Hyperspectral Remote Sensing Of Vegetation

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Remote Sensing of Vegetation - Hamlyn G Jones 2010-07-15
An accessible yet rigorous introduction to remote sensing and its application to the study of vegetation for advanced undergraduate and graduate students. The underlying physical and mathematical principles of the techniques disucussed are explained in a way readily understood by those without a strong mathematical background.
Remotely Sensed Data Characterization, Classification, and Accuracies - Ph.D., Prasad S. Thenkabail 2015-10-02
A volume in the Remote Sensing Handbook series, Remotely Sensed Data Characterization, Classification, and Accuracies documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Land Resources Monitoring, Modeling, and Mapping with Remote Sensing, and Remote Sensing of
Hyperspectral Remote Sensing and Spectral Signature Applications - S. Rajendran 2009
Contributed papers presented at the National Seminar on "Hyperspectral Remote Sensing and Spectral Signature Databse Management System," held on February 14-15, 2008 at Annamalai University.
Thermal Infrared Remote Sensing - Claudia Kuenzer 2013-06-17
This book provides a comprehensive overview of the state of the art in the field of thermal infrared remote sensing. Temperature is one of the most important physical environmental variables monitored by earth observing remote sensing systems. Temperature ranges define the boundaries of habitats on our planet. Thermal hazards endanger our resources and well-being. In this book renowned international experts have contributed chapters on currently available thermal sensors as well as innovative plans for future missions. Further chapters discuss the underlying physics and image processing techniques for analyzing thermal data. Ground-breaking chapters on applications present a wide variety of case studies leading to a deepened understanding of land and sea surface temperature dynamics, urban heat island effects, forest fires, volcanic eruption precursors, underground coal fires, geothermal systems, soil moisture variability, and temperature-based mineral discrimination. ‘Thermal Infrared Remote Sensing: Sensors, Methods, Applications’ is unique because of the large field it spans, the potentials it reveals, and the detail it provides. This book is an indispensable volume for scientists, lecturers, and decision makers interested in thermal infrared technology, methods, and applications.
Remote Sensing of Impervious Surfaces - Qihao Weng 2007-10-03
Remote sensing of impervious surfaces has matured using advances in geospatial technology so recent that its applications have received only sporadic coverage in remote sensing literature. Remote Sensing of Impervious Surfaces is the first to focus entirely on this developing field. It provides detailed coverage of mapping, data extraction, and modeling techniques specific to analyzing impervious surfaces, such as roads and buildings. Written by renowned experts in the field, this book reviews the major approaches that apply to this emerging field as well as current challenges, developments, and trends. The authors introduce remote sensing digital image processing techniques for estimating and mapping impervious surfaces in urban and rural areas. Presenting the latest modeling tools and algorithms for data extraction and analysis, the book explains how to differentiate roads, roofs, and other manmade structures from remotely sensed images for individual analysis. The final chapters examine how to use impervious surface data for predicting the flow of storm- or floodwater and studying trends in population, land use, resource distribution, and other real-world applications in environmental, urban, and regional planning. Each chapter offers a consistent format including a concise review of basic concepts and methodologies, timely case studies, and guidance for solving problems and analyzing data using the techniques presented.
Hyperspectral Remote Sensing - Prem Chandra Pandey 2020-08-05
Hyperspectral Remote Sensing: Theory and Applications offers the latest information on the techniques, advances and wide-ranging applications of hyperspectral remote sensing, such as forestry, agriculture, water resources, soil and geology, among others. The book also presents hyperspectral data integration with other sources, such as LiDAR, Multi-spectral data, and other remote sensing techniques. Researchers who use this resource will be able to understand and implement the technology and data in their respective fields. As such, it is a valuable reference for researchers and data analysts in remote sensing and Earth Observation fields and those in ecology, agriculture, hydrology and geology. Includes the theory of hyperspectral remote sensing, along with techniques and applications across a variety of disciplines Presents the processing, methods and techniques utilized for hyperspectral remote sensing and in-situ data collection Provides an overview of the state-of-the-art, including algorithms, techniques and case studies
Biophysical and Biochemical Characterization and Plant Species Studies - Prasad S. Thenkabail 2018-12-07
Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing stateof- the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Hyperspectral remote sensing or imaging spectroscopy data has been increasingly used in studying and assessing the biophysical and biochemical properties of agricultural crops and natural vegetation. Volume III, Biophysical and Biochemical Characterization and Plant Species Studies demonstrates the methods that are developed and used to study terrestrial vegetation using hyperspectral data. This volume includes extensive discussions on hyperspectral data processing and how to implement data processing mechanisms for specific biophysical and biochemical applications such as crop yield modeling, crop biophysical and biochemical property characterization, and crop moisture assessments. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume III through the editors' perspective. Key Features of Volume III: Covers recent abilities to better quantify, model, and map plant biophysical, biochemical water, and structural properties. Demonstrates characteristic hyperspectral properties through plant diagnostics or throughput phenotyping of plant biophysical, biochemical, water, and structural properties. Establishes plant traits through hyperspectral imaging spectroscopy data as well as its integration with other data, such as LiDAR, using data from various platforms (ground-based, UAVs, and earth-observing satellites). Studies photosynthetic efficiency and plant health and stress through hyperspectral narrowband vegetation indices. Uses hyperspectral data to discriminate plant species and\or their types as well as their characteristics, such as growth stages. Compares studies of plant species of agriculture, forests, and other

