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As for change detection via terrestrial laser scans, most works focus on deformation analysis for designated objects. Comparison can be performed by the subtraction of a resampled set of the data (Sch ä fer et al. 2004), or adjustment to surface models like cylinders (Gosliga et al., 2006) or planes (Lindenbergh and Pfeifer, 2005).

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We present in this paper an algorithm for the detection of changes based on terrestrial laser scanning data. Detection of changes has been a subject for research for many years, seeing applications such as motion tracking, inventory-like comparison and deformation analysis as only a few examples. One of the more difficult tasks in the detection of changes is performing informed comparison when ...

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Terrestrial images provides rich texture information for change detection, but the change detection with terrestrial images from different epochs sometimes faces problems with illumination changes, perspective distortions and unreliable 3D geometry caused by the lack of performance of automatic image matchers, while mobile laser scanning (MLS) data acquired from different epochs provides accurate 3D geometry for change detection, but is very expensive for periodical acquisition.

3D change detection at street level using mobile laser ...
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Terrestrial laser scanning, Forest structure, Mangrove forest, Sea level rise, Surface elevation change Related Search. Stem and root assessment in mangrove forests using a low-cost, rapid-scan terrestrial laser scanner; Surface elevation change and susceptibility of different mangrove zones to sea-level rise on Pacific high islands o Micronesia

Surface elevation change evaluation in mangrove forests ...
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Change Detection Via Terrestrial Laser Scanning Isprs
Three-dimensional (3D) morphological changes in rocky coasts need to be precisely measured for protecting coastal areas and evaluating the associated sediment dynamics, although volumetric measurements of bedrock erosion in rocky coasts have been limited due to the lack of appropriate measurement methods. Here we carried out repeat surveys of the 3D measurements of a small coastal island using terrestrial laser scanning (TLS) and structure-from-motion (SfM) photogrammetry with an unmanned ...

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Mukupa, Wallace (2017) Change detection and deformation monitoring of concrete structures using terrestrial laser scanning. PhD thesis, University of Nottingham. PDF (Thesis - as examined) - Repository staff only - Requires a PDF viewer such as GSview, Xpdf or Adobe Acrobat Reader Download (8MB)

Change detection and deformation monitoring of concrete ...
Change detection and deformation monitoring is an active area of research within the field of engineering surveying as well as overlapping areas such as structural and civil engineering. The application of Terrestrial Laser Scanning (TLS) techniques for change detection and deformation monitoring of concrete structures has increased over the years as illustrated in the past studies.

A review of the use of terrestrial laser scanning ...
Title: Change Detection Via Terrestrial Laser Scanning Isprs Author: media.ctsnet.org-Juliane Junker-2020-10-03-04-25-43 Subject: Change Detection Via Terrestrial Laser Scanning Isprs

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Wechat. ABSTRACT. Detection of surface change is a fundamental task in geomorphology. Terrestrial laser scanners are increasingly used for monitoring surface change resulting from a variety of geomorphic processes, as they allow the rapid generation of high‐resolution digital elevation models. Irrespective of instrument specifics, survey design or data processing, such data are subject to a finite level of ambiguity in position measurement, a consideration of which must be taken into ...

Detection of surface change in complex topography using ...
Detection of surface change is a fundamental task in geomorphology. Terrestrial laser scanners are increasingly used for monitoring surface change resulting from a variety of geomorphic processes, as they allow the rapid generation of high-resolution digital elevation models. Irrespective of instrument specifics, survey design or data processing, such data are subject to a finite level of ambiguity in position measurement, a consideration of which must be taken into account when deriving change.

Detection of surface change in complex topography using ...
Change detection and assessment of fire-damaged concrete using terrestrial laser scanning . By Wallace Mukupa, ... The results obtained from the study clearly demonstrated the feasibility of using terrestrial laser scanning to detect fire-damaged concrete via modelling and analysis of laser returned intensity. Laser scanning has emerged as a ...

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.

