



HAVi Newsletters

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TEC2014-53176-R HAVideo (2015-2017)

High Availability Video Analysis for People Behaviour Understanding

<http://www-vpu.eps.uam.es/HAVideo/>

Seventh four-months period progress report

The project has been working on plan and four deliverables have been published on schedule:

- D2.2 "Contextual modelling and extraction for people behavior understanding" version 2
- D3.1 "Online adaptive people behavior understanding based on contextual and quality information" version 1
- D3.2 "Collaborative approaches for people behavior understanding" version 1
- D4.2.1 "Framework and Guidelines for the development of applications" version 1

The main achievements of the different workpackages are described below.

WP1 "Video Analysis Framework"

The virtual camera network simulator has been completed in a first version that is being used for teaching and dissemination to industry. Plans for further development are being discussed.

WP2 "Video analysis tools, models and performance indicators"

For workpackage WP.2, the main achievements are:

- Development of a point-of-interest description method that uses spatial context to constrain descriptions.
- Development of a new feature to fight camouflage in background subtraction scenarios.

- Definition of transferring approaches to associate people detections between cameras based on offline extracted contextual information.
- Definition of transferring approaches in a multi-camera PTZ scenario to associate and adapt semantic maps which define the location of static contextual objects.

WP3 “Self-configurable approaches for long-term analysis”

For workpackage WP.3, the main achievements are:

- Development of a people detection algorithm based on contextual information (scene knowledge about object types and their locations).
- Development of a people detection algorithm based on adaptive selection of scales to detect people. Such selection is based on previous information.
- Development of a single-target video tracking algorithm able to quantify the importance of features to adapt to target or scene changes over time.
- Development of an approach for abandoned object detection able to counteract stationary people and adapt to illumination changes.
- A model describing the usage of resources of smart cameras which enables the development of collaborative approaches based on resource-aware policies.
- Collaborative approaches to adapt parameters during runtime via maximizing the agreement of independent sources. This strategy has been applied to shadow and people detection.
- Several approaches for collaborative video tracking based on quality signals for detections and tracking results. The following setups have been explored to combine multiple algorithms for single-target and single-view, single-target and multi-view, and multi-target and multi-view.

WP4 “Evaluation framework, demonstrators and dissemination”

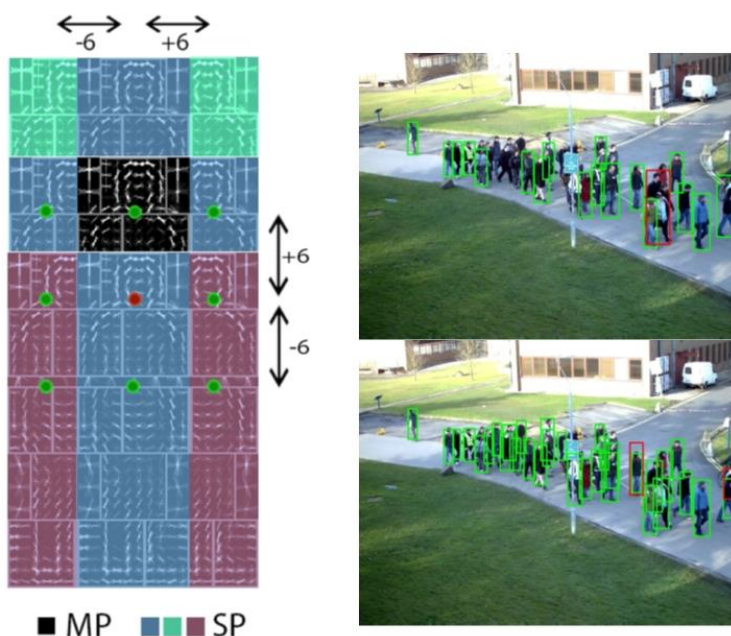
For workpackage WP.4, the main achievements are:

- Definition of the framework and guidelines for the development of applications and demonstrators
- Design and on-going implementation of a developer application for a configurable abandoned-stolen object detection system in security-video that integrates the most relevant techniques in each one of its stages
- Design and on-going implementation of a developer application for testing trackers, making use of both files (for use with State-of-the-Art datasets and off-line operation and adjustments) and a camera (for real-time demonstrations).
- Design and on-going implementation of a client application for a system that records and edits a video lecture without the need of a camera operator.
- Design and on-going implementation of a developer application for online context update in multi-camera scenarios.

