

# COM.Geo 2010

1st International Conference and Exhibition on  
Computing for Geospatial Research & Application

June 21-23, 2010

Washington, DC

## PROGRAM



[www.com-geo.org](http://www.com-geo.org)

# Program at a Glance

<b>Sunday, June 20</b>	4:00 PM - 6:00 PM	Registration		
	3:00 PM - 8:00 PM	Exhibition Setup		
<b>Monday, June 21</b>	6:30 AM - 8:30 AM	Complimentary Breakfast (Hotel guests only, Concourse Terrace +, Lobby Level)		
	8:00 AM - 4:30 PM	Registration		
	8:30 AM - 9:30 AM	Short Papers I		
	9:30 AM - 9:45 AM	Coffee Break		
	9:45 AM - 12:00 PM	9:45 AM - 10:30 AM	Keynote 1: Microsoft SQL Server	
		10:30AM - 11:15 AM	Keynote 2: MIT	
		11:15 AM - 12:00 PM	Keynote 3: OGC	
	12:00 PM - 1:15 PM	Welcome Banquet (Concourse Terrace +, Lobby Level)		
	1:15 PM - 2:15 PM	Full Papers I	Tech Talk/Demo Talk I	Panel I: FEMA
	2:15 PM - 2:30 PM	Coffee Break		
	2:30 PM - 4:30 PM	Full Papers II	Short Papers II	Course I: Microsoft
	1:15 PM - 4:30PM	Microsoft Focus Group		
	1:15 PM - 4:30 PM	Free iExhibit & Exhibition, Posters, Job Fair, Networking		
<b>Tuesday, June 22</b>	6:30 AM - 8:30 AM	Complimentary Breakfast (Hotel guests only, Concourse Terrace +, Lobby Level)		
	8:00 AM - 4:30 PM	Registration		
	8:30 AM - 9:30 AM	Full Papers III		
	9:30 AM - 9:45 AM	Coffee Break		
	9:45 AM - 12:00 PM	9:45 AM - 10:30 AM	Featured Note 1: Purdue	
		10:30 AM - 11:15 AM	Featured Note 2: FHWA-DOT	
		11.15 AM - 12:00 PM	Keynote 4: Oracle	
	12:00 PM - 1:15 PM	Lunch Break		
	1:15 PM - 2:15 PM	Full Papers IV	Short Papers III	Tech Talk/Demo Talk II
	2:15 PM - 2:30 PM	Coffee Break		
	2:30 PM - 4:30 PM	Invited Session: U.S. DOJ	Panel+ II: Microsoft SQL	Course II: Oracle
	1:15 PM - 4:30PM	Microsoft Focus Group	GviTech Focus Group	
	8:30 PM - 4:30 PM	Free iExhibit & Exhibition, Posters, Job Fair, Networking		
<b>Wednesday, June 23</b>	6:30 AM - 8:30 AM	Complimentary Breakfast (Hotel guests only, Concourse Terrace +, Lobby Level)		
	8:00 AM - 2:30 PM	Registration		
	8:30 AM - 9:30 AM	Full Papers V / Demo Talks		
	9:30 AM - 9:45 AM	Coffee Break		
	9:45 AM - 12:00PM	9:45 AM - 10:30 AM	Keynote 5: USGS	
		10:30 AM - 11:15 AM	Keynote 6: Microsoft Azure	
		11:15 AM - 12:00 PM	Featured Note 3: ORNL	
	12:00 PM - 1:15 PM	Featured Banquet (Concourse Terrace +, Lobby Level)		
	1:15 PM - 2:45 PM	Panel+ III: ORNL	Panel+ IV: Microsoft Azure	Tech Talk/Demo Talk III
	2:45 PM - 2:55 PM	Coffee Break		
	2:55 PM - 4:30 PM	Panel+ III: ORNL	Panel+ IV: Microsoft Azure	Microsoft Focus Group
	1:15 PM - 4:30PM	Microsoft Focus Group	Gvitech Focus Group	
	8:30 PM - 4:30 PM	Free iExhibit & Exhibition, Posters, Job Fair, Networking		

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# General Information

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## **Alcohol**

The COM.Geo conference expects all attendees to act responsibly when consuming alcoholic beverages. Consumption of alcohol by those under the age of 21 is prohibited.