land use\land cover as established by hyperspectral narrowband data versus multispectral broadband data. Discusses complete solutions from methods to applications, inventory, and modeling considering various platform (e.g., earth-observing satellites, UAVs, handheld spectroradiometers) from where the data is gathered. Dwells on specific applications to detect and map invasive species by using hyperspectral data.

Digital Soil Mapping - Janis L. Boettinger 2010-06-28

Digital Soil Mapping is the creation and the population of a geographically referenced soil database. It is generated at a given resolution by using field and laboratory observation methods coupled with environmental data through quantitative relationships. Digital soil mapping is advancing on different fronts at different rates all across the world. This book presents the state-of-the art and explores strategies for bridging research, production, and environmental application of digital soil mapping.It includes examples from North America, South America, Europe, Asia, and Australia. The chapters address the following topics: - evaluating and using legacy soil data - exploring new environmental covariates and sampling schemes - using integrated sensors to infer soil properties or status - innovative inference systems predicting soil classes, properties, and estimating their uncertainties - using digital soil mapping and techniques for soil assessment and environmental application - protocol and capacity building for making digital soil mapping operational around the globe.

Monitoring of the Biophysical Status of Vegetation Using Multi-angular, Hyperspectral Remote Sensing for the Optimization of a Physically-based SVAT Model - Natascha Oppelt 2010

Vegetation Monitoring - Caryl L. Elzinga 1998-05

This annotated bibliography documents literature addressing the design and implementation of vegetation monitoring. It provides resources managers, ecologists, and scientists access to the great volume of literature addressing many aspects of vegetation monitoring: planning and objective setting, choosing vegetation attributes to measure, sampling design, sampling methods, statistical and graphical analysis, and communication of results. Over half of the 1400 references have been annotated. Keywords pertaining to the type of monitoring or method are included with each bibliographic entry. Keyword index.

Handbook of Satellite Applications - Joseph N. Pelton

Hyperspectral Remote Sensing - Ruiliang Pu 2017-08-16

Advanced imaging spectral technology and hyperspectral analysis techniques for multiple applications are the key features of the book. This book will present in one volume complete solutions from concepts, fundamentals, and methods of acquisition of hyperspectral data to analyses and applications of the data in a very coherent manner. It will help readers to fully understand basic theories of HRS, how to utilize various field spectrometers and bioinstruments, the importance of radiometric correction and atmospheric correction, the use of analysis, tools and software, and determine what to do with HRS technology and data.

Remote Sensing of Plant Biodiversity - Jeannine Cavender-Bares 2020-01-01

This Open Access volume aims to methodologically improve our understanding of biodiversity by linking disciplines that incorporate remote sensing, and uniting data and perspectives in the fields of biology, landscape ecology, and geography. The book provides a framework for how biodiversity can be detected and evaluated--focusing particularly on plants--using proximal and remotely sensed hyperspectral data and other tools such as LiDAR. The volume, whose chapters bring together a large cross-section of the biodiversity community engaged in these methods, attempts to establish a common language across disciplines for understanding and implementing remote sensing of biodiversity across scales. The first part of the book offers a potential basis for remote detection of biodiversity. An overview of the nature of biodiversity is described, along with ways for determining traits of plant biodiversity through spectral analyses across spatial scales and linking spectral data to the tree of life. The second part details what can be detected spectrally and remotely. Specific instrumentation and technologies are described, as well as the technical challenges of detection and data synthesis, collection and processing. The third part discusses spatial resolution and integration across scales and ends with a vision for developing a global biodiversity monitoring system. Topics include spectral and functional variation across habitats and biomes, biodiversity variables for global scale assessment, and the prospects and pitfalls in remote sensing of biodiversity at the global scale.

