

Temasek Defence Systems Institute

## Assessment of an Onboard EO Sensor to Enable Detect-and-Sense Capability for UAVs Operating in a Cluttered Environment

CPT Ang Wee Kiong  
Professor Oleg Yakimenko  
Assistant Professor Dong Hye Ye

### Objectives:

This thesis demonstrates the feasibility of using visual sensors onboard an UAV to autonomously detect and track moving targets in real-time operation. It aims to develop, integrate and assess the use of autonomous detection and tracking of multiple moving targets.

### Main Research Ideas:

To ensure the safe operation of unmanned systems in modern complex environment, this thesis strives to answer two critical research questions:

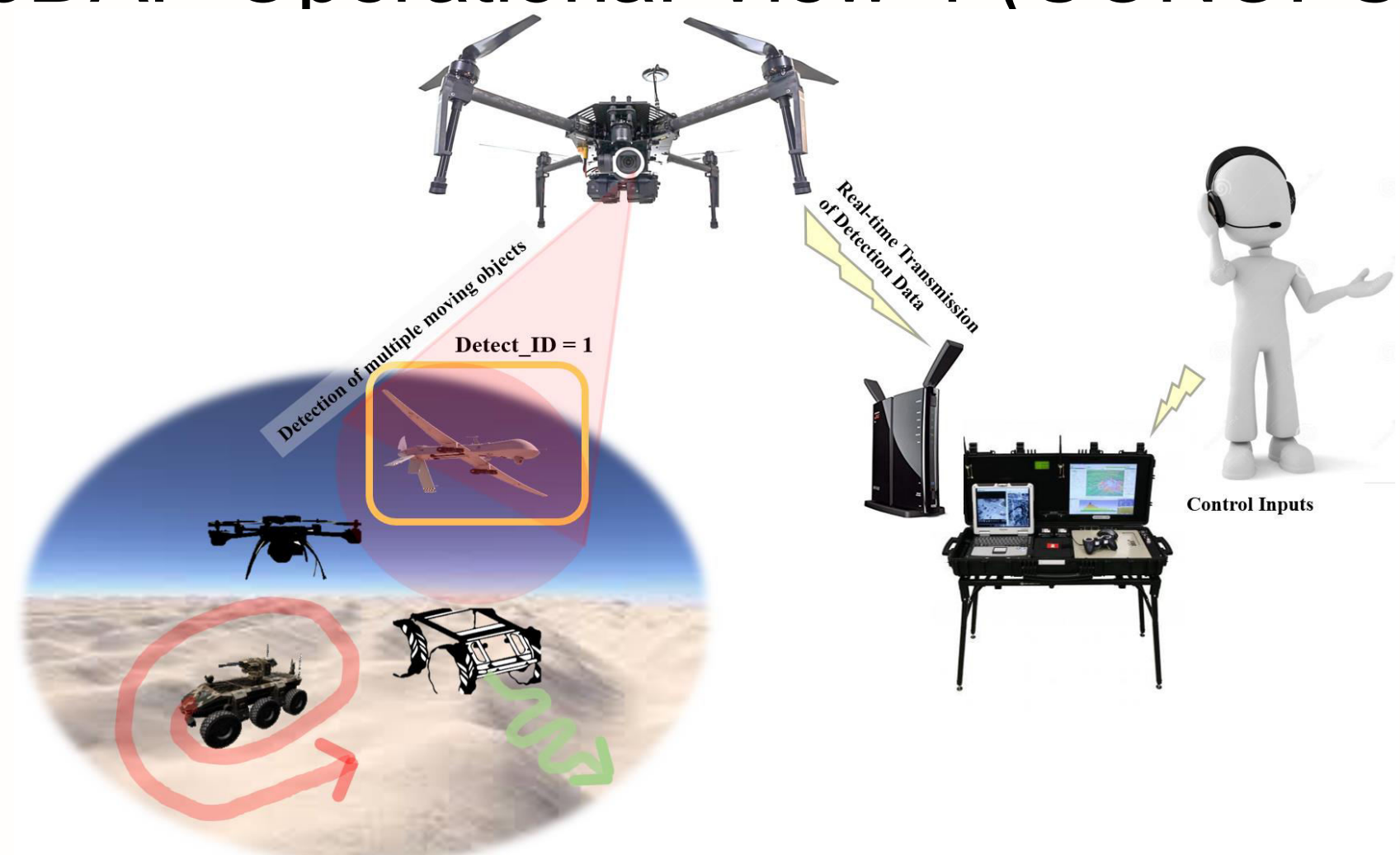
- 1) Can the UAV perform accurate and timely autonomous detection and tracking during its flight?
- 2) Will the computer vision algorithm work in a complex operating environment with multiple moving objects?