Seventh four-months period results Journals

Álvaro García-Martín, Ricardo Sánchez, José M. Martínez, "Hierarchical detection of persons in groups", *Signal, Image and Video Processing*, (first online Feb. 2017), Springer, ISSN 1863-1703 (Print) 1863-1711 (Online) (DOI [10.1007/s11760-017-1073-z](https://doi.org/10.1007/s11760-017-1073-z))

Abstract: In this paper, we address one of the most typical problems of person detection: scenarios with the presence of groups of persons. In this kind of scenarios, traditional person detectors have difficulties as they have to deal with several simultaneous occlusions. In order to try to solve this problem, we propose the use of two different hierarchies. The first one consists of a hierarchy of persons, i.e., the use of the detection of different persons belonging to a group in order to refine the individual's detections. The second one consists of a hierarchy of parts, i.e., the use of different combinations of body parts in order to refine the final detections. Experimental results over several video sequences show that the proposed hierarchies significantly improve the results with respect to different approaches from the state of the art.



Book chapters

Juan Carlos San Miguel, Mónica Lozano, José M. Martínez, "Performance Evaluation of Single Object Visual Tracking: Methodology, Dataset and Experiments", ch. 3, pp. 107-142, *Surveillance Systems: Design, Applications and Technology*, R. Simmons (ed.), 2017, Nova Publishers. (ISBN 978-1-53610-703-6) (ISBN 978-1-53610-726-5 eBook).

Abstract: Performance evaluation of visual tracking approaches (trackers) based on ground-truth data allows to determine their strengths and weaknesses. In this paper, we present a methodology for tracker evaluation that quantifies performance against variations of the tracker input (data and configuration). It addresses three aspects: dataset, performance criteria and evaluation measure. A dataset with ground-truth is designed including common tracking problems

such as illumination changes, complex movements and occlusions. Four performance criteria are defined: parameter stability, initialization robustness, global accuracy and computational complexity. A new measure is proposed to estimate spatio-temporal tracker accuracy to account for the human errors in the generation of ground-truth data. Then, such measure is compared with the related state-of-the-art showing its superiority to evaluate trackers. Finally, the proposed methodology is validated on state-of-the-art trackers demonstrating their utility to identify tracker characteristics.

Graduate thesis

Sistema Multi-cámara Distribuido basado en Unity (**Multicamera distributed system based on Unity**), Mario González Jiménez (advisor: Juan Carlos San Miguel), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería Informática, Univ. Autónoma de Madrid, Feb. 2017.

Abstract: This Bachelor Thesis presents a software tool to simulate multi-camera systems using 3D virtual data. This tool offers an alternative to traditional Computer Vision research by addressing the technical and flexibility limitations of common testing environments that are based on pre-recorded videos or live video streams from network cameras. The objective of this Thesis is to provide a flexible testing environment for Computer Vision algorithms where it can be simulated virtual scenarios which cannot be easily replicated with real world. This tool is based on the Unity game engine that allows to design and to load realistic 3D environments and extends its functionality with a multi-camera system able to simulate the management of several distributed virtual cameras in real time, as well as setting their properties and transmitting the captured frames to third party applications (i.e. algorithms). By using a Client-Server architecture, this tool allows the remote configuration and use of the system as well as in localhost mode. Finally, system performance is evaluated and results are discussed, establishing recommended configurations and technical limitations for successful operation.

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