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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/

Eighth trimester progress report

The first PhD thesis developed within the project has been successfully defended in October. Several outcomes of the project have been published and the work has continued without any problem. Good advances have been done in the area of demonstrators, integrating algorithms developed within the project in applications able to operate over different cameras in several environments (lab, corridors, hall, ...). The first one working, for the detection of stolen and abandoned objects, is currently in a final beta version and will be finished in the next weeks. We have also started to plan the organization of a workshop to be held during the first semester of 2014 in order to show the results of the project.

Eighth trimester results

Project Documents

- D6.2 "EventVideo results report", v4, December 2013

Publications

Juan Carlos San Miguel, Sergio Suja, **"Skin detection by dual maximization of detectors agreement for video monitoring"**, Pattern Recognition Letters, 34(16):2102-2109, December 2013, Elsevier Science Inc., ISSN 0167-8655 (DOI 10.1016/j.patrec.2013.07.016.

Abstract: This paper presents an approach for skin detection which is able to adapt its parameters to image data captured from video monitoring tasks with a medium field of view. It is composed of two detectors designed to get high and low probable

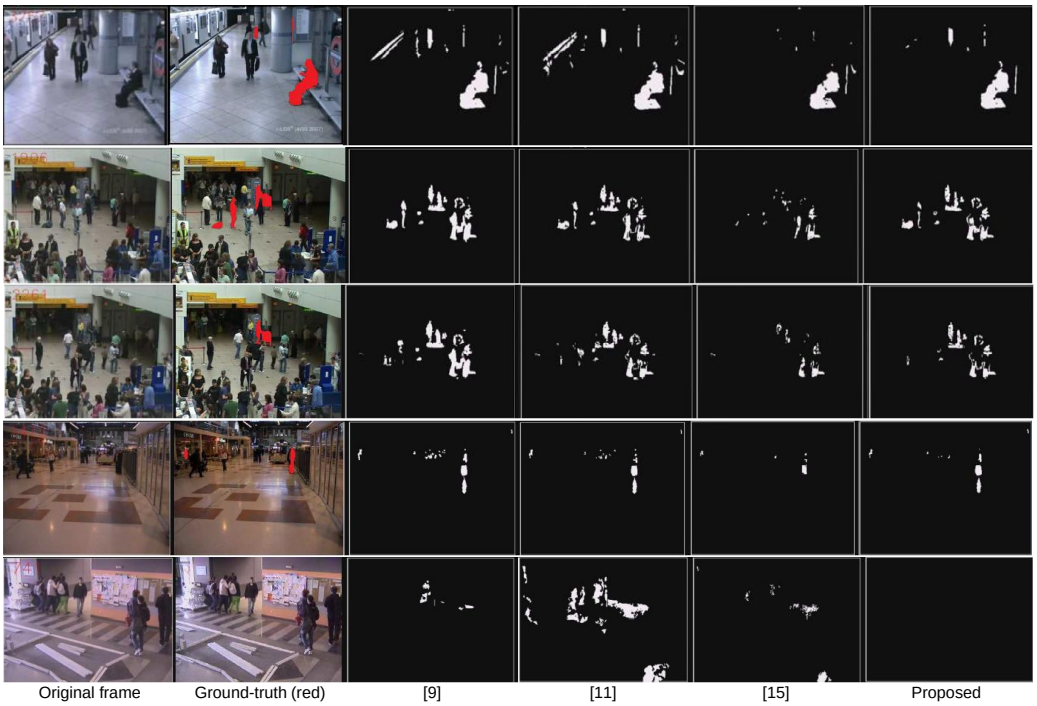
skin pixels (respectively, regions and isolated pixels). Each one is based on thresholding two color channels, which are dynamically selected. Adaptation is based on the agreement maximization framework, whose aim is to find the configuration with the highest similarity between the channel results. Moreover, we improve such framework by learning how detector parameters are related and proposing an agreement function to consider expected skin properties. Finally, both detectors are combined by morphological reconstruction filtering to keep the skin regions whilst removing wrongly detected regions. The proposed approach is evaluated on heterogeneous human activity recognition datasets outperforming the most relevant state-of-the-art approaches.

