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Intelligent Scene Modelling Information Systems Intelligent Scene Modeling and Human-Computer Interaction Some Considerations in a Model Building System for Scene Analysis Plenoptic Scene Modelling from Uncalibrated Image Sequences Simplified Scene Modeling Using Curved Surfaces and Texturing Efficient 3D Scene Modeling and Mosaicing Handbook on Advances in Remote Sensing and Geographic Information Systems Biologically Inspired Signal Processing for Chemical Sensing Foundations of Computational Intelligence Handbook of Mathematical Models in Computer Vision Taking SketchUp Pro to the Next Level Cloud Scene Simulation Modeling Incremental Acquisition of a Three-dimensional Scene Model from Images Building Information Modeling for a Smart and Sustainable Urban Space Automated 3D Object Modeling from Aerial Video Imagery Model-Based Scene Matching Information Computing and Applications International Conference on Space Information Technology Visual Complexity and Intelligent Computer Graphics Techniques Enhancements Context Modeling for Semantic Text Matching and Scene Text Detection 3D Scene Modeling and Understanding from Image Sequences Unlocking the Urban Photographic Record Through 4D Scene Modeling Computer Vision -- ECCV 2014 Natural Scene Classification, Annotation and Retrieval Sensor Fusion 3D Modeling in Blender - Tools, Tips and Tricks 3D Dynamic Scene Analysis Modeling and Using Context Visual Attention Models for Far-field Scene Analysis Proceedings of the International Symposium on Remote Sensing of Environment A Computational Paradigm for Three Dimensional Scene Analysis Autonomous Mobile Robots: Control, planning, and architecture On Hierarchical Models for Visual Recognition and Learning of Objects, Scenes, and Activities International Conference on Multimodal Interfaces Journal of the Optical Society of America Wiley Pathways Introduction to Google SketchUp Introductory Digital Image Processing Efficient Affine Image Matching for Building and Maintaining 3D Models Image Patch Modeling in a Light Field Geographica helvetica

Efficient Affine Image Matching for Building and Maintaining 3D Models Dec 17 2019 3D models of buildings are used in many applications such as location recognition, augmented reality, virtual training and entertainment. Creating models of buildings automatically is a longstanding goal in computer vision research. Many current applications rely on manual creation of models using images and a 3D authoring tool. While more automated approaches exist, they typically are inefficient, require dense imagery, other sensor data, or frequent manual interventions. The focus of this thesis is to automate and increase the efficiency of 3D model creation from image collections. Matching sets of images to each other is a frequent step in 3D model building. In many applications image matching must be done hundreds or thousands of times. Thus, any increase in matching efficiency will be multiplied hundreds or thousands of times when used in these applications. This dissertation presents a new image matching method that achieves greater efficiency by using the fact that images taken from similar viewing angles are approximately related by an affine transformation. An affine transformation models translation, rotation and non-isotropic scaling between image pairs. When images are related by an affine transformation ratios of areas of corresponding shapes are invariant. The method uses this invariant to fit an affine transformation model to a set of putative matches and detect incorrect matches. Methods assuming global and local affine transformation models were created. The first assumes a single global affine transformation between each image pairs. The second method imposes a structure on the feature points to cluster features in a local region. The method then fits different affine models to each cluster. Both methods were evaluated using sets of synthetic matches with varying percentages of incorrect matches, localization error and rotation. Additionally, the methods were applied to a large publicly available image database and the results were compared to several recent model fitting methods. The results show the best affine method using local regions maintains equivalent accuracy

and is consistently more efficient than current state of the art methods. When creating and using 3D models, it is often important to predict if images taken from specific locations will match existing images in the model. Image matching prediction is used to evaluate image sets for vision-based location recognition and augmented reality applications. This dissertation presents a new way to predict if images will match by measuring affine distortion. Distortion is measured by projecting features into a second image and computing the affine transformation between the corresponding feature regions. Feature distortion is computed from the skew, stretch and shear of the transformed region. Using the distortion measure for all features in an image pair, a distortion vector is created describing the image pair. Using the distortion vectors and the actual number of matches, a classifier is trained to predict the confidence that images will match. Results are presented that compare this method to other published approaches. The results demonstrate the affine distortion-based classifier predicts matching confidence more accurately than other published techniques. The classifier is also used to create a spatial model of locations around a building. The spatial model shows the confidence that a new image taken from a specific location and pose will match an existing set of images. Using this model, location recognition applications can determine how well they will work throughout the scene. The approach presented uses the classifier described above and more realistic location sampling to create a spatial map that is more accurate than other published approaches. Additionally, as part of this goal, the minimum set of images needed to cover the space around the building is computed. The approach uses structure from motion to create 3D information about the scene. Synthetic cameras are then created using approximate locations and directions from which people commonly take pictures. The affine distortion-based classifier is applied to compute the confidence that images from the synthetic cameras will match the existing set of images. Results are presented on a spatial map showing the confidence that new images captured at specific locations and poses will match the existing image set. Additionally, the minimal set of images needed to maintain the matching coverage is computed using a greedy set cover algorithm. The minimal set can be used to increase efficiency in applications that need to match new images to an existing set of images (e.g. location recognition, augmented reality and 3D modeling applications). Finally, a process is presented to validate the 3D information computed using structure from motion. Validation ensures that the data is precise and accurate enough to provide a realistic 3D model of the scene structure. Results from the process show that the Bundler structure from motion software generates 3D information accurately enough to calculate distortion and generate the spatial coverage map

