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LURS - Lightweight UAV-based Rad/Nuc Sensing

Capability Description

This system offers the capability to rapidly search large areas for concealed radiological threats and nuclear materials using Unmanned Aerial Vehicles at a rate of a few 1000 m^2 in <10 minutes. The capability is enabled by newly developed sensors offering highest sensitivity-per-weight gamma radiation detectors. The capability can be provided either as:

- a full UAV system with Rad/Nuc sensor
- the Rad/Nuc sensor for use with GFE (Government Furnished Equipment) UAV platforms

UAV Platform Description

The Aeraccess Q800X UAV is a quadcopter with exceptional stability during flight able to fly:

- in all-weather conditions (heavy rain up to 10mm/hr, night, fog)
- in winds up to 80km/h

The UAV is ruggedized to be operated in harsh environments: extreme cold, heat, heavy rain, sand, etc… This includes maritime applications as the UAV is designed to take-off and land on moving platforms: ships, vehicles, and ground robots.

The Q800X UAV can be deployed tethered (left) or autonomously (right) with the "dronebox", enabling 24/7 autonomous take-off/landing and battery recharging. Image copyright © Aeraccess

Rad/Nuc Sensor Description

The proposed detector offers the highest sensitivity per payload radiation detection. Radiation detection is a tradeoff between sensitivity (*detect the presence of a weak radiation source*) and specificity (*measure what kind of source*). The Flat Panel Gamma (FPG) detector offers the highest degree of *sensitivity* at a *specificity* sufficient to discern the type of radioactive source (medical, natural, nuclear, industrial). This detector is suited for search missions aiming to find and detect radioactive sources or Nuclear Materials.
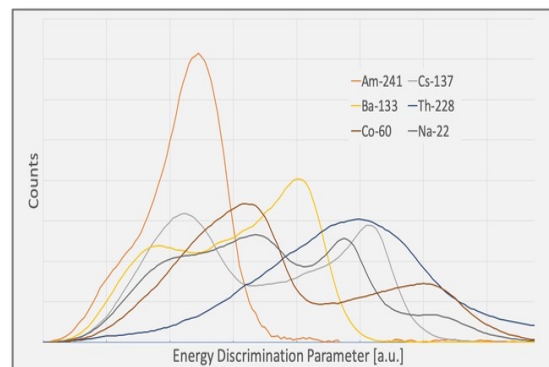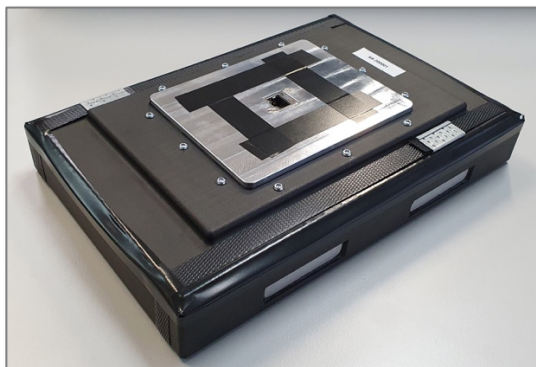
Plug & play (left): The FPG detectors connect via Power-over-Ethernet. The plot (right) shows the FPG's response to a number of common radioisotopes, allowing it to discern different radioisotopes. Image copyright © Arktis Radiation Detectors Ltd

Finding and detecting radioactive sources at a distance is a challenging task. Due to the laws of physics, the strength of the radiation signature of a source drops dramatically with distance, and soon falls below the intensity of the natural background radiation that is present in any environment. As a consequence, the detection of radioactive sources at distances beyond tens of meters requires large area detectors. Arktis FPG detectors offer a solution in the form of a thin, large area detector that optimizes sensitivity-per-weight for UAV based detection.

The detector controls and the UAV controls are integrated into the same ground control station/computer to allow a smoother control of the operation, to focus the mission on the radiation detection tasks as well as save space and weight for the operator. In order to push further the automation of the operation, the UAV can perform autonomous missions using the "dronebox" shown in the picture above. The same UAV can deliver persistent surveillance in its tethered version as it is truly plug&play.

Multi-mission Solution
As mentioned above, the Aeraccess Q800X UAV enables multi-mission solutions, e.g. fully-automated perimeter surveillance AND radioactive mapping. Like the Arktis FPG, other payloads mate with the Q800X UAV in a plug&play manner: These include a large panel of day&night cameras; an ad-hoc network node; an IMSI catcher; a chemical sensor; an electromagnetic sensor for IED detection; a laser designator and munition disruptors.

Multi-mission focus: Besides the FPG radiation sensor (top left), the UAV mates with many payloads in plug&play manner: A magnetic sensor (top right), a chemical sensor (lower left), and an IMSI catcher (lower right) are shown. Image copyright © Aeraccess

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Background

The capabilities offered here were developed with EU funding under the TERRIFFIC Project (https://www.terriffic.eu) in a collaboration including Bruhn NewTech, École Centrale de Lyon, Aeraccess, Nexter Robotics, Luxembourg Institute of Science & Technology and others.

The TERRIFFIC project has brought together 10 European organisations, which are working to deliver an important step change in the effectiveness of first responders during the first hours of a Radiological, Nuclear, explosive (RNe) incident. This will lead to reduced response times, less health and safety risks for the response teams, and less human intervention in the operation due to more automated processes and extended mobile detection capabilities.

TERRIFFIC is a new research and innovation project, funded under the European Commission's Horizon 2020 programme, which will enrich the European response to RNe events by a set of modular technology components in a comprehensive system. These components include new detectors, algorithms, drones, robots, dispersion models, information management software and decision support systems. Although the primary focus of the project is on the response to an explosion containing radioactive or nuclear elements, the project will also provide detailed information on the applicability of some developments within a chemical and biological (C/B) context.

Project partners

- Aeraccess https://www.aeraccess-group.com
- Arktis Radiation Detectors https://www.arktis-detectors.com
- ARTTIC SAS http://www.arttic.eu/pages/en/home
- Bruhn NewTech https://bruhn-newtech.com/cbrn-defence/cbrn-information-management-software/
- The French Alternative Energies and Atomic Energy Commission (CEA) - http://www-list.cea.fr/en/
- École Centrale de Lyon - https://www.ec-lyon.fr/en/research
- International Security and Emergency Management Institute - https://www.isemi.sk/en_GB/
- Luxembourg Institute of Science & Technology - https://www.list.lu
- Nexter Robotics https://www.nexter-group.fr/en
- TL & Associates - http://www.tl-a.net/index.php