## **Bags/Packages**

For security reasons, the COM.Geo conference is unable to hold attendees' bags, packages, briefcases, coats, laptops or other personal items at registration. For your own safety and the security of your belongings, we strongly recommend checking these items at a hotel bell stand.

## **Internet Access**

The Hyatt Regency Bethesda Hotel offers complimentary wireless internet access in the COM.Geo conference meeting rooms and conference guest sleeping rooms.

## **Non-Smoking Policy**

The COM.Geo conference maintains a non-smoking policy in all meeting rooms, the exhibit room, and the registration room. Smoking is allowed only in designated smoking areas of the hotel.

## **Photography and Videography in Sessions**

Photos and videos may not be taken during presentations without the permission of the presenter. Anyone except COM.Geo conference photographer taking a photo or video without permission will be asked to leave the conference.

## **Presentation Content**

The COM.Geo conference is an open forum for sharing the results of research and application in computing for geospatial and related specialties. The contents of presentations by individuals or groups at the COM.Geo conference are their alone. The COM.Geo conference neither endorses nor disclaims the conclusions, interpretations, or opinions expressed by speakers at the conference.

## **Professional Conduct**

Professional ideas and information are exchanged most effectively at the COM.Geo conference in an atmosphere free of abuse or harassment and characterized by courtesy and respect. To that end, the COM.Geo conference expects all individuals who attend to conduct themselves in a manner that

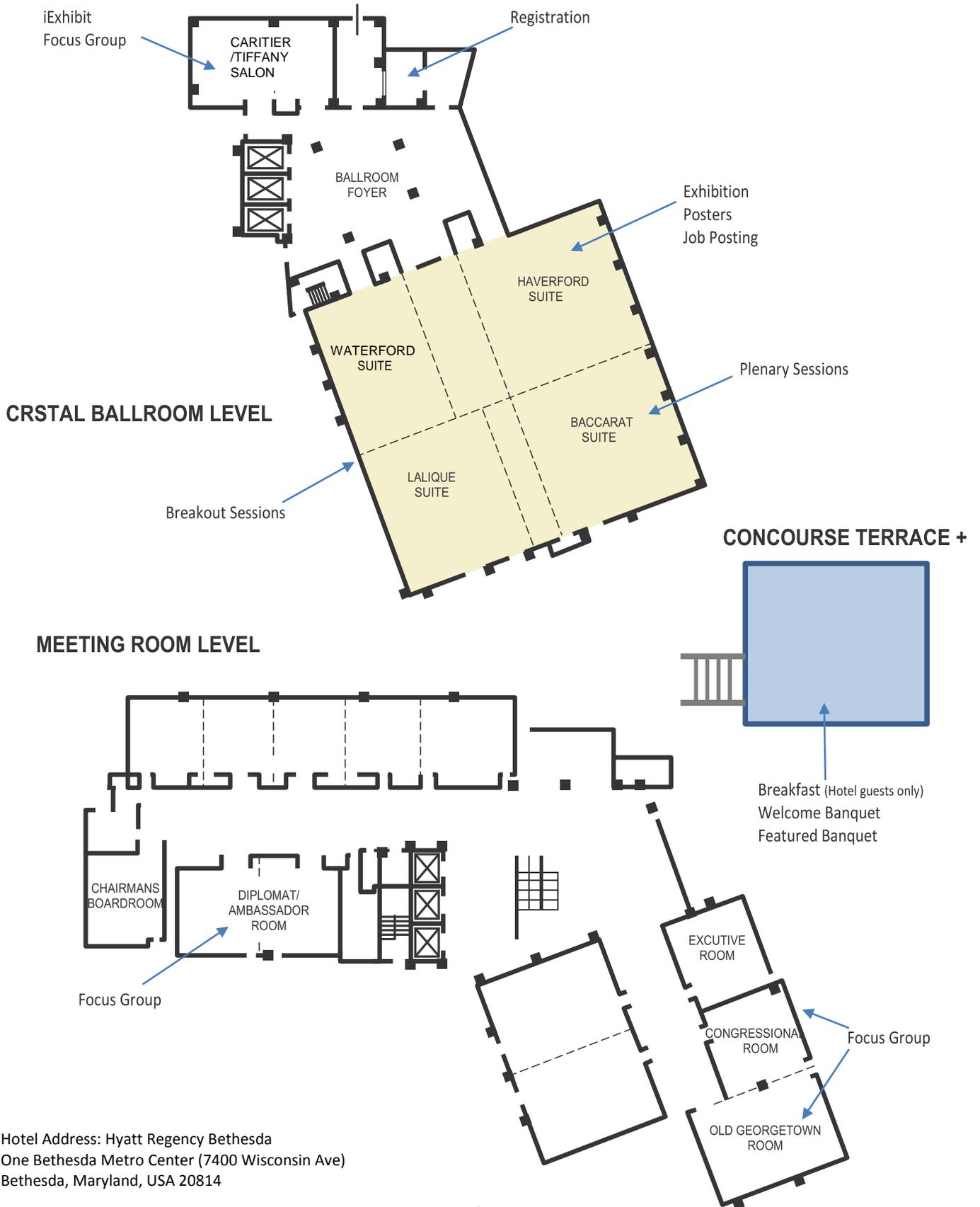
establishes an atmosphere free from discriminatory practices.

