

Multi-Camera Human Tracking At Airports Based on an Intelligent System Architecture



HOCHSCHULE RUHR WEST
UNIVERSITY OF APPLIED SCIENCES
INSTITUT INFORMATIK

easc



Background

A central application field of this developed video analytics system is the protection of critical infrastructures, especially airports. The size and complexity of major airports require an extensive number of cameras for a sufficient surveillance. The timely analysis of the acquired video material from several hundreds of cameras poses a challenge for the security operators. Cases at the airports of Munich or Newark / New Jersey in January 2010 have proven that the recovery of a once detected person over several camera viewpoints is a difficult and tedious task despite the availability of modern video processing technologies that is currently in place.

Objectives

The system aims to support operators of a security control room by detecting and assessing the movements of suspects from video data:

- The detection of the actual location of a person by using live-video streams: Where is the person right now?
- The detection of the covered way/path on the basis of recorded video data sets (backward analysis): Where did the person come from?
- The prediction of the movement of persons and the most likely probabilistic location (forward analysis): Where could the person go to resp. has been gone to?

Hardware Architecture

The developed system consists of two classes: the decentralized camera-based data analysis as well as the centralized processing of the extracted information across all cameras.

The decentralized components are:

- Several cameras, each one connected to a video server
- A computer cluster used for the data analysis

The centrally organized components are:

- A control and visualization unit, which enables the interaction between the operator and the several modules
- A recognition module
- A geometrical model of the airport to reduce the search area

Software Architecture

Analog to the hardware architecture the software part is also divided into decentralized and centralized components.

The decentralized camera-based analysis consists of:

- Illumination correction
- Salient-based people / face detection
- GPU-based detection methods
- Tracking and feature extraction
- Data fusion
- Several image processing modules like motion detection and background subtraction methods

The centrally organized part consists of:

- Multi-camera people tracking
- Location prediction

Funding

This work was funded by the German Federal Ministry of Education and Research (BMBF) in the framework of the APFEL project under grants 13N10798 and 13N10800.

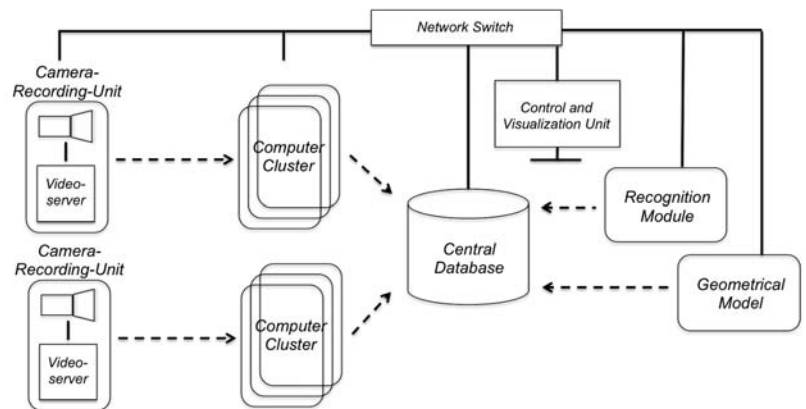
Contact

Matthias Grimm, M.Sc.,
Dipl.-Inf. Sebastian Hommel,
Prof. Dr. Uwe Handmann
Computer Science Institute
University of Applied Sciences Ruhr West
Bottrop, Germany
www.hs-ruhrwest.de

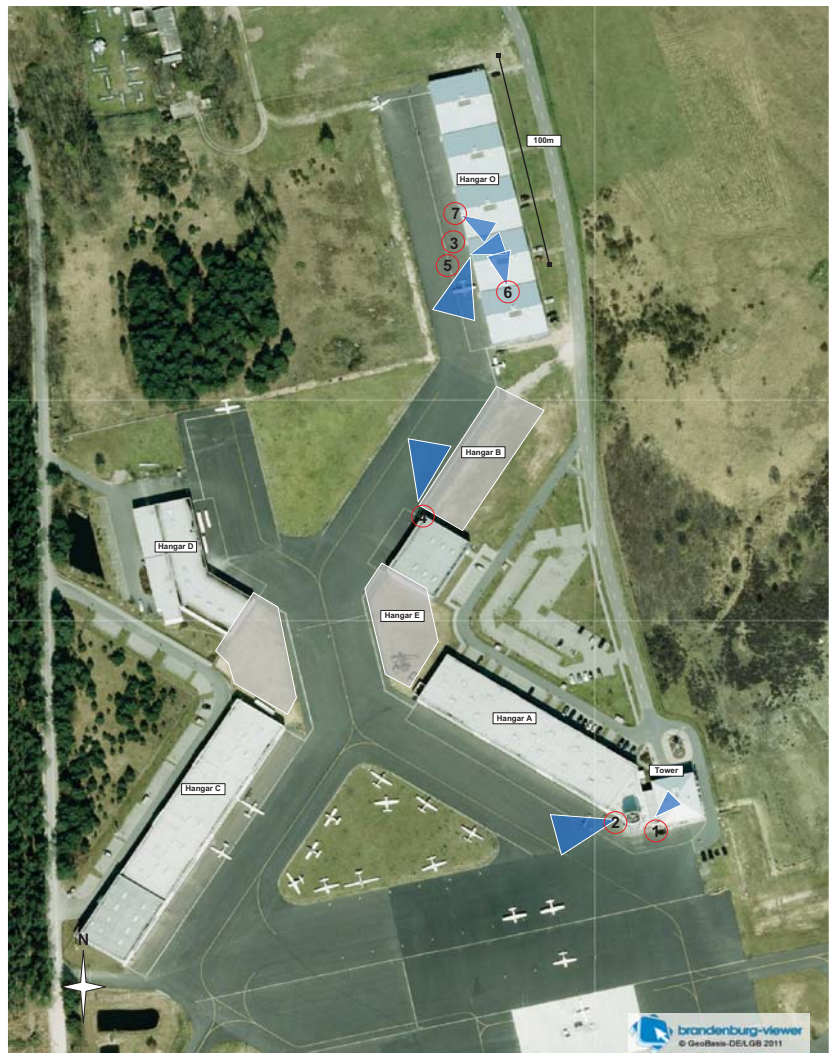
Dipl.-Ing. Veit Voges,
Dr. Uwe Weigmann
European Aviation Security Center e.V.
Schönhagen, Germany
www.easc-ev.org



Application of the system at the General Aviation airport Schönhagen



Overview of the hardware architecture schematically for two cameras



Camera positions at the Schönhagen airfield