Advances in Mapping from Remote Sensor Imagery - Xiaojun Yang 2012-12-12

Advances in Mapping from Remote Sensor Imagery: Techniques and Applications reviews some of the latest developments in remote sensing and information extraction techniques applicable to topographic and thematic mapping. Providing an interdisciplinary perspective, leading experts from around the world have contributed chapters examining state-of-the-art techniques as well as widely used methods. The book covers a broad range of topics including photogrammetric mapping and LiDAR remote sensing for generating high quality topographic products, global digital elevation models, current methods for shoreline mapping, and the identification and classification of residential buildings. Contributors also showcase cutting-edge developments for environmental and ecological mapping, including assessment of urbanization patterns, mapping vegetation cover, monitoring invasive species, and mapping marine oil spills—crucial for monitoring this significant environmental hazard. The authors exemplify the information presented in this text with case studies from around the world. Examples include: Envisat/ERS-2 images used to generate digital elevation models over northern Alaska In situ radiometric observations and MERIS images employed to retrieve chlorophyll a concentration in inland waters in Australia ERS-1/2 SAR images utilized to map spatiotemporal deformation in the southwestern United States Aerospace sensors and related information extraction techniques that support various mapping applications have recently garnered more attention due to the advances in remote sensing theories and technologies. This book brings together top researchers in the field, providing a state-of-the-art review of some of the latest advancements in remote sensing and mapping technologies.

Hyperspectral Remote Sensing of Tropical and Sub-Tropical Forests - Margaret Kalacska 2008-02-26

While frequently used in temperate environments, hyperspectral sensors and data are still a novelty in the tropics. Exploring the potential of hyperspectral remote sensing for assessing ecosystem characteristics, Hyperspectral Remote Sensing of Tropical and Sub-Tropical Forests focuses on the complex and unique set of challenges involved in using t

Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation - Prasad S. Thenkabail 2018-12-07

Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume IV, Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation discusses the use of hyperspectral or imaging spectroscopy data in numerous specific and advanced applications, such as forest management, precision farming, managing invasive species, and local to global land cover change detection. It emphasizes the importance of hyperspectral remote sensing tools for studying vegetation processes and functions as well as the appropriate use of hyperspectral data for vegetation management practices. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume IV through the editors' perspective. Key Features of Volume IV: Guides readers to harness the capabilities of the most recent advances in applying hyperspectral remote sensing technology to the study of terrestrial vegetation. Includes specific applications on agriculture, crop management practices, study of crop stress and diseases, crop characteristics based on inputs (e.g., nitrogen, irrigation), study of vegetation impacted by heavy metals, gross and net primary productivity studies, light use efficiency studies, crop water use and actual evapotranspiration studies, phenology monitoring, land use and land cover studies, global change studies, plant species detection, wetland and forest characterization and mapping, crop productivity and crop water productivity mapping, and modeling. Encompasses hyperspectral or imaging spectroscopy data in narrow wavebands used across visible, red-edge, near-infrared, far-infrared, shortwave infrared, and thermal portions of the spectrum. Explains the implementation of hyperspectral remote sensing data processing mechanisms in a standard, fast, and efficient manner for their applications. Discusses cloud computing to overcome hyperspectral remote sensing massive big data challenges. Provides hyperspectral analysis of rocky surfaces on the earth and other planetary systems.

Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation - Prasad S.

