Airborne And Terrestrial Laser Scanning

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Forestry Applications of Airborne Laser Scanning - Matti Maltamo 2014-04-08
Airborne laser scanning (ALS) has emerged as one of the most promising remote sensing technologies to provide data for research and operational applications in a wide range of disciplines related to management of forest ecosystems. This book provides a comprehensive, state-of-the-art review of the research and application of ALS in a broad range of forest-related disciplines, especially forest inventory and forest ecology. However, this book is more than just a collection of individual contributions — it consists of a well-composed blend of chapters dealing with fundamental methodological issues and contributions reviewing and illustrating the use of ALS within various domains of application. The reviews provide a comprehensive and unique overview of recent research and applications that researchers, students and practitioners in forest remote sensing and forest ecosystem assessment should consider as a useful reference text.
Remote Sensing and Modeling - Charles W. Finkl

2014-09-01
This book is geared for advanced level research in the general subject area of remote sensing and modeling as they apply to the coastal marine environment. The various chapters focus on the latest scientific and technical advances in the service of better understanding coastal marine environments for their care, conservation and management. Chapters specifically deal with advances in remote sensing coastal classifications, environmental monitoring, digital ocean technological advances, geophysical methods, geoacoustics, X-band radar, risk assessment models, GIS applications, real-time modeling systems, and spatial modeling. Readers will find this book useful because it summarizes applications of new research methods in one of the world's most dynamic and complicated environments. Chapters in this book will be of interest to specialists in the coastal marine environment who deals with aspects of environmental monitoring and assessment via remote sensing techniques and numerical modeling.

Laser Scanning for the Environmental Sciences - George Heritage 2009-05-06
3D surface representation has long been a source of information describing surface character and facilitating an understanding of system dynamics from micro-scale (e.g. sand transport) to macro-scale (e.g. drainage channel network evolution). Data collection has been achieved through field mapping techniques and the use of remotely sensed data. Advances in this latter field have been considerable in recent years with new rapid-acquisition methods being developed centered around laser based technology. The advent of airborne and field based laser scanning instruments has allowed researchers to collect high density accurate data sets and these are revealing a wealth of new information and generating important new ideas concerning terrain characterisation and landform dynamics. The proposed book collates a series of invited peer reviewed papers presented at the a conference on geoinformatics and LIDAR to be held at the National Centre for Geocomputation based in the National University of Ireland, Maynooth. Current constraints in field survey and DEM construction are reviewed together with technical and applied issues around the new technology. The utility of the data in process modelling is also covered. The book will be of great value to researchers in the field of geomorphology, geostatistics, remote sensing and GIS and will prove extremely useful to students and practitioners concerned with terrain analysis. The proposed work will: Highlight major technological breakthrough in 3D data collection. Feature examples of application across a wide range of environmental areas. Critically evaluate the role of laser based techniques in the environment. Detail theory and application of laser techniques in the natural environment.

Advances in Airborne Lidar Systems and Data Processing - 2018-05-11
This book collects the papers in the special issue "Airborne Laser Scanning" in Remote Sensing (Nov. 2016) and several other selected papers published in the same journal in the past few years. Our intention is to reflect recent technological developments and innovative techniques in this field. The book consists of 23 papers in six subject areas: 1) Single photon and Geiger-mode Lidar, 2) Multispectral lidar, 3) Waveform lidar, 4) Registration of point clouds, 5) Trees and terrain, and 6) Building extraction. The book is a valuable resource for scientists, engineers, developers, instructors, and graduate students interested in lidar systems and data processing.

Measurement of Shrub Canopy Structures Using Terrestrial Laser Scanning and Implications for Airborne LiDAR Application - Yanyin Xu 2010

