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Automatic detection of salient objects and spatial relations in videos for a video database system

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Abstract

Multimedia databases have gained popularity due to rapidly growing quantities of multimedia data and the need to perform efficient indexing, retrieval and analysis of this data. One downside of multimedia databases is the necessity to process the data for feature extraction and labeling prior to storage and querying. Huge amount of data makes it impossible to complete this task manually. We propose a tool for the automatic detection and tracking of salient objects, and derivation of spatio-temporal relations between them in video. Our system aims to reduce the work for manual selection and labeling of objects significantly by detecting and tracking the salient objects, and hence, requiring to enter the label for each object only once within each shot instead of specifying the labels for each object in every frame they appear. This is also required as a first step in a fully-automatic video database management system in which the labeling should also be done automatically. The proposed framework covers a scalable architecture for video processing and stages of shot boundary detection, salient object detection and tracking, and knowledge-base construction for effective spatio-temporal object querying.
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Keywords: Multimedia databases; Salient object detection and tracking; Camera focus estimation; Object labeling; Knowledge-base construction; Spatio-temporal queries

1. Introduction

The rapid increase in the amount of multimedia data has resulted in the development of various technologies for handling large volumes of data. These technologies concentrate on efficient compression and storage of the multimedia data. One of the particularly interesting storage systems is the "multimedia database", which stores multimedia content that can be queried by various features [1]. Some examples of prototype multimedia database systems include QBIC [2], VisualSeek [3], and VideoQ [4]. If the media is video, the queried features are spatial, spatio-temporal, semantic, motion (e.g., object trajectories) and object features (e.g., color, shape, texture) [5]. Before retrieval, the videos need to be processed to extract the features that can be queried. Since the first appearance of multimedia databases, research on efficient means of feature extraction has become popular. To this end, some manual, semi-automatic and automatic tools have been developed [3,4,6–8].

This paper proposes a framework for automatic salient object extraction. The framework is used to detect and track salient objects in a given video automatically and construct a list of spatio-temporal features for our video database system, *BilVideo* [9]. This process aims to reduce the huge amount of time and effort required for manual selection and labeling of objects for video indexing.

We first use a color histogram-based shot boundary detector to find the shot boundaries. Then, each video is processed on a shot basis following the common practice; salient objects within each shot are detected and tracked. At the end of processing each shot, tracked objects satisfying

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Pagani, Margherita

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Genetic and Evolutionary Computing Jeng-Shyang Pan,Pavel Krömer,Václav Snášel,2013-08-04 Genetic and Evolutionary Computing This volume of Advances in Intelligent Systems and Computing contains accepted papers presented at ICGEC 2013 the 7th International Conference on Genetic and Evolutionary Computing The conference this year was technically co sponsored by The Waseda University in Japan Kaohsiung University of Applied Science in Taiwan and VSB Technical University of Ostrava ICGEC 2013 was held in Prague Czech Republic Prague is one of the most beautiful cities in the world whose magical atmosphere has been shaped over ten centuries Places of the greatest tourist interest are on the Royal Route running from the Powder Tower through Celetna Street to Old Town Square then across Charles Bridge through the Lesser Town up to the Hradcany Castle One should not miss the Jewish Town and the National Gallery with its fine collection of Czech Gothic art collection of old European art and a beautiful collection of French art The conference was intended as an international forum for the researchers and professionals in all areas of genetic and evolutionary computing The main topics of ICGEC 2013 included Intelligent Computing Evolutionary Computing Genetic Computing and Grid Computing **Neural Information Processing** Sabri Arik,Tingwen Huang,Weng Kin Lai,Qingshan Liu,2015-12-08 The four volume set LNCS 9489 LNCS 9490 LNCS 9491 and LNCS 9492 constitutes the proceedings of the 22nd International Conference on Neural Information Processing ICONIP 2015 held in Istanbul Turkey in November 2015 The 231 full papers presented were carefully reviewed and selected from 375 submissions The 4 volumes represent topical sections containing articles on Learning Algorithms and Classification Systems Artificial Intelligence and Neural Networks Theory Design and Applications Image and Signal Processing and Intelligent Social Networks **RGB-D Image Analysis and Processing** Paul L. Rosin,Yu-Kun Lai,Ling Shao,Yonghuai Liu,2019-10-26 This book focuses on the fundamentals and recent advances in RGB D imaging as well as covering a range of RGB D applications The topics covered include data acquisition data quality assessment filling holes 3D reconstruction SLAM multiple depth camera systems segmentation object detection salience detection pose estimation geometric modelling fall detection autonomous driving motor rehabilitation therapy people counting and cognitive service robots The availability of cheap RGB D sensors has led to an explosion over the last five years in the capture and application of colour plus depth data The addition of depth data to regular RGB images vastly increases the range of applications and has resulted in a demand for robust and real time processing of RGB D data There remain many technical challenges and RGB D image processing is an ongoing research area This book covers the full state of the art and consists of a series of chapters by internationally renowned experts in the field Each chapter is written so as to provide a detailed overview of that topic RGB D Image Analysis and Processing will enable both students and professional developers alike to quickly get up to speed with contemporary techniques and apply RGB D imaging in their own projects *Advances in Semantic Media Adaptation and Personalization, Volume 2* Marios C. Angelides,Phivos Mylonas,Manolis Wallace,2009-03-17

