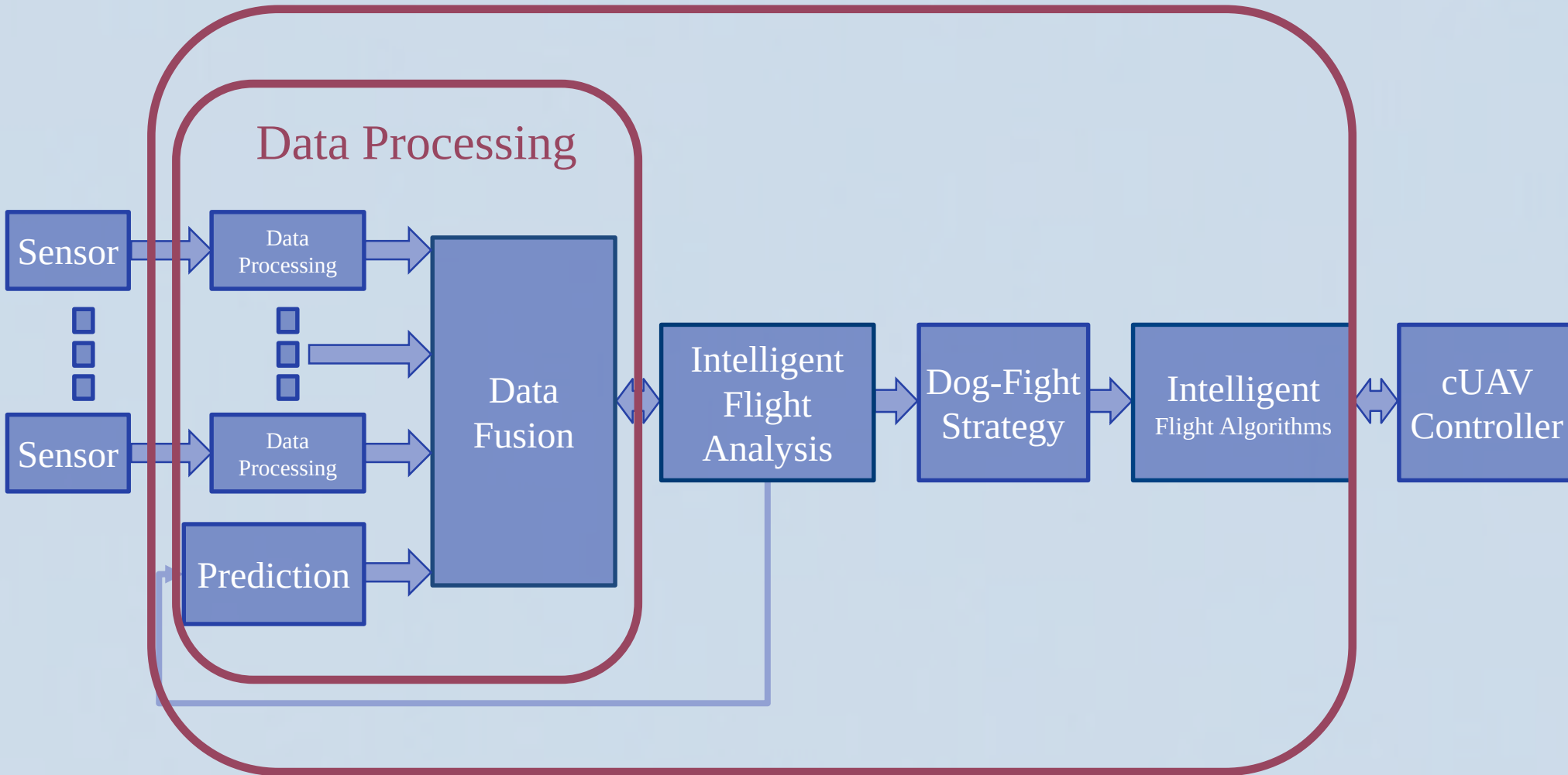
Bionic
Intelligence



AI Unit



AI Unit



Intelligent Data Processing & Data Fusion

Color Images



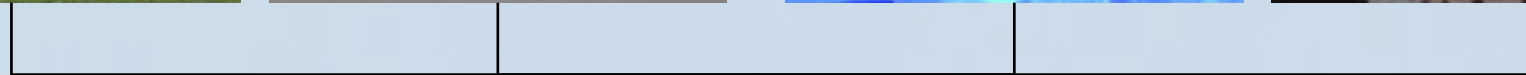
Stereo Depth Images



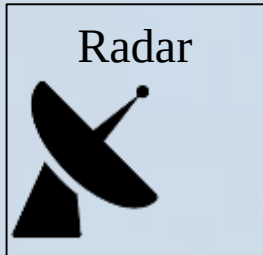
Infrared Images