Thenkabail 2018-12-11
Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume I, Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation introduces the fundamentals of hyperspectral or imaging spectroscopy data, including hyperspectral data processes, sensor systems, spectral libraries, and data mining and analysis, covering both the strengths and limitations of these topics. This book also presents and discusses hyperspectral narrowband data acquired in numerous unique spectral bands in the entire length of the spectrum from various ground-based, airborne, and spaceborne platforms. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume I through the editors' perspective. Key Features of Volume I: Provides the fundamentals of hyperspectral remote sensing used in agricultural crops and vegetation studies. Discusses the latest advances in hyperspectral remote sensing of ecosystems and croplands. Develops online hyperspectral libraries, proximal sensing and phenotyping for understanding, modeling, mapping, and monitoring crop and vegetation traits. Implements reflectance spectroscopy of soils and vegetation. Enumerates hyperspectral data mining and data processing methods, approaches, and machine learning algorithms. Explores methods and approaches for data mining and overcoming data redundancy; Highlights the advanced methods for hyperspectral data processing steps by developing or implementing appropriate algorithms and coding the same for processing on a cloud computing platform like the Google Earth Engine. Integrates hyperspectral with other data, such as the LiDAR data, in the study of vegetation. Includes best global expertise on hyperspectral remote sensing of agriculture, crop water use, plant species detection, crop productivity and water productivity mapping, and modeling.

Vegetation Dynamics - Derek Eamus 2016-03-31
Understanding ecosystem structure and function requires familiarity with the techniques, knowledge and concepts of the three disciplines of plant physiology, remote sensing and modelling. This is the first textbook to provide the fundamentals of these three domains in a single volume. It then applies cross-disciplinary insights to multiple case studies in vegetation and landscape science. A key feature of these case studies is an examination of relationships among climate, vegetation structure and vegetation function, to address fundamental research questions. This book is for advanced students and researchers who need to understand and apply knowledge from the disciplines of plant physiology, remote sensing and modelling. It allows readers to integrate and synthesise knowledge to produce a holistic understanding of the structure, function and behaviour of forests, woodlands and grasslands.

Remote Sensing Handbook - Three Volume Set - Prasad Thenkabail 2018-10-03
A volume in the three-volume Remote Sensing Handbook series, Remote Sensing of Water Resources, Disasters, and Urban Studies documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Remotely Sensed Data Characterization, Classification, and Accuracies, and Land Reso

Biophysical and Biochemical Characterization and Plant Species Studies - Prasad S. Thenkabail 2018-12-06
Hyperspectral remote sensing has been increasingly used in studding and assessing biophysical and biochemical properties of agricultural crops. This volume demonstrates the experience and the methods used in studying terrestrial vegetation using hyperspectral data. It focuses on specific applications, reviews existing “state-of-art” knowledge, highlights the advances made, and provides guidance for appropriate use of hyperspectral data in applications such as crop yield modeling, crop biophysical and biochemical property characterization, and crop moisture assessment. Includes extensive discussions on data processing and how to implement data processing mechanisms.

Geospatial Technologies for Crops and Soils - Tarik Mitran 2020-10-24
The sustainable development of the agriculture sector is the only option to meet the demands of increased and economically viable production in a changing climate. This means there is a need to introduce the latest technologies to enhance production, and also help policymakers make decisions for the future. Geospatial technologies & tools, such as remote sensing, geographical information systems (GIS), global positioning systems (GPS), and mobile & web applications, provide unique capabilities to analyze multi-scale, multi-temporal datasets, and support decision-making in sustainable agriculture development and natural resources management. Further, the availability of reliable and timely geospatial information on natural resources and environmental conditions is essential for sustainable agricultural development and food security. Since remote sensing solutions are fast, non-destructive and have large spatial coverage, they can play a significant role in the identification, inventory, and mapping of land resources. Over the past four decades, remote sensing has proved to be a cost-effective and powerful tool to assess crop and soil properties in varying spatial and temporal scales using both visual and digital techniques. Satellite remote sensing coupled with GIS & mobile-app based positional information has emerged as an efficient tool for optimizing input resources, and minimizing cost of production and risk of biotic/ abiotic factors nature to promote sustainable agriculture. This book comprehensively documents the applications of space-based technologies for crop and soil assessments for the sustainable development of agriculture.