Some Considerations in a Model Building System for Scene Analysis Dec 21 2022 This paper outlines the design of a system, called VISIONS, whose goal is to build a semantic 3-dimensional model from a 2-dimensional digitized scene. There are many kinds of information that must be employed in model construction, ranging from processed visual data to highly structured semantic information embodied in context frames. The modular subsystems that process this information interact through an executive which is responsible for the model construction. The authors discuss a variety of considerations in making such a system both flexible and feasible. Brief arguments are offered for dealing with confidences, expectations, and importance of objects, attributes, and partial models in a rough manner. A simplified scenario of model construction demonstrates how the system might work.

Foundations of Computational Intelligence Jun 15 2022 Recent years have seen numerous applications across a variety of fields using various techniques of Computational Intelligence. This book, one of a series on the foundations of Computational Intelligence, is focused on learning and approximation.

Handbook on Advances in Remote Sensing and Geographic Information Systems Aug 17 2022 This book presents the latest advances in remote-sensing and geographic information systems and applications. It is divided into four parts, focusing on Airborne Light Detection and Ranging (LiDAR) and Optical Measurements of Forests; Individual Tree Modelling; Landscape Scene Modelling; and Forest Eco-system Modelling. Given the scope of its coverage, the book offers a valuable resource for students, researchers, practitioners, and educators interested in remote sensing and geographic

information systems and applications.

Intelligent Scene Modelling Information Systems Feb 23 2023 This book is dedicated to and contains the latest research in intelligent scene modelling information systems. Declarative scene modeling techniques are presented, as well as their implementation in an intelligent information system.

Geographica helvetica Oct 15 2019

Incremental Acquisition of a Three-dimensional Scene Model from Images Feb 11 2022 We describe the current state of the 3D Mosaic project, whose goal is to incrementally acquire a 3D model of a complex urban scene from images. The notion of incremental acquisition arises from the observations that (1) single images contain only partial information about a scene, (2) complex images are difficult to fully interpret, and (3) different features of a given scene tend to be easier to extract in different images because of differences in viewpoint and lighting conditions. In our approach, multiple images of the scene are sequentially analyzed so as to incrementally construct the model. Each new image provides information which refines the model. We describe some experiments toward this end. Our method of extracting 3D shape information from the images is stereo analysis. Because we are dealing with urban scenes, a junction-based matching technique proves very useful. This technique produces rather sparse wire-frame descriptions of the scene. A reasoning system that relies on task-specific knowledge generates an approximate model of the scene from the stereo output. Gray scale information is also acquired for the faces in the model. Finally, we describe an experiment in combining two views of the scene to obtain a refined model. (Author).

Visual Attention Models for Far-field Scene Analysis Sep 25 2020 The amount of information available to an intelligent monitoring system is simply too vast to process in its entirety. One way to address this issue is by developing attentive mechanisms that recognize parts of the input as more interesting than others. We apply this concept to the domain of far-field activity analysis by addressing the problem of determining where to look in a scene in order to capture interesting activity in progress. We pose the problem of attention as an unsupervised learning problem, in which the task is to learn from long-term observation a model of the usual pattern of activity. Such a statistical scene model then makes it possible to detect and attend to examples of unusual activity. We present two data-driven scene modeling approaches. In the first, we model the pattern of individual observations (instances) of moving objects at each scene location as a mixture of Gaussians. In the second approach, we model the pattern of sequences of observations -- tracks -- by grouping them into clusters. We employ a similarity measure that combines comparisons of multiple attributes -- such as size, position, and velocity -- in a principled manner so that only tracks that are spatially similar and have similar attributes at spatially corresponding points are grouped together. We group the tracks using spectral clustering and represent the scene model as a mixture of Gaussians in the spectral embedding space. New examples of activity can be efficiently classified by projection into the embedding space. We demonstrate clustering and unusual activity detection results on a week of activity in the scene (about 40,000 moving object tracks) and show that human perceptual judgments of unusual activity are well-correlated with the statistical model. The human validation suggests that the track-based anomaly detection framework would perform well as a classifier for unusual events. To our knowledge, our work is the first to evaluate a statistical scene modeling and anomaly detection framework against human judgments.

