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Introduction

The term virtual globe is being used frequently to refer to a virtual and digital global environment enabled by advanced information technologies. It is capable of letting users freely fly anywhere on a virtual Earth, with different views of Earth such as satellite imagery, geographical features, terrain, 3D buildings, and advanced stars, atmosphere or sunlight effects. More specifically, it allows users to fuse heterogeneous geospatial data from multiple sources, conduct network-based local-to-global multi-resolution visualization, and share data with others. The wide popularity of virtual globe software such as Google Earth, Microsoft Virtual Earth, NASA World Wind and EarthBrowser in the geospatial and general communities inspires more ways of exploring and using virtual globes. Context-aware visualization and analysis is a particularly important part of these activities, as it can continuously fit the current user's situation or operating environment. When combined with 2D and 3D geospatial Web services, virtual globes can support data analysis, information extraction and even knowledge discovery. Processing of multi-temporal images and change detection has been an active research and application field in remote sensing for decades. The wider availability of large archives of historical images at a global scale makes it also possible for long-term change detection and modeling in a virtual globe platform.

Virtual Changing Globe for Visualisation and Analysis 2009 aims at providing a timely forum for the exchange of state-of-the-art research results in the areas of virtual globes, context-aware visualisation/analysis and change detection and process modelling.

Committees

Workshop Organising Committee:

ISPRS WG IV/4 “Virtual Globes and Context-Aware Visualisation/Analysis”

ISPRS WG VII/5“Methods for Change Detection and Process Modelling”

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State Key Laboratory of Information Engineering in Surveying,Mapping and Remote Sensing(LIESMARS),Wuhan University,China

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Keynote Abstracts

TOWARDS A GEOSPATIAL SERVICE WEB

Deren Li, Academician, Wuhan University

Abstract: With the advancement of Earth Observation (EO) and information technologies, the capabilities for collecting, transferring, processing, and sharing geospatial data have dramatically increased in recent years. For example, the wide deployment of distributed sensors can provide real-time or near real-time data. How to extract information and discover knowledge from oceans of data, therefore, is one of greatest challenges today. The distinguished features of the Web such as distribution and openness, and the evolving Web-related technologies such as Web Service, Web 2.0, Semantic Web, Sensor Web, Grid and Cloud Computing, make the Web a promising platform for providing services on geospatial data discovery, information extraction, and knowledge discovery.

This talk provides envision of Geospatial Service Web (GSW), a geospatial infrastructure that makes all types of distributed geospatial resources Web discoverable, accessible, and “plug-and-play”. It provides a framework towards an integrated seamless distributed Space-Earth system, which covers the lifecycle of geospatial applications, from the collection of geospatial data to the end user-oriented applications, thus significantly enhancing the efficient and effective sharing of geospatial data, information, and knowledge. The presentation will outline the mission of GSW, discuss the framework of GSW, and list the service components in GSW. The standards to support interoperability in GSW will be described. And finally, the system architecture and recent development on the prototype system (i.e. GeoGlobe) for the implementation of GSW will be presented.

CHALLENGES IN ACHIEVING OPERATIONAL LAND COVER AND LAND USE MONITORING

John Townshend, University of Maryland at College Park, USA

Abstract: There is widespread recognition of the importance of land cover and land use information Although there is widespread agreement that the products must be generated on a regular basis operationally in reality we still have not established this capability. The presentation will explore reasons for this situation and ways in which obstacles may be overcome. The latter include the absence of sufficient data, the weakness of data delivery systems, problems in generating sufficient training and validation data and inadequate algorithms for information extraction. The presentation will be illustrated by results from research directed towards the monitoring of forest cover globally at Landsat resolutions. The use of Virtual Globes as an organizing framework for operational monitoring will be discussed.

GLOBAL ACCESS OF LOCAL KNOWLEDGE

Vincent Tao, Microsoft Virtual Earth

Abstract: Among many drivers that made a profound impact to the emergency of the Web as a computing and social platform, geospatial technology is probably the least expected. From online mapping to virtual worlds, from location based services to location commerce (L-commerce), from local search to local targeted advertising, location became indispensable part of the Web evolution.
This presentation will address the evolution of the virtual globe technology, in particular, we will discuss the evolution of Microsoft Virtual Earth technology from its roadmap to technical architecture, infrastructure and operations. The most technical challenging is it's the scalability of the Microsoft Virtual Earth platform to support world-wide operations and user base. We will discuss how Microsoft has taken steps to address these technical issues. We will also present real-world examples of Microsoft Virtual Earth applications for global based local search and knowledge discovery.