LiDAR Pointclouds



Radar

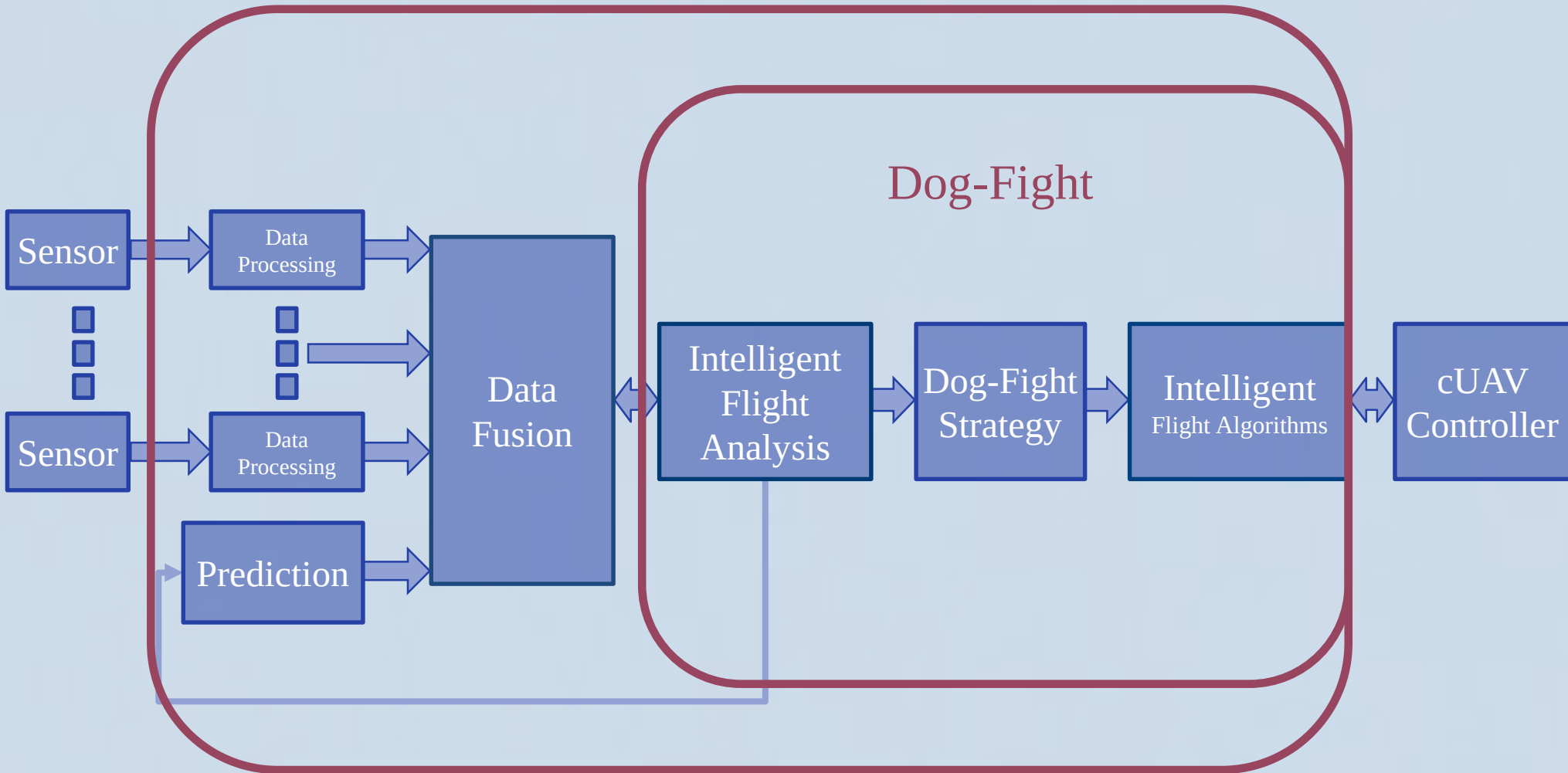


Intelligent Data Fusion

Target Position

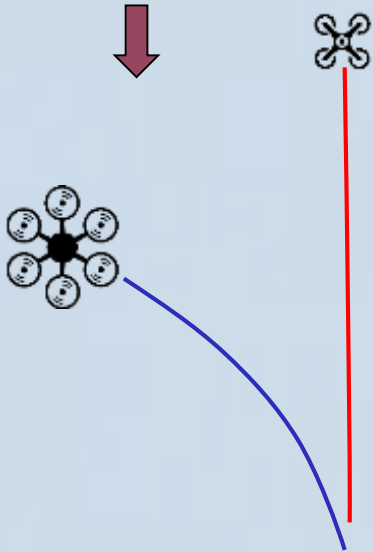
- Highly accurate
- Highly confident
- Highly reliable
- Fault tolerant
- Ambiance & weather robust