Modeling and Using Context Oct 27 2020

Intelligent Scene Modeling and Human-Computer Interaction Jan 22 2023 This edited book is one of the first to describe how Autonomous Virtual Humans and Social Robots can interact with real people and be aware of the surrounding world using machine learning and AI. It includes: · Many algorithms related to the awareness of the surrounding world such as the recognition of objects, the interpretation of various sources of data provided by cameras, microphones, and wearable sensors · Deep Learning Methods to provide solutions to Visual Attention, Quality Perception, and Visual Material Recognition · How Face Recognition and Speech Synthesis will replace the traditional mouse and keyboard interfaces · Semantic modeling and rendering and shows how these domains play an important role in Virtual and Augmented Reality Applications. Intelligent Scene Modeling and Human-Computer

Interaction explains how to understand the composition and build very complex scenes and emphasizes the semantic methods needed to have an intelligent interaction with them. It offers readers a unique opportunity to comprehend the rapid changes and continuous development in the fields of Intelligent Scene Modeling.

Information Computing and Applications Oct 07 2021 This two-volume set of CCIS 391 and CCIS 392 constitutes the refereed proceedings of the Fourth International Conference on Information Computing and Applications, ICICA 2013, held in Singapore, in August 2013. The 126 revised full papers presented in both volumes were carefully reviewed and selected from 665 submissions. The papers are organized in topical sections on Internet computing and applications; engineering management and applications; intelligent computing and applications; control engineering and applications; cloud and evolutionary computing; knowledge management and applications; computational statistics and applications.

3D Modeling in Blender - Tools, Tips and Tricks Dec 29 2020 3D Modeling in Blender is your guide to the tools and functionality used to create or facilitate the creation of 3D Models in Blender. There are plenty of books about Blender and many cover the topic of 3D Modeling. The majority of books only give you an overview of 3D Modeling and teach you just enough to complete a 3D Model before moving on to the next topic. What is often missing is a comprehensive discussion of all the available tools and functionality at your disposal when modeling in Blender. With this book you will get a detailed overview of all the Blender tools and functionality related directly or indirectly to 3D Modeling. Each tool or feature is explained in detail with the help of numerous illustrations. Also included are plenty of tips, tricks and mini tutorials to help you get the most out of Blender. What You Will Learn Learn about the Blender UI including how to use Layers and the Outliner to organize your Scene. Learn how to use the 3D View which includes Rotating, Orbiting, Panning, Zooming, Aligning your View, enable shading features, enable Object and Mesh Display panels to gain valuable information about your Model and much more. Learn about Mesh Topology and how to create a Mesh with good topology in mind. Get an in depth description of the Transform Tools in Blender including the Transform Orientation Menu, the Pivot Point, how to constrain Transform Operations, Apply and Clear Transformations, perform precise Transformations and more. Learn about Blenders Selection tools including the Region Selection Tools as well as how to Hide Objects and Mesh Elements, Select Linked Mesh Elements, Select Less / More, Select an Edge Loop, Face Loop, Boundary Loop, Edge Ring and more. How to use Blenders functionality to aid in the process of creating a 3D Model including the Snap Menu, Empties, Parenting, Grouping and Joining Objects, Separating a Mesh, using Vertex Groups and more. Learn how to manipulate Geometry by adding and deleting Mesh Elements. This includes discussing the Knife Tool, Bridge Tool, Rip Tool, Split Tool, Separate Tool, Spin Tool, Snap to Mesh Tool, Proportional Editing and more. Learn about the Blender Modifiers that aid in the 3D Modeling process including the Subdivision Surface Modifier, Mirror Modifier, Shrinkwrap Modifier, Array Modifier, Solidify Modifier and more. The information in this book will broaden your knowledge of Blenders Tools which translates into spending more time bringing your ideas to life and less time trying to figure out how to accomplish a modeling task. Having a comprehensive understanding of all available tools will make you a better and more efficient Modeler.

Model-Based Scene Matching Nov 08 2021 Results form this work on model-based scene-matching schemes lead us to believe that our approach is sufficiently sound and robust to perform adequately with complex real imagery appropriate to various possible mission scenarios. Some of these results were given in this report; in particular, schemes include: the feasibility demonstration of the vertex-based model-matching system for registering two scenes. Many parts of this system have already been perfected--interfacing and feedback loops between the different parts remain to be developed. The needed modifications are outlined in this section. Experimental results on scene matching using vertex models are reported. The results illustrate the robustness and inherent power of mode-based matching techniques. The approach has the advantage that the reference model is simple and has low data requirements. The reference model is constructed before it is needed; it is often only necessary to store

a list of points (vertices) and their interconnections, and it is feasible to store multiple references. Also, any modifications or changes needed to update the reference model can be conveniently specified. In a software implementation on a general-purpose machine of the model construction and matching techniques, the majority of computing required was at the lowest level (e.g., edge detection). Edges are currently detected by the Hueckel operator, which is a complex, time-consuming process. However, the Hueckel operator apparently can be replaced with a simpler edge-detection technique. This technique can be implemented in hardware for real-time operation.

