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UAV Photogrammetry MDPI
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Tectonics of Asia (Northern, Central and Eastern Asia) Academic Press
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.

Structure from Motion in the Geosciences Taylor & Francis

The advances in unmanned aerial vehicle (UAV) platforms and onboard sensors in the past few years have greatly increased our ability to monitor and map crops. The ability to register images at ultrahigh spatial resolution at any moment has made remote sensing techniques increasingly useful in crop management. These technologies have revolutionized the way in which remote sensing is applied in precision agriculture, allowing for decision-making in a matter of days instead of weeks. However, it is still necessary to continue research to improve and maximize the potential of UAV remote sensing in agriculture. This Special Issue of Remote Sensing includes different applications of UAV remote sensing for crop management, covering RGB, multispectral, hyperspectral and light detection and ranging (LiDAR) sensor applications aboard UAVs. The papers reveal innovative techniques involving image analysis and cloud points. However, it should be emphasized that this Special Issue is a small sample of UAV applications in agriculture and that there is much more to investigate.

Accuracy Assessment of Low-cost Terrestrial and UAV-based Photogrammetry for Geomatics Applications in Architectural and Cultural Heritage Contexts MDPI

"Unmanned Aerial Systems (UAS) are rapidly blurring the lines between traditional and close range photogrammetry, and between surveying and photogrammetry. UAS are providing an economic platform for performing aerial surveying on small projects. The focus of this research was to describe traditional photogrammetric imagery and Light Detection and Ranging (LiDAR) geospatial products, describe close range photogrammetry (CRP), introduce UAS and computer vision (CV), and investigate whether industry mapping standards for accuracy can be met using UAS collection and CV processing. A 120-acre site was selected and 97 aerial targets were surveyed for evaluation purposes. Four UAS flights of varying heights above ground level (AGL) were executed, and three different target patterns of varying distances between targets were analyzed for compliance with American Society for Photogrammetry and Remote Sensing (ASPRS) and National Standard for Spatial Data Accuracy (NSSDA) mapping standards. This analysis resulted in

twelve datasets. Error patterns were evaluated and reasons for these errors were determined. The relationship between the AGL, ground sample distance, target spacing and the root mean square error of the targets is exploited by this research to develop guidelines that use the ASPRS and NSSDA map standard as the template. These guidelines allow the user to select the desired mapping accuracy and determine what target spacing and AGL is required to produce the desired accuracy. These guidelines also address how UAS/CV phenomena affect map accuracy. General guidelines and recommendations are presented that give the user helpful information for planning a UAS flight using CV technology."--Abstract, page iii.

A Novel Method for Photogrammetric Mapping Using Uav Rotary System Springer Nature

In order to acquire geographical data by aerial photogrammetry, many images should be taken from an aerial vehicle. After that, the images are processed with the help of the structure-from-motion (SfM) technique. Multiple neighboring images with a high rate of overlapping should be obtained for high-accuracy measurement. In the event of natural disasters, UAV operation may sometimes involve risk and should be avoided. Therefore, an easy and convenient method of operating the UAVs is needed. Reports exist on some applications of the UAVs with other devices; however, it will be difficult to prepare a number of such devices in emergency. We considered the most suitable condition for image acquisition by using the UAV. Specifically, some of the altitudes and the rate of overlapping were attempted, and accuracies of the 3D measurement were confirmed. Furthermore, we developed a new camera calibration and measurement method that requires only a few images taken in a simple UAV flight. The UAV in this method was flied vertically and the images were taken at a different altitude. As a result, the plane and height accuracy was ¬±0.093 and ¬±0.166¬†m, respectively. These values were of higher accuracy than the results of the usual SfM software.

