CLOVIS - A generic framework for general purpose visual surveillance applications.

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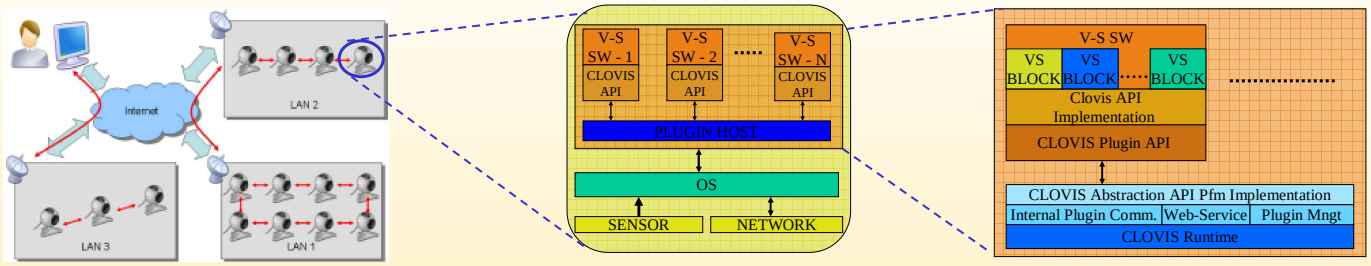
Abstract

Today's video-surveillance software is often based upon monolithic software running on PCs or embedded systems also called intelligent sensors; but, no real interaction exists between elements of a network dedicated to a video-surveillance scenario. The new framework, named "Clovis" (which stands for `Composant LOgiciel pour la VIdeo-Surveillance' - Software Component for Video-Surveillance) proposes, for the video-analysis world, a new approach to develop and deploy modular software for and in those sensors on scalable network. Through three sample applications, we present in this article, how the underlined framework can be used to easily develop software in a stand-alone manner or using distributed computing to enhance video-analysis.

The Framework



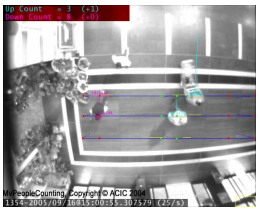
✓**Modular architecture for V-S software development and execution**
- ✓ Development API – Interface Pattern
- ✓ Inter- « plugin » communication through Event Oriented API
- ✓ Built-in network support through Web-Service (event transport between sensors in a network)

✓**XML-based detections descriptions embed in Events**

✓**Video-Surveillance application based upon reusable blocs**

✓Image Analysis Library
- ✓Background extrarction
- ✓Low-pass filter
- ✓Morphological operators
- ✓ …

People Counting



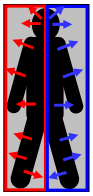
Detects moving people on a set of detection lines. Once it is possible to group a detection on each line, the algorithm considers that a person can be counted.

7 steps processing :
- •Background Estimation
- •Compute difference with current image
- •Automatic thresholding using Otsu method and mathematical morphology operators
- •Performing shadow removal
- •Candidates to counting extraction
- •Evaluate the speed of candidate
- •Tracking and collision detection

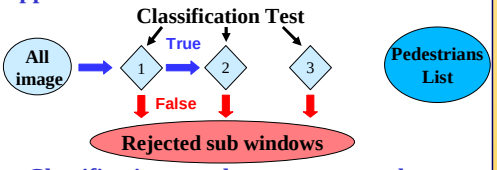
➢**Real-time processing tested on real-world environment.**

➢**Up to 92% fiability for fine-tuned application**

Pedestrians detection



Our method is based on pedestrians appearance in images. The gradient orientations are used as shape features. In order to speed up the detection our approach is based on a cascade of classifiers:



- **Classification tests become more and more complex along the cascade and need more and more image features.**
- **All classifiers are trained by AdaBoost.**
- **Each stage is trained in order to correct previous stages errors.**
- **Detection percentage superior to 90% for a false alarm rate per window less than 2.0e-7**

Tracking using multiple cameras with non-overlapping views

Detection and tracking of people within a scene. Extraction of relevant color signatures for identification.

1 – Simple Background Estimation

2 – Filtering by morphological operators (openings, reconstruction and dual reconstruction of the difference)

3 – Detection of moving objects

4 – Segmentation with a hierarchical watershed method into a few number of regions

5 – Color measure in HLS color space

Conclusion

The CLOVIS framework allows each third-party integrator to develop his own specific modules and exploit these in the same runtime environment. Moreover, basic image processing operators can be used directly from the built-in image processing library and modules sequence execution is performed thanks to the plugin host feature of the platform.Video-analysis applications developed in the scope of the project may be enhanced in the future such as the blob signature, metrics and network layer part. Another planned improvement of the platform is the development of a complete user interface for assemblage of modules, for the deployment on a network of sensors and for the management of the system.