Input image (a) | Ground-truth (b) | FD_1 (c) | FD_2 (d) | $\gamma^{rec}(FD_1, FD_2)$ (e)

Fig. 2. Sample results for an image of the EDds dataset showing the output of the skin detectors FD_1 (H-a, $\beta_H = .06$, $\beta_a = .16$) and FD_2 (H-b, $\beta_H = .10$, $\beta_b = .49$) after optimum channel selection and their combination through mathematical morphology γ^{rec}.

Diego Ortego, Juan Carlos San Miguel, "**Stationary foreground detection for video-surveillance based on foreground segmentation and motion history images**", in Proc. of 2013 IEEE International Conference on Advanced Video and Signal-based Surveillance, AVSS 2013, Kraków, Poland, 27-30 August 2013, pp. 75-80

Abstract: Stationary foreground detection is a common stage in many video-surveillance applications. In this paper, we propose an approach for stationary foreground detection in video based on the spatio-temporal variation of foreground



Original frame | Ground-truth (red) | [9] | [11] | [15] | Proposed

and motion data. Foreground data are obtained by Background Subtraction to detect regions of interest. Motion data allows to filter out the moving regions and it is estimated using median filters over sliding windows. Spatiotemporal patterns of both data are computed through history images and the final detection is obtained using a two-threshold scheme that considers motion activity. Partial visibility of stationary foreground for short-time intervals is handled to increase robustness. The results over challenging video-surveillance sequences show an improvement of the proposed approach against the related work.

PhD Thesis

Álvaro García Martín, "Contributions to robust people detection in video-surveillance", Tesis Doctoral (PhD Thesis), Escuela Politécnica Superior, Universidad Autónoma de Madrid, October 2013.

Abstract: During the past years, automatic video surveillance systems have experienced a great development driven by the growing need of security. These automatic systems include several image and video processing techniques from the computer vision field and for monitoring purposes. Computer vision is a field with multiple lines of research and different application domains, being video surveillance one of the most developed during the last years. Within the different video surveillance tasks, the main objective of this thesis has been the exploration of the state of the art in people detection, analyze the most representative approaches, identify their weaknesses and propose contributions to improve current people detection state of the art.

Firstly, in order to analyze the people detection problems in surveillance scenarios, it has been identified the critical tasks in any people detection algorithm and it has been designed a consequently framework for their evaluation. The people detection task consists mostly of, firstly, the design and training of a person model based on characteristic parameters (motion, dimensions, silhouette, etc); and, secondly, the adjustment of this model to the candidate objects in the scene. Thus, the critical tasks in any people detection algorithm are the generation or extraction of the initial object hypotheses to be people from the scene and the person model used to classify those initial object hypotheses. Secondly, it has been proposed three different people detection algorithms and compared with the state of the art, covering all the people detection issues previously identified. Finally, it has been also proposed two different people detection post-processing subtasks focused on improving the final detection results.

The performance of the proposed people detection algorithms and post-processing subtasks has been thoroughly evaluated on the proposed evaluation dataset. The experiments conducted demonstrated the advantages and disadvantages of every proposed people detection approach in typical surveillance scenarios. Finally, the inclusion of the proposed post-processing subtasks provides robustness and improves the final detection results.

Master Thesis

Luis A. Caro Campos, "Anomaly Detection in Video Sequences", Trabajo Fin de Master (Master Thesis), Master Universitario en Investigación e Innovación en TIC (i2TIC), Escuela Politécnica Superior, Universidad Autónoma de Madrid, October 2013.

Abstract: In this work, a comprehensive study of an existing anomaly detection framework has been carried out. After identifying current challenges in the field of anomaly detection in video sequences, an existing framework has been selected for its implementation and evaluation. A set of video sequences containing anomalies from common surveillance scenarios have been selected from publicly available datasets. The system has been evaluated on these video sequences in order to identify existing shortcomings. Improvements to the original algorithm have been proposed in order to address the observed limitations. Finally, the performance of the proposed changes has been evaluated on the same video sequences for comparison.

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