"Forests fulfill an important role in natural ecosystems, e.g., they provide food, fiber, habitat, and biodiversity, all of which contribute to stable ecosystems. Assessing and modeling the structure and characteristics in forests can lead to a better understanding and management of these resources. Traditional methods for collecting forest traits, known as " forest inventory ", is achieved using rough proxies, such as stem diameter, tree height, and foliar coverage; such parameters are limited in their ability to capture fine-scale structural variation in forest environments. It is in this context that terrestrial laser scanning (TLS) has come to the fore as a tool for addressing the limitations of traditional forest structure evaluation methods. However, there is a need for improving TLS data processing methods. In this work, we developed algorithms to assess the structure of complex forest environments – defined by their stem density, intricate root and stem structures, uneven-aged nature, and variable understory - using data collected by a low-cost, portable TLS system, the Compact Biomass Lidar (CBL). The objectives of this work are listed as follow: 1. Assess the utility of terrestrial lidar scanning (TLS) to accurately map elevation changes (sediment accretion rates) in mangrove forest; 2. Evaluate forest structural attributes, e.g., stems and roots, in complex forest environments toward biophysical characterization of such forests; and 3. Assess canopy-level structural traits (leaf area index; leaf area density) in complex forest environments to estimate biomass in rapidly changing environments. The low-cost system used in this research provides lower-resolution data, in terms of scan angular resolution and resulting point density, when compared to higher-cost commercial systems. As a result, the algorithms developed for evaluating the data collected by such systems should be robust to issues caused by low-resolution 3D point cloud data. The data used in various parts of this work were collected from three mangrove forests on the western Pacific island of Pohnpei in the Federated States of Micronesia, as well as tropical forests in Hawai ' i, USA. Mangrove forests underscore the economy of this region, where more than half of the annual household income is derived from these forests. However, these mangrove forests are endangered by sea level rise, which necessitates an evaluation of the resilience of mangrove forests to climate change in order to better protect and manage these ecosystems. This includes the preservation of positive sediment accretion rates, and stimulating the process of root growth, sedimentation, and peat development, all of which are influenced by the forest floor elevation, relative to sea level. Currently, accretion rates are measured using surface elevation tables (SETs), which are posts permanently placed in mangrove sediments. The forest floor is measured annually with respect to the height of the SETs to evaluate changes in elevation (Cahoon et al. 2002). In this work, we evaluated the ability of the CBL system for measuring such elevation changes, to address objective #1. Digital Elevation Models (DEMs) were produced for plots, based on the point cloud resulted from co-registering eight scans, spaced 45 degree, per plot. DEMs are refined and produced using Cloth Simulation Filtering (CSF) and kriging interpolation. CSF was used because it minimizes the user input parameters, and kriging was chosen for this study due its consideration of the overall spatial arrangement of the points using semivariogram analysis, which results in a more robust model. The average consistency of the TLS-derived elevation change was 72%, with and RMSE value of 1.36 mm. However, what truly makes the TLS method more tenable, is the lower standard error (SE) values when compared to manual methods (10-70x lower). In order to achieve our second objective, we assessed structural characteristics of the above-mentioned mangrove forest and also for tropical forests in Hawaii, collected with the same CBL scanner. The same eight scans per plot (20 plots) were co-registered using pairwise registration and the Iterative Closest Point (ICP). We then removed the higher canopy using a normal change rate assessment algorithm. We used a combination of geometric classification techniques, based on the angular orientation of the planes fitted to points (facets), and machine learning 3D segmentation algorithms to detect tree stems and above-ground roots. Mangrove forests are complex forest environments, containing above-ground root mass, which can create confusion for both ground detection and structural assessment algorithms. As a result, we needed to train a supporting classifier on the roots to detect which root lidar returns were classified as stems. The accuracy and precision values for this classifier were assessed via manual investigation of the classification results in all 20 plots. The accuracy and precision for stem classification were found to be 82% and 77%, respectively. The same values for root detection were 76% and 68%, respectively. We simulated the stems using alpha shapes in order to assess their volume in the final step. The consistency of the volume evaluation was found to be 85%. This was obtained by comparing the mean stem volume (m3/ha) from field data and the TLS data in each plot. The reported accuracy is the average value for all 20 plots. Additionally, we compared the diameter-at-breast-height (DBH), recorded in the field, with the TLS-derived DBH to obtain a direct measure of the precision of our stem models. DBH evaluation resulted in an accuracy of 74% and RMSE equaled 7.52 cm. This approach can be used for automatic stem detection and structural assessment in a complex forest environment, and could contribute to biomass assessment in these rapidly changing environments. These stem and root structural assessment efforts were complemented by efforts to estimate canopy-level structural attributes of the tropical Hawai ' i forest environment; we specifically estimated the leaf area index (LAI), by implementing a density-based approach. 242 scans were collected using the portable low-cost TLS (CBL), in a Hawaii Volcano National Park (HAVO) flux tower site. LAI was measured for all the plots in the site, using an AccuPAR LP-80 Instrument. The first step in this work involved detection of the higher canopy, using normal change rate assessment. After segmenting the higher canopy from the lidar point clouds, we needed to measure Leaf Area Density (LAD), using a voxel-based approach. We divided the canopy point cloud into five layers in the Z direction, after which each of these five layers were divided into voxels in the X direction. The sizes of these voxels were constrained based on interquartile analysis and the number of points in each voxel. We hypothesized that the power returned to the lidar system from woody materials, like branches, exceeds that from leaves, due to the liquid water absorption of the leaves and higher reflectivity for woody material at the 905 nm lidar wavelength. We evaluated leafy and woody materials using images from projected point clouds and determined the density of these regions to support our hypothesis. The density of points in a 3D grid size of 0.1 m, which was determined by investigating the size of the branches in the lower portion of the higher canopy, was calculated in each of the voxels. Note that " density " in this work is defined as the total number of points per grid cell, divided by the volume of that cell. Subsequently, we fitted a kernel density estimator to these values. The threshold was set based on half of the area under the curve in each of the distributions. The grid cells with a density below the threshold were labeled as leaves, while those cells with a density above the threshold were set as non-leaves. We then modeled the LAI using the point densities derived from TLS point clouds, achieving a R2 value of 0.88. We also estimated the LAI directly from lidar data by using the point densities and calculating leaf area density (LAD), which is defined as the total one-sided leaf area per unit volume. LAI can be obtained as the sum of the LAD values in all the voxels. The accuracy of LAI estimation was found to be 90%. Since the LAI values cannot be considered spatially independent throughout all the plots in this site, we performed a semivariogram analysis on the field-measured LAI data. This analysis showed that the LAI values can be assumed to be independent in plots that are at least 30 m apart. As a result, we divided the data into six subsets, where each of the plots were 30 meter spaced for each subset. LAI model R2 values for these subsets ranged between 0.84 - 0.96. The results bode well for using this method for automatic estimation of LAI values in complex forest environments, using a low-cost, low point density, rapid-scan TLS."--Abstract.