Land Resources Monitoring, Modeling, and Mapping with Remote Sensing - Ph.D., Prasad S. Thenkabail 2015-10-02
A volume in the three-volume Remote Sensing Handbook series, Land Resources Monitoring, Modeling, and Mapping with Remote Sensing documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Remotely Sensed Data Characterization, Classification, and Accuracies, and Remo

Biophysical and Biochemical Characterization and Plant Species Studies - Prasad S. Thenkabail 2018-12-07
Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing stateof- the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Hyperspectral remote sensing or imaging spectroscopy data has been increasingly used in studying and assessing the biophysical and biochemical properties of agricultural crops and natural vegetation. Volume III, Biophysical and Biochemical Characterization and Plant Species Studies demonstrates the methods that are developed and used to study terrestrial vegetation using hyperspectral data. This volume includes extensive discussions on hyperspectral data processing and how to implement data processing mechanisms for specific biophysical and biochemical applications such as crop yield modeling, crop biophysical and biochemical property characterization, and crop moisture assessments. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume III through the editors’ perspective. Key Features of Volume III: Covers recent abilities to better quantify, model, and map plant biophysical, biochemical water, and structural properties. Demonstrates characteristic hyperspectral properties through plant diagnostics or throughput phenotyping of plant biophysical, biochemical, water, and structural properties. Establishes plant traits through hyperspectral imaging spectroscopy data as well as its integration with other data, such as LiDAR, using data from various platforms (ground-based, UAVs, and earth-observing satellites). Studies photosynthetic efficiency and plant health and stress through hyperspectral narrowband vegetation indices. Uses hyperspectral data to discriminate plant species and\or their types as well as their characteristics, such as growth stages. Compares studies of plant species of agriculture, forests, and other land use\land cover as established by hyperspectral narrowband data versus multispectral broadband data. Discusses complete solutions from methods to applications, inventory, and modeling considering various platform (e.g., earth-observing satellites, UAVs, handheld spectroradiometers) from where the data is gathered. Dwells on specific applications to detect and map invasive species by using hyperspectral data.

Hyperspectral Indices and Image Classifications for Agriculture and Vegetation - Prasad S. Thenkabail 2018-12-11
Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of- the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume II, Hyperspectral Indices and Image Classifications for Agriculture and Vegetation evaluates the performance of hyperspectral narrowband or imaging spectroscopy data with specific emphasis on the uses and applications of

hyperspectral narrowband vegetation indices in characterizing, modeling, mapping, and monitoring agricultural crops and vegetation. This volume presents and discusses topics such as the non-invasive quantification of foliar pigments, leaf nitrogen concentration of cereal crop, the estimation of nitrogen content in crops and pastures, and forest leaf chlorophyll content, among others. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume II through the editors' perspective. Key Features of Volume II: Provides the fundamentals of hyperspectral narrowband vegetation indices and hyperspectral derivative vegetation indices and their applications in agriculture and vegetation studies. Discusses the latest advances in hyperspectral image classification methods and their applications. Explains the massively big hyperspectral sensing data processing on cloud computing architectures. Highlights the state-of-the-art methods in the field of hyperspectral narrowband vegetation indices for monitoring agriculture, vegetation, and their properties such as plant water content, nitrogen, chlorophyll, and others at leaf, canopy, field, and landscape scales. Includes best global expertise on hyperspectral remote sensing of agriculture, crop water use, plant species detection, crop productivity and water productivity mapping, and modeling.

Remote Sensing of Water Resources, Disasters, and Urban Studies - Ph.D., Prasad S. Thenkabail 2015-10-02

A volume in the three-volume Remote Sensing Handbook series, Remote Sensing of Water Resources, Disasters, and Urban Studies documents the scientific and methodological advances that have taken place during the last 50 years. The other two volumes in the series are Remotely Sensed Data Characterization, Classification, and Accuracies, and Land Reso

