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

Tarkan Sevilmiş, Muhammet Baştan, Uğur Güdükbay, Özgür Ulusoy *

Department of Computer Engineering, Bilkent University, Bilkent, 06800 Ankara, Turkey

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.
© 2008 Elsevier B.V. All rights reserved.

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

---

* Corresponding author. Tel.: +90 312 290 15 77; fax: +90 312 266 40 47.

E-mail addresses: sevilmis@cs.bilkent.edu.tr (T. Sevilmiş), bastan@cs.bilkent.edu.tr (M. Baştan), gudukbay@cs.bilkent.edu.tr (U. Güdükbay), oulusoy@cs.bilkent.edu.tr (Özgür Ulusoy).

Automatic Detection Of Salient Objects And Spatial

DJ Losen

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

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 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 **ACM SIGIR Conference on Research and Development in Information Retrieval** International Conference on Research and Development in Information Retrieval. 27, 2004, Sheffield,2004 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 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 *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 *1997 IEEE International Conference on Intelligent Processing Systems* ,1997 **Modeling and Using Context** ,2005 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 **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

Reviewing **Automatic Detection Of Salient Objects And Spatial**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Automatic Detection Of Salient Objects And Spatial**," an enthralling opus penned by a highly acclaimed wordsmith, readers attempt an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

https://db1.greenfirefarms.com/About/virtual-library/index.jsp/Easy_Content_Marketing_Strategy_Guide_For_Students.pdf

Table of Contents Automatic Detection Of Salient Objects And Spatial

Automatic Detection Of Salient Objects And Spatial Introduction

In this digital age, the convenience of accessing information at our fingertips has become a necessity. Whether its research papers, eBooks, or user manuals, PDF files have become the preferred format for sharing and reading documents. However, the cost associated with purchasing PDF files can sometimes be a barrier for many individuals and organizations. Thankfully, there are numerous websites and platforms that allow users to download free PDF files legally. In this article, we will explore some of the best platforms to download free PDFs. One of the most popular platforms to download free PDF files is Project Gutenberg. This online library offers over 60,000 free eBooks that are in the public domain. From classic literature to historical documents, Project Gutenberg provides a wide range of PDF files that can be downloaded and enjoyed on various devices. The website is user-friendly and allows users to search for specific titles or browse through different categories. Another reliable platform for downloading Automatic Detection Of Salient Objects And Spatial free PDF files is Open Library. With its vast collection of over 1 million eBooks, Open Library has something for every reader. The website offers a seamless experience by providing options to borrow or download PDF files. Users simply need to create a free account to access this treasure trove of knowledge. Open Library also allows users to contribute by uploading and sharing their own PDF files, making it a collaborative platform for book enthusiasts. For those interested in academic resources, there are websites dedicated to providing free PDFs of research papers and scientific articles. One such website is Academia.edu, which allows researchers and scholars to share their work with a global audience. Users can download PDF files of research papers, theses, and dissertations covering a wide range of subjects. Academia.edu also provides a platform for discussions and networking within the academic community. When it comes to downloading Automatic Detection Of Salient Objects And Spatial free PDF files of magazines, brochures, and catalogs, Issuu is a popular choice. This digital publishing platform hosts a vast collection of publications from around the world. Users can search for specific titles or explore various categories and genres. Issuu offers a seamless reading experience with its user-friendly interface and allows users to download PDF files for offline reading. Apart from dedicated platforms, search engines also play a crucial role in finding free PDF files. Google, for instance, has an advanced search feature that allows users to filter results by file type. By specifying the file type as "PDF," users can find websites that offer free PDF downloads on a specific topic. While downloading Automatic Detection Of Salient

Objects And Spatial free PDF files is convenient, its important to note that copyright laws must be respected. Always ensure that the PDF files you download are legally available for free. Many authors and publishers voluntarily provide free PDF versions of their work, but its essential to be cautious and verify the authenticity of the source before downloading Automatic Detection Of Salient Objects And Spatial. In conclusion, the internet offers numerous platforms and websites that allow users to download free PDF files legally. Whether its classic literature, research papers, or magazines, there is something for everyone. The platforms mentioned in this article, such as Project Gutenberg, Open Library, Academia.edu, and Issuu, provide access to a vast collection of PDF files. However, users should always be cautious and verify the legality of the source before downloading Automatic Detection Of Salient Objects And Spatial any PDF files. With these platforms, the world of PDF downloads is just a click away.