Object and Pattern Recognition in Remote Sensing - Professor Stefan Hinz 2017-08-31
Fully automated interpretation and understanding of remotely sensed data by a computer has been a challenge for many decades, and many approaches have been developed over the years. Significant advances in knowledge-based image understanding, machine learning and artificial intelligence has led to this topic being the focus of much research in recent years. This book highlights the different theoretical and application-oriented aspects and potential solutions to the topic of automated remote sensing data analysis. Thereby, both classical knowledge-based as well as modern machine

learning-oriented concepts are described. A field such as this is specialized and dynamic and also interdisciplinary and multilayered. Written by an international team of experts, the book has therefore been split into parts dealing with the concepts and applications, and the focus is on elucidating the complementarity of different lines of research rather than providing the complete set of scientific approaches.Part A of this book gives insight into the basic theories and concepts of feature extraction, image understanding and the respective assessment strategies as well as into geometric, radiometric and sensor-related fundamentals of remote sensing technology. Part B focuses on various scientific and practical applications of remote sensing data analysis. These range from the automatic detailed reconstruction of complex 3D environments to visual tracking of objects in image sequences as well as monitoring natural and anthropogenic long-term processes on a regional scale. Part C sketches recent trends in automatic analysis of remote sensing data.

Advances and Trends in Geodesy, Cartography and Geoinformatics II - Soňa Molčíková 2020-04-01
This volume contains a selection of peer-reviewed papers presented at the International Scientific and Professional Conference Geodesy, Cartography and Geoinformatics 2019 (GCG 2019). The conference provided a forum for prominent scientists, researchers and professionals from Slovakia, Poland and the Czech Republic to present novel and fundamental advances in the fields of geodesy, cartography and geoinformatics. Conference participants had the opportunity to exchange and share their experiences, research and results solved within scientific research projects with other colleagues. The conference was focused on a wide spectrum of actual topics and subjects areas in Surveying and mine surveying, Geodetic control and geodynamics and Cartography and Geoinformatics collected in this proceedings volume. The Book Series "Advances and Trends in Geodesy, Cartography and Geoinformatics" is, in line with its long tradition, devoted to the publication of proceedings of peer-reviewed international conferences focusing on presenting technological and scientific advances in modern geodesy, geoinformatics, cartography, photogrammetry, remote sensing, geography, and related sciences. It plays an extremely important role in accelerating the development of all these disciplines, stimulating advanced education and training through the wide dissemination of new scientific knowledge and trends in Geodesy, Cartography and Geoinformatics to a broad group of scientists and specialists.

The Rise of Big Spatial Data - Igor Ivan 2016-10-14
This edited volume gathers the proceedings of the Symposium GIS Ostrava 2016, the Rise of Big Spatial Data, held at the Technical University of Ostrava, Czech Republic, March 16–18, 2016. Combining theoretical papers and applications by authors from around the globe, it summarises the latest research findings in the area of big spatial data and key problems related to its utilisation. Welcome to dawn of the big data era: though it's in sight, it isn't quite here yet. Big spatial data is characterised by three main features: volume beyond the limit of usual geo-processing, velocity higher than that available using conventional processes, and variety, combining more diverse geodata sources than usual. The popular term denotes a situation in which one or more of these key properties reaches a point at which

traditional methods for geodata collection, storage, processing, control, analysis, modelling, validation and visualisation fail to provide effective solutions.
>Entering the era of big spatial data calls for finding solutions that address all "small data" issues that soon create "big data" troubles. Resilience for big spatial data means solving the heterogeneity of spatial data sources (in topics, purpose, completeness, guarantee, licensing, coverage etc.), large volumes (from gigabytes to terabytes and more), undue complexity of geo-applications and systems (i.e. combination of standalone applications with web services, mobile platforms and sensor networks), neglected automation of geodata preparation (i.e. harmonisation, fusion), insufficient control of geodata collection and distribution processes (i.e. scarcity and poor quality of metadata and metadata systems), limited analytical tool capacity (i.e. domination of traditional causal-driven analysis), low visual system performance, inefficient knowledge-discovery techniques (for transformation of vast amounts of information into tiny and essential outputs) and much more. These trends are accelerating as sensors become more ubiquitous around the world.
A Comparison of Tree Height Estimates Using Three Remote Sensing Methods -stereo Photogrammetry, Airborne Laser Scanning and Terrestrial Laser Scanning- in Tropical Forest - Jianqi Ding 2018