SPATIAL INFORMATION PROCESSING: STANDARDS-BASED OPEN SOURCE VISUALIZATION TECHNOLOGY - WORLD WIND VISUALIZATION TECHNOLOGY

Patrick Hogan, NASA Ames Research Center, USA

Abstract: Information security is a global issue that will increasingly affect our ability to survive as a species. Collectively we must better appreciate the complex relationships that make life on Earth possible. Providing spatial information in its native context can accelerate our ability to process that information. To maximize this ability to process information, three basic elements are required: data delivery (server technology), data access (client technology), and data processing (information intelligence). NASA World Wind provides open source server and client technologies based on open standards. The possibilities for data processing and data sharing are enhanced by this open infrastructure for geographic information. It is interesting that this open source and open standards approach, unfettered by proprietary constraints, simultaneously provides for entirely proprietary use of this same technology.

Proceedings Papers

Session 1: Virtual Globe,Visualization and Analysis

POINT CLOUD PROCESSING FOR 3D CITY MODEL PRODUCTION
George Vosselman
Abstract: The high pulse frequencies of today's airborne, mobile and terrestrial laser scanners enable the acquisition of point clouds with densities from some 20-50 points/m2 for airborne scanners to several thousands points/m2 for mobile and terrestrial scanners. Dense image matching can nowadays also result into high point density point clouds. For the (semi-) automated extraction of geo-information from point clouds these high point densities are very beneficial. The large number of points on the surfaces of objects to be extracted describe the surface geometry with a high redundancy. This allows the reliable detection of such surfaces in a point cloud. After a comparison of point clouds obtained from imagery and from laser scanners, various examples are presented on how point cloud segmentations can be used to obtain 3D building models at various levels of detail. The usage of generic knowledge on the objects to be mapped is shown to play a key role in the automation of the point cloud interpretation.

CONTEXT-AWARE ANALYSIS,GEOVISUALISATION AND VIRTUAL GLOBES FOR MANAGING EARTH RESOURCES
(KEY WORDS:Web-based,Visualization,Segmentation,Decision Support,Databases,Resources,Management)
M.Madden,H.Zhao,T.R.Jordan,M. Blankenship,J.Masour,H.Yang, J.L.Corn

INTEGRATING VIRTUAL GLOBE AND WEB SERVICE TECHNOLOGIES FOR ISPRS HIGHER-EDUCATION TEACHING AND RESEAR
(KEY WORDS: Virtual Globe, Web Service, Geospatial, Education, GeoGlobe, GeoPW)
Jianya Gong , Peng Yue, Longgang Xiang , Jing Chen

REAL-TIME CONTOUR MAP RECONSTRUCTION WITH 3D TERRAIN ON MODERN GRAPHICS HARDWARE
(KEY WORDS: Contour Map, Contour Lines, 3D terrain, GPU, Digital earth)
Chen Zhuo, Zhao Yanqing, Yang Chongjun

VISUALIZE ORACLE GEORASTER OBJECTS IN GEOGLOBE SYSTEM UNDER INTERNET ENVIRONMENT
(KEY WORDS: Raster Data, GeoGlobe, *GeoRaster*, Google Earth, Visualization, Pyramid)
Longgang Xiang , Qingyun Xie, Charles Wang

Session 2:Virtual Globe Case Studies

NOVEL EMERGENCY/PUBLIC HEALTH SITUATION ROOMS AND MORE USING 4-D GIS
(KEY WORDS: Public health, emergency preparedness, 3-D mirror worlds, 3-D virtual worlds, geo-mashups, GIS, Internet)
Maged N. Kamel Boulos

ORGANIZETION MULTI-SCALE 3D MODEL DATA TO MEET NETWORK TRANSMISSION
(KEY WORDS: 3D Model，Point-indexed Data Structure，Multi-Scales，Quadtree-based Tile，Network Transmission)
Chen Jing,Gong JianYa,Xie BingXiong

SUPERMAP GIS 6R: A REAL SPACE GIS
(KEY WORDS: Real Space GIS, 3D GIS, 2D GIS, SuperMap GIS 6R, UGC)
F.X.Luo,G.F. Song,E.Q.Wang,L.Q.Ma

THE VISUALIZATION SIMULATION OF REMOTE-SENSING SATELLITE SYSTEM
(KEY WORDS: the model of global discrete grids, texture mapping, coverage analysis, satellite simulation)
Deng Fei, Chu YanLai, Zhang Peng, Feng Chen, Liang JingYong

Session 3:Spatio-Temporal Process Modelling

A METHOD OF BUILDING MODELING FROM TRUE ORTHO-IMAGE AND DSM
(KEY WORDS: Ortho-image; DSM; Building model; Triangulation technology)
Jiang Heng-biao, Guang Hong-liang, Liu Xian-lin

THE TAXIS' EXPERIENCE KNOWLEDGE MODELING AND ROUTE PLANNING
(KEY WORDS: floating car data (FCD); TEKM; route planning; GIS-T)
Tang Luliang,Li Qingquan,Chang Xiaomeng

VISUALIZATION OF EARTH SCIENCE DATA USING GOOGLE EARTH™
(KEY WORD: Virtual Globes, Google Earth, Earth Science Data, Vertical Profiles, Visualization)
A.Chen,G.G.Leptoukh,S.J.Kempler,L.Di