### Benefits / Potential Applications:

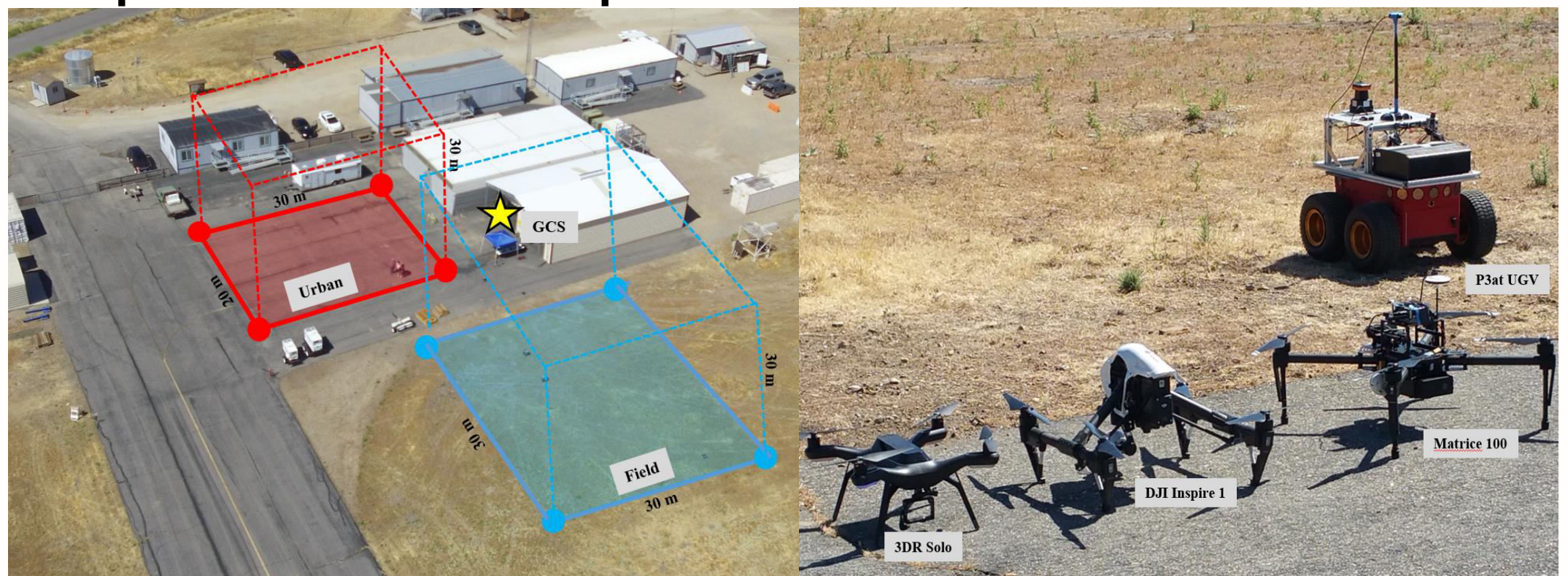
Today's pilots faced an overcrowded operating space with manned and unmanned systems, The numerous operating interfaces increased their cognitive load and reduces their attention span. Technological advancements can be leveraged on to enhance the overall safety and situation awareness.