Unmanned Aerial Systems for Monitoring Soil, Vegetation, and Riverine Environments Elsevier

Remote Sensing of Geomorphology, Volume 23, discusses the new range of remote-sensing techniques (lidar, structure from motion photogrammetry, advanced satellite platforms) that has led to a dramatic increase in terrain information, and as such provided new opportunities for a better understanding of surface morphology and related Earth surface processes. As several papers have been published (including paper reviews and special issues) on this topic, this book summarizes the major advances in remote sensing techniques for the analysis of Earth surface morphology and processes, also highlighting future challenges. Useful for MSc and PhD students, this book is also ideal for any scientists that want to have a single volume guideline to help them develop new ideas. In addition, technicians and private and public sectors working on remote sensing will find the information useful to their initiatives. Provides a useful guideline for MSc and PhD students, scientists, technicians, and land planners on the use of remote sensing in geomorphology Includes applications on specific case studies that highlight issues and benefits of one technique compared to others Presents future trends in remote sensing and geomorphology

Remote Sensing Platforms John Wiley & Sons

This volume gathers the latest advances, innovations, and applications in the field of geographic information systems and unmanned aerial vehicle (UAV) technologies, as presented by leading researchers and engineers at the 1st International Conference on Unmanned Aerial System in Geomatics (UASG), held in Roorkee, India on April 6-7, 2019. It covers highly diverse topics, including photogrammetry and remote sensing, surveying, UAV manufacturing, geospatial data sensing, UAV processing, visualization, and management, UAV applications and regulations, geo-informatics and geomatics. The contributions, which were selected by means of a rigorous international peer-review process, highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaboration among different specialists.

Close Range Photogrammetry and Machine Vision Elsevier
Unmanned aerial vehicles (UAVs) are new platforms that have been increasingly used in the last few years for forestry applications that benefit from the added value of flexibility, low cost, reliability, autonomy, and capability of timely provision of high-resolution data. The main adopted image-based technologies are RGB, multispectral, and thermal infrared. LiDAR sensors are becoming commonly used to improve the estimation of relevant plant traits. In comparison with other permanent ecosystems, forests are particularly affected by climatic changes due to the longevity of the trees, and the primary objective is the conservation and protection of forests. Nevertheless, forestry and agriculture involve the cultivation of renewable raw materials, with the difference that forestry is less tied to economic aspects and this is reflected by the delay in using new monitoring technologies. The main forestry applications are aimed toward inventory of resources, map diseases, species classification, fire monitoring, and spatial gap estimation. This Special Issue focuses on new technologies (UAV and sensors) and innovative data elaboration methodologies (object recognition and machine vision) for applications in forestry.

Photogrammetric Mapping John Wiley & Sons
This book discusses about a generic approach of the use of digital camera and light weight unmanned aerial vehicle (UAV) as photogrammetry tool for speeding up the process of acquiring aerial data. There were three experiments has been carried out in this study. All UAV images were processed using photogrammetry technique. There were two main photogrammetric results has been produced in this research such as digital elevation model and digital orthophoto. The results of this study also showed that the differences of DEM and digital orthophoto between both methods are not significant. We also investigate contour line behavior of landslide area and perform calculation of area and volume at the landslide area. The results of the study showed that the integration between digital camera and UAV are capable of producing digital orthophoto and capable of determining the excavated volume of the simulated model. Based on the results, UAV is useful for are many applications such as urban planning, data infrastructure of landslide risk area, forestry mapping, river surveillance and flood surveillance.

UAV Photogrammetry and Remote Sensing Elsevier
As the need for geographical data rapidly expands in the 21st century, so too do applications of small-format aerial photography for a wide range of scientific, commercial and

governmental purposes. Small-format Aerial Photography (SFAP) presents basic and advanced principles and techniques with an emphasis on digital cameras. Unmanned platforms are described in considerable detail, including kites, helium and hot-air blimps, model airplanes, and paragliders. Several case studies, primarily drawn from the geosciences, are presented to demonstrate how SFAP is actually used in various applications. Many of these integrate SFAP with ground-based investigations as well as conventional large-format aerial photography, satellite imagery, and other kinds of geographic information. Full-color photographs throughout Case studies from around the globe Techniques presented allow for image resolution impossible to match via traditional aerial photography or satellite datasets Glossary clarifies key terms

Integration of Civil Unmanned Aircraft Systems (Uas) in the National Airspace System (NAS) Roadmap MDPI

Unmanned Aerial Systems for Monitoring Soil, Vegetation, and Riverine Environments provides an overview of how unmanned aerial systems have revolutionized our capability to monitor river systems, soil characteristics, and related processes at unparalleled spatio-temporal resolutions. This capability has enabled enhancements in our capacity to describe water cycle and hydrological processes. The book includes guidelines, technical advice, and practical experience to support practitioners and scientists in increasing the efficiency of monitoring with the help of UAS. The book contains field survey datasets to use as practical exercises, allowing proposed techniques and methods to be applied to real world case studies. Includes a summary of technical UAS issues allowing readers to focus on how the exact technology fits their scientific question Provides specific applications enabling readers to understand the benefits and threats within the field Includes a comprehensive literature review in each chapter, allowing readers to know the key players and research in the field

Precision Agriculture '19 Walter de Gruyter

This book is a printed edition of the Special Issue "UAV or Drones for Remote Sensing Applications" that was published in Sensors

Introduction to UAV Systems MDPI

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.