AI Unit

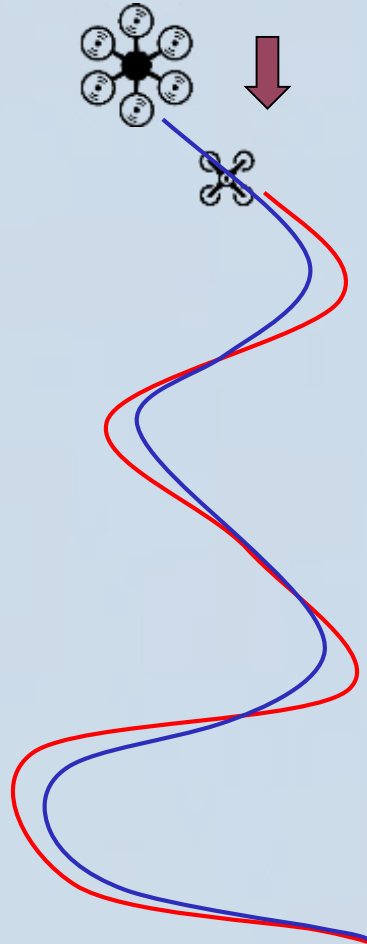


Intelligent Flight Algorithms

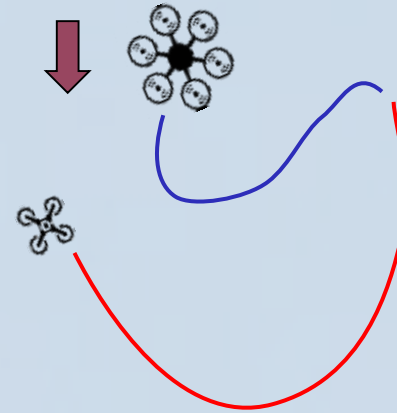
Anticipates