FAQs About Automatic Detection Of Salient Objects And Spatial Books

1. Where can I buy Automatic Detection Of Salient Objects And Spatial books? Bookstores: Physical bookstores like Barnes & Noble, Waterstones, and independent local stores. Online Retailers: Amazon, Book Depository, and various online bookstores offer a wide range of books in physical and digital formats.
2. What are the different book formats available? Hardcover: Sturdy and durable, usually more expensive. Paperback: Cheaper, lighter, and more portable than hardcovers. E-books: Digital books available for e-readers like Kindle or software like Apple Books, Kindle, and Google Play Books.
3. How do I choose a Automatic Detection Of Salient Objects And Spatial book to read? Genres: Consider the genre you enjoy (fiction, non-fiction, mystery, sci-fi, etc.). Recommendations: Ask friends, join book clubs, or explore online reviews and recommendations. Author: If you like a particular author, you might enjoy more of their work.
4. How do I take care of Automatic Detection Of Salient Objects And Spatial books? Storage: Keep them away from direct sunlight and in a dry environment. Handling: Avoid folding pages, use bookmarks, and handle them with clean hands. Cleaning: Gently dust the covers and pages occasionally.
5. Can I borrow books without buying them? Public Libraries: Local libraries offer a wide range of books for borrowing. Book Swaps: Community book exchanges or online platforms where people exchange books.
6. How can I track my reading progress or manage my book collection? Book Tracking Apps: Goodreads, LibraryThing, and Book Catalogue are popular apps for tracking your reading progress and managing book collections. Spreadsheets: You can create your own spreadsheet to track books read, ratings, and other details.

7. What are Automatic Detection Of Salient Objects And Spatial audiobooks, and where can I find them? Audiobooks: Audio recordings of books, perfect for listening while commuting or multitasking. Platforms: Audible, LibriVox, and Google Play Books offer a wide selection of audiobooks.
8. How do I support authors or the book industry? Buy Books: Purchase books from authors or independent bookstores. Reviews: Leave reviews on platforms like Goodreads or Amazon. Promotion: Share your favorite books on social media or recommend them to friends.
9. Are there book clubs or reading communities I can join? Local Clubs: Check for local book clubs in libraries or community centers. Online Communities: Platforms like Goodreads have virtual book clubs and discussion groups.
10. Can I read Automatic Detection Of Salient Objects And Spatial books for free? Public Domain Books: Many classic books are available for free as theyre in the public domain. Free E-books: Some websites offer free e-books legally, like Project Gutenberg or Open Library.

Find Automatic Detection Of Salient Objects And Spatial :

easy content marketing strategy guide for students
top method for side hustles explained
expert us national parks online
how to pilates for beginners 2025
what is budgeting tips ideas for experts
best minimalist lifestyle tips for students
~~ultimate pilates for beginners online for workers~~
trending home workout ideas for students
beginner friendly minimalist lifestyle explained for experts
~~why anti inflammatory diet guide for students~~
beginner friendly minimalist lifestyle 2025 for workers
top minimalist lifestyle tips for experts
top keyword research for moms for beginners
ultimate sleep hygiene tips tips for experts
advanced ai video generator for students

Automatic Detection Of Salient Objects And Spatial :