Applications of Small Unmanned Aircraft Systems CRC Press

Classic text on the subject which, remarkably, still sells

Accuracy Assessment of Low-cost Terrestrial and UAV-based Photogrammetry for Geomatics Applications in Architectural and Cultural Heritage Contexts Springer Nature

Advances in high spatial resolution mapping capabilities and the new rules established by the Federal Aviation Administration in the United States for the operation of Small Unmanned Aircraft Systems (sUAS) have provided new opportunities to acquire aerial data at a lower cost and more safely versus other methods. A similar opening of the skies for sUAS applications is being allowed in countries across the world. Also, sUAS can access hazardous or inaccessible areas during disaster events and provide rapid response when needed. Applications of Small Unmanned Aircraft systems: Best Practices and Case Studies is the first book that brings together the best practices of sUAS applied to a broad range of issues in high spatial resolution mapping projects. Very few sUAS pilots have the knowledge of how the collected imagery is processed into value added mapping products that have commercial and/or academic import. Since the field of sUAS applications is just a few years old, this book covers the need for a compendium of case studies to guide the planning, data collection, and most importantly data processing and map error issues, with the range of sensors available to the user community. Written by experienced academics and professionals, this book serves as a guide on how to formulate sUAS based projects, from choice of a sUAS, flight planning for a particular application, sensors and data acquisition, data processing software, mapping software and use of the high spatial resolution maps produced for particular types of geospatial modeling. Features: Focus on sUAS based data acquisition and processing into map products Broad range of case studies by highly experienced academics Practical guidance on sUAS hardware, sensors, and software utilized Compilation of workflow insights from expert professors and professionals Relevant to academia, government, and industry Positional and thematic map accuracy, UAS curriculum development and workflow replicability issues This book would be an excellent text for upper-level undergraduate to graduate level sUAS mapping application courses. It is also invaluable as a reference for educators designing sUAS based curriculum as well as for potential sUAS users to assess the scope of mapping projects that can be done with this technology.

Remote Sensing of Geomorphology CRC Press

Since the early 1990s, unmanned aircraft systems (UAS) have

operated on a limited basis in the National Airspace System (NAS). Until recently, UAS mainly supported public operations, such as military and border security operations. The list of potential uses is now rapidly expanding to encompass a broad range of other activities, including aerial photography, surveying land and crops, communications and broadcast, monitoring forest fires and environmental conditions, and protecting critical infrastructures. UAS provide new ways for commercial enterprises (civil operations) and public operators to enhance some of our nation's aviation operations through increased operational efficiency and decreased costs, while maintaining the safety of the NAS.

3D Modeling of Ultra-high-resolution UAV Imagery Using Low-cost Photogrammetric Software and Structure from Motion MDPI

The text offers a comprehensive and unique perspective on disaster risk associated with natural hazards. It covers a wide range of topics, reflecting the most recent debates but also older and pioneering discussions in the academic field of disaster studies as well as in the policy and practical areas of disaster risk reduction (DRR). This book will be of particular interest to undergraduate students studying geography and environmental studies/science. It will also be of relevance to students/professionals from a wide range of social and physical science disciplines, including public health and public policy, sociology, anthropology, political science and geology.