Interpreting Archaeological Topography - David Cowley 2013
Airborne Laser Scanning (ALS), or lidar, is an enormously important innovation for data collection and interpretation in archaeology. The application of archaeological 3D data deriving from sources including ALS, close-range photogrammetry and terrestrial and photogrammetric scanners has grown exponentially over the last decade. Such data present numerous possibilities and challenges, from ensuring that applications remain archaeologically relevant, to developing practices that integrate the manipulation and interrogation of complex digital datasets with the skills of archaeological observation and interpretation. This volume addresses the implications of multi-scaled topographic data for contemporary archaeological practice in a rapidly developing field, drawing on examples of ongoing projects and reflections on best practice. Twenty papers from across Europe explore the implications of these digital 3D datasets for the recording and interpretation of archaeological topography, whether at the landscape, site or artifact scale. The papers illustrate the variety of ways in which we engage with archaeological topography through 3D data, from discussions of its role in landscape archaeology, to issues of context and integration, and to the methodological challenges of processing, visualization and manipulation. Critical reflection on developing practice and implications for cultural resource management and research contextualize the case studies and applications, illustrating the diverse and evolving roles played by multi-scalar topographic data in contemporary archaeology.
The Registration and Segmentation of Heterogeneous Laser Scanning Data - Mohannad M. Al-Durgham 2014

Advances in 3D Geoinformation Systems - Peter van Oosterom 2008-11-19
The book covers the international state-of-the-art research in the field of 3D geo-information modeling. It

focuses on comparing several types of 3D models. Due to the rapid developments in sensor techniques more and more 3D data becomes available. Effective algorithms for (semi) automatic object reconstruction are required. 3D analysis and 3D simulation techniques explore and extend the possibilities in spatial applications.

Digital Geoarchaeology - Christoph Siart 2017-12-03 This book focusses on new technologies and multi-method research designs in the field of modern archaeology, which increasingly crosses academic boundaries to investigate past human-environmental relationships and to reconstruct palaeolandscapes. It aims at establishing the concept of Digital Geoarcheology as a novel approach of interdisciplinary collaboration situated at the scientific interface between classical studies, geosciences and computer sciences. Among others, the book includes topics such as geographic information systems, spatiotemporal analysis, remote sensing applications, laser scanning, digital elevation models, geophysical prospecting, data fusion and 3D visualisation, categorized in four major sections. Each section is introduced by a general thematic overview and followed by case studies, which vividly illustrate the broad spectrum of potential applications and new research designs. Mutual fields of work and common technologies are identified and discussed from different scholarly perspectives. By stimulating knowledge transfer and fostering interdisciplinary collaboration, Digital Geoarchaeology helps generate valuable synergies and contributes to a better understanding of ancient landscapes along with their forming processes. Chapters 1, 2, 6, 8 and 14 are published open access under a CC BY 4.0 license at link.springer.com.

New Technologies for Archaeology - Markus Reindel 2009-02-07 This heavily-illustrated book covers recent developments in archaeometry and offers a multidisciplinary approach to reconstructing complex cultural histories. It also presents a detailed history of human development in South America's Nasca region.

The SAGE Handbook of Remote Sensing - Timothy A Warner 2009-06-18 'A magnificent achievement. A who's who of contemporary remote sensing have produced an engaging, wide-ranging and scholarly review of the field in just one volume' - Professor Paul Curran, Vice-Chancellor, Bournemouth University Remote Sensing acquires and interprets small or large-scale data about the Earth from a distance. Using a wide range of spatial, spectral, temporal, and radiometric scales Remote Sensing is a large and diverse field for which this Handbook will be the key research reference. Organized in four key sections: • Interactions of Electromagnetic Radiation with the Terrestrial Environment: chapters on Visible, Near-IR and Shortwave IR; Middle IR (3-5 micrometers); Thermal IR ; Microwave • Digital sensors and Image Characteristics: chapters on Sensor Technology; Coarse Spatial Resolution Optical Sensors ; Medium Spatial Resolution Optical Sensors; Fine Spatial Resolution Optical Sensors; Video Imaging and Multispectral Digital Photography; Hyperspectral Sensors; Radar and Passive Microwave Sensors; Lidar • Remote Sensing Analysis - Design and Implementation: chapters on Image Pre-Processing; Ground Data Collection; Integration with GIS; Quantitative Models in Remote Sensing; Validation and accuracy assessment; • Remote Sensing Analysis - Applications: LITHOSPHERIC SCIENCES: chapters on Topography; Geology; Soils; PLANT SCIENCES: Vegetation;

Agriculture; HYDROSPHERIC and CRYSOPHERIC SCIENCES: Hydrosphere: Fresh and Ocean Water; Cryosphere; GLOBAL CHANGE AND HUMAN ENVIRONMENTS: Earth Systems; Human Environments & Links to the Social Sciences; Real Time Monitoring Systems and Disaster Management; Land Cover Change Illustrated throughout, an essential resource for the analysis of remotely sensed data, the SAGE Handbook of Remote Sensing provides researchers with a definitive statement of the core concepts and methodologies in the discipline.