User manual Siemens Landis & Staefa RAA20 (English Manual. View the manual for the Siemens Landis & Staefa RAA20 here, for free. This manual comes under the category thermostat and has been rated by 2 people ... Operating instructions Landis & Staefa RAV11... Getting started. The controller is supplied with factory-set switching patterns, switching times and temperatures. To commission it, proceed as follows:. Landis Staefa System 600 Programming Manual May 5, 2005 — Anyone know where I can obtain a programming manual for a Landis Staefa system 600 EMS? Staefa Control Manual control. The valve can be opened an closed manually by turning the screw. ... Staefa. Control. System staefa peripher. Valves. Mounting. Flanged valves. Staefa Control System Product Specification Technical ... Manual Stationary Engine Manuals & Books · Data Acquisition Units & Systems · Manual Metalworking Manuals, Books & Plans · Tractor Manuals & Books for Kubota. Staefa Smart II N4 Driver User Guide Like other NiagaraN4 drivers, you can do most configuration from special "manager" views and property sheets using Workbench. •. "Configure the Staefa network". Landis & Staefa Manuals - 116246 Oct 19, 2014 — You need the INTEGRAL PLAN (staefa plan) tool to program the NRK16-B/A controller. The INTEGRAL PLAN requires a dongle. As the INTEGRAL PLAN has ... RK8, RK88 RK2, RK22 RK82 Universal P controllers The CLASSIC electronic universal P controller is suitable for the control of temperatures, relative humidity, air quality, pressure etc. The controller compares ... Building Technologies - Staefa Control System Dec 16, 2012 — The Secure Choice - Staefa Control System · LINHA TALENT - Staefa Control System · Valve and Valve Actuator Selection Guide - Staefa Control ... Kid Trax CAT Bulldozer 12V Parts ... Replacement Parts · Parts by Brand · Contact Us · Your Shopping Cart ... Kid Trax CAT Bulldozer 12V Parts. Kid Trax CAT Bulldozer 12V Parts. Kid Trax Replacement Parts Amazon.com: kid trax replacement parts. ... SHENGLE Battery Wiring Harness with Fuse for Kid Trax, Kids Ride On Car Power Connector Replacement Parts. Kid Trax 12V CAT Bulldozer (KT1136WM) Compatible ... 100% Compatible replacement battery for Kid Trax 12 Volt CAT Bulldozer; Compatibility: KT1136WM, new and older models of Kid Trax 12V Ride on toys; Arrives ... 12V 12AH SLA Replacement for Kid Trax Cat Bulldozer Dimensions: 5.94 inches x 3.86 inches x 3.98 inches. Terminal: F2. Listing is for the Battery only. No wire harness or mounting accessories included. SLA / AGM ... Kid Trax Parts - All Recreational Brands We offer the correct 6 volt and 12 volt batteries and battery chargers for these very popular ride-on toys from Kid Trax. Email Sign-Up. Submit. Instagram. 36mm Wide Plug...NEW! CAT BULLDOZER ... 36mm Wide Plug...NEW! CAT BULLDOZER REPLACEMENT KID TRAX 12 VOLT BATTERY CHARGER ; Condition. New ; Quantity. 31 sold. More than 10 available ; Item Number. 24mm Wide Plug...NEW! CAT BULLDOZER ... 24mm Wide Plug...NEW! CAT BULLDOZER REPLACEMENT KID TRAX 12 VOLT BATTERY CHARGER ; MPN. Does Not Apply ; Brand. TRAX ; Accurate description. 4.8 ; Reasonable ... Repair Parts for your Power Wheels ride-on toy MLToys has OEM stock replacement parts for Power Wheels, Kid Trax, and other brands of ride-on toy cars and trucks. Bulldozer Only replace with a Kid. Trax Toys 12V rechargeable battery and charger. On average you will

need to charge the battery between 14 and 18 hours. Do not charge. Tutorials in Introductory Physics - 1st Edition Our resource for Tutorials in Introductory Physics includes answers to chapter exercises, as well as detailed information to walk you through the process step ... Tutorials in Introductory Physics 1st Edition, Peter S. Shaffer This landmark book presents a series of physics tutorials designed by a leading physics education research group. Emphasizing the development of concepts ... Tutorials In Introductory Physics and Homework Package Access Tutorials In Introductory Physics and Homework Package 1st Edition solutions now. Our solutions are written by Chegg experts so you can be assured of ... Tutorial 33-35 | PDF Tutorial 33-35 - Free download as PDF File (.pdf), Text File (.txt) or read online for free. Tutorials in Introductory Physics Forces. Tutorials In Introductory Physics Mcdermott Answer Key ... Tutorials In Introductory Physics Mcdermott Answer Key Tutorials in introductory from PHYSICS 1101 at University of Texas. Introductory Physics - 1st Edition - Solutions and Answers Our resource for Introductory Physics includes answers to chapter exercises, as well as detailed information to walk you through the process step by step. With ... The First Law of Thermodynamics Tutorials in Introductory ... The First Law of Thermodynamics Tutorials in Introductory Physics Homework Answers - Free download as PDF File (.pdf) or read online for free. Tutorials In Introductory Physics - With Homework Tutorials In Introductory Physics - With Homework · Course Information · The UC Irvine Official Online Store. Solved Tutorials in Introductory Physics Homework - Charge Aug 31, 2015 — Answer to Solved Tutorials in Introductory Physics Homework - Charge | Chegg.com. Tutorials in Introductory Physics: Homework Tutorials in Introductory Physics: Homework [Lillian C. McDermott, Peter S. Shaffer] on Amazon.com. *FREE* shipping on qualifying offers.