

## 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*

Received 10 March 2006; received in revised form 25 December 2007; accepted 3 January 2008

### 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, *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.

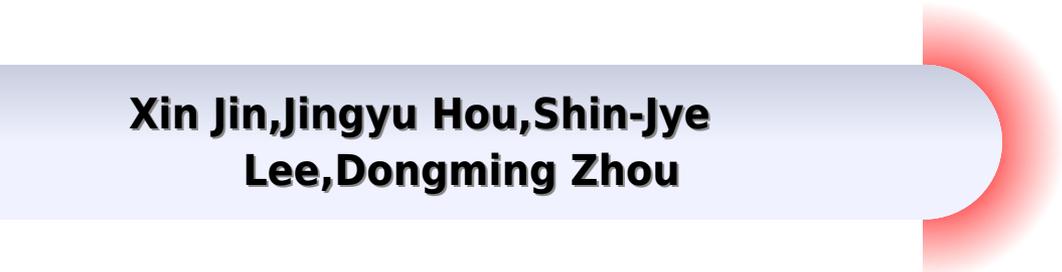
We first use a color histogram-based shot boundary detector to find the shot boundaries. Then, each video is processed on a shot basis following the common practice: salient objects within each shot are detected and tracked. At the end of processing each shot, tracked objects satisfying

\* Corresponding author. Tel.: +90 312 260 15 77; fax: +90 312 266 40 47.

E-mail addresses: [sevilmis@cs.bilkent.edu.tr](mailto:sevilmis@cs.bilkent.edu.tr) (T. Sevilmiş), [bastan@cs.bilkent.edu.tr](mailto:bastan@cs.bilkent.edu.tr) (M. Baştan), [godukbay@cs.bilkent.edu.tr](mailto:godukbay@cs.bilkent.edu.tr) (U. Güdükbay), [ulusoy@cs.bilkent.edu.tr](mailto:ulusoy@cs.bilkent.edu.tr) (Özgür Ulusoy).

# Automatic Detection Of Salient Objects And Spatial

**Xin Jin,Jingyu Hou,Shin-Jye  
Lee,Dongming Zhou**



## **Automatic Detection Of Salient Objects And Spatial:**

Getting the books **Automatic Detection Of Salient Objects And Spatial** now is not type of inspiring means. You could not without help going similar to books accretion or library or borrowing from your connections to edit them. This is an enormously easy means to specifically get guide by on-line. This online notice Automatic Detection Of Salient Objects And Spatial can be one of the options to accompany you subsequently having other time.

It will not waste your time. agree to me, the e-book will categorically song you additional business to read. Just invest tiny period to approach this on-line statement **Automatic Detection Of Salient Objects And Spatial** as with ease as evaluation them wherever you are now.

<https://matrix.jamesarcher.co/public/book-search/fetch.php/Globalization%20And%20Social%20Movements%20Islamism%20Feminism%20And%20The%20Global%20Justice%20Movement%202nd%20Second%20Edition%20By%20Moghadam%20Valentine%20M%20Published%20By%20Rowman%20Littlefield%20Publishers%20201.pdf>

## **Table of Contents Automatic Detection Of Salient Objects And Spatial**

1. Understanding the eBook Automatic Detection Of Salient Objects And Spatial
  - The Rise of Digital Reading Automatic Detection Of Salient Objects And Spatial
  - Advantages of eBooks Over Traditional Books
2. Identifying Automatic Detection Of Salient Objects And Spatial
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Automatic Detection Of Salient Objects And Spatial
  - User-Friendly Interface
4. Exploring eBook Recommendations from Automatic Detection Of Salient Objects And Spatial
  - Personalized Recommendations

- Automatic Detection Of Salient Objects And Spatial User Reviews and Ratings
- Automatic Detection Of Salient Objects And Spatial and Bestseller Lists
- 5. Accessing Automatic Detection Of Salient Objects And Spatial Free and Paid eBooks
  - Automatic Detection Of Salient Objects And Spatial Public Domain eBooks
  - Automatic Detection Of Salient Objects And Spatial eBook Subscription Services
  - Automatic Detection Of Salient Objects And Spatial Budget-Friendly Options
- 6. Navigating Automatic Detection Of Salient Objects And Spatial eBook Formats
  - ePub, PDF, MOBI, and More
  - Automatic Detection Of Salient Objects And Spatial Compatibility with Devices
  - Automatic Detection Of Salient Objects And Spatial Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Automatic Detection Of Salient Objects And Spatial
  - Highlighting and Note-Taking Automatic Detection Of Salient Objects And Spatial
  - Interactive Elements Automatic Detection Of Salient Objects And Spatial
- 8. Staying Engaged with Automatic Detection Of Salient Objects And Spatial
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Automatic Detection Of Salient Objects And Spatial
- 9. Balancing eBooks and Physical Books Automatic Detection Of Salient Objects And Spatial
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Automatic Detection Of Salient Objects And Spatial
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Automatic Detection Of Salient Objects And Spatial
  - Setting Reading Goals Automatic Detection Of Salient Objects And Spatial
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Automatic Detection Of Salient Objects And Spatial
  - Fact-Checking eBook Content of Automatic Detection Of Salient Objects And Spatial

- Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
- 14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

### **Automatic Detection Of Salient Objects And Spatial Introduction**

Automatic Detection Of Salient Objects And Spatial Offers over 60,000 free eBooks, including many classics that are in the public domain. Open Library: Provides access to over 1 million free eBooks, including classic literature and contemporary works. Automatic Detection Of Salient Objects And Spatial Offers a vast collection of books, some of which are available for free as PDF downloads, particularly older books in the public domain. Automatic Detection Of Salient Objects And Spatial : This website hosts a vast collection of scientific articles, books, and textbooks. While it operates in a legal gray area due to copyright issues, its a popular resource for finding various publications. Internet Archive for Automatic Detection Of Salient Objects And Spatial : Has an extensive collection of digital content, including books, articles, videos, and more. It has a massive library of free downloadable books. Free-eBooks Automatic Detection Of Salient Objects And Spatial Offers a diverse range of free eBooks across various genres. Automatic Detection Of Salient Objects And Spatial Focuses mainly on educational books, textbooks, and business books. It offers free PDF downloads for educational purposes. Automatic Detection Of Salient Objects And Spatial Provides a large selection of free eBooks in different genres, which are available for download in various formats, including PDF. Finding specific Automatic Detection Of Salient Objects And Spatial, especially related to Automatic Detection Of Salient Objects And Spatial, might be challenging as theyre often artistic creations rather than practical blueprints. However, you can explore the following steps to search for or create your own Online Searches: Look for websites, forums, or blogs dedicated to Automatic Detection Of Salient Objects And Spatial, Sometimes enthusiasts share their designs or concepts in PDF format. Books and Magazines Some Automatic Detection Of Salient Objects And Spatial books or magazines might include. Look for these in online stores or libraries. Remember that while Automatic Detection Of Salient Objects And Spatial, sharing copyrighted material without permission is not legal. Always ensure youre either creating your own or obtaining them from legitimate sources that allow sharing and downloading. Library Check if your local library offers eBook lending services. Many libraries have digital catalogs where you can borrow Automatic Detection Of Salient Objects And Spatial eBooks for free, including popular titles. Online Retailers: Websites like Amazon,

Google Books, or Apple Books often sell eBooks. Sometimes, authors or publishers offer promotions or free periods for certain books. Authors Website Occasionally, authors provide excerpts or short stories for free on their websites. While this might not be the Automatic Detection Of Salient Objects And Spatial full book, it can give you a taste of the authors writing style. Subscription Services Platforms like Kindle Unlimited or Scribd offer subscription-based access to a wide range of Automatic Detection Of Salient Objects And Spatial eBooks, including some popular titles.

### **FAQs About Automatic Detection Of Salient Objects And Spatial Books**

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer web-based readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Automatic Detection Of Salient Objects And Spatial is one of the best book in our library for free trial. We provide copy of Automatic Detection Of Salient Objects And Spatial in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Automatic Detection Of Salient Objects And Spatial. Where to download Automatic Detection Of Salient Objects And Spatial online for free? Are you looking for Automatic Detection Of Salient Objects And Spatial PDF? This is definitely going to save you time and cash in something you should think about.

### **Find Automatic Detection Of Salient Objects And Spatial :**

~~globalization and social movements islamism feminism and the global justice movement 2nd second edition by moghadam valentine m published by rowman littlefield publishers 2012~~  
~~guided reading activity 13-1 answer key~~  
~~grolier talking english logico disney magic english~~  
~~greenwood earnshaw chemistry of the elements~~

**gigabyte motherboard service manual**

~~globalisation policy and shipping fordism post fordism and the european union maritime sector transport economics management and policy series~~

~~grade 12 geography map work exam paper bengenore~~

~~group travel tours 2017 wesbanco wesbanco bank inc~~

~~great gatsby socratic seminar questions and answers~~

**guidebook for the design of asme section viii pressure vessels third edition pipelines and pressure vessels**

**grade 12 mathematics paper 1 june examination**

~~geography militant cultures of exploration and empire~~

~~great dane care guide~~

**gualtiero marchesi ricette dolci gustoblog it**

~~gesundheits und krankheitslehre lehrbuch f r die gesundheits kranken und altenpflege 3rd edition~~