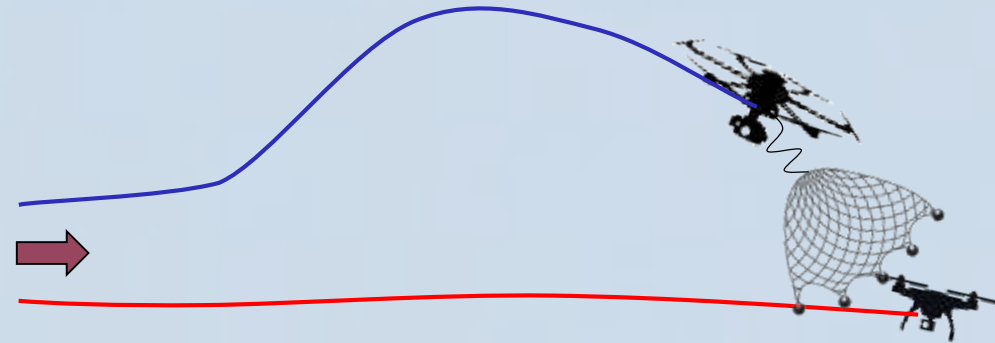
Pursues



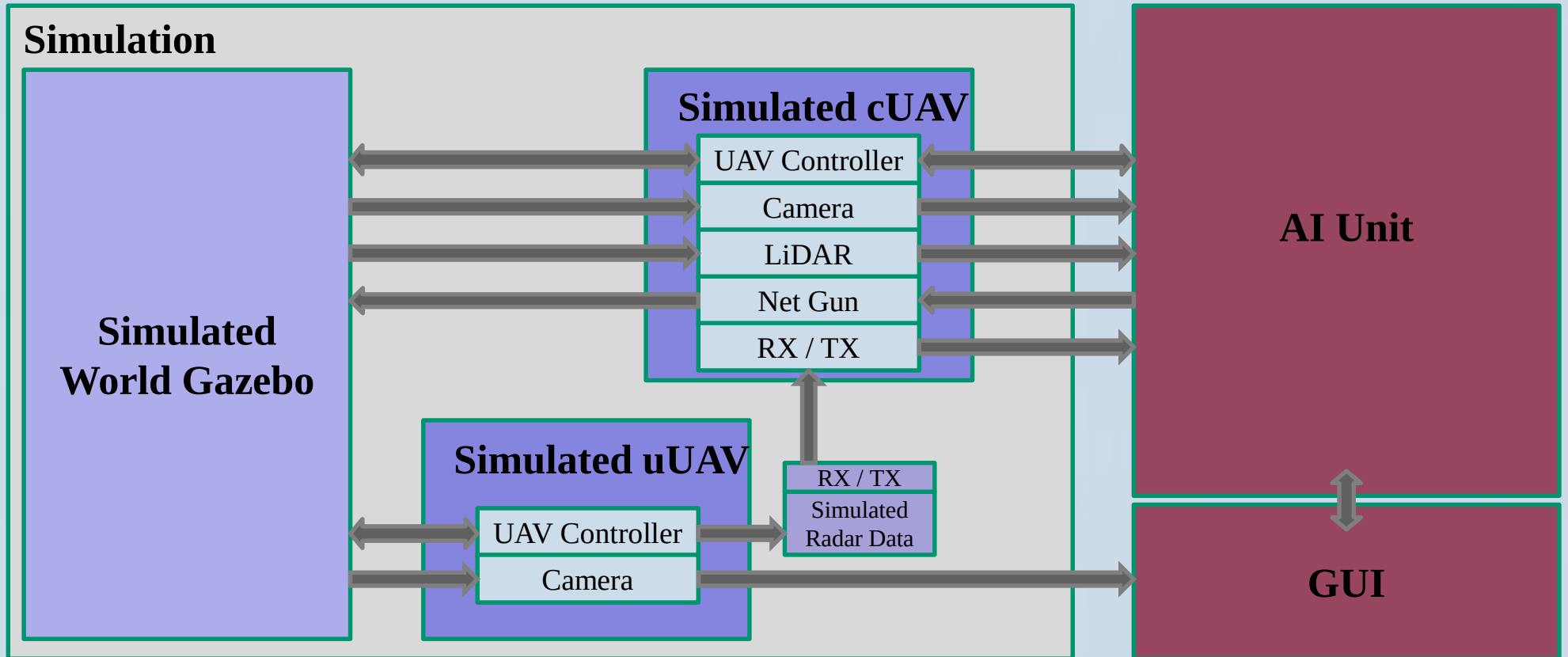
Intersects



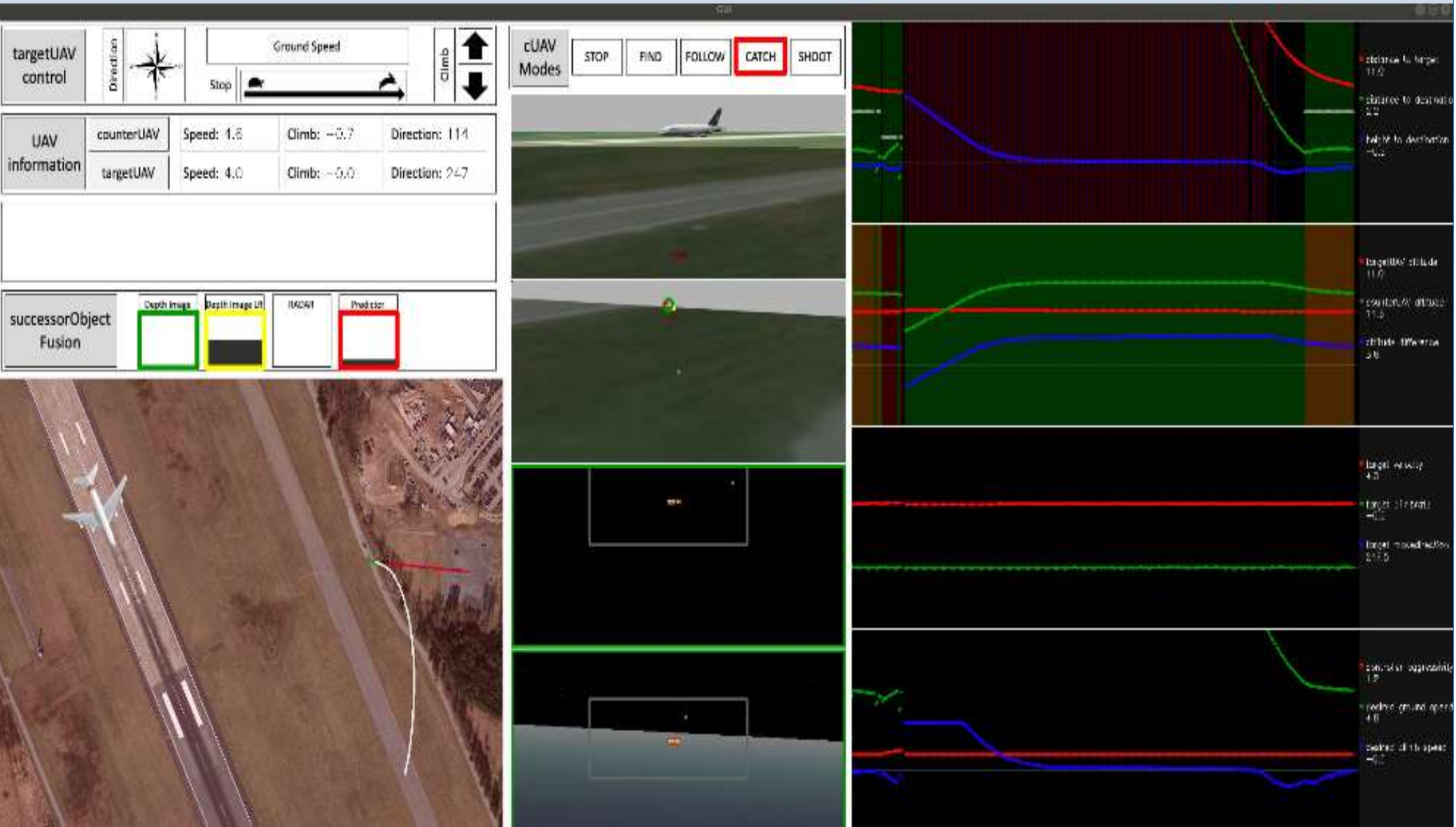