Hyperspectral Remote Sensing of Vegetation - Prasad S. Thenkabail 2016-04-19

Hyperspectral narrow-band (or imaging spectroscopy) spectral data are fast emerging as practical solutions in modeling and mapping vegetation. Recent research has demonstrated the advances in and merit of hyperspectral data in a range of applications including quantifying agricultural crops, modeling forest canopy biochemical properties, detecting crop stress and disease, mapping leaf chlorophyll content as it influences crop production, identifying plants affected by contaminants such as arsenic, demonstrating sensitivity to plant nitrogen content, classifying vegetation species and type, characterizing wetlands, and mapping invasive species. The need for significant improvements in quantifying, modeling, and mapping plant chemical, physical, and water properties is more critical than ever before to reduce uncertainties in our understanding of the Earth and to better sustain it. There is also a need for a synthesis of the vast knowledge spread throughout the literature from more than 40 years of research. Hyperspectral Remote Sensing of Vegetation integrates this knowledge, guiding readers to harness the capabilities of the most recent advances in applying hyperspectral remote sensing technology to the study of terrestrial vegetation. Taking a practical approach to a complex subject, the book demonstrates the experience, utility, methods and models used in studying vegetation using hyperspectral data. Written by leading experts, including pioneers in the field, each chapter presents specific applications, reviews existing state-of-the-art knowledge, highlights the advances made, and provides guidance for the appropriate use of hyperspectral data in the study of vegetation as well as its numerous applications, such as crop yield modeling, crop and vegetation biophysical and biochemical property characterization, and crop moisture assessment. This comprehensive book brings together the best global expertise on hyperspectral remote sensing of agriculture, crop water use, plant species detection, vegetation classification, biophysical and biochemical modeling, crop productivity and water productivity mapping, and modeling. It provides the pertinent facts, synthesizing findings so that readers can get the correct picture on issues such as the best wavebands for their practical applications, methods of analysis using whole spectra, hyperspectral vegetation indices targeted to study specific biophysical and biochemical quantities, and methods for detecting parameters such as crop moisture variability, chlorophyll content, and stress levels. A collective "knowledge bank," it guides professionals to adopt the best practices for their own work.

Hyperspectral Remote Sensing of Vegetation - Prasad S. Thenkabail 2018-12-11

Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume I, Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation introduces the fundamentals of hyperspectral or imaging spectroscopy data, including hyperspectral data processes, sensor systems, spectral libraries, and data mining and analysis, covering both the strengths and limitations of these topics. Volume II, Hyperspectral Indices and Image Classifications for Agriculture and Vegetation evaluates the performance of hyperspectral narrowband or imaging spectroscopy data with specific emphasis on the uses and applications of hyperspectral narrowband vegetation indices in characterizing, modeling, mapping, and monitoring agricultural crops and vegetation. Volume III, Biophysical and Biochemical Characterization and Plant Species Studies demonstrates the methods that are developed and used to study terrestrial vegetation using hyperspectral data. This volume includes extensive discussions on hyperspectral data processing and how to implement data processing mechanisms for specific biophysical and biochemical applications such as crop yield modeling, crop biophysical and biochemical property characterization, and crop moisture assessments. Volume IV, Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation discusses the use of hyperspectral or imaging spectroscopy data in numerous specific and advanced applications, such as forest management, precision farming, managing invasive species, and local to global land cover change detection.

Hyperspectral Remote Sensing - Michael Theodore Eismann 2012-01-01

Hyperspectral remote sensing is an emerging, multidisciplinary field with diverse applications that builds on the principles of material spectroscopy, radiative transfer, imaging spectrometry, and hyperspectral data processing. While there are many resources that suitably cover these areas individually and focus on specific aspects of the hyperspectral remote sensing field, this book provides a holistic treatment that thoroughly captures its multidisciplinary nature. The content is oriented toward the physical principles of hyperspectral remote sensing as opposed to applications of hyperspectral technology. Readers can expect to finish the book armed with the required knowledge to understand the immense literature available in this technology area and apply their knowledge to the understanding of material spectral properties, the design of hyperspectral systems, the analysis of hyperspectral imagery, and the application of the technology to specific problems.

Remote Sensing of Drought - Brian D. Wardlow 2012-04-24

Remote Sensing of Drought: Innovative Monitoring Approaches presents emerging remote sensing-based tools and techniques that can be applied to operational drought monitoring and early warning around the world. The first book to focus on remote sensing and drought monitoring, it brings together a wealth of information that has been scattered throughout the literature and across many disciplines. Featuring contributions by leading scientists, it assembles a cross-section of globally applicable techniques that are currently operational or have potential to be operational in the near future. The book explores a range of applications for monitoring four critical components of the hydrological cycle related to drought: vegetation health, evapotranspiration, soil moisture and groundwater, and precipitation. These applications use remotely sensed optical, thermal, microwave, radar, and gravity data from instruments such as AMSR-E, GOES, GRACE, MERIS, MODIS, and Landsat and implement several advanced modeling and data assimilation techniques. Examples show how to integrate this information into routine drought products. The book also examines the role of satellite remote sensing within traditional drought monitoring, as well as current challenges and future prospects. Improving drought monitoring is becoming increasingly important in addressing a wide range of societal issues, from food security and water scarcity to human health, ecosystem services, and energy production. This unique book surveys innovative remote sensing approaches to provide you with new perspectives on large-area drought monitoring and early warning.

