Image and Video Analysis, Detection and Recognition

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1 Introduction

The main goal of this special section was to have an overview of recent findings in theory, methodology, and applications in the field of image and video analysis, detection, and recognition. In addition to selected contributions from the Proceedings of the 2017 International Conference on Image Analysis and Processing (ICIAP 2017), a well-established conference organized biennially by the Italian Member Society (CVPL) of the International Association for Pattern Recognition (IAPR), contributions were received from all around the world. After a rigorous, multiple-round peer-review process, 29 papers were accepted for publication.

Not surprisingly, the contributions in this special section show that image segmentation and feature extraction remain the most attractive subjects for many researchers, while the increasing role of machine learning is confirmed when complex tasks typical of image classification and recognition are considered. We present a brief overview of the 29 contributions below.

2 Contributions

The special section opens with two papers on image filtering. Hou et al. develop an L1-based nonlocal total variational model based on Retinex theory for image restoration. Kennedy describes a procedure for designing highly isotropic separable filters with steerable responses, vanishing moments, and configurable scale.

The next four papers focus on traditional tasks, such as character representation and recognition, with approaches based on classic as well as modern machine learning methods. In the work of Chen and Chao, skeletonization is used to represent Chinese calligraphy characters. Obaidullah et al. employ Extreme Learning Machines for handwritten Indic script identification. The Hindi handwritten character recognition problem is addressed by Yadav and Purwar using supervised classifiers, namely support vector machines and multilayer perceptrons. Handwriting analysis is the subject of the work of Guarnera et al., who present GRAPHJ, a tool designed to implement a real forensic protocol adopted in Italy.

The special section continues with six papers on image segmentation. Oh and You investigate a visual saliency region detection method based on soft- and hard-segmentation, while Zhang et al. propose a graph-based approach inspired by multiple Gestalt principles to detect salient regions. Gao et al. propose an active contour method for image segmentation combining color, texture, and saliency. Kothapalli et al. combine fractional derivatives with information sets to improve the performance of traditional edge detectors. In recent years, deep convolutional neural networks have shown state-of-the-art performance in many image segmentation tasks. Wang et al. discuss contextual aspects of deep convolutional neural networks for semantic image segmentation, while Gabriel et al. analyze the discriminative generalized Hough transform in a deep CNN context for pedestrian and car detection.

Two papers deal with the subject of medical image analysis. Öztürk and Akdemir propose a rescaling method for histopathological images, while Kumari et al. present a method to develop anatomically realistic breast phantoms using several dispersion models.

Six papers focus on feature extraction. Ji et al. propose an algorithm that analyzes the state of the eye and mouth, an important step in fatigue detection, by extracting contour features. Misra and Laskar develop a practical hand detection system using sparse texture features and color–texture features. Saeed and Khan address the problem of unconstrained ear recognition by combining traditional ear recognition and ear-based soft biometric traits. Petrelli and Di Stefano use color and depth information for content-based image retrieval of RGB-D imagery. Zhuo et al. describe a lightweight convolutional network model for vehicle classification. Zwemer et al. propose a learning-based vehicle make and model recognition system.

Three papers explore various machine learning applications in image processing and analysis. Watson and Bhalerao explore person reidentification by means of deep foreground appearance models. Cai et al. use depth motion maps and improved convolutional neural networks for human action recognition. Bianco et al. design a multiscale fully convolutional network architecture for image saliency estimation.

The remaining six papers are devoted to video processing and analysis. Zhuo et al. deal with vehicle color recognition in surveillance videos using a hierarchical fine-tuning strategy. Meurie et al. present a human detection method based on a genetically optimized ensemble of classifiers. Thirumurthy et al. propose statistical-based approaches for change detection in scene regions. Spampinato et al. present a low-cost rototranslational video stabilization algorithm. Ramadan and Tairi investigate salient video object segmentation using boundary connectedness and space-time salient regions. Finally, Borneman et al. develop a technique to characterize information content in observed motion using fractal complexity analysis of optical flow.

Edoardo Ardizzone is currently a full professor of computer systems at the University of Palermo, Italy. He is an author or co-author of over 160 scientific papers in peer-reviewed journals and proceedings of international conferences, mainly in the areas of image processing and analysis, computer vision, content-based image and video databases. He is active in several projects funded by the European Union, the Italian Government, and the Italian National Research Council. He teaches image processing in the Master of Computer Engineering program at the University of Palermo. He is a member of the Italian Association for Computer Vision, Pattern Recognition and Machine Learning (CVPL), and the Italian chapter of IAPR.

M. Emre Celebi received his BSc degree in computer engineering from the Middle East Technical University (Ankara, Turkey) in 2002. He received his MSc and PhD degrees in computer science and engineering from the University of Texas at Arlington (Arlington, Texas, USA) in 2003 and 2006, respectively. He is currently a professor and the chair at the Department of Computer Science in the University of Central Arkansas (Conway, Arkansas, USA). He has actively pursued research in the field of image processing and analysis with an emphasis on medical image analysis and color image processing. He has worked on several projects funded by the US National Science Foundation and the National Institutes of Health and published over 140 articles in peer-reviewed journals and conference proceedings. He is a senior member of the IEEE and SPIE.