GRADIENT ANALYSIS OF LANDSCAPE PATTERN SPATIAL-TEMPORAL CHANGES IN BEIJING METROPOLITAN AREA, CHINA
(KEY WORDS: gradient analysis, landscape metrics, spatio-temporal, urban expansion)
Yetao Yang,Oiming Zhou,Jianya Gong

SEMI-SUPERVISED CLASSIFICATION BASED ON GAUSS MIXTURE MODEL FOR REMOTE IMAGERY
(KEY WORDS: Virtual Globe; Remote Sensing Image; Thematic Information; Semi-Supervised Classification; Gauss Mixture Model; EM algorithms)
Xiong Biao, Zhang Xiaojun, Jiang Wanshou

AUTOMATED FOREST COVER CHANGE ANALYSIS USING LANDSAT OBSERVATIONS
Chengquan Huang
Abstract: The series of Landsat instruments have produced a unique imagery record suitable for deriving forest change products at different spatial and temporal scales. Such products are needed in order to advance studies on many pressing environmental issues, including carbon accounting, ecosystem dynamics, sustainability, and the vulnerability of natural and human systems. Large quantities of Landsat images are often needed in order to develop forest change products with spatial and temporal characteristics suitable for many of these studies. The purpose of this talk is to present two automated approaches for deriving forest change products using Landsat images. The first approach is designed to reconstruct forest change history using Landsat time series stacks (LTSS) and a vegetation change tracker (VCT) algorithm. A LTSS typically consists of a sequence of images of the same location that have a nominal temporal interval (e.g., 1 image every two years). This approach will not only allow detection of forest changes, but also date the detected changes using the acquisition date of the LTSS images. The second approach is designed for forest change analysis in cases where available images are not adequate for assembling LTSS but are adequate for 2-date change analysis. This approach consists of a training data automation (TDA) method for delineating necessary training samples and uses an advanced support vector machines (SVM) algorithm to map changes. Both approaches have been tested extensively, and are being used to generate forest disturbance products through several NASA funded projects.

MULTITEMPORAL SPACEBORN SAR DATA FOR CHANGE DETECTION IN URBAN AREAS:A CASE STUDY IN SHANGHAI
(KEY WORDS: Change detection, SAR, Minimum-error thresholding, Ratio image, Modified ratio, Urban area)
Osama Adam,Yifang Ban

A NEW RELATIVE RADIOMETRIC CONSISTENCY PROCESSING METHOD FOR CHANGE DETECTION BASED ON WAVELET TRANSFORM AND LOW-PASS FILTER
(KEY WORDS: wavelet transform; radiometric normalization; low-pass filter; change detection)
Kaiming SUN, Haigang SUI, Deren LI,Chuan XU

Session 4:Methods of Change Detection

MODELING AND VISUALIZING SPATIO-TEMPORAL PATTERN OF LAND COVER CHANGE IN PEARL RIVER DELTA REGION OF CHINA USING MULTI-TEMPORAL IMAGERY
(KEY WORDS:Spatio-temporal pattern, LUCC, Change detection, Pearl River Delta region, urban growth mode)
Qiming Zhou,Bo Sun

COMPARATIVE EVALUTION OF THE INFLUENCE OF THE TERRAIN TOPOGRAPHY ON THE REGISTRATION ACCURACY OF THE FUSED MULTI-SENSOR SATELLITE IMAGES(CASE STUDY:P5 AND P6 IRS SATELLITE IMAGES)
(KEY WORDS: Image fusion, RPC transformation, 3D affine transformation, polynomial transformation)
M.Fallah Yakhdani , A.Azizi

A NEW APPROACH TOWARD OBJECT-BASED CHANGE DETECTION
(KEY WORDS: change detection, object-based, segmentation, mean shift, intensity, texture, integration)
Guo Zhang, Yang Li

LAND-USE SPATIAL OPTIMIZATION MODEL BASED ON PARTICLE SWARM OPTIMIZATION
(KEY WORDS: Particle Swarm Optimization – PSO , Land-Use Spatial Allocation , Spatial Modeling , GIS)
Shifa MA , Jianhua He, Feng Liu

THE DECISION TREE ALGORITHM OF URBAN EXTRACTION FROM MULTI-SOURCE IMAGE DATA
(KEY WORDS: Multi-Source Image Data, Decision Tree, Unified Conceptual Model)
Yu Qiao， HuiPing Liu, Mu Bai, XiaoDong Wang, XiaoLuo Zhou

A NEW URBAN ROAD DETECTION METHOD IN HIGH-RESOLUTION IMAGES BASEDON BAYESIAN NETWORK
(KEY WORDS: High Resolution Image; Road Detection; Bayesian Network; GIS Guidance)
Chuan Xu,Yuanyuan Feng,Juan Du

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