UAV Photogrammetry and Remote Sensing - Fernando Carvajal-Ramírez 2021-09-06
The concept of remote sensing as a way of capturing information from an object without making contact with it has, until recently, been exclusively focused on the use of Earth observation satellites. The emergence of unmanned aerial vehicles (UAV) with Global Navigation Satellite System (GNSS) controlled navigation and sensor-carrying capabilities has increased the number of publications related to new remote sensing from much closer distances. Previous knowledge about the behavior of the Earth's surface under the incidence different wavelengths of energy has been successfully applied to a large amount of data recorded from UAVs, thereby increasing the special and temporal resolution of the products obtained. More specifically, the ability of UAVs to be positioned in the air at pre-programmed coordinate points; to track flight paths; and in any case, to record the coordinates of the sensor position at the time of the shot and at the pitch, yaw, and roll angles have opened an interesting field of applications for low-altitude aerial photogrammetry, known as UAV photogrammetry. In addition, photogrammetric data processing has been improved thanks to the combination of new algorithms, e.g., structure from motion (SfM), which solves the collinearity equations without the need for any control point, producing a cloud of points referenced to an arbitrary coordinate system and a full camera calibration, and the multi-view stereopsis (MVS) algorithm, which applies an expanding procedure of sparse set of matched keypoints in order to obtain a dense point cloud. The set of technical advances described above allows for geometric modeling of terrain surfaces with high accuracy, minimizing the need for topographic campaigns for georeferencing of such products. This Special Issue aims to compile some applications realized thanks to the synergies established between new remote sensing from close distances and UAV photogrammetry.

Mapping of Landslides Under Forest Using High Resolution Lidar Data - S.N. Suprijatna 2011

Airborne and Terrestrial Laser Scanning - George Vosselman 2010
Written by a team of international experts, this book provides a comprehensive overview of the major applications of airborne and terrestrial laser scanning. It focuses on principles and methods and presents an integrated treatment of airborne and terrestrial laser scanning technology. After consideration of the technology and processing methods, the book turns to applications, such as engineering, forestry, cultural heritage, extraction of 3D building models, and mobile mapping. This book brings together the various facets of the subject in a coherent text that will be relevant for advanced students, academics and practitioners.

Handbook on Advances in Remote Sensing and Geographic Information Systems - Margarita N. Favorskaya 2017-02-24

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.

Rock Mechanics: Meeting Society's Challenges and Demands, Two Volume Set - Erik Eberhardt 2007-05-17
Ore extraction through surface and underground mining continues to involve deeper excavations in more complex rock mass conditions. Communities and infrastructure are increasingly exposed to rock slope hazards as they expand further into rugged mountainous terrains. Energy needs are accelerating the development of new hydroelectric dams and exploit

Laser Scanning Systems in Highway and Safety Assessment - Biswajeet Pradhan 2019-04-02
This book aims to promote the core understanding of a proper modelling of road traffic accidents by deep learning methods using traffic information and road geometry delineated from laser scanning data. The first two chapters of the book introduce the reader to laser scanning technology with creative explanation and graphical illustrations, review and recent methods of extracting geometric road parameters. The next three chapters present different machine learning and statistical techniques applied to extract road geometry information from laser scanning data. Chapters 6 and 7 present methods for modelling roadside features and automatic road geometry identification in vector data.

After that, this book goes on reviewing methods used for road traffic accident modelling including accident frequency and injury severity of the traffic accident (Chapter 8). Then, the next chapter explores the details of neural networks and their performance in predicting the traffic accidents along with a comparison with common data mining models. Chapter 10 presents a novel hybrid model combining extreme gradient boosting and deep neural networks for predicting injury severity of road traffic accidents. This chapter is followed by deep learning applications in modelling accident data using feed-forward, convolutional, recurrent neural network models (Chapter 11). The final chapter (Chapter 12) presents a procedure for modelling traffic accident with little data based on the concept of transfer learning. This book aims to help graduate students, professionals, decision makers, and road planners in developing better traffic accident prediction models using advanced neural networks.

