

26.1 PEDESTRIAN MOVEMENT ANALYSIS AT AIRPORTS  
VIDEO-BASED ANALYSIS ACROSS MULTIPLE CAMERA SYSTEMS

ABSTRACT

The size and complexity of major airports requires a vast number of cameras to provide sufficient surveillance. The fast analysis of the acquired video material from several hundred cameras poses a challenge for security operators. In 2010, studies at Munich and Newark airports showed that the recovery of a detected person over several camera viewpoints is a difficult and tedious task despite modern video technology. This research project aims at developing a support system that helps the human operator to analyse video data in order to track and search for pedestrians in cases where the operator has found a suspicious person and activated an alarm.

The developed system consists of two parts: the decentralised camera-based analysis, and the centralised processing of the extracted information across all cameras. The decentralised components include several cameras, each one connected to a video server, and a computer cluster for data analysis. The centrally organised components include a control and visualisation unit, which enables interactions between the operator and the modules, a recognition module, and a geometrical model of the airport to reduce the search area.

The software is also divided into decentralised and centralised components. The decentralised camera-based analysis consists of: illumination correction, salient-based people / face detection, GPU-based detection methods, tracking and feature extraction, data fusion and image processing modules, like motion detection and background subtraction methods. Meanwhile multi-camera people tracking and location prediction belong to the centrally organised software.

The General Aviation Airport Schönhagen and Erfurt-Weimar Airport were chosen to test and evaluate the developed system. Here, the research work could be applied to realistic airport infrastructures and the prototype system could be tested under conditions that are not subject to the strict security regulations found at major airports with significant passenger volumes. Furthermore, the GA airports themselves are a targeted application area for this research project, since the developed technology could prove to be a cost-efficient solution for the securing of assets and aircraft, especially if the security regulations are strengthened.

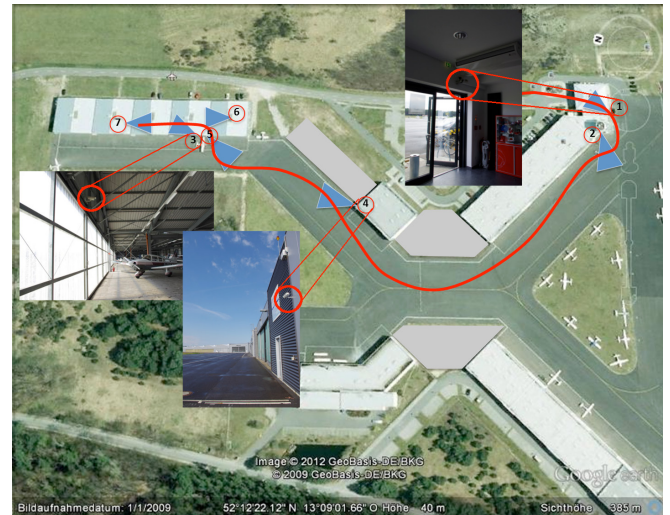
LIST OF PARTICIPANTS

L-1 Identity Solutions, Bochum (project manager); Hochschule Ruhr West University of Applied Sciences, Computer Science Institute, Campus Bottrop; Ilmenau University of Technology, Neuroinformatics and Cognitive Robotics Lab; Ruhr University Bochum, Law Faculty for Criminology, Criminal Policy and Police Science; Avistra GmbH, Berlin; European Aviation Security Center e.V., Schönhagen; Erfurt-Weimar Airport, Erfurt; Hannover-Langenhagen Airport, Hannover (associated partner)

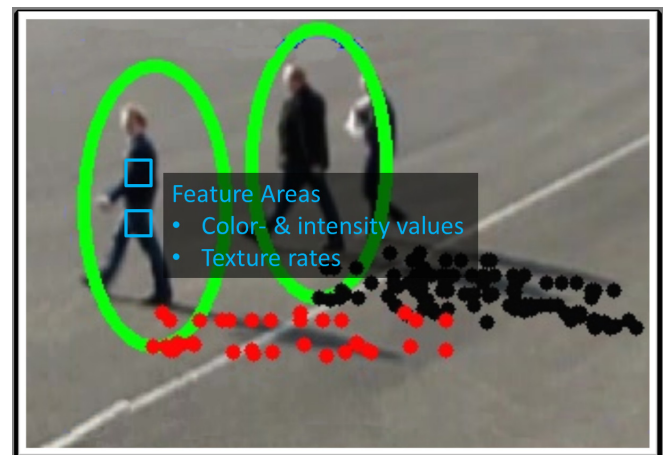
PROJECT START AND DURATION,  
TOTAL COSTS AND FUNDING

- Project:** January 2010 – March 2013
- Costs:** 395,182 Euro (HRW)
- Funding:** Federal Ministry of Education and Research (BMBF), grant 13N10798

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Camera positions at the Schönhagen airfield. Indoor and outdoor cameras are mounted with lenses of different focal length. © easc e.V. and Google Earth



During the tracking process features like hue, intensity and texture proportion are extracted. © Hochschule Ruhr West University of Applied Sciences

PERSPECTIVES, APPROACHES AND IDEAS FOR FURTHER DEVELOPMENT AT THE EU LEVEL

The system's usability will be further tested and evaluated from the security operator standpoint, and its acceptance evaluated by persons who use the airport infrastructure, such as pilots, passengers, and airport employees. Furthermore, in order to satisfy the need for speed in security applications, the algorithms will be organised in parallel. The tracking of single persons within larger groups of people will be a challenge for future work. Although the system is primarily intended to be used at airports, it is possible to adapt the system to other public areas, like train stations or subways.