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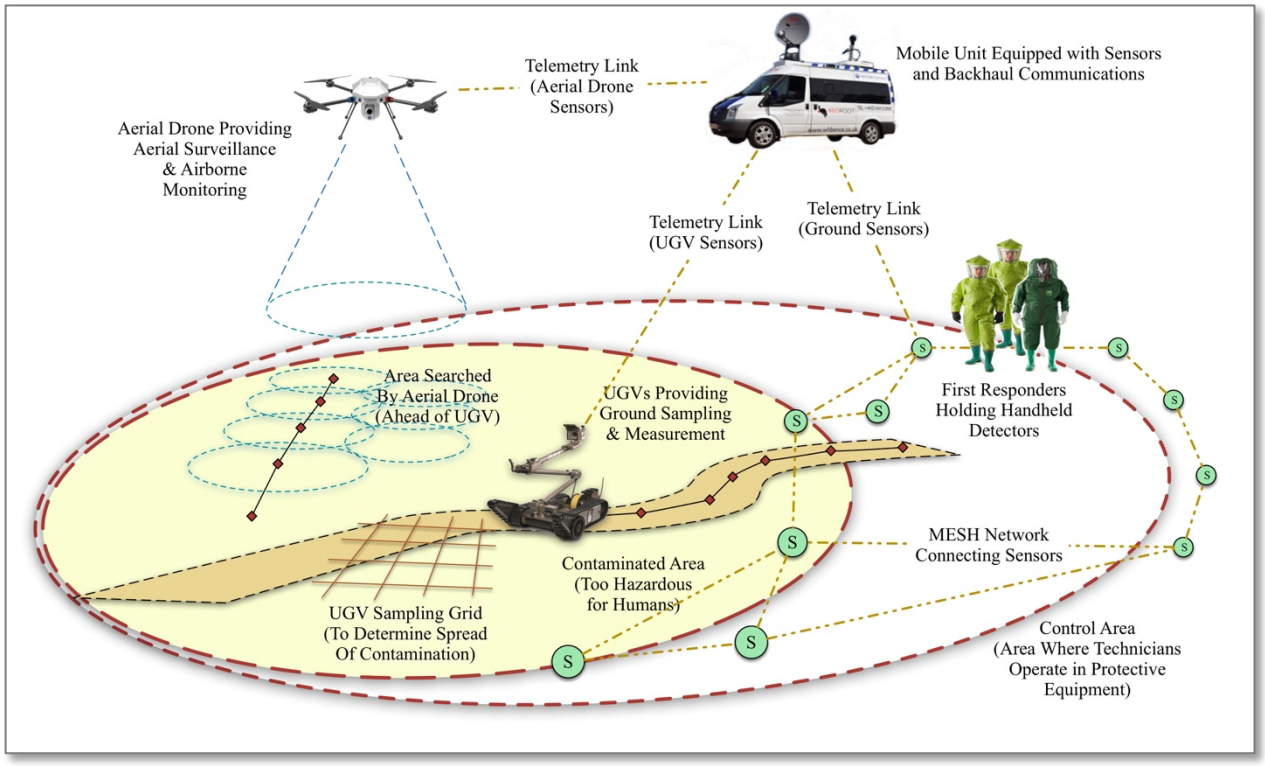
Toolkit enabling rapid forensics after radiological incidents



Top: To enable rapid forensics following a radiological incident, autonomous UGV/UAV equipped with radiation sensors feed data to dynamically update a computer model of the radioactive plume and ground contamination. The information flow is depicted in the chevron diagram below. The contamination information is provided to operators in an augmented reality solution.

Capability Description

In the immediate aftermath of a radiological incident (reactor accident, act of radiological terrorism or nuclear detonation), decision makers face a race against time to obtain the forensics results enabling attribution. In order to perform forensics, operators need to know what the specific source is, how large the radiation plume is, estimate how rapidly it is spreading and understand the extent to which forensics efforts need to be conducted in a radioactively contaminated environment.

The quantity of radiation released, the source of the radiation and the wind and weather are all factors that are used to determine this. The initial estimations, regularly updated by data fed back from mobile detectors into the plume modelling software, are used to provide a more accurate and dynamically updated assessment of the contaminated area and the control zone.

