

event
video

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TEC2011-25995 EventVideo (2012-2014)

Strategies for Object Segmentation, Detection and Tracking in Complex
Environments for Event Detection in Video Surveillance and Monitoring

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

Tenth trimester progress report

The work during this trimester has evolved on plan. Several outcomes of the project have been published: two conference papers, two Master thesis, and three Graduate thesis; and several papers have been accepted for publication. Also the following deliverables have been published with a small delay:

- D3.1v1 - People detection in dense environments (public) - June 2014
- D4.1v1 - Tracking in dense or cluttered environments - (public) June 2014
- D4.2v1 - Visual attention driven tracking (public) - June 2014
- D6.2v5 - EventVideo Results Report (public) - June 2014

Other deliverables due this trimester are under final edition and will be published in the next weeks:

- D2.1 "Segmentation for static cameras"
- D2.2 "Segmentation for moving cameras"
- D3.2 "Events detection in dense environments"

The work in the area of demonstrators has already provided several demonstrators most of them shown at the eventVideo Workshop held on the 23rd May.

eventVideo Workshop - Friday 23rd May 2014

The workshop was held during the morning of 23rd May of 2014 with over 30 attendees (not including the presenters). After a presentation of the project and an overview of the workshop program the technical sessions started with a description of the infrastructure used in the project, both material and software development framework. Afterwards four sessions were devoted to the main research areas of the project. Session 2 presented the work done in segmentation, presenting two works:

foreground-background segmentation in multimodal environments and Segmentation for PTZ cameras, both including live demos. Session 3 presented results in people detection, detailing after an overview of all the work done, the results obtained in real-time people detection (demonstrating live several real time people detectors) and people-background segmentation. In Session 4, devoted to object tracking, two works were presented: visual attention based tracking and long-term object tracking, the later showing a live demo with cameras installed in the workshop room and allowing the public to interactively test the system. The last session on Event detection included three presentations on specific topics: people activities and interactions detection, stolen and abandoned objects detection and anomaly detection, including two live demos.



Tenth trimester results

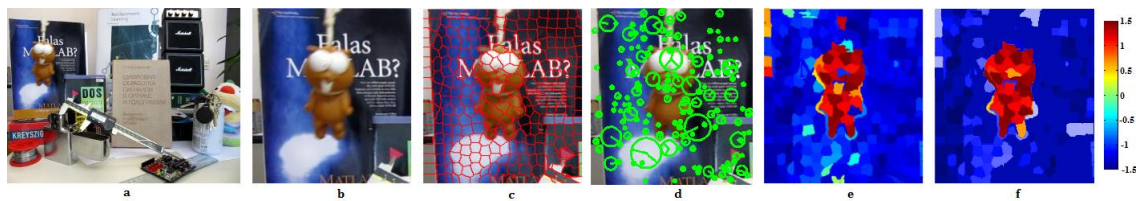
Publications

Rafael Martín, José M. Martínez, “**Evaluation of Bounding Box Level Fusion of Single Target Video Object Trackers**”, en *Hybrid Artificial Intelligence Systems – HAIS 2014*, M. Polycarpou et al. (eds.), *Lecture Notes in Computer Science*, Vol. 8480, Springer Verlag, 2014, pp. 200–210. (ISBN 978-3-319-07616-4).

Abstract: The main objective of this work is to evaluate a simple fusion system which improves the performance of several object trackers, within a methodological and rigorous evaluation framework. The considered algorithms are monocamera single target trackers. After analyzing in detail the state of the art, an evaluation framework is selected and presented. The sequences selected in this evaluation try to represent different real scenes and conditions. Then, classical and modern tracking algorithms are selected and evaluated individually, in order to understand their performance in different scenarios and problems. Finally, some fusion methods are described and evaluated, comparing their results with the results of the individual tracking algorithms.

Fulgencio Navarro, Marcos Escudero, Jesús Bescós, “Enhancing region-based object tracking with the SP-SIFT feature”, in Proc. of 2014 International Workshop on Content-Based Multimedia Indexing, CBMI 2014, Klagenfurt, Austria, 18–20 Jun. 2014.

Abstract: Existing tracking approaches are design-varied. Several features have been proposed to describe low, mid and high level cues and used to drive frame to frame tracking correspondences under mainly two strategies: purely matching and discriminative matching. However, despite the enormous amount of approaches proposed, single object tracking is still an unresolved task. In this paper we explore, to our knowledge, a new tracking approach that combines the cues at each tracking level that are currently considered the best among the existing possibilities. In this sense, point of interest (POI) descriptions are used to characterize midlevel region-based cues. These cues define a discriminative scheme whereby new instances are either classified as tracked target or surrounding background. In order to assess the advantages of our proposal, we have selected a top-ranked algorithm in the state-of-the-art, based on the use of mid-level cues, and we have integrated the SP-SIFT feature, a POI descriptor, into its scene model and decision scheme. Results indicate that the proposed approach outperforms the selected base tracking algorithm by increasing the discriminative capacity of its description feature.



Master Thesis

Entorno de desarrollo de aplicaciones de vídeo-seguridad multicámara (Development environment for multicamera video-surveillance applications), Carlos Sánchez Bueno (advisor: José M. Martínez), Proyecto Fin de Carrera (Master Thesis), Escuela Politécnica Superior, Univ. Autónoma de Madrid, Jun. 2014.