### Research Results:

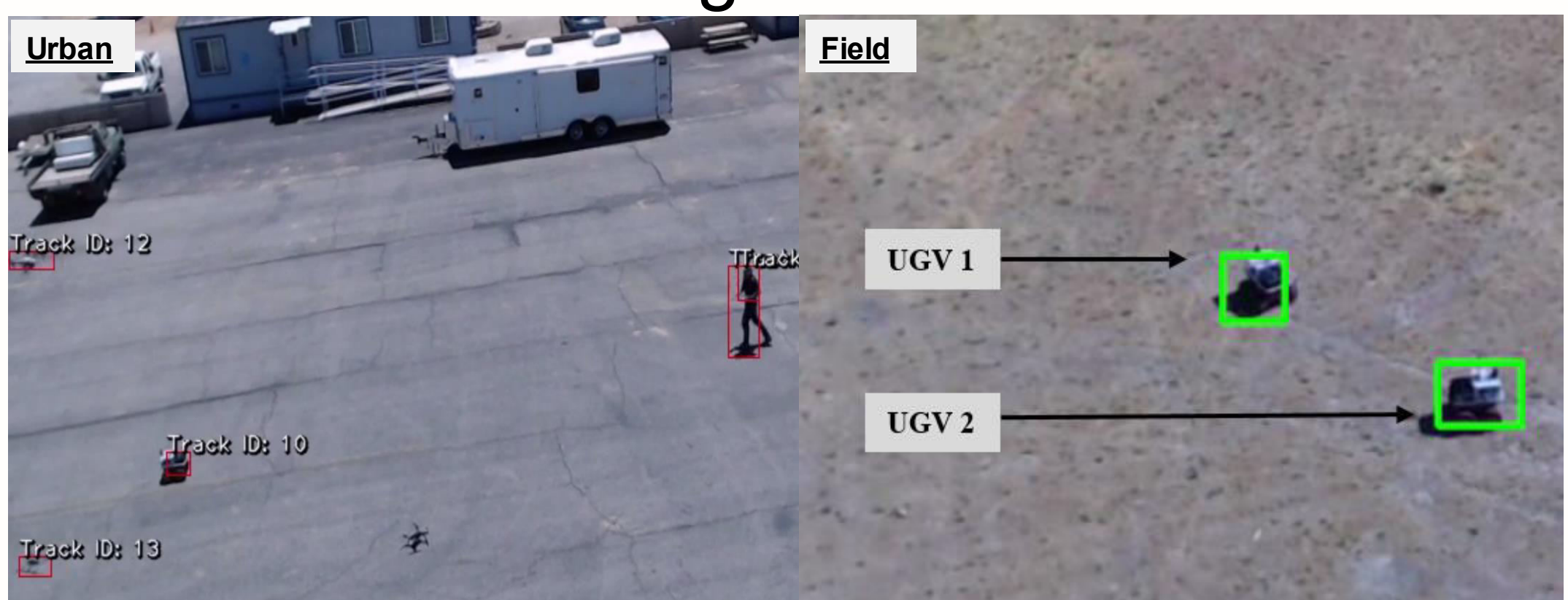
DoDAF Operational View 1 (CONOPS):



### Experiment Setup:



### Detection & Tracking Results:



### Follow-up Research Activities:

- Enhance Onboard Embedded System
- Enabling Detect-Sense-Act capability (using detection inputs to control the unmanned systems for attrition or avoidance motion)

### References

Jing Li, Dong Hye Ye, Timothy Chung, Mathias Kolsch, Juan Wachs, and Charles Bouman. 2016. "Multi-Target Detection and Tracking from a Single Camera in Unmanned Aerial Vehicles (UAVs)." 2016 IEEE/RSJ International Conference on Intelligent Robots and Systems: 4992-97. New York: Institute of Electrical Electronics Engineers. doi:10.1109/IROS.2016.7759733.

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