Landslides and Engineered Slopes. Experience, Theory and Practice contains the invited lectures and all papers presented at the 12th International Symposium on Landslides, (Naples, Italy, 12-19 June 2016). The book aims to emphasize the relationship between landslides and other natural hazards. Hence, three of the main sessions focus on Volcanic-induced landslides, Earthquake-induced landslides and Weather-induced landslides respectively, while the fourth main session deals with Human-induced landslides. Some papers presented in a special session devoted to "Subareal and submarine landslide processes and hazard " and in a " Young Session " complete the books. Landslides and Engineered Slopes. Experience, Theory and Practice underlines the importance of the classic approach of modern science, which moves from experience to theory, as the basic instrument to study landslides. Experience is the key to understand the natural phenomena focusing on all the factors that play a major role. Theory is the instrument to manage the data provided by experience following a mathematical approach; this allows not only to clarify the nature and the deep causes of phenomena but mostly, to predict future and, if required, manage similar events. Practical benefits from the results of theory to protect people and man-made works. Landslides and Engineered Slopes. Experience, Theory and Practice is useful to scientists and practitioners working in the areas of rock and soil mechanics, geotechnical engineering, engineering geology and geology.

In the past several years, there have been significant technological advances in the field of crisis response. However, many aspects concerning the efficient collection and integration of geo-information, applied semantics and situation awareness for disaster management remain open. Improving crisis response systems and making them intelligent requires extensive collaboration between emergency responders, disaster managers, system designers and researchers alike. To facilitate this process, the Gi4DM (GeoInformation for Disaster Management) conferences have been held regularly since 2005. The events are coordinated by the Joint Board of Geospatial Information Societies (JB GIS) and ICSU GeoUnions. This book presents the outcomes of the Gi4DM 2018 conference, which was organised by the ISPRS-URSI Joint Working Group ICWG III/IVa: Disaster Assessment, Monitoring and Management and held in Istanbul, Turkey on 18-21 March 2018. It includes 12 scientific papers focusing on the intelligent use of geo-information, semantics and situation awareness.

Modern Technologies for Landslide Investigation and Prediction presents eleven contributed chapters from Chinese and Italian authors, as a follow-up of a bilateral workshop held in Shanghai on September 2013. Chapters are organized in three main parts: ground-based monitoring techniques (photogrammetry, terrestrial laser scanning, ground-based InSAR, infrared thermography, and GNSS networks), geophysical (passive seismic sensor networks) and geotechnical methods (SPH and SLIDE), and satellite remote-sensing techniques (InSAR and optical images). Authors of these contributes are internationally-recognized experts in their respective research fields. Marco Scaioni works in the college of Surveying and Geo-Informatics at Tongji University, Shanghai (P.R. China). His research fields are mainly Close-range Photogrammetry, Terrestrial Laser Scanning, and other ground-based sensors for metrological and deformation monitoring applications to structural engineering and geosciences. In the period 2012-2016 he is chairman of the Working Group V/3 in the International Society for Photogrammetry and Remote Sensing, focusing on ' Terrestrial 3D Imaging and Sensors '.

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.

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.

This text provides coverage of the fundamentals, the techniques, and the demonstrated results of a variety of projects in a manner accessible to both the novice and the advanced user of remotely sensed data.