Manual of Aerial Survey - Roger E. Read 2002

Engineering Surveys for Industry - Alojz Kopáčik 2020-07-22
This book is the translated English version of a text on industrial surveys, originally published in Slovak by SPEKTRUM STU Publishing. This updated version is not only a translation of the original, but also a reviewed, extended version, which reflects up-to-date international standards and regulations. The book covers topics in engineering surveying not available in other publications in this complex form, and addresses the design methodology, data processing and implementation of geodetic measurements under specific conditions to make industrial work environments safer and more

efficient. The book begins by introducing readers to these conditions, and then discusses design of maps, geodetic networks and information systems of industrial plants, the usage of cartesian and polar coordinate measuring systems, terrestrial laser scanning technology, as well as measurement of cranes, rotary kilns and special objects of nuclear power plants. The book will be of use to teachers, students, practitioners (e.g. surveyors), quality production managers, equipment designers and mechanical engineers.

Mango Information Kit - 1999

3D Laser Scanning for Heritage - Clive Boardman 2018
The first edition of 3D Laser Scanning for Heritage was published in 2007 and originated from the Heritage3D project that in 2006 considered the development of professional guidance for laser scanning in archaeology and architecture. Publication of the second edition in 2011 continued the aims of the original document in providing updated guidance on the use of three-dimensional (3D) laser scanning across the heritage sector. By reflecting on the technological advances made since 2011, such as the speed, resolution, mobility and portability of modern laser scanning systems and their integration with other sensor solutions, the guidance presented in this third edition should assist archaeologists, conservators and other cultural heritage professionals unfamiliar with the approach in making the best possible use of this now highly developed technique.

Urban Informatics - Wenzhong Shi 2021-04-06
This open access book is the first to systematically introduce the principles of urban informatics and its application to every aspect of the city that involves its functioning, control, management, and future planning. It introduces new models and tools being developed to understand and implement these technologies that enable cities to function more efficiently – to become 'smart' and 'sustainable'. The smart city has quickly emerged as computers have become ever smaller to the point where they can be embedded into the very fabric of the city, as well as being central to new ways in which the population can communicate and act. When cities are wired in this way, they have the potential to become sentient and responsive, generating massive streams of 'big' data in real time as well as providing immense opportunities for extracting new forms of urban data through crowdsourcing. This book offers a comprehensive review of the methods that form the core of urban informatics from various kinds of urban remote sensing to new approaches to machine learning and statistical modelling. It provides a detailed technical introduction to the wide array of tools information scientists need to develop the key urban analytics that are fundamental to learning about the smart city, and it outlines ways in which these tools can be used to inform design and policy so that cities can become more efficient with a greater concern for environment and equity.

Geo-information - Mathias Lemmens 2011-08-03
Geomatics, the handling and processing of information and data about the Earth, is one geoscience discipline that has seen major changes in the last decade, as mapping and observation systems become ever more sensitive and sophisticated. This book is a unique and in-depth survey of the field, which has a central role to play in tackling a host of environmental issues faced by society. Covering all three strands of geomatics -

applications, information technology and surveying - the chapters cover the history and background of the subject, the technology employed both to collect and disseminate data, and the varied applications to which geomatics can be put, including urban planning, assessment of biodiversity, disaster management and land administration. Relevant professionals, as well as students in a variety of disciplines such as geography and surveying, will find this book required reading. This rapidly developing field uses increasingly complex and accurate systems. Today, technology enables us to capture geo-data in full 3D as well as to disseminate it via the Web at the speed of light. We are able to continuously image the world from space at resolutions of up to 50 cm. Airborne LiDAR (laser surveying) sensors can be combined with digital camera technology to produce geometrically correct images of the Earth's surface, while integrating these with large-scale topographic maps and terrestrial as well as aerial images to produce 3D cityscapes that computer users can explore from their desktops.

