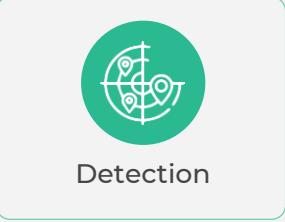




KR06 – Face Detection and face Recognition

SCOPE

The **Face Detection and Recognition (FDR)** module is designed to be used as a primary detection tool which provides the 7SHIELD ecosystem with raw data, concerning facial detection and recognition. The **raw detections** are being **collected and propagated, through the 7SHIELD system**, in the physical correlator Geospatial Complex Event Processing Engine (G-CEP) of 7SHIELD for further analysis.



CONTRIBUTION

M4D, part of CERTH, is a group intensively involved in miscellaneous European Projects, starting from 7 Framework Programme (FP7) and more extensively in H2020 projects. It focuses mainly in the areas of **computer vision, semantic multimedia analysis and retrieval**, web data mining, multimodal analytics and decision support, crisis management, fight crime and terrorism, border surveillance and digital security, Earth Observation and Migration and applies these technologies mainly in the health, and **security domain**. M4D focuses on developing cutting-edge technologies and solutions to be applied to real problems.

PARTNERS



CERTH
Greece

The **Centre for Research and Technology-Hellas (CERTH)**, founded in 2000, is the largest Research Centre in Northern Greece. It is governed by private law, while it has a non-profit status and it's supervised by the General Secretariat for Research and Innovation (GSRI) of the Greek Ministry of Development & Investments.

Besides other institutes, it contains the **Information Technologies Institute (ITI)**, which is the largest institute of CERTH. ITI is one of the leading Institutions of Greece in the fields of Informatics, Telematics and Telecommunications. ITI's research teams show their remarkable scientific work through a number of publications, and their extensively experience in multidiscipline via their participation in more than 70 EU and 85 National projects.

The **Multimedia, Knowledge and Social Media Analytics Lab (MKLab)** is one of the research units of ITI institute. The MKLab has active involvement in numerous Horizon 2020, FP7 and National projects. The **Multimodal Data Fusion and Analytics (M4D)** group is part of the MKLab.

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

This module can process live video streams from **Close Circuit Television (CCTV) cameras**, in order to warn about **detected faces that may belong to unauthorised individuals**.

The main algorithm is linked with an **authorised-person database** which contains image data of individuals that have authorization to move into the monitored area. The module produces alarms whenever a detected face cannot be matched with any person from the database.

STAKEHOLDERS

The output is **forwarded to the (G-CEP)** which is responsible to **combine physical threats**. After the recognition process, a detailed report can be produced with the detection and recognition details and is represented with a United Alert Format (UAF).

The advantage of the **produced alerts** is that they include **information for the camera location and type**, as well as **visualizations** of the analysis results, that will be **available to the ground segment operators** for further examination, enhancing their **situational awareness**.

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TECHNOLOGY

The FDR module is enabled by **state-of-the-art deep learning algorithms**, pre-trained for human face detection and recognition in **various poses, conditions and viewpoints**. Modern systems such as this, depend heavily on deep learning methodologies to achieve a significant boost in performance. In this class of algorithms, **large-scale neural networks** are first constructed and then **trained with a large amount of images**, in a way that tries to **mimic fundamental concepts of human learning**.

More specifically for face detection and recognition, the learning process fine-tunes the automatic extraction of **human facial features** in order to generate face representations that are **“readable” by the machine**.

FUTURE IMPROVEMENTS

The performance of this module, as with any technology relying on deep-learning, heavily depends on the quantity and quality of the training data. The algorithms are capable of producing robust and unbiased results, as long as the training data that are being fed into them are unbiased and include a wide variety of instances that are representative of the target population. There is room for improvement in that area, as long as **more and better-quality data will become available**.