A Computational Paradigm for Three Dimensional Scene Analysis Jul 24 2020 This paper presents a computational paradigm for a system which will dynamically model the contents of a three dimensional scene. The dynamic scene model may be made available to processes which analyze and interpret the scene as a composition of objects, and processes which plan and execute actions based on the composition of the surfaces or objects in the scene. This computational paradigm is presented as a collection of processes and data structures, many of which are currently areas of active research. The system receives information in the form of a time sequence of stereo images. These images are immediately converted into an initial representation which facilitates the processing of later stages. The initial representation is then passed to a number of independent processes called shape experts. Each shape expert extracts information about three dimensional surfaces from a different source. Surface information is integrated with the information obtained over time to maintain a Composite Surface Model. The Composite Surface Model is then made available to process for planning, analysis, or object recognition. The framework is introduced, and then each of the components are examined. The problems associated with each component are discussed, and a brief description is given of current research in that area.

3D Dynamic Scene Analysis Nov 27 2020 he problem of analyzing sequences of images to extract three-dimensional T motion and structure has been at the heart of the research in computer vi sion for many years. It is very important since its success or failure will determine whether or not vision can be used as a sensory process in reactive systems. The considerable research interest in this field has been motivated at least by the following two points: 1. The redundancy of information contained in time-varying images can over come several difficulties encountered in interpreting a single image. 2. There are a lot of important applications including automatic vehicle driv ing, traffic control, aerial surveillance, medical inspection and global model construction. However, there are many new problems which should be solved: how to effi ciently process the abundant information contained in time-varying images, how to model the change between images, how to model the uncertainty inherently associated with the imaging system and how to solve inverse problems which are generally ill-posed. There are of course many possibilities for attacking these problems and many more remain to be explored. We discuss a few of them in this book based on work carried out during the last five years in the Computer Vision and Robotics Group at INRIA (Institut National de Recherche en Informatique et en Automatique).

Wiley Pathways Introduction to Google SketchUp Feb 17 2020 Considerably easier to use than other 3D software, Google SketchUp has found a niche in architecture, landscape design, real estate development, furniture building, and other design professions. This book provides an accessible approach that assumes no previous 3D modeling experience and explains the basic concepts involved in 3D modeling. Wiley Pathways SketchUp shows you how to build a 3D model, print it, share it, export it to another professional design package, export it to Google Earth, and create a 3D animated tour. The book will also help you harness the power of Google SketchUp so you can populate Google Earth with 3D buildings, monuments, and other sculptures.

Visual Complexity and Intelligent Computer Graphics Techniques Enhancements Aug 05 2021 In this book, three main notions will be used in the editors search of improvements in various areas of computer graphics: Artificial Intelligence, Viewpoint Complexity and Human Intelligence. Several Artificial Intelligence techniques are used in presented intelligent scene modelers, mainly declarative ones. Among them, the mostly used techniques are Expert systems, Constraint Satisfaction Problem

resolution and Machine-learning. The notion of viewpoint complexity, that is complexity of a scene seen from a given viewpoint, will be used in improvement proposals for a lot of computer graphics problems like scene understanding, virtual world exploration, image-based modeling and rendering, ray tracing and radiosity. Very often, viewpoint complexity is used in conjunction with Artificial Intelligence techniques like Heuristic search and Problem resolution. The notions of artificial Intelligence and Viewpoint Complexity may help to automatically resolve a big number of computer graphics problems. However, there are special situations where is required to find a particular solution for each situation. In such a case, human intelligence has to replace, or to be combined with, artificial intelligence. Such cases, and proposed solutions are also presented in this book.

Autonomous Mobile Robots: Control, planning, and architecture Jun 22 2020

Building Information Modeling for a Smart and Sustainable Urban Space Jan 10 2022 Urban spaces are being called upon to develop a capacity for resilience and sustainability in order to meet the major challenges they face. To achieve such a goal, a practical development framework must be implemented in order to take advantage of the technological innovations that characterize the field of construction and urban engineering. Today, multi-scale BIM is bringing about significant changes that are redefining the paradigms of urban management. It facilitates simulations of the sustainability of urban spaces with respect to several criteria; most notably relating to energy, the economy and the environment. Building Information Modeling for a Smart and Sustainable Urban Space proposes a theoretical and practical framework for implementing BIM models for the creation of sustainable and intelligent urban spaces. It addresses the issues of acquisition, modeling, interoperability, and BIM and GIS integration for the production of BIM models. Case studies are presented, providing a practical dimension that demonstrates the production process of the urban model and its contribution to multiscale simulations, particularly in real estate evaluation and urban renewal.