Leaf Optical Properties - Stéphane Jacquemoud 2019-09-05

Presents state-of-the-art research into leaf interactions with light, for scientists working in remote sensing, plant physiology, ecology and resource management.

Hyperspectral Indices and Image Classifications for Agriculture and Vegetation - Prasad S. Thenkabail 2018-12-06

Evaluating the performance of various types of hyperspectral vegetation indices in characterizing agricultural crops, this volume discusses non-invasive quantification of foliar pigments, leaf nitrogen

concentration of cereal crop, the estimation of nitrogen content in crops and pastures, forest leaf chlorophyll content, among others. Each chapter reviews existing “state-of-art” knowledge, highlights the advances made, and provides guidance for appropriate use of hyperspectral images in study of vegetation. The concluding chapter provides readers with the editor’s view and guidance on the highlights and the essence of the Volume 2 and the editor’s perspective.

Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation - Prasad S. Thenkabail 2018-12-07

Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume IV, Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation discusses the use of hyperspectral or imaging spectroscopy data in numerous specific and advanced applications, such as forest management, precision farming, managing invasive species, and local to global land cover change detection. It emphasizes the importance of hyperspectral remote sensing tools for studying vegetation processes and functions as well as the appropriate use of hyperspectral data for vegetation management practices. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume IV through the editors’ perspective. Key Features of Volume IV: Guides readers to harness the capabilities of the most recent advances in applying hyperspectral remote sensing technology to the study of terrestrial vegetation. Includes specific applications on agriculture, crop management practices, study of crop stress and diseases, crop characteristics based on inputs (e.g., nitrogen, irrigation), study of vegetation impacted by heavy metals, gross and net primary productivity studies, light use efficiency studies, crop water use and actual evapotranspiration studies, phenology monitoring, land use and land cover studies, global change studies, plant species detection, wetland and forest characterization and mapping, crop productivity and crop water productivity mapping, and modeling. Encompasses hyperspectral or imaging spectroscopy data in narrow wavebands used across visible, red-edge, near-infrared, far-infrared, shortwave infrared, and thermal portions of the spectrum. Explains the implementation of hyperspectral remote sensing data processing mechanisms in a standard, fast, and efficient manner for their applications. Discusses cloud computing to overcome hyperspectral remote sensing massive big data challenges. Provides hyperspectral analysis of rocky surfaces on the earth and other planetary systems.

Monitoring of the Biophysical Status of Vegetation - Natascha Oppelt 2010

Imaging Spectrometry - Freek D. van der Meer 2011-03-29

A significant step forward in the world of earth observation was made with the development of imaging spectrometry. Imaging spectrometers measure reflected solar radiance from the earth in many narrow spectral bands. Such a spectroscopical imaging system is capable of detecting subtle absorption bands in the reflectance spectra and measure the reflectance spectra of various objects with a very high accuracy. As a result, imaging spectrometry enables a better identification of objects at the earth surface and a better quantification of the object properties than can be achieved by traditional earth observation sensors such as Landsat TM and SPOT. The various chapters in the book present the concepts of imaging spectrometry by discussing the underlying physics and the analytical image processing techniques. The second part of the book presents in detail a wide variety of applications of these new techniques ranging from mineral identification, mapping of expansive soils, land degradation, agricultural crops, natural vegetation and surface water quality. Additional information on extras.springer.com Sample hyperspectral remote sensing data sets and ENVI viewing software (Freelook) are available on http://extras.springer.com

Hyperspectral Remote Sensing of Agriculture and Vegetation - Simone Pascucci 2021-01-20

This book shows recent and innovative applications of the use of hyperspectral technology for optimal quantification of crop, vegetation, and soil biophysical variables at various spatial scales, which can be an important aspect in agricultural management practices and monitoring. The articles collected inside the book are intended to help researchers and farmers involved in precision agriculture techniques and practices, as well as in plant nutrient prediction, to a higher comprehension of strengths and limitations of the application of hyperspectral imaging to agriculture and vegetation. Hyperspectral remote sensing for studying agriculture and natural vegetation is a challenging research topic that will remain of great interest for different sciences communities in decades.

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.

Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation - Prasad S. Thenkabail 2018-12-07

Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume I, Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation introduces the fundamentals of hyperspectral or imaging spectroscopy data, including hyperspectral data processes, sensor systems, spectral libraries, and data mining and analysis, covering both the strengths and limitations of these topics. This book also presents and discusses hyperspectral narrowband data acquired in numerous unique spectral bands in the entire length of the spectrum from various ground-based, airborne, and spaceborne platforms. The concluding chapter provides readers with useful guidance on the highlights and essence of Volume I through the editors’ perspective. Key Features of Volume I: Provides the fundamentals of hyperspectral remote sensing used in agricultural crops and vegetation studies. Discusses the latest advances in hyperspectral remote sensing of ecosystems and croplands. Develops online hyperspectral libraries, proximal sensing and phenotyping for understanding, modeling, mapping, and monitoring crop and vegetation traits. Implements reflectance spectroscopy of soils and vegetation. Enumerates hyperspectral data mining and data processing methods, approaches, and machine learning algorithms. Explores methods and approaches for data mining and overcoming data redundancy; Highlights the advanced methods for hyperspectral data processing steps by developing or implementing appropriate algorithms and coding the same for processing on a cloud computing platform like the Google Earth Engine. Integrates hyperspectral with other data, such as the LiDAR data, in the study of vegetation. Includes best global expertise on hyperspectral remote sensing of agriculture, crop water use, plant species detection, crop productivity and water productivity mapping, and modeling.

Hyperspectral Remote Sensing of Vegetation, Second Edition, Four Volume Set - Prasad S. Thenkabail 2022-07-30

Written by leading global experts, including pioneers in the field, the four-volume set on Hyperspectral Remote Sensing of Vegetation, Second Edition, reviews existing state-of-the-art knowledge, highlights

advances made in different areas, and provides guidance for the appropriate use of hyperspectral data in the study and management of agricultural crops and natural vegetation. Volume I, Fundamentals, Sensor Systems, Spectral Libraries, and Data Mining for Vegetation introduces the fundamentals of hyperspectral or imaging spectroscopy data, including hyperspectral data processes, sensor systems, spectral libraries, and data mining and analysis, covering both the strengths and limitations of these topics. Volume II, Hyperspectral Indices and Image Classifications for Agriculture and Vegetation evaluates the performance of hyperspectral narrowband or imaging spectroscopy data with specific emphasis on the uses and applications of hyperspectral narrowband vegetation indices in characterizing, modeling, mapping, and monitoring agricultural crops and vegetation. Volume III, Biophysical and Biochemical Characterization and Plant Species Studies demonstrates the methods that are developed and used to study terrestrial vegetation using hyperspectral data. This volume includes extensive discussions on hyperspectral data processing and how to implement data processing mechanisms for specific biophysical and biochemical applications such as crop yield modeling, crop biophysical and biochemical property characterization, and crop moisture assessments. Volume IV, Advanced Applications in Remote Sensing of Agricultural Crops and Natural Vegetation discusses the use of hyperspectral or imaging spectroscopy data in numerous specific and advanced applications, such as forest management, precision farming, managing invasive species, and local to global land cover change detection.

Canopy Photosynthesis: From Basics to Applications - Kouki Hikosaka 2015-12-17

The last 30 years has seen the development of increasingly sophisticated models that quantify canopy carbon exchange. These models are now essential parts of larger models for prediction and simulation of crop production, climate change, and regional and global carbon dynamics. There is thus an urgent need for increasing expertise in developing, use and understanding of these models. This in turn calls for an advanced, yet easily accessible textbook that summarizes the “canopy science” and introduces the present and the future scientists to the theoretical background of the current canopy models. This book presents current knowledge of functioning of plant canopies, models and strategies employed to simulate canopy function, and the significance of canopy architecture, physiology and dynamics in ecosystems, landscape and biosphere.

Hyperspectral Remote Sensing - Ruiliang Pu 2017-08-16

Advanced imaging spectral technology and hyperspectral analysis techniques for multiple applications are the key features of the book. This book will present in one volume complete solutions from concepts, fundamentals, and methods of acquisition of hyperspectral data to analyses and applications of the data in a very coherent manner. It will help readers to fully understand basic theories of HRS, how to utilize various field spectrometers and bioinstruments, the importance of radiometric correction and atmospheric correction, the use of analysis, tools and software, and determine what to do with HRS technology and data.