

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, *BSVideo* [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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Automatic Detection Of Salient Objects And Spatial

**International Conference on Research
and Development in Information
Retrieval. 27, 2004, Sheffield**

Automatic Detection Of Salient Objects And Spatial:

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 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 *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

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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

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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 **The Quarterly Journal of Experimental Psychology** ,1999

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