Intercepts



AI Unit Testbench



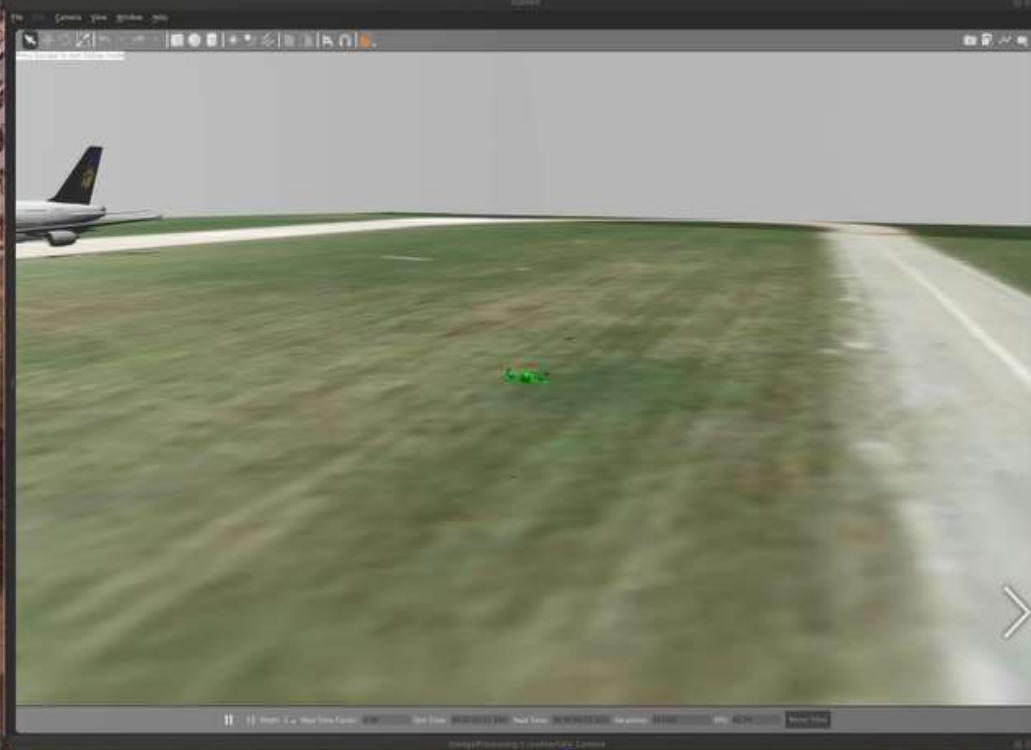
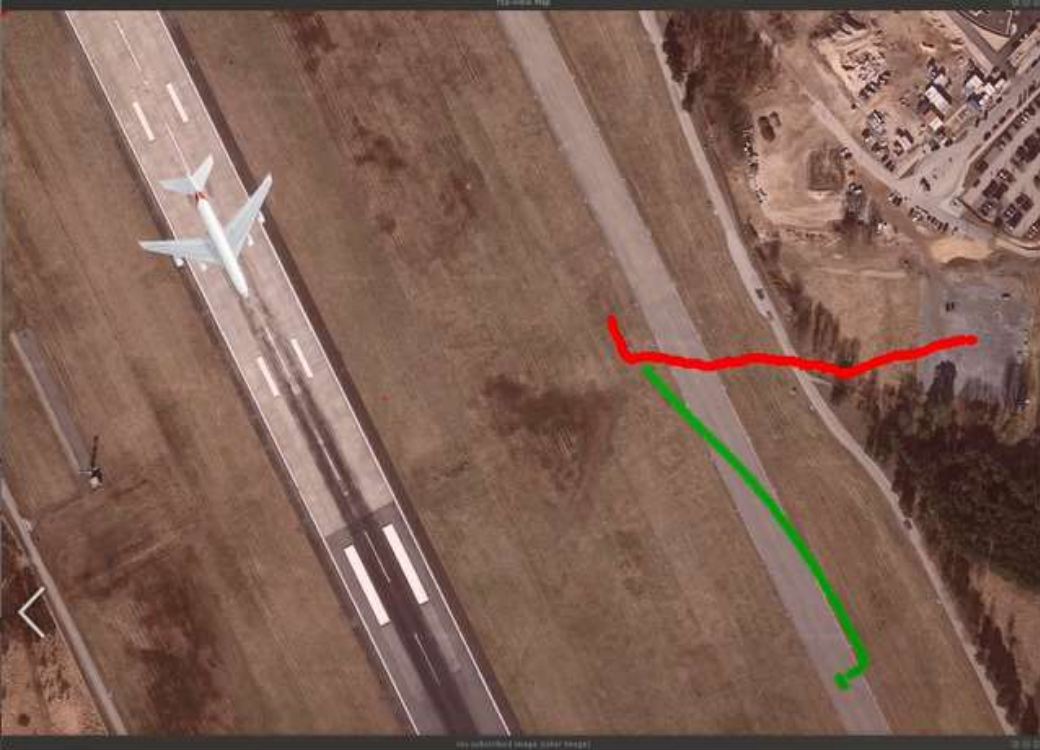
AI Unit Simulation



