7SHIELD

KR09 – Thermal and near-infrared image processing for man-made threats

MODULE

- Multi-Modal Automated Surveillance (MMAS)

SCOPE

The MMAS is an ideal candidate for the detection of possible **physical threats** based on **imagery/video detection**. The MMAS is located at the first layer of the 7SHIELD system, in the sensor level, of the 7SHIELD hierarchical architecture, it should be deployed in the Ground Station facilities.

The architecture of the MMAS is defined as a composition of several components namely a Processing Unit, a Graphical User Interface and a sensor unit. The Processing Unit is a program that performs all the processing of the MMAS, it is integrated with two entities, with **Bi-spectral Pan Tilt and Zoom (PTZ) cameras** and with 7SHIELD modules through a KAFKA broker.

Detection

Sensors Technologies

CONTRIBUTION

INOV designed and developed the MMAS based on the expertise in Artificial Intelligence, Telecommunication Equipment, Sensor Networks, Network Architectures and Protocols, Navigation Systems, Remote Monitoring and Surveillance Systems, Security and Defence Systems.

PARTNERS

INOV
Portugal

The Inov Inesc Inovacao – **Instituto De Novas Tecnologias (INOV)** is a private non-profit research institute and has strong technical expertise in Artificial Intelligence, Cybersecurity, Telecommunication Equipment and Services, Access Networks, Mobile Communication Systems, Sensor Networks, Network Architectures and Protocols, Speech Technologies, Navigation Systems and Fleet Management, Remote Monitoring and Surveillance Systems, Security and Defence Systems, Control and Electronics Development, New Technologies for Aeronautics & Aerospace, and Organizational Engineering.

CERTH
Greece

CERTH will reinforce its research competencies in the machine learning, image/video processing and face recognition as well as risk assessment and decision-making fields

ACCELIGENCE
Cyprus

Acceligence LTD (ACCELI) is engaged in cutting edge R&D activities in order to boost innovation capital, improve products and ensure alignment of the services to the state of the art. Not relevant to the purpose of the questionnaire

All the modules developed in the frame of 7SHIELD have been designed with the consultancy of identified external stakeholders, first responders and following the **requirements** provided by the partners working in the space sector acting as Pilots, who provided the Critical Infrastructures for **testing and demonstration**.

PURPOSE

Visually analyzing multiple video streams captured by the cameras can be a repetitive and boring process that can lead to missing some relevant events. After only twenty minutes of watching and evaluating monitor screens, the attention can go well below acceptable levels. This decrease in capacity can be up to 95% loss, which usually leads to missing possible important occurrences.

A Multi-Modal Automated Surveillance (MMAS) system based on the latest **Artificial Intelligent (AI) techniques** improves the detection of possible threats, efficiently and with less human effort or intervention. This system needs minimum human intervention during the operational time, generates alarms with low percentage of false positives and is easily integrated into the complex 7SHIELD project.

STAKEHOLDERS

The main markets are the **surveillance market and security systems** and other related markets where the solution could be applicable. In the identified markets the target segments are:

- Industrial areas
- Vehicle transfer areas
- Port areas (ex. container areas)
- Police and paramilitary large installations
- Critical communications facilities

CONTACT

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TECHNOLOGY

Thermal cameras are optimal to be used in surveillance systems designed to monitor outdoor spaces. The thermal features enable the user to obtain acceptable images even in places with highly varying ambient light, which are often difficult to analyze using traditional color images. Additionally, **thermal cameras** enable efficient **night surveillance**, since they do not require extra lighting equipment to illuminate the area.

Advances in Artificial Intelligence (AI) algorithms meant that **object detection algorithms** present an interesting approach to the detection and classification. Computer vision models provide better adaptability to different scenarios, leading to easier and more flexible implementations, EfficientDet,used in the in the MMAS, is a good example of a model that perform such image analysis.

FUTURE IMPROVEMENTS

The future work for the MMAS may fall in the development of features that will permit the **engagement of the MMAS with other 7SHIELD sensors**, namely following drones and other events detected by complementary tools, or inform other tools, as an example the integration of MMAS with Data Collection and Edge Processing (DCEP), from ACCELI. The loosely coupled integration of sensors permits to augment the overall system results by using the best complementary characteristics of each sensor.

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