Smart Retrieval on Surveillance Video Databases

In literature, many Video Content Analysis (VCA) algorithms have been proposed without considering the means to exploit the generated content descriptions. This work considers the integration of multiple VCA algorithms into a single system, particularly focusing on efficient storage and fast retrieval on a semantic meaningful manner. The emphasis will be on the analysis of object trajectories.

Video Content Analysis Development System
Distributed processing middleware (based on SOAP)
Multiple VCA algorithms
  Segmentation & tracking
  Filtering of object location
  Perspective compensation
  Face recognition*
Database storage to enable offline retrieval
Standard data formats:
  MPEG-4 for video data
  MPEG-7 for description metadata

Figure 1: VCA Development System.

Smart storage of trajectory data
To decrease storage footprint and enable fast retrieval, the location points of the segmented and tracked objects are filtered. The filtered data is stored in the database in an efficient way, to enable fast retrieval.

Figure 2: Filtering, storage and retrieval.

* Face recognition work by F. Zuo, Ph.D., TU/e

Figure 3: Trajectory pre-processing for storage.

Segmentation output
Trajectory Filtering
Hierarchical R*-tree indexing

Figure 4: Filtered trajectory storage in an R*-tree.

Figure 5: Use of hierarchical structure in a query.

Retrieval Client
Because all information is stored in the database in an efficient way, the user can search large amounts of video data in limited time. In the User Interface, users can search for specific object-types, speeds and specific events. The trajectory data can be exploited by querying using trip-wires, trajectory matching and area-of-interest selection. Integration with the face-recognition algorithm* also enables searching for video of a specific person.

Figure 6: Retrieval client: searching in the database and displaying found video.

Future work
- Object modeling using multiple features (colour, shape, size, speed, trajectory)
- Search by example (using multiple features)
- Path learning