INTEGRATED AIR & MISSILE DEFENCE

CENTRE OF EXCELLENCE

Souda Air Base, 73100, Chania

https://www.iamd-coe.org

1st/2023 Steering Committee Meeting
POINT PAPER

Our Ref:	NU. 579	Tel.:	+302821440781
		NCN:	302-615-4081
Date:	28 Jul 2023	Email:	info@iamd-coe.org

TO: See Distribution

SUBJECT: **Research Collaborative Project between the Foundation For Research and Technology – Hellas/ Institute of Computer Science (FORTH-ICS) & IAMD CoE: AI-Empowered Drone Detection Passive Radar Using 5G Signals (AIRE5G)**

No: 16

PURPOSE: To note the initiation and further attainment of the AIRE5G project between FORTH – ICS and IAMD CoE.

BACKGROUND: Existing radar systems for UAVs are distinguished in two categories, namely, active and passive, which differ in their operating principles and functionalities. Currently, drone detection technologies rely on dedicated high-cost transmitters. Nevertheless, passive radar systems (PRS) are becoming increasingly popular due to their low cost, low power consumption, and reduced susceptibility to electronic warfare. PRS rely on the detection and characterization of signals emitted by other sources, such as cellular networks, instead of a dedicated transmitter. Notably, the ever-increasing deployment of 5G networks, which offer high-bandwidth, low-latency, and multiple-input-multiple-output capabilities, could enable the widespread use of PRS for drone surveillance in complex environments. Motivated by this, this R&D project focuses on the development of a drone detection PRS that learns and extracts meaningful patterns and relationships from large amount of 5G signals via properly designed artificial intelligence (AI) models.

ANALYSIS &   AIRE5G will leverage and enhance state-of-the-art Machine Learning
STATUS: algorithms for the automated extraction of discriminating features

1st /2023 SCM   Subject No 16

from 5G signals acquired in noisy and cluttered environments. Equally importantly, RF

signals can be susceptible to adversarial attacks, where malicious actors intentionally manipulate signals to deceive the detection and classification algorithms. To tackle this challenge, AIRE5G will develop Machine Learning algorithms that are resilient against adversarial attacks and can detect anomalous or malicious signals, towards ensuring the reliability and security of its RF signal processing system. The proposed AI framework will be computationally efficient and scalable to respect the real-time performance constraints in real operational environments.

Driven by the need to develop an efficient, interoperable, yet low-cost, PRS with advanced capabilities that will be able to tackle the above challenges, the AIRE5G project aims at bridging state-of-the-art artificial intelligence (AI) technologies with 5G networks that are nowadays ubiquitous, in order to address the following objectives:

Objective 1: Design low-cost PRS leveraging commercially deployed transmitters.

Objective 2: Develop high-performance AI models for autonomous data cleansing, anomaly detection, and inference.

Objective 3: Implement and evaluate an integrated computational intelligence platform for drone detection and classification.

FINANCIAL CONSIDERATIONS & FUNDING:
Any financial impacts of the aforementioned project can be covered from the existing budget of the current year (by transferring of appropriations following SC approval as proposal detailed in NU.580/28 Jul 23/ IAMD COE Point Paper) without the need for a supplementary budget.

RECOMMENDATIONS & DECISION:
SC members are requested to note the initiation and further attainment of the AIRE5G project between FORTH – ICS and IAMD CoE.

FOR THE IAMD COE:

B. Gen (OF-6) Nikolaos KOKKONIS GRC (AF)
IAMD COE Director

Disclaimer: This is a document of the Integrated Air & Missile Defence Centre of Excellence (IAMD COE). It is produced for specific motives with regard to the IAMD COE Program of Work and does not necessarily reflect the notions of NATO or the Participating States of IAMD COE.

1st /2023 SCM   Subject No 16

DISTRIBUTION (via e-mail if not otherwise stated)

<u>External</u>

Action: IAMD COE SC - Members

Information: -

<u>Internal</u>

Action: CD&E BRANCH

Information: DIRECTOR

                      FINCON