**Automatic Detection Of Salient Objects And Spatial :**

Don't Let Me Be Lonely Sep 1, 2004 — Don't Let Me Be Lonely is an important new confrontation with our culture right now, with a voice at its heart bewildered by the anxieties of ... Don't Let Me Be Lonely: Rankine, Claudia In this powerful sequence of TV images and essay, Claudia Rankine explores the personal and political unrest of our volatile new century Don't Let Me Be Lonely Tonight (2019 Remaster) Don't Let Me Be Lonely Tonight (2019 Remaster) ; James Taylor - Fire And Rain (BBC In Concert, 11/16/1970) · 6.8M views ; Secret O' Life · 305K ... Don't Let Me Be Lonely "Don't Let Me Be Lonely" is a song recorded by American country music group The Band Perry. It was released in August 2013 as the third single from their ... Don't Let Me Be Lonely Provided to YouTube by Universal Music Group Don't Let Me Be Lonely · The Band Perry Pioneer □ 2013 Big Machine Label Group, LLC Released ... Don't Let Me Be Lonely - Claudia Rankine In this powerful sequence of TV images and essay, Claudia Rankine explores the personal and political unrest of our volatile new century. Don't Let Me Be Lonely [There was a time] by Claudia ... It is this simple: Resistance will only make matters more difficult. Any resistance will only make matters worse. By law, I will have to restrain you. His tone ... Don't Let Me Be Lonely A brilliant and unsparing examination of America in the early twenty-first century, Claudia Rankine's Don't Let Me Be Lonely invents a new genre to confront ... Don't Let Me Be Lonely: An American Lyric Don't Let Me Be Lonely is an important new confrontation with our culture, with a voice at its heart bewildered by its inadequacy in the face of race riots ... A First Course in Mathematical Modeling Offering a solid introduction to the entire modeling process, A FIRST COURSE IN MATHEMATICAL MODELING, 4th Edition delivers an excellent balance of theory ... A First Course in Mathematical Modeling Fourth (4th) Edition

Throughout the book, students practice key facets of modeling, including creative and empirical model construction, model analysis, and model research. The ... First Course in Mathematical Modeling Jul 3, 2008 — Offering a solid introduction to the entire modeling process, A FIRST COURSE IN MATHEMATICAL MODELING, 4th Edition delivers an excellent ... A First Course in Mathematical Modeling, Fourth Edition This book delivers a balance of theory and practice, and provides relevant, hands-on experience to develop your modeling skills. The book emphasizes key facets ... A First Course in Mathematical Modeling Offering a solid introduction to the entire modeling process, A FIRST COURSE IN MATHEMATICAL MODELING, 4th Edition delivers an excellent balance of theory ... A First Course in Mathematical Modeling Synopsis: Offering a solid introduction to the entire modeling process, A FIRST COURSE IN MATHEMATICAL MODELING, 4th Edition delivers an excellent balance of ... A First Course in Mathematical Modeling Offering an introduction to the entire modeling process, this book delivers a balance of theory and practice, giving students hands-on experience developing ... A First Course in Mathematical Modeling ... - eBay Offering a solid introduction to the entire modeling process, A FIRST COURSE IN MATHEMATICAL MODELING, 4th Edition delivers an excellent balance of theory ... First Course In Mathematical Modeling Buy A First Course In Mathematical Modeling By Frank R Giordano ISBN 9780495011590 0495011592. A First Course in Mathematical Modeling | Rent COUPON: RENT A First Course in Mathematical Modeling 4th edition by Heintz eBook (9781111795665) and save up to 80% on online textbooks at Chegg.com now! OCR A level Biology A H420/02 Biological diversity June 2017 A Level Biology H420/02 2020 Oct 16, 2020 — 17 Tannase is an enzyme produced by some microorganisms. Tannase is useful in many industrial applications including food production. The ... H420/03 Unified biology Sample Question Paper 2 This question is about the impact of potentially harmful chemicals and microorganisms. (a) (i). Salts that a plant needs, such as nitrates and phosphates, are ... Summary Notes - Topic 6.3 OCR (A) Biology A-Level The process occurs as following: • Nitrogen is first fixed by bacteria such as Rhizobium which live in the root nodules of leguminous plants such as pea plants. A level biology- enzymes A level biology- enzymes ... Explain how the following food preservation works: 1) Placing peas in boiling water for 1 minute then freezing them at -18 degrees. 2 ... ocr-a-level-biology-a-sb2-answers.pdf (e) Illuminated chloroplast produces oxygen; in light-dependent stage of photosynthesis; from photolysis of water; bacteria cluster where there is most oxygen; ... ocr a level biology nitrogen cycle Flashcards rhizobium as a nitrogen fixing bacteria. found in root nodules of leguminous plants such as peas and beans. nitrification definition. the process of converting ... The Nitrogen Cycle A2 OCR Biology Asking questions is a ... The Nitrogen Cycle A2 OCR Biology Asking questions is a sign of INTELLIGENCE ... bacteria) nitrogen fixing plant eg pea, clover bacteria. Nitrogen in the air ... 5.4.1 Plant Responses - 5.4.1 OCR bio notes Abscisic acid Inhibit seed germination and growth of stems. Ethene Promotes fruit ripening. The cell wall around a plant cell limits the cell's ability to divide ...