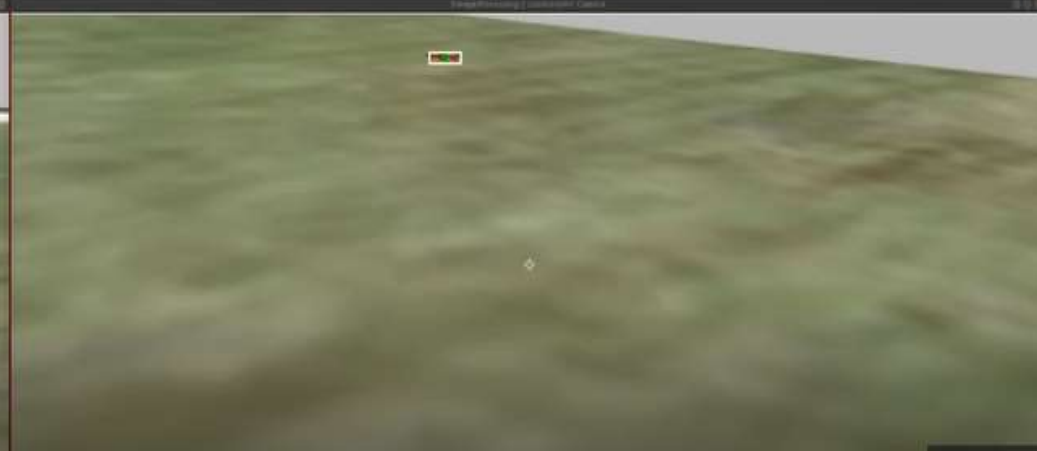
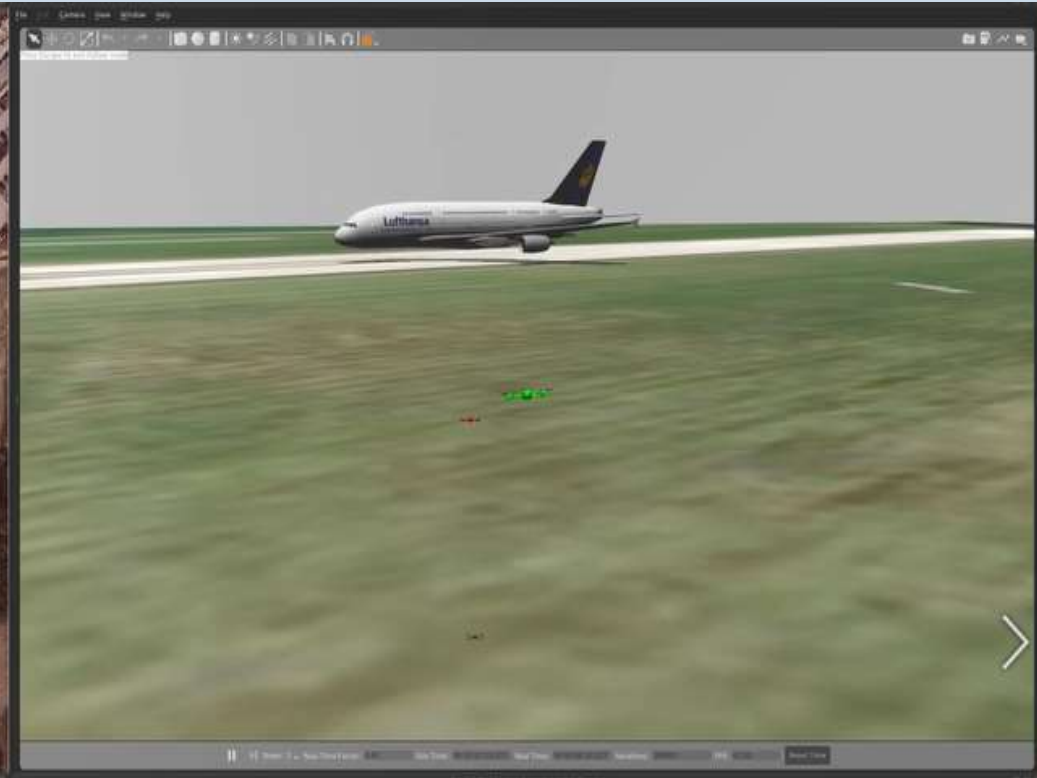
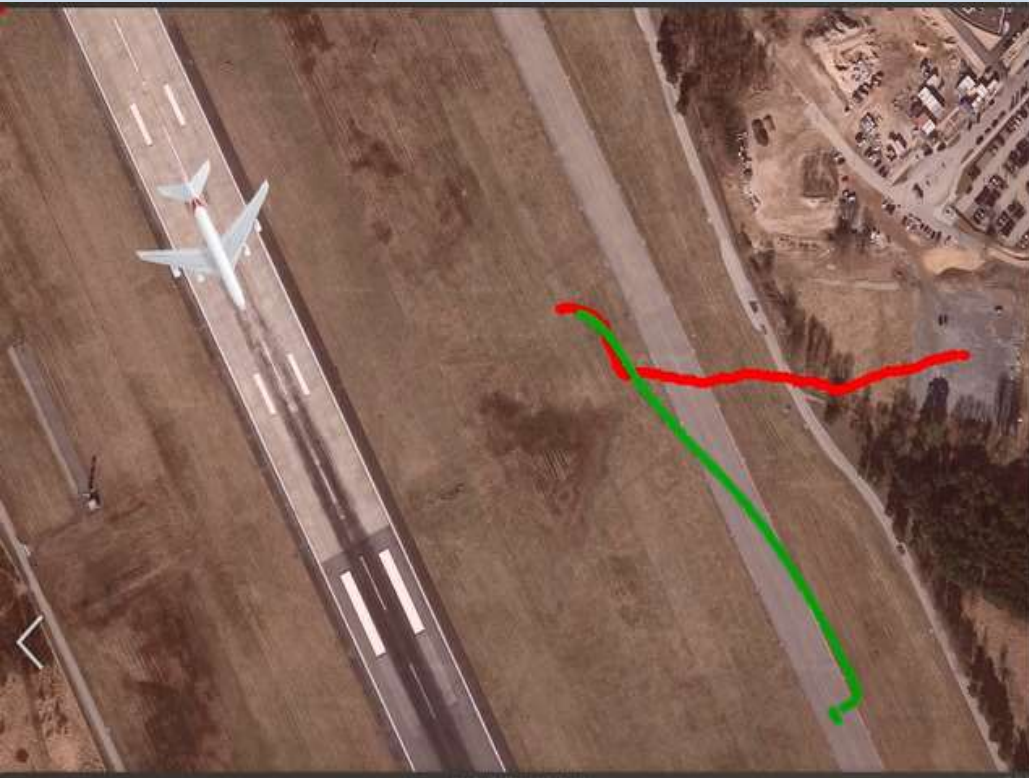
AI Unit Simulation



