Optag

An EU funded project to design build and validate a new airport tracking system

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Introduction

• Optag is the short name for:  
  Improving airport Efficiency, Security and Passenger Flow by Enhanced Passenger Monitoring

• Funding: FP6 Aeronautics and Space

• 3 year feasibility study and demonstration
  - Combines high resolution panoramic cameras and radio frequency tagging to locate individuals within an airport
  - Completed the information gathering/spec stage
  - Now in the design / build / test phase
  - Ends with a demonstration at an airport in Hungary
Airports....

Efficiency
Existing aviation infrastructure saturated
~10% of the total delays in European air transport are caused by passengers and their bags costing some €100M each year

Security
“Direct and discreet communication systems link the passenger screening points and other access control points to an airport control centre capable of quickly responding in suspect, or actual, cases of unlawful interference.” (IATA)

Safety
Demand for safer and more secure aviation
Evacuation / search and rescue procedures (poor visibility)

Optag objectives
Increase the safety and security of air travel
Maximise the utilisation of existing facilities
The system

Elements

- Digital panoramic imaging system
- Far Radio Frequency Identification (RFID) tags
- A user interface and data storage (server) facility
- 3D model of the airport environment - provides spatial "hook"

Implementation

- Airport 'users' carry tags
- Radio system tracks tags
- Panoramic camera system overlays tag locations onto images
- Network connection combined with distributed processing - no synchronisation between units required

The system will facilitate

- Real-time location of individual passengers within the airport
- Potential for the analysis of both mass traffic & individual behaviour
- Semi-automatic control of vision systems to observe and record suspicious or unauthorised activity
- Monitoring and targeting of individuals who may pose an economic or security risk to effective airport operations
• Separate map, live video and video playback windows
• **Green** - location updated within previous 30 s; **Red** - location not updated within previous 30 s; **Blue** - tag location unchanged for more than 10 minutes.
• Options to track all tags and/or specific individuals (named triangles)
• Auto-tracking facility to keep a specified tag within view at all times

An example of what the user might see...
The Optag TAG

A compact far-field RFID-tag transponder to be placed on a passenger or his baggage

- Compact
- Cheap possibly disposable
- Given to all passengers (e.g. boarding card)

Developed in the Department of Electrical Engineering at UCL
Some RFID design considerations

Tags and reader system tested by in a laboratory environment, to investigate

- Active (Battery powered)
- Range 10-20 metres
- Detector able to give bearing to tag - overlaid on camera outputs and 3D airport model
- Specific R&D to mitigate multi-path
- Reader unit can be separate from camera cluster
- Ability to search for tag within the space

Design moving to beta prototype
- higher volumes of tags and several readers will be produced
The Optag Camera

Colour panoramic image delivery

- 360° by 54° images supplied at 15 to 30 fps
- 9,600 x 1,600 pixels giving 0.03° per pixel
- geometrically calibrated for traceable image quality and geometry
- in camera processing – live panorama generation and person tracking
- rapid and accurate registration between multiple views of the same person or object

Multiple live outputs

- allow multiple users access to live views of differing directions from a single camera
- no need to mechanically pan and tilt the camera (no moving parts or delays to view a chosen portion of the scene
In camera geometric correction and panoramic image stitching

Distorted camera image

Corrected camera image
The Optag Camera
- Surveillance Expectations -

UK PSDB analogue security camera specifications and simulated images based on the Optag vertical pixel spacing of 23.7 pixels per degree

A single Optag camera will allow:

- Monitoring at 50m
- Detection at 30m
- Recognition at 6m
- Identification at 3 m
Simulated tests
Matched to Optag camera image quality
Subject at 3m
- identification-

Note, Optag camera view will cover a greater vertical angle than this view

90 pixels
Simulated tests of Optag camera image quality

Subject at 6m - recognition -

48 pixels
Simulated tests of Optag camera image quality

Subject at 9m - recognition? -

33 pixels
Simulated tests of Optag camera image quality

Subject at 15 m recognition? / detection

20 pixels
Simulated tests of Optag camera image quality

Subject at 30 m

Out of main lit area...

- detection -
Link the correct tag with the imaged person

Identify the same person in another Optag image

Key issue: direction finding ability of the tag system

Feedback from tags gives possible choices

Four tags identified within location volume pinpointed by camera
Possible Installations

**Fixed**
- Part coverage (key zones)
- Full airport coverage
- Door monitoring

**Mobile Unit**
- Modular - key zones
- High risk areas
- One-off surveys

In combination with existing surveillance systems
Potential Benefits

- **Efficiency**
  - Passenger flows
  - Late passengers to gate
  - Staff Management
- **Security**
  - Passenger tracking
  - Unusual behaviour analysis
  - Secure/restricted area access (1 tag/1 person)
  - Special users
- **Safety**
  - Evacuation
  - Lost person
Consortium

- Innovision
- UCL (EE & GE)
- Photonic
- TSI
- L&B
- Slot
- Debrecen Airport
- Europus

http://www-research.ge.ucl.ac.uk/Optag