Abstract: The main objective of this project has been to develop a methodology for the development of video surveillance applications that make use of video sequence analysis. The development environment of the applications is a framework for distributed video processing, which allows the connection between different elements that form part of the system. The project also includes upgrades in the operation of the framework as well as new functionalities. During the development of this project two algorithms have been integrated in the system in order to assess the developed methodology. For each algorithm all the steps of development have been covered to finally obtain applications with a graphic user interface that allow the processing of images obtained by the platform's capturing systems and observe its results.

Seguimiento de personas en vídeo basado en detección (Detection-based people tracking in video sequences), Raúl Porras Martín (advisor: José M. Martínez), Proyecto Fin de Carrera (Master Thesis), Escuela Politécnica Superior, Univ. Autónoma de Madrid, Jun. 2014.

Abstract: The main objective of this project is to create a multiple-person tracking system based on a combination of information provided by a person detector and a tracker. The first goal is to develop a system which can be used as a base where you can implement improvements in its identities association module. After analyzing in detail the state of the art, an assessment protocol is developed to evaluate the implemented algorithm's performance. In this way, a dataset with different levels of complexity is proposed, and the most frequent state of the art metrics are chosen to measure the performance of the tracking system. Then, people detection and object tracking algorithms are chosen. A base system of multiple-person tracking is generated. It uses a matching process to make the association of detections between consecutive frames. The implemented algorithm is assessed using previously selected metrics. Identities association module is improved after the basic system implementation has been finished. The new algorithm is assessed and the new results are compared with the results obtained for the previous algorithm. It is done for every combination of people detectors and tracking algorithms chosen.

Graduate Thesis

Detección de personas en tiempo real (Real-time people detection), Patricia Marín Belinchón (advisor: Álvaro García), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería y Tecnologías de Telecomunicación, Escuela Politécnica Superior, Universidad Autónoma de Madrid, Jun. 2014.

Abstract: The main goal of this project is the implementation of several people detection algorithms on a proprietary video analysis platform called DiVA, adapting its functionality so that it can run with off-line videos, as well as in real time. Furthermore, demonstrators have been developed for each of these algorithms as graphic interfaces. In this way, interactivity between the user and the algorithm is allowed and testing its performance becomes a simpler and more intuitive task. To carry out this work and during its development, each of the selected people detectors have been studied, implemented and evaluated. These are four, namely: First, HOG and Latent SVM, which perform an exhaustive search for detection and, secondly, Fusion and Edge, which use pre-segmentation classification, thus allowing real-time detection. During this work the performance of all these algorithms for people detection have been studied in depth to finally analyze the results, evaluating the computational cost of each implemented detector.

Detección de caídas para vídeo-monitorización en entornos domésticos (Fall Detection for Video-monitoring in domestic environments), Sara Cerro Pardo (advisor: José M. Martínez), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería y Tecnologías de Telecomunicación, Escuela Politécnica Superior, Universidad Autónoma de Madrid, Jun. 2014.

Abstract: This work has been motivated by the need to develop a system for fall detection, aimed for senior people who want to live independently assuring their well-being and feeling comfortable. Given the constant growth of this type of population, this system has a high potential, so it is currently being investigated in this field. This system based on video-monitoring has a large state of the art, with numerous implementations and different techniques used for this purpose. The main target during the development of this project has been to obtain reasonable results detecting falls, testing the algorithm with datasets made up of videos with different features and providing some approaches to set conclusions. In the same way, the problems attached to this type of implementations have been explained and, in particular, the difficulties that have appeared throughout this work. Finally, it has been established the main basis for future studies on how to correct these problems and create at the same time a more robust algorithm so that it can make space for itself in this field.

Detección de intrusión con cámaras móviles en tiempo real (Real-time Intrusion detection with mobile cameras), Alberto Palero Almazán (advisor: Jesús Bescós), Trabajo Fin de Grado (Graduate Thesis), Grado en Ingeniería y Tecnologías de Telecomunicación, Escuela Politécnica Superior, Universidad Autónoma de Madrid, Jun. 2014.

Abstract: The main motivation behind this project has been to develop an intrusion-detection system based on a video surveillance system that uses a background subtraction algorithm which uses a moving camera (PTZ camera) so that, compared with a fixed camera, it increases its field of view. In general, a background subtraction algorithm is designed for fixed cameras. In order to adapt it to PTZ cameras we propose using panoramic pictures as the input for the background subtraction algorithm. The process used to generate the panoramic image that will be used in the background subtraction algorithm is explained in this project, as well as all the problems that can be encountered in this process and all the solutions we propose to solve said problems. Once the panoramic image has been generated, it is explained how to use this image and the new frame that comes from the PTZ camera, in each instance, so that these two images are merged together, and this new image, that is a mix between the front of the new frame and the panoramic image, as the input image of the background subtraction algorithm. The output will be a mask that overlaps over the panoramic image and highlights the areas of the image where there is intrusion. Finally it has been evaluated separately, first the algorithm that creates the panoramic image and the complete solution, that includes the background

subtraction. Conclusions have been obtained based on these results.

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