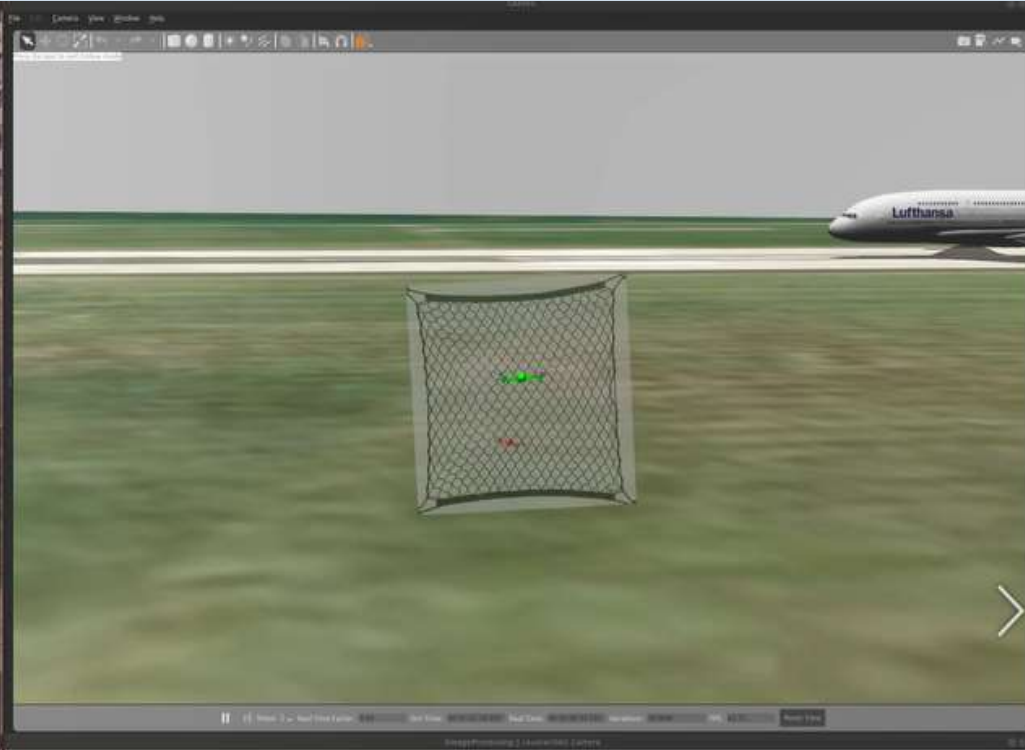
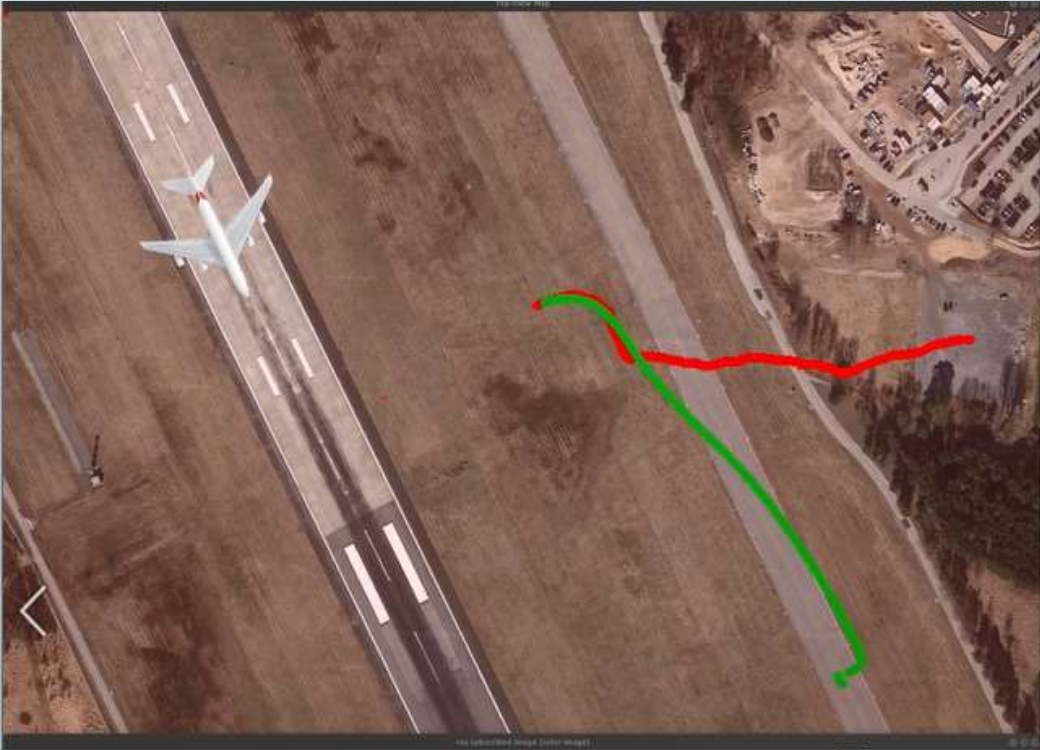
AI Unit Simulation



