EdgeVision Detect and Avoid: Ultra-Low-SWaP AI for Long Range Aircraft Detection on RPAS

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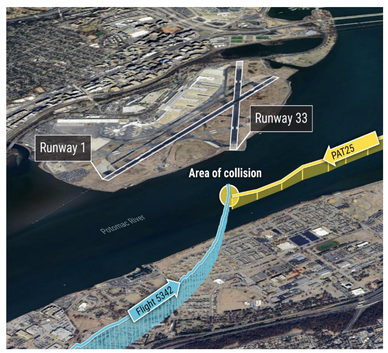
AUTONOMY, ROBOTICS, & CONNECTIVITY

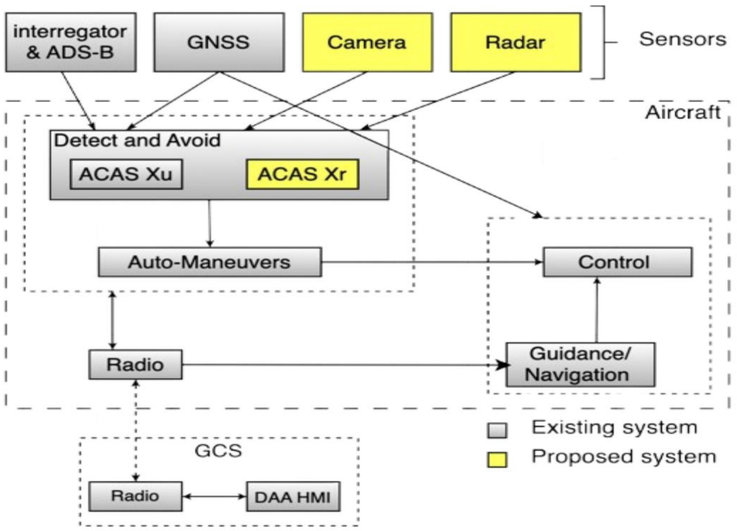
Motivation

Recent mid-air collision incidents, including a January 2025 collision near Washington D.C., highlight the limitations of existing “See and Avoid” approaches and the urgent need for reliable Detect and Avoid systems.



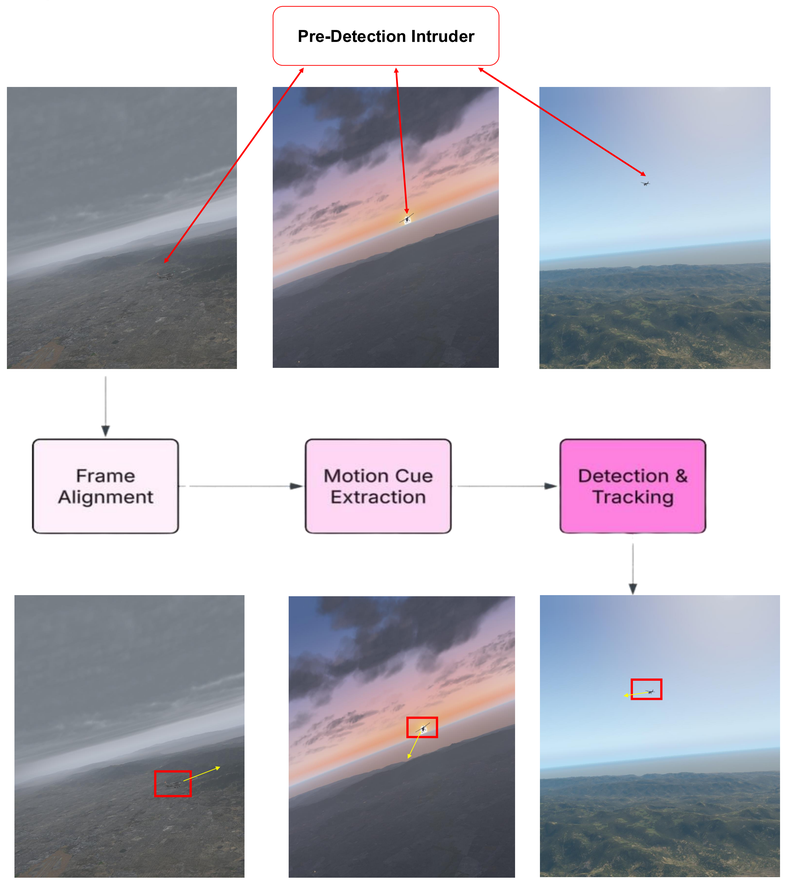
State of the Art

Existing certified DAA architectures rely on multi-sensor fusion, including radar and cooperative systems, integrated through ACAS logic.