Disaster Risk Frontiers Media SA

Unmanned aircraft systems (UAS) are rapidly emerging as flexible platforms for capturing imagery and other data across the sciences. Many colleges and universities are developing courses on UAS-based data acquisition. Fundamentals of Capturing and Processing Drone Imagery and Data is a comprehensive, introductory text on how to use unmanned aircraft systems for data capture and analysis. It provides best practices for planning data capture missions and hands-on learning modules geared toward UAS data collection, processing, and applications. FEATURES Lays out a step-by-step approach to identify relevant tools and methods for UAS data/image acquisition and processing Provides practical hands-on knowledge with visual interpretation, well-organized and designed for a typical 16-week UAS course offered on college and university campuses Suitable for all levels of readers and does not require prior knowledge of UAS, remote sensing, digital image processing, or geospatial analytics Includes real-world environmental applications along with data interpretations and software used, often nonproprietary Combines the expertise of a wide range of UAS researchers and practitioners across the geospatial sciences This book provides a general introduction to drones along with a series of hands-on exercises that students and researchers can engage with to learn to integrate drone data into real-world applications. No prior background in remote sensing, GIS, or drone knowledge is needed to use this book. Readers will learn to process different types of UAS imagery for applications (such as precision agriculture, forestry, urban landscapes) and apply this knowledge in environmental monitoring and land-use studies.

Forestry Applications of Unmanned Aerial Vehicles (UAVs) 2019 CRC Press

This book is a printed edition of the Special Issue "UAV or Drones

for Remote Sensing Applications" that was published in Sensors
Photogrammetry CreateSpace
Remote sensing is a method of collecting data without making any physical contact with the object under inspection. Modern day remote sensing kicked off with the invention of the camera and continued on to the invention of advanced satellite mounted sensors. Photogrammetry is defined as a science that measures distances using one or more images captured remotely. Remote collection of images within a range of 1000 ft is termed close-range photogrammetry (CRP).Unmanned aerial vehicle systems (UAV or UAS) have become a popular means of remotely gathering information and assessing infrastructure conditions due to their versatile nature. Multirotor and fixed-wing are two types of UAVs that are frequently used in field operations. Close-range photogrammetry (CRP) using UAVs can generate dense point cloud images, orthomosaics, digital elevation models (DEMs), and digital terrain models (DTMs) in a short time period. Analyses of these models help transportation engineers and agencies to understand the infrastructure health conditions. Several studies have addressed UAV-CRP surveys for infrastructure health condition assessments primarily due to restrictions imposed by the Federal Aviation Administration (FAA) on UAV studies and their operations in the field. After the introduction of Part 107exemption of UAV operations by FAA in August 2016, more studies have been planned and performed with UAVs, evaluating their abilities to perform infrastructure condition assessments. In the present research, the UAV-CRP technology using a hexacopter was primarily used to conduct infrastructure monitoring and assessments. As a part of the research, a comprehensive literature review of remote sensing and photogrammetry studies, UAV-related research by different states' departments of transportation, calibration checks for different accessories, as well as research on pavement and bridge infrastructure management was conducted. Then, a comprehensive calibration study was performed by conducting total system error analysis on both the UAV as well as accessories used in the research. This unique calibration analysis provided a much-needed understanding of how environmental conditions, including field temperature conditions, lens temperatures, flight altitudes, humidity, and different overlap conditions influence the quality of images captured as well as three-dimensional dense point cloud models generated using these images. Later, UAV-CRP technology was used in various infrastructure inspection studies owing to its multifaceted benefits. UAV-CRP studies on pavement sections showed they could provide pavement distress data including information on longitudinal and transverse cracks, permanent deformation or rutting, as well as pavement characteristics such as longitudinal and cross-slope values, and sight distances at crossings. All the photogrammetry-based imaging analyses yielded results that are in agreement with other traditional methods. UAV-CRP studies performed on various construction material stock piles yielded volume results matching with ground truth measurements from traditional field survey results. Bridge sites were inspected using UAVs equipped with both top and bottom gimbals to provide a complete 360° view of the bridge including substructure and superstructure elements. UAV-CRP results can provide condition assessments on approach slab settlements, movements and

cracking in abutment and wing walls, bridge foundation conditions, columns, and under-bridge decks as well as upper deck. UAV-CRP studies conducted on rail corridors also proved that the photogrammetry results could be used to evaluate encroachments at crossings, and washout site detection including an appraisal of factors that may have contributed to washouts. UAVs were also used for emergency operations immediately after a hurricane event and proved its value in providing debris assessments in post disaster reconnaissance studies performed in Beaumont, Texas. A preliminary cost analysis indicates that UAV-CRP technology could provide an inexpensive way of monitoring infrastructure conditions and gathering valuable data related to infrastructure-related annual and biennial rating surveys. All the procedures, analyses, and results indicate the UAV-CRP tool provides a quick, efficient, and safe method for assessing infrastructure health conditions.