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Computational Intelligence for Multimedia Understanding

International Workshop, MUSCLE 2011
Pisa, Italy, December 13-15, 2011
Revised Selected Papers

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Preface

We live in a world where multimedia technology and resources improve the quality of our daily experiences. Multimedia data, in the form of still pictures, graphics, 3D models, audio, speech, video and a combination of these are in fact playing an increasingly important role in our life. Multimedia offers awe-inspiring possibilities to meet modern needs by enabling the distribution of content through several means. This information can be processed to create new knowledge. Therefore, we need to develop algorithms for computational interpretation and processing of such data, but also to share them across the network in an intelligent manner. Networked multimedia communications, such as video and audio on demand, video conferencing and e-learning, give us an idea of the growing diffusion of these data. Multimedia communications produce a growing demand for systems and tools to satisfy the most sophisticated requirements for storing, searching, accessing, retrieving, managing and sharing complex resources with many different formats of media types. A multimedia system is generally made of different components: database, multimedia storage server, network and client systems, often in a mobile environment. New initiatives are trying to bind these components together in open multimedia frameworks for an interoperable use of multimedia data in a distributed environment. Finding multimedia objects by content in a distributed database means searching for them on the basis of content descriptions and similarity measures. Looking for events in a video library requires not only searching a database for objects related to the specified events, but also considering bandwidth constraints. Enabling automatic classification and segmentation of digital resources is necessary to produce information that can be then extracted from multimedia also considering annotations. The above processes involve multimedia producers, but also several scientific communities (*e.g.*, cultural heritage, education, medicine, etc.) who want to merge multimedia description, management, and processing for their domain-specific requirements. This entails a proper understanding of the semantic relationships between the multimedia requisites in different domains. Research in multimedia analysis and understanding ranges from low-level data processing to automatic recognition. Current research domains involve methods and techniques for pattern recognition, content-based indexing, image understanding, object/subject-based retrieval and representation, segmentation, multimodal and multisource signal fusion, as well as knowledge processing and tracking. Multimedia understanding has a wide range of applications. Fundamental research and new technologies give rise to the growth of new understanding and applications outcomes.

March 2012

A. Enis Çetin
Ovidio Salvetti

Introduction

This book contains the contributions presented at the International Workshop on Computational Intelligence for Multimedia Understanding, organized by the ERCIM working group on Multimedia Understanding Through Semantics, Computation, and Learning (MUSCLE) as an open forum to discuss the most recent advances in this field. The workshop took place in Pisa, Italy, during December 13–15, 2011.

An open call-for-papers was issued in May 2011. After a first review, the contributions that scored more than 4/5 (43% of the original submissions) were accepted for publication. The papers that scored no more than 3/5 were rejected. Among the other papers, those that scored 4/5 were accepted, but their second versions were subjected to scrutiny by the editors, and the ones that scored between 3/5 and 4/5 were given the possibility to be presented at the workshop, but their second versions underwent a new full review before final acceptance. In this way, with the help of more than 20 external reviewers, the Program Committee managed to ensure both a high scientific level and an acceptance rate of more than 80%. I am highly indebted to the members of the Program Committee and the reviewers for their hard work. I must also thank all the contributors, whose presentations made the workshop extremely interesting and fruitful, and whose authoritative papers give value to this book. Two greatly appreciated invited lectures were given by Sanni Siltanen of VTT, Finland, and Bülent Sankur of Bogaziçi University, Turkey. I thank them very much on behalf of the entire audience.

The papers presented here are both theoretical and application-oriented, covering a wide range of subjects. As far as the media are concerned, most contributions deal with still images, but there are some on video and text. Two papers also use results from human perception experiments for image and video analysis and synthesis. The organization of the volume follows, where possible, both criteria of media/methodology and application. The first three papers are all related to meaning and semantics. The papers by Perner and Colantonio et al. are devoted to ontologies, a very important subject for knowledge-based media analysis, also devising the possibility of including the processing algorithms in the ontological reference. Then, the only paper dealing with text analysis, by Malandrakis et al., describes a technique to detect the affective meaning of text fragments to expand specialized lexica. The papers by Ruiz et al., Kayabol et al., and Szirányi and Szolgay deal with classification, with different applications and approaches. Classification also emerges as one of the most important issues in media understanding, since, with segmentation, it is probably an essential prerequisite for the extraction of meaning. Another often essential step to extraction of meaning is shape reconstruction. The papers by Kim and Dahyot and Kovács are devoted to this topic. Keskin and Çetin improve on fractional

wavelets to build a powerful signal analysis tool. Han et al. treat spatial registration, another essential task when dealing with multimodal data. They adopt a geometric approach, pointing out that raw data or low-level features may not be appropriate to match images that are different in nature. Four papers from the same research team (Vácha and Haindl, Haindl and V. Havlíček, Haindl and M. Havlíček, and Filip et al.) deal with texture modeling, synthesis, and recognition, which are relevant to multimedia understanding and visualization, and also affect the fixation/attention of human observers. Carcel et al., Martienne et al., and Gallego et al. deal with the video media, describing annotation, labeling, and segmentation strategies, respectively. Magrini et al. present a real-time image analysis system deployed in an infomobility scenario. Finally, Szalai et al. describe a statistical model of human observers' behavior that helps to estimate possible tracking paths and regions of interest of the human visual system presented with video data.

Just to add a general remark to this conceptual map, I would say that there is a ubiquitous quest in this volume, which is mentioned explicitly in the Preface: “information can be processed to create new knowledge.” This is not immediate, and trying to work the details out would drive us to ancient philosophical questions. As often happens, great poetry helps us:¹

*Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?*

Well, these papers show us how information processing can bring us to *meaning*. Perhaps meaning processing could bring us nearer to *knowledge*. Also, knowledge processing could bring us to wisdom, but this is out of the scope of this volume.

March 2012

Emanuele Salerno

¹ T. S. Eliot, *The Rock*, 1934

Organization

MUSCLE 2011 was organized by ERCIM, the European Research Consortium in Informatics and Mathematics, Working Group on Multimedia Understanding through Semantics, Computation and Learning.

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