Unlocking the Urban Photographic Record Through 4D Scene Modeling May 02 2021 Vast collections of historical photographs are being digitally archived and placed online, providing an objective record of the last two centuries that remains largely untapped. We propose that time-varying 3D models can pull together and index large collections of images while also serving as a tool of historical discovery, revealing new information about the locations, dates, and contents of historical images. In particular, our goal is to use computer vision techniques to tie together a large set of historical photographs of a given city into a consistent 4D model of the city: a 3D model with time as an additional dimension. To extract 4D city models from historical images, we must perform inference about the position of cameras and scene structure in both space and time. Traditional structure from motion techniques can be used to deal with the spatial problem, while here we focus on the problem of inferring temporal information: a date for each image and a time interval for which each structural element in the scene persists. We first formulate this task as a constraint satisfaction problem based on the visibility of structural elements in each image, resulting in a temporal ordering of images. Next, we present methods to incorporate real date information into the temporal inference solution. Finally, we present a general probabilistic framework for estimating all temporal variables in structure from motion problems, including an unknown date for each camera and an unknown time interval for each structural element. Given a collection of images with mostly unknown or uncertain dates, we can use this framework to automatically recover the dates of all images by reasoning probabilistically about the visibility and existence of objects in the scene. We present results for image collections consisting of hundreds of historical images of cities taken over decades of time, including Manhattan and downtown Atlanta.

Automated 3D Object Modeling from Aerial Video Imagery Dec 09 2021 "Research in physically accurate 3D modeling of a scene is gaining momentum because of its far reaching applications in civilian and defense sectors. The modeled 3D scene must conform both geometrically and spectrally to the real world for all the applications. Geometric modeling of a scene can be achieved in many ways of which the two most popular methods are a) using multiple 2D passive images of the scene also called stereo vision and b) using 3D point clouds like Lidar (light detection and ranging) data. In this research work, we derive the 3D models of objects in a scene using passive aerial video imagery. At present, this

geometric modeling requires a lot of manual intervention due to a variety of factors like sensor noise, low contrast conditions during image capture, etc. Hence long time periods, in the order of weeks and months, are required to model even a small scene. This thesis focuses on automating the process of geometric modeling of objects in a scene from passive aerial video imagery. The aerial video frames are stitched into stereo mosaics. These stereo mosaics not only provide the elevation information of a scene but also act as good 3D visualization tools. The 3D information obtained from the stereo mosaics is used to identify the various 3D objects, especially man-made buildings using probabilistic inference provided by Bayesian Networks. The initial 3D building models are further optimized by projecting them onto the individual video frames. The limitations of the state-of-the-art technology in attaining these goals are presented along with the techniques to overcome them. The improvement that can be achieved in the accuracy of the 3D models when Lidar data is fused with aerial video during the object identification process is also examined."--Abstract.

Simplified Scene Modeling Using Curved Surfaces and Texturing Oct 19 2022 Constructing a scene data base for current computer image generation systems is a costly and time-consuming task. Thousands of edges must be defined by positioning the end points, or vertices, of each edge. In addition, edges bounding a common surface or face must be linked in a list. Data for each face must include information for a normal vector, and data for faces representing curved objects must include information for normal interpolation to simulate smooth shading across the object. This paper describes a more efficient scene model that is earlier to construct and yet produces a more faithful representation of the real world. Scene geometry is modeled by quadric surface bounded by planes. Scene detail is modeled by a mathematical texturing function which modulates surface shading intensity and translucence. The paper describes how the new model simplifies modeling terrain, cultural features, moving targets, and special effects. (Author).

Proceedings of the International Symposium on Remote Sensing of Environment Aug 25 2020

On Hierarchical Models for Visual Recognition and Learning of Objects, Scenes, and Activities May 22 2020 In many computer vision applications, objects have to be learned and recognized in images or image sequences. This book presents new probabilistic hierarchical models that allow an efficient representation of multiple objects of different categories, scales, rotations, and views. The idea is to exploit similarities between objects and object parts in order to share calculations and avoid redundant information. Furthermore inference approaches for fast and robust detection are presented. These new approaches combine the idea of compositional and similarity hierarchies and overcome limitations of previous methods. Besides classical object recognition the book shows the use for detection of human poses in a project for gait analysis. The use of activity detection is presented for the design of environments for ageing, to identify activities and behavior patterns in smart homes. In a presented project for parking spot detection using an intelligent vehicle, the proposed approaches are used to hierarchically model the environment of the vehicle for an efficient and robust interpretation of the scene in real-time.