Airborne and Terrestrial Laser Scanning - George Vosselman 2010

Unmanned Aircraft System-based Lidar Survey of Structures Above and Below the Water Surface: Hilo Deep Draft Harbor Breakwater, Hawaii - Adam L. LeWinter 2018
With recent advancements in unmanned aircraft system (UAS) technology, along with the miniaturization of airborne laser scanning systems, capabilities of unmanned laser scanning (ULS) systems have increased. Traditional terrestrial laser scanning surveys provide high density point clouds (hundreds - thousands of pts/m2) of a focus area, but have limited field-of-view and line-of-sight due to the constrained static nature of the system. While airborne and mobile laser scanning platforms relieve many of these limitations, lower point density (airborne), confined operation pathways (mobile), and higher operational costs become a factor. Here we present results from ULS data acquired over the Hilo Deep Draft Harbor Breakwater in Hawaii in June 2018. Inspecting the breakwater for failures and instabilities is of vital importance for Hilo. At three kilometers length and exposure to open ocean, a terrestrial laser scanning survey of the breakwater is not possible. Airborne and mobile laser scanning are not ideal due to reduced point densities and site access, respectively. In June 2018, using a RIEGL RiCOPTER with VUX laser system, the authors collected high resolution data over the above water breakwater extents. For below water surfaces, a Riegl BDF-1 bathymetric depth finder was operated from the same UAS, used to generate profiles of subaqueous surfaces of the breakwater. These bathymetric transects supplement the detailed topographic data collected above water on the breakwater. We discuss the operational concerns in both project planning and acquisition phases, as well as detailed analysis of the resulting data, used for a rigorous structure inspection program.

Structure from Motion in the Geosciences - Jonathan L. Carrivick 2016-07-15
Structure from Motion with Multi View Stereo provides hyperscale landform models using images acquired from standard compact cameras and a network of ground control points. The technique is not limited in temporal frequency and can provide point cloud data comparable in density and accuracy to those generated by terrestrial and airborne laser scanning at a fraction of the cost.

It therefore offers exciting opportunities to characterise surface topography in unprecedented detail and, with multi-temporal data, to detect elevation, position and volumetric changes that are symptomatic of earth surface processes. This book firstly places Structure from Motion in the context of other digital surveying methods and details the Structure from Motion workflow including available software packages and assessments of uncertainty and accuracy. It then critically reviews current usage of Structure from Motion in the geosciences, provides a synthesis of recent validation studies and looks to the future by highlighting opportunities arising from developments in allied disciplines. This book will appeal to academics, students and industry professionals because it balances technical knowledge of the Structure from Motion workflow with practical guidelines for image acquisition, image processing and data quality assessment and includes case studies that have been contributed by experts from around the world.

Engineering Geology for Society and Territory - Volume 3 - Giorgio Lollino 2014-08-21
This book is one out of 8 IAEG XII Congress volumes and deals with river basins, which are the focus of many hydraulic engineering and hydrogeological studies worldwide. Such studies examine river systems as both a resource of the fluvial environment, and also explore river-related hazards and risks. The contributions of researchers from different disciplines focus on: surface-groundwater exchanges, stream flow, stream erosion, river morphology and management, sediment transport regimes, debris flows, evaluation of water resources, dam operation and hydropower generation, flood risks and flood control, stream pollution and water quality management. The contributions include case studies for advancing field monitoring techniques, improving modeling and assessment of rivers and studies contributing to better management plans and policies for the river environment and water resources. The Engineering Geology for Society and Territory volumes of the IAEG XII Congress held in Torino from September 15-19, 2014, analyze the dynamic role of engineering geology in our changing world and build on the four main themes of the congress: environment, processes, issues and approaches. The congress topics and subject areas of the 8 IAEG XII Congress volumes are: Climate Change and Engineering Geology. Landslide Processes. River Basins, Reservoir Sedimentation and Water Resources. Marine and Coastal Processes. Urban Geology, Sustainable Planning and Landscape Exploitation. Applied Geology for Major Engineering Projects. Education, Professional Ethics and Public Recognition of Engineering Geology. Preservation of Cultural Heritage.