Approach

We develop a lightweight, vision-based DAA pipeline that combines classical computer vision with machine learning to identify non-cooperative aircraft.



Reference

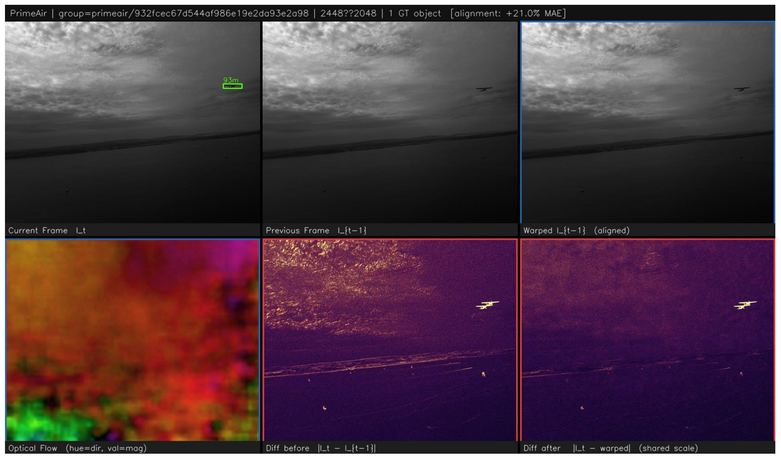
[1] Y. Guo, et al., “Long-Range Vision-Based Intruder Detection Using Alignment and Trajectory Filtering for Small UAVs,” IEEE Transactions on Intelligent Transportation Systems, 2024.

[2] K. Lai, et al., “Optical Flow-Based Intruder Tracking and Risk Assessment for Vision-Based Detect-and-Avoid Systems,” IEEE Robotics and Automation Letters, 2024.

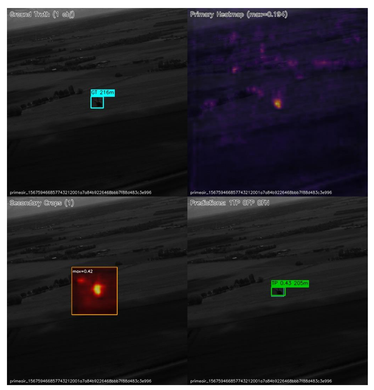
[3] S. Ghosh, J. Patrikar, B. Moon, M. M. Hamidi, and S. Scherer, “AirTrack: Onboard Deep Learning Framework for Long-Range Aircraft Detection and Tracking,” IEEE International Conference on Robotics and Automation (ICRA), 2023.

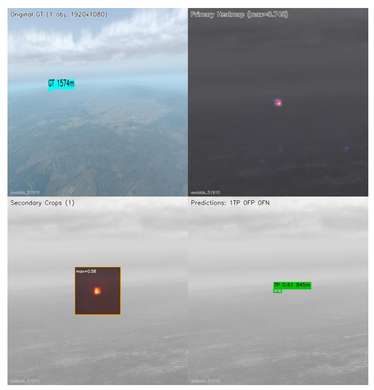
Experimental Work

Frame Alignment:

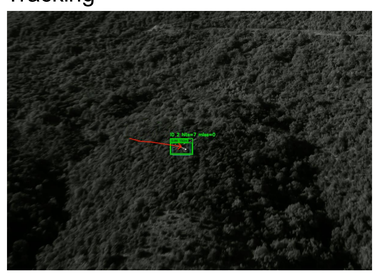


Detection





Tracking



Final Output

SCAN ME

ELECTRICAL & COMPUTER ENGINEERING

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