Taking SketchUp Pro to the Next Level Apr 13 2022 Create beautiful custom materials and leverage powerful extensions for efficient modeling Key Features Understand how to get the most out of SketchUp's powerful native tools with key images printed in color Customize and transform your workspace for efficient 3D modeling Go beyond SketchUp's capabilities with extensions and free online resources Book Description Anyone who's worked with it will know that SketchUp is the quickest and easiest way to create 3D models. While its approachable interface makes it super easy to learn, this book will show you how the extremely capable SketchUp software can take you far beyond what you may have initially thought possible. Get ready to level up from a basic user to becoming a SketchUp ninja! Each chapter will take you through the capabilities of SketchUp, challenging you to use tools in innovative ways. This includes organizing your model, modifying native commands, customizing your interface, utilizing inferencing, and much more. Additionally, you'll learn about the extensions that can be added to SketchUp to supplement the tools you have been using, allowing you to make your 3D modeling process quicker, easier, and more powerful. By the end of this SketchUp book, you'll have an

enhanced understanding of how to use the impressive range of tools and be on your way to customizing SketchUp for your one-of-a-kind workflow. What you will learn Recap the basics of navigation and SketchUp's native modeling tools Modify commands, toolbars, and shortcuts to improve your modeling efficiency Use default templates, as well as create custom templates Organize your models with groups, components, tags, and scenes Analyze your own modeling workflow and understand how to improve it Discover extensions and online repositories that unlock the advanced capabilities of SketchUp Leverage your existing SketchUp Pro subscription for even better results Who this book is for This book is for designers, architects, and professional modelers who have used SketchUp before, perhaps self-taught, or have completed software training but find themselves needing more than just the basics from SketchUp. The book assumes that you have spent some time in SketchUp and have basic modeling experience.

Computer Vision -- ECCV 2014 Apr 01 2021 The seven-volume set comprising LNCS volumes 8689-8695 constitutes the refereed proceedings of the 13th European Conference on Computer Vision, ECCV 2014, held in Zurich, Switzerland, in September 2014. The 363 revised papers presented were carefully reviewed and selected from 1444 submissions. The papers are organized in topical sections on tracking and activity recognition; recognition; learning and inference; structure from motion and feature matching; computational photography and low-level vision; vision; segmentation and saliency; context and 3D scenes; motion and 3D scene analysis; and poster sessions.

International Conference on Space Information Technology Sep 06 2021

International Conference on Multimodal Interfaces Apr 20 2020

Biologically Inspired Signal Processing for Chemical Sensing Jul 16 2022 Biologically inspired approaches for artificial sensing have been extensively applied to different sensory modalities over the last decades and chemical senses have been no exception. The olfactory system, and the gustatory system to a minor extent, has been regarded as a model for the development of new artificial chemical sensing s- tems. One of the main contributions to this field was done by Persaud and Dodd in 1982 when they proposed a system based on an array of broad-selective chemical sensors coupled with a pattern recognition engine. The array aimed at mimicking the sensing strategy followed by the olfactory system where a population of bro- selective olfactory receptor neurons encodes for chemical information as patterns of activity across the neuron population. The pattern recognition engine proposed was not based on bio-inspired but on statistical methods. This influential work gave rise to a new line of research where this paradigm has been used to build chemical sensing instruments applied to a wide range of odor detection problems. More recently, some researchers have proposed to extend the biological inspiration of this system also to the processing of the sensor array signals. This has been mo- vated in part by the increasing body of knowledge available on biological olfaction, which has become in the last decade a focus of attention of the experimental neu- science community.

Context Modeling for Semantic Text Matching and Scene Text Detection Jul 04 2021 Context is the information that surrounds and defines the target information it encapsulates. Without context, the most related target information could be misinterpreted. Most existing models utilize context by encoding it as a set of human-crafted heuristic features for machine learning, which may not fully capturemany connections between the context and the target. We contend that, in the setting of big data, context information should be modeled in a more principled way that is tightly coupled with learning algorithms. We present several machine learning models that learn the relations between context and related target information for two fundamental tasks in natural language processing and computer vision: semantictext matching and scene text detection. In particular, this dissertation addresses two different applications with context modeling: citation recommendation for scientific papers and localizing text in the wild.Citations are crucial in academic attribution. A good citation recommendation engine can help both researchers and reviewers check the completeness of citations. Existing models for citation recommendation were mostly built on general recommendation models. Such methods usually project context into high dimensional feature vectors without directly modeling the relation between the citation context and the citation. Here, we propose two context-based models which learn the semantic

relations between the citation contexts and the cited documents. Both models achieve state-of-the-art recommendation results on the CiteSeerX dataset. Detecting text in an unconstrained natural scene environment is a challenging task because of the many fonts, sizes, backgrounds, and alignments of the characters. Most existing models for scene text detection focus on small image patches of character areas. However, text in natural scenes is surrounded with informational context which can help locate the wanted text. We present a novel context-basedattention model for detecting arbitrary oriented and curved scene text. Combining the model with an off-the-shelf text region proposal method, Extremal Regions, the text detection pipeline achieves the state-of-the-art performance on the ICDAR 2013 dataset and the MSRA Text Detection 500 dataset.