Advanced Procrustes Analysis Models in Photogrammetric Computer Vision - Fabio Crosilla 2019-02-28
This book gives a comprehensive view of the developed procrustes models, including the isotropic, the generalized and the anisotropic variants. These represent original tools to perform, among others, the bundle block adjustment and the global registration of multiple 3D LiDAR point clouds. Moreover, the book also reports the recently derived total least squares solution of the anisotropic Procrustes model, together with its practical application in solving the exterior orientation of one image. The book is aimed at all those interested in discovering valuable innovative algorithms for solving various photogrammetric computer vision problems. In this context, where functional models are

non-linear, Procrustean methods prove to be powerful since they do not require any linearization nor approximated values of the unknown parameters, furnishing at the same time results comparable in terms of accuracy with those given by the state-of-the-art methods.

Laser Scanning - Belén Riveiro 2019-10-18
This book provides an overview on the evolution of laser scanning technology and its noticeable impact in the structural engineering domain. It provides an up-to-date synthesis of the state-of-the-art of the technology for the reverse engineering of built constructions, including terrestrial, mobile, and different portable solutions, for laser scanning. Data processing of large point clouds has experienced an important advance in the last years, and thus, an intense activity in the development of automated data processing algorithms has been noticed. Thus, this book aims to provide an overview of state-of-the-art algorithms, different best practices and most recent processing tools in connection to particular applications. Readers will find this a comprehensive book, that updates the practice of laser scanning for researchers and professionals not only from the geomatic domain, but also other fields such as structural and construction engineering. A set of successful applications to structural engineering are illustrated, including also synergies with other technologies, that can inspire professionals to adopt laser scanning in their day-to-day activity. This cutting-edge edited volume will be a valuable resource for students, researchers and professional engineers with an interest in laser scanning and its applications in the structural engineering domain.

Remote Sensing of Savannas and Woodlands - Michael J Hill 2021-09-27
Savannas and woodlands are one of the most challenging targets for remote sensing. This book provides a current snapshot of the geographical focus and application of the latest sensors and sensor combinations in savannas and woodlands. It includes feature articles on terrestrial laser scanning and on the application of remote sensing to characterization of vegetation dynamics in the Mato Grosso, Cerrado and Caatinga of Brazil. It also contains studies focussed on savannas in Europe, North America, Africa and Australia. It should be important reading for environmental practitioners and scientists globally who are concerned with the sustainability of the global savanna and woodland biome.

A Voxel-based Method for Individual Tree Detection Using Airborne Lidar in Eastern U.S. Hardwood Forests - Jeff Hershey 2021
For more than a century, forest inventories have been used to support forest management and timber valuation activities. Today's inventories still rely primarily on manual measurements combined with sampling and modeling techniques. In recent years, new opportunities in carbon sequestration and an increasingly sophisticated timber market have prompted a need for more scalable and efficient inventory methods. To meet this demand, the industry has turned to remote sensing--predominantly light detection and ranging (LiDAR), which utilizes lasers to scan and measure features in 3D space. While much progress has been made, data resolution and cost challenges for both airborne and terrestrial LiDAR still exist. Airborne Laser Scanning (ALS) is more efficient for measuring large forest areas but faces challenges with respect to resolution and occlusion, leading to omission of understory trees. Terrestrial Laser Scanning

(TLS) performs better in those respects but relies on expensive and typically unwieldy hardware. Area-based LiDAR approaches have been successful for large-scale applications but are not ideal for smaller parcels. As such, a need persists for a LiDAR-based solution that enables efficient generation of large-area forest inventory data yet is scalable to smaller forest plots and a range of forest types. The objective of this study was the development of a scalable individual tree detection method that leveraged airborne LiDAR data and performed well in mixed-species hardwood forests found in the northeastern United States. Existing research in individual tree detection has focused on methods that work well in conifer-dominated forests and homogenous settings such as plantations. These approaches, many of them based on top-down canopy height models, perform less favorably in deciduous stands due to the canopy complexity and crown characteristics inherent to these forest types. The voxel-based method proposed here uses detailed ground-measured tree survey data and leaf-off LiDAR collected in 2019-2020 over the Shavers Creek Watershed in Pennsylvania, United States. The method detected 68% of all reference trees greater than 10cm diameter at breast height (DBH) and 87% of sawtimber-sized trees greater than 28cm DBH, and it performed consistently across 48 subplots in the three-hectare test area. A new tree matching method leveraging linear integer programming was used for training and evaluation of the method. This tool enabled true one-to-one matching of predicted and reference trees and the validation of tree detections. Mean positional accuracy for predicted trees was within one meter of ground-measured reference trees. The results indicate the method has potential to be operationalized for both traditional forest management activities and in meeting the demand for more frequent and scalable inventories spurred by a growing forest carbon sequestration industry.