The emergence of content and context aware search engines which not only personalize searching and delivery but also the content has caused the emergence of new infrastructures capable of end to end ubiquitous transmission of personalized multimedia content to any device on any network at any time Personalizing and adapting content requires pro *Medical Informatics: Concepts, Methodologies, Tools, and Applications* Tan, Joseph,2008-09-30 Provides a collection of medical IT research in topics such as clinical knowledge management medical informatics mobile health and service delivery and gene expression **Electronics, Communications and Networks IV** Amir Hussain,Mirjana Ivanovic,2015-07-01 The 4th International Conference on Electronic Communications and Networks CECNet2014 inherits the fruitfulness of the past three conferences and lays a foundation for the forthcoming next year in Shanghai CECNet2014 was hosted by Hubei University of Science and Technology China with the main objective of providing a comprehensive global forum for experts and participants from acadamia to exchange ideas and presenting results of ongoing research in the most state of the art areas of Consumer Electronics Technology Communication Engineering and Technology Wireless Communications Enginneering and Technology and Computer Engineering and Technology In this event 13 famous scholars and Engineers have delivered the keynote speeches on their latest research including Prof Vijaykrishnan Narayanan a Fellow of the Institute of Electrical and ElectronicsEngineers Prof Han Chieh Chao the Director of the Computer Center for Ministry of Education Taiwan from September 2008 to July 2010 Prof Borko Furht the founder of the Journal of Multimedia Tools and Applications Prof Kevin Deng who served as Acting Director of Hong Kong APAS R D Center in 2010 and Prof Minho Jo the Professor of Department of Computer and Information Science Korea University **ACM SIGIR Conference on Research and Development in Information Retrieval** International Conference on Research and Development in Information Retrieval. 27, 2004, Sheffield,2004 **Recent Advances in Artificial Neural Networks and Embedded Systems for Multi-Source Image Fusion** Xin Jin,Jingyu Hou,Shin-Jye Lee,Dongming Zhou,2022-09-13 Encyclopedia of Multimedia Technology and Networking Pagani, Margherita,2005-05-30 This encyclopedia offers a comprehensive knowledge of multimedia information technology from an economic and technological perspective Provided by publisher Modeling and Using Context Anind Dey,2005-06-24 This book constitutes the refereed proceedings of the 5th International and Interdisciplinary Conference on Modeling and Using Context CONTEXT 2005 held in Paris France in July 2005 The 42 revised full papers presented were carefully reviewed and selected from a total of 120 submissions The papers presented deal with the interdisciplinary topic of modeling and using context from various points of view ranging through cognitive science formal logic artifical intelligence computational intelligence philosophical and psychological aspects and information processing Highly general philosophical and theoretical issues are complemented by specific applications in various fields

Computational Methods in Science and Engineering George Maroulis,Theodore E. Simos,2009-09-02 The aim of ICCMSE 2008 is to bring together computational scientists and engineers from several disciplines in order to share methods

methodologies and ideas The potential readers are all the scientists with interest in Computational Mathematics Theoretical Physics Computational Physics Theoretical Chemistry Computational Chemistry Mathematical Chemistry Computational Engineering Computational Mechanics Computational Biology and Medicine Scientific Computation High Performance Computing Parallel and Distributed Computing Visualization Problem Solving Environments Software Tools Advanced Numerical Algorithms Modelling and Simulation of Complex Systems Web based Simulation and Computing Grid based Simulation and Computing Computational Grids and Computer Science **Multimedia Computing and Networking** ,1998 **1997 IEEE International Conference on Intelligent Processing Systems** ,1997 **Design and Management of Multimedia Information Systems** Syed Mahbubur Rahman,Mahbubur Rahman Syed,2001 Multimedia technology has the potential to transform end user computing from interactive text and graphics models into something more compatible with the digital and electronic world of the 21st century This work aims to help technology professionals gain an understanding and perspective on areas related to multimedia computing and communication while addressing the major issues and challenges in the design and management of multimedia information systems Topics covered include the development of multimedia systems and applications use of multimedia standards temporal issues legal issues media content management and multimedia document retrieval issues **Modeling and Using Context** ,2005 *Multimedia Computing and Networking 1999* Kevin Jeffay,Timothy Roscoe,IS & T--the Society for Imaging Science and Technology,ACM Special Interest Group on Multimedia,Society of Photo-optical Instrumentation Engineers,1998 This collection of papers from the IS T SPIE Electronic Imaging Symposium includes articles on a variety of relevant issues and topics *Optical Engineering* ,2001 Publishes papers reporting on research and development in optical science and engineering and the practical applications of known optical science engineering and technology *1999 International Conference on Image Processing : Proceedings* ,1999 *The Quarterly Journal of Experimental Psychology* ,1999 *IEEE International Conference on Multimedia Computing and Systems* IEEE Computer Society. Technical Committee on Multimedia Computing,1998 This collection of papers examines the field of computer graphics It covers topics such as supporting adaptation in transport protocols multimedia storage servers network and operating system support for multimedia content based retrieval and audio video compression and security

Unveiling the Energy of Verbal Beauty: An Emotional Sojourn through **Automatic Detection Of Salient Objects And Spatial**

In some sort of inundated with monitors and the cacophony of instantaneous communication, the profound power and emotional resonance of verbal beauty usually diminish into obscurity, eclipsed by the continuous onslaught of noise and distractions. However, located within the musical pages of **Automatic Detection Of Salient Objects And Spatial**, a captivating work of fictional beauty that impulses with natural feelings, lies an unique journey waiting to be embarked upon. Published with a virtuoso wordsmith, this magical opus instructions viewers on an emotional odyssey, gently revealing the latent possible and profound affect stuck within the complicated web of language. Within the heart-wrenching expanse with this evocative analysis, we will embark upon an introspective exploration of the book is key styles, dissect their fascinating publishing model, and immerse ourselves in the indelible effect it leaves upon the depths of readers souls.

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