Introductory Digital Image Processing Jan 18 2020 For junior/graduate-level courses in Remote Sensing in Geography, Geology, Forestry, and Biology. This revision of Introductory Digital Image Processing: A Remote Sensing Perspective continues to focus on digital image processing of aircraft- and satellite-derived, remotely sensed data for Earth resource management applications. Extensively illustrated, it explains how to extract biophysical information from remote sensor data for almost all multidisciplinary land-based environmental projects. Part of the Prentice Hall Series Geographic Information Science.

Image Patch Modeling in a Light Field Nov 15 2019 Understanding image content is one of the ultimate goals of computer vision, and effectively and efficiently extracting features from images is a key component of all vision research. This thesis discusses methods related to an image-patch based approach to this feature analysis. Image-patch based methods have attracted a lot of interest for the analysis of a single images in application areas such as visual object recognition, image denoising, and super-resolution computation. The basic idea is to treat a single image as a collection of independent image patches, each of which can be encoded by, for example, a sparse coding model. The global characterization of that image is attained by aggregating the patch codes, which brings some level of shift-invariance and robustness to image noise and signal degradation. In this thesis, a new scheme, \textit{scene geometry-aware image-patch modeling}, based on the concept of a \textbf{patch-cube}, is proposed to model image patches in a light field, rather than in a single image. A light field is a collection of images all acquired at the same instant, providing a set of perspectives on the scene as though observing all of the light information that passes through a windowing portal (clearly with some discretization and sampling). The scene geometric information is implicitly incorporated in our modeling process, including depth and occlusion, without explicit knowledge of 3D scene structure. These extra constraints on the scene geometry empower our learned features to be less affected by image noise, lighting conditions, etc. As demonstration, we apply our method to joint image denoising and joint spatial/angular image super-resolution tasks, where its use of the light field will be seen to permit it to outperform its image-patch based counterparts. Here, a 2D camera array with small incremental baselines is used to capture the light field data, and this analysis is the majority of what we report. Additionally, working with real data from real light-field cameras, we present novel and highly effective methods for the calibration of these camera arrays. In common with the single-image model, learning a good "dictionary" plays a very important role in our work -- selecting an appropriate set of features that can provide succinct representations of a scene. Inspired by the success of the image patch-based method \cite{NGSingle}, we show that feature extraction for image patches is closely related to the low-rank kernel matrix approximation using the Nystrom method. The dictionary in sparse coding, or cluster centers in K-means clustering, are actually landmark points which can better capture the underlying higher-dimensional (manifold) structure of the data. Based upon this observation, our contribution is two fold: 1) an efficient algorithm to perform Kernel Principle Component Analysis feature extraction using landmark points, and 2) an alternative method for finding better landmark points based on \textit{Generalized Extreme Value distribution}s, GEV-Kmeans.

Sensor Fusion Jan 30 2021

Efficient 3D Scene Modeling and Mosaicing Sep 18 2022 This book proposes a complete pipeline for monocular (single camera) based 3D mapping of terrestrial and underwater environments. The aim is to

provide a solution to large-scale scene modeling that is both accurate and efficient. To this end, we have developed a novel Structure from Motion algorithm that increases mapping accuracy by registering camera views directly with the maps. The camera registration uses a dual approach that adapts to the type of environment being mapped. In order to further increase the accuracy of the resulting maps, a new method is presented, allowing detection of images corresponding to the same scene region (crossovers). Crossovers then used in conjunction with global alignment methods in order to highly reduce estimation errors, especially when mapping large areas. Our method is based on Visual Bag of Words paradigm (BoW), offering a more efficient and simpler solution by eliminating the training stage, generally required by state of the art BoW algorithms. Also, towards developing methods for efficient mapping of large areas (especially with costs related to map storage, transmission and rendering in mind), an online 3D model simplification algorithm is proposed. This new algorithm presents the advantage of selecting only those vertices that are geometrically representative for the scene.