Airborne and Terrestrial Laser Scanning - George Vosselman 2010
Written by a team of international experts, this book provides a comprehensive overview of the major applications or airborne and terrestrial laser scanning.

Detection of Changes in Dynamic Geomorphological Environments Using Airborne and Terrestrial Laser Scanning Datasets - Reuma Arav 2013

Airborne laser scanning raster data visualization - Žiga Kokalj 2017-03-15
This guide provides an insight into a range of visualization techniques for high-resolution digital elevation models (DEMs). It is provided in the context of investigation and interpretation of various types of historical and modern, cultural and natural small-scale relief features and landscape structures. It also provides concise guidance for selecting the best techniques when looking at a specific type of landscape and/or looking for particular kinds of forms. The three main sections – descriptions of visualization techniques, guidance for selection of the techniques, and visualization tools – accompany examples of visualizations, exemplar archaeological and geomorphological case studies, a glossary of terms, and a list of references and recommendations for further reading. The structure facilitates people of different academic background and level of expertise to understand different visualizations, how to read them, how to manipulate the settings in a calculation, and choose the

best suited for the purpose of the intended investigation. _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Monografija nudi vpogled v nabor tehnik prikaza visokoločljivih modelov višin. Napisana je v kontekstu preučevanja in interpretacije različnih tipov zgodovinskih in modernih, kulturnih in naravnih majhnih reliefnih oblik. Daje jedrnate napotke za izbiro najboljših tehnik prikaza določenih tipov pokrajine in izrazitih oblik. Tri glavna poglavja – opis tehnik prikazovanja digitalnih modelov višin, napotki za njihovo izbiro in orodja za izračun prikazov –, spremljajo izbrani primeri tipičnih arheoloških in geomorfoloških študij, slovarček pojmov ter seznam literature in priporočenega branja. Posameznikom z različnih znanstvenih področij in z različnim predznanjem o tematiki je struktura v pomoč pri razumevanju različnih tehnik prikazov, kako jih brati, kako izbrati prave nastavitve pri njihovem izračunu in kako prepoznati najbolj primerne za namen zasnovane raziskave.

Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences: 2008 ISPRS Congress Book - Zhilin Li 2008-07-01
Published on the occasion of the XXIst Congress of the International Society for Photogrammetry and Remote Sensing (ISPRS) in Beiijng, China in 2008, Advances in Photogrammetry, Remote Sensing and Spatial Information Sciences: 2008 ISPRS Congress Book is a compilation of 34 contributions from 62 researchers active within the ISPRS. The book covers
Topographic Laser Ranging and Scanning - Jie Shan 2017-12-19
A systematic, in-depth introduction to theories and principles of Light Detection and Ranging (LiDAR) technology is long overdue, as it is the most important geospatial data acquisition technology to be introduced in recent years. An advanced discussion, this text fills the void. Professionals in fields ranging from geology, geography and geoinformatics to physics, transportation, and law enforcement will benefit from this comprehensive discussion of topographic LiDAR principles, systems, data acquisition, and data processing techniques. The book covers ranging and scanning fundamentals, and broad, contemporary analysis of airborne LiDAR systems, as well as those situated on land and in space. The authors present data collection at the signal level in terms of waveforms and their properties; at the system level with regard to calibration and georeferencing; and at the data level to discuss error budget, quality control, and data organization. They devote the bulk of the book to LiDAR data processing and information extraction and elaborate on recent developments in building extraction and reconstruction, highlighting quality and performance evaluations. There is also extensive discussion of the state-of-the-art technological developments used in: filtering algorithms for digital terrain model generation; strip adjustment of data for registration; co-registration of LiDAR data with imagery; forestry inventory; and surveying. Readers get insight into why LiDAR is the effective tool of choice to collect massive volumes of explicit 3-D data with unprecedented accuracy and simplicity. Compiled by leading experts talking about much of their own pioneering work, this book will give researchers, professionals, and senior students novel ideas to supplement their own experience and practices.