Faster finding and tracking of suspects in multiple CCTV cameras

Jan Willem Marck, Henri Bouma, Jan Baan, Judith Dijk
Camera surveillance

High Probability Low Impact Events:
- Theft
- Robberies
- Aggression
- Graffiti
- Vandalism

Questions:
- Where did the individual come from?
- Where is the individual (going) now?
Problem definition

- Manual search of suspects in multiple CCTV cameras:
  - Search is **time consuming**
  - Suspects are **easily missed**, especially in crowded situations
TNO System

Real-time processing of multiple cameras

Person detection -> Within-cam tracking -> Tracklet database

Tracklet generation

Interactive retrieval

Re-identification engine

Similarity matching -> Space-time loc.

tracklet DB (updated in realtime)

User Interface

Interactive retrieval
Real-time track generation
Interactive re-identification

Re-identification:
- Retrieve similar candidates
- Patent

Note: Applicable to CCTV resolution
Detect many candidates...
...show only similar candidates
Benefits

› The TNO method is up to **five** times faster than without support

› Less people are missed
  › Especially in larger area’s or large timespans
    › (see our demo)
Live demonstrated at railway station

- Live demonstration
- Test railway track and station with 50 volunteers
- Heterogeneous light/weather
- Natural clothing

Scenario:
- Left luggage
- Who left the luggage?
- Where did suspect go to?
Moving forward ...

We are looking for:

- For partners to help in putting our technology on the market

What we bring to the table:

- State of the art video analytics expertise
- Our patented re recognition algorithm
Recent references for tracking and re-identification:


Related projects:

- WPSS
- PROTECTRAIL
Track record & contributions

- **Real-time tracking** [Bouma, 2013]
- **Re-identification over multiple CCTV cameras** [Bouma, 2013]

- **Fusion of multiple detections**
  - Behavioral profiling by combining multiple subtle suspicious observations [2013]

- **Action recognition and behavior analysis**

- **Threat detection**
  - (EDA: ARENA): Truck on parking lot [Burghouts, 2014]
  - (Passive sensors): Pickpockets in shopping mall [Bouma, 2014]
People flow measurement

Multitel