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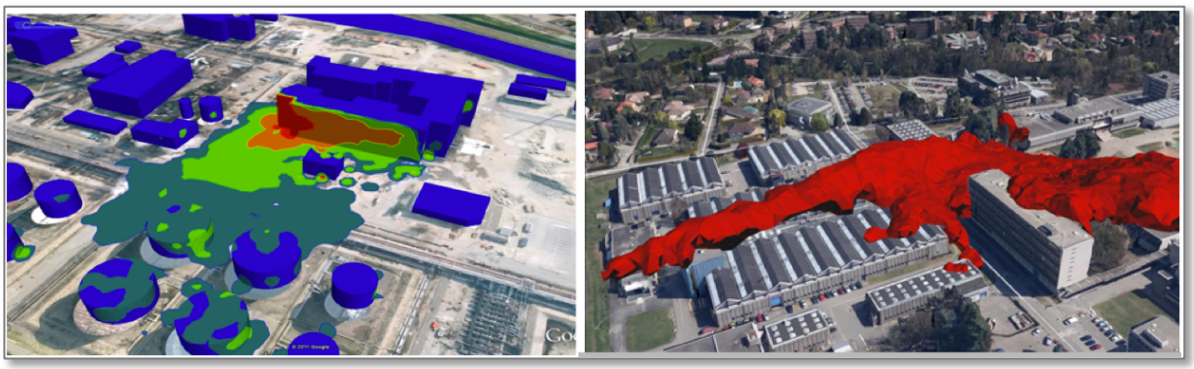
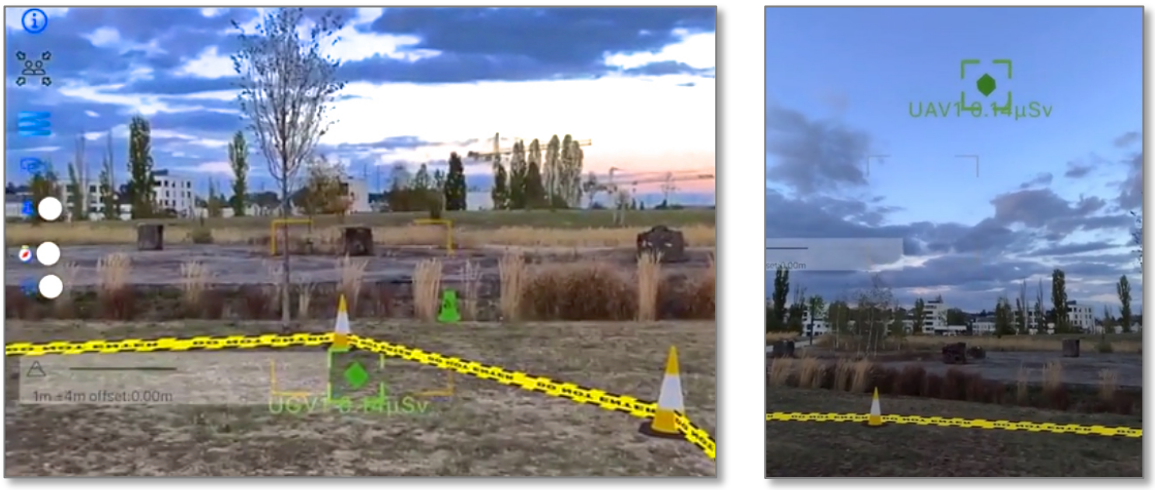
This data is provided to operators in an augmented reality solution, informing their decision-making pertaining to force protection measures, cordons and evacuations.



The 3D computer model of the radiation plume (top) is dynamically updated with the measurement data from UAV/UGV. The contamination information is provided via 4G or WIFI to operators using augmented reality (below), compatible with the Bruhn NewTech Frontline application, used in the monitoring and management of CBRN events. Image copyrights: Top 2 images © École Centrale de Lyon. Lower image © Luxembourg Institute of Science and Technology.



Autonomous AGV/UAV carrying state-of the-art radiation detectors and carrying MESH based communications systems, transmit the sensor telemetry out of the affected area. This information is then passed to the analysis and estimation systems - which take live sensor data and continuously calculate the current estimated location, characterization (type of material) and source term of the incident. This information is then passed to a command and control software reporting module where the data is displayed and annotated before this is then finally transmitted to operators in the field.

The complete solution results in less human intervention in the operation, as a direct result of the higher number of automated processes. Recent technological developments ranging from new detectors, drones and robots to dispersion models, have been leveraged to deliver faster, more concise information management and decision support software. The information is dynamically updated, enabling operators to have situational awareness in a timely manner in the early minutes and hours of an incident.

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The overall system includes a software solution that provides enhanced situational awareness via augmented reality. It leverages recent technological developments, a core element of which is a newly developed Flat Panel Gamma (FPG) radiation sensor.

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

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement (GA) N° 786729