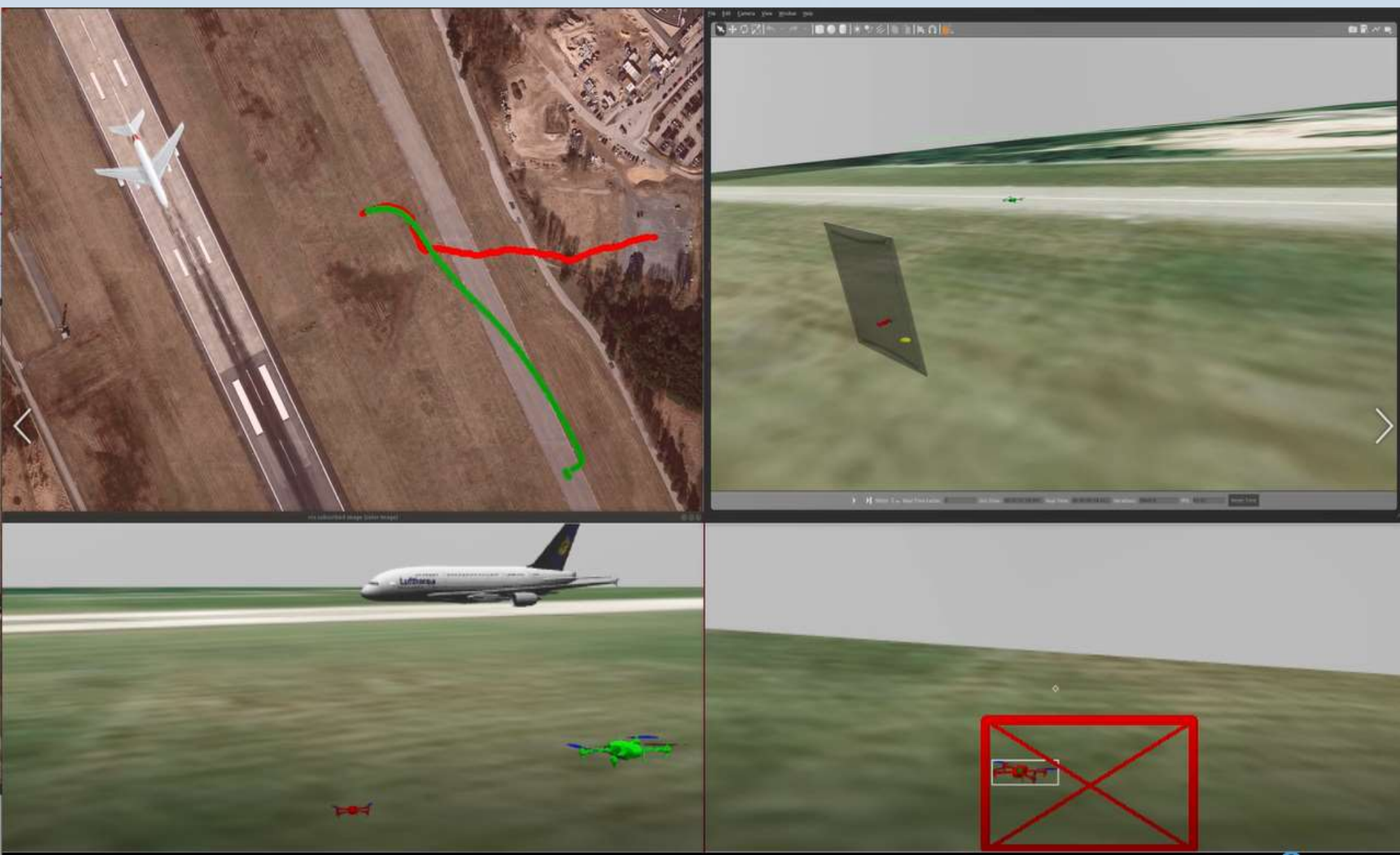
AI Unit Simulation



AI Unit Simulation



AI Unit Simulation





Field Test



Field Test





Thank you for your attention.

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