Journal of the Optical Society of America Mar 20 2020

Natural Scene Classification, Annotation and Retrieval Feb 28 2021 With the availability of inexpensive hardware and software, digital imaging has become an important medium of communication in our daily lives. A huge amount of digital images are being collected and become available through the internet and stored in various fields such as personal image collections, medical imaging, digital arts etc. Therefore, it is important to make sure that images are stored, searched and accessed in an efficient manner. The use of bag of visual words (BOW) model for modelling images based on local invariant features computed at interest point locations has become a standard choice for many computer vision tasks. Based on this promising model, this thesis investigates three main problems: natural scene classification, annotation and retrieval. Given an image, the task is to design a system that can determine to which class that image belongs to (classification), what semantic concepts it contain (annotation) and what images are most similar to (retrieval). This thesis contributes to scene classification by proposing a weighting approach, named keypoints density-based weighting method (KDW), to control the fusion of colour information and bag of visual words on spatial pyramid layout in a unified framework. Different configurations of BOW, integrated visual vocabularies and multiple image descriptors are investigated and analyzed. The proposed approaches are extensively evaluated over three well-known scene classification datasets with 6, 8 and 15 scene categories using 10-fold cross validation. The second contribution in this thesis, the scene annotation task, is to explore whether the integrated visual vocabularies generated for scene classification can be used to model the local semantic information of natural scenes. In this direction, image annotation is considered as a classification problem where images are partitioned into 10x10 fixed grid and each block, represented by BOW and different image descriptors, is classified into one of predefined semantic classes. An image is then represented by counting the percentage of every semantic concept detected in the image. Experimental results on 6 scene categories demonstrate the effectiveness of the proposed approach. Finally, this thesis further explores, with an extensive experimental work, the use of different configurations of the BOW for natural scene retrieval.

3D Scene Modeling and Understanding from Image Sequences Jun 03 2021 A new method for 3D modeling is proposed, which generates a content-based 3D mosaic (CB3M) representation for long video sequences of 3D, dynamic urban scenes captured by a camera on a mobile platform. In the first phase, a set of parallel-perspective (pushbroom) mosaics with varying viewing directions is generated to capture both the 3D and dynamic aspects of the scene under the camera coverage. In the second phase, a unified patch-based stereo matching algorithm is applied to extract parametric representations of the color, structure and motion of the dynamic and/or 3D objects in urban scenes, where a lot of planar surfaces exist. Multiple pairs of stereo mosaics are used for facilitating reliable stereo matching, occlusion handling, accurate 3D reconstruction and robust moving target detection. The outcome of this phase is a CB3M representation, which is a highly compressed visual representation for a dynamic 3D scene, and has object contents of both 3D and motion information. In the third phase, a multi-layer

based scene understanding algorithm is proposed, resulting in a planar surface model for higher-level object representations. Experimental results are given for both simulated and several different real video sequences of large-scale 3D scenes to show the accuracy and effectiveness of the representation. We also show the patch-based stereo matching algorithm and the CB3M representation can be generalized to 3D modeling with perspective views using either a single camera or a stereovision head on a ground mobile platform or a pedestrian. Applications of the proposed method include airborne or ground video surveillance, 3D urban scene modeling, traffic survey, transportation planning and the visual aid for perception and navigation of blind people.

Plenoptic Scene Modelling from Uncalibrated Image Sequences Nov 20 2022 The main aim of this work is to combine the fields of computer vision and computer graphics for visualising real scenes three-dimensionally and in a photo-realistic quality. The challenge was to perform the complete processing pipeline of recording images, of analysing for retrieving camera parameters and of visualising the recorded scene with image-based methods using plenoptic scene-models. Additionally, visualisation results are used for computer vision tasks.

Handbook of Mathematical Models in Computer Vision May 14 2022 Abstract Biological vision is a rather fascinating domain of research. Scientists of various origins like biology, medicine, neurophysiology, engineering, math ematics, etc. aim to understand the processes leading to visual perception process and at reproducing such systems. Understanding the environment is most of the time done through visual perception which appears to be one of the most fundamental sensory abilities in humans and therefore a significant amount of research effort has been dedicated towards modelling and repro ducing human visual abilities. Mathematical methods play a central role in this endeavour. Introduction David Marr's theory v^as a pioneering step tov^ards understanding visual percep tion. In his view human vision was based on a complete surface reconstruction of the environment that was then used to address visual subtasks. This approach was proven to be insufficient by neuro-biologists and complementary ideas from statistical pattern recognition and artificial intelligence were introduced to bet ter address the visual perception problem. In this framework visual perception is represented by a set of actions and rules connecting these actions. The emerg ing concept of active vision consists of a selective visual perception paradigm that is basically equivalent to recovering from the environment the minimal piece information required to address a particular task of interest.

Cloud Scene Simulation Modeling Mar 12 2022 This report documents the development of the Enhanced Cloud Scene Simulation Model developed by TASC for Phillips Laboratory in support of the Smart Weapons Operability Enhancement (SWOE) Program under the Balanced Technology Initiative. The model simulates multi-dimensional cloud water density fields for input to radiative transfer models and scene generation systems. The enhanced cloud model incorporates additional capabilities and modifications to previous model versions. This document focuses on those new capabilities and briefly summarizes the technical tasks completed under the Cloud Scene Model Development Project. Cloud model, Fractal model, Scene simulation, Cumulus model.

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