## **Registration**

The COM.Geo conference Registration Desk will be located in the Crystal Ballroom level of the Hyatt Regency Bethesda Hotel. Registration will be open during the following hours:

Sunday, June 20	4:00 p.m. – 6:00 p.m.
Monday, June 21	8:00 a.m. – 4:30 p.m.
Tuesday, June 22	8:00 a.m. – 4:30 p.m.
Wednesday, June 23	8:00 a.m. – 2:30 p.m.

# Location of Meeting Rooms



# Plenary Sessions

Barracat/Lalique Suite, Crystal Ballroom Level

**Monday, June 21 9:45 AM – 12:00 PM**

Keynotes Chair:

Prof. Simon Y. Berkovich

*George Washington University*

## **Keynote 1**

9:45 AM - 10:30 AM

### **Spatial Data Streaming Or Streaming Spatial Data: Just Stream It the Way You Like**

*Balan Sethu Raman*

*Microsoft Distinguished Engineer*

*Dr. Mohamed Ali*

*Microsoft SQL Server*

Have you ever counted the number of times the word “streaming” has occurred in a geospatial oriented conference proceedings over the past few years? Have you ever monitored the growth of the geospatial research and industrial community? Have you ever noticed that geospatial researchers are living the luxury of an era where real-time data is streamed at the convenience of their fingertips? Thanks to advances in the “geosensing” technologies, the geospatial community is “almost” ready for their next revolutionary jump. But not quite ready yet! Until we understand how we can process, mine, and analyze the massive amount of data being streamed from geo-sensors every second, the challenge is still there.

However, the horizon looks bright. There have been several success stories to continuously monitor and manage spatiotemporal stream data, each of which has its own position and promise. They ranged from leveraging a geographic information system with streaming capabilities (call it, spatial-data streaming) to leveraging a full-fledged data streaming system with spatial libraries (streaming spatial data, with the emphasis on the word streaming coming first). The spectrum in between these two extremes has been investigated as well.

This talk covers the “Today of Geospatial” and introduces to the audience several geospatial directions at Microsoft, e.g., SQL Server Spatial, Bing Maps, SQL Server BI, SQL Spatial Library, and then, goes into the “Future of Geospatial”: geostreaming and, more specifically, geostreaming in the cloud. The talk is divided into two parts: The first part provides a 10,000 foot view of various geospatial efforts at Microsoft and, then, zooms-in through selected angles to highlight key milestones that have advanced the geostreaming state of the art. The second part of the talk introduces the Microsoft SQL Server StreamInsight approach to geostreaming and highlights its impact on the future of the geo-world. This talk provides the unique lessons that have been taken over the last few years, an industrial perspective of the problem, and definitely a vision of how the “geo” term will be one of the hottest terms over the coming decades (if not over the coming years).

#### *Short Biography*

Balan Sethu Raman is a Distinguished Engineer at Microsoft. He began his career with the aspirations to become a

hardware designer. While designing software to help chip designers he developed an interest in software which led him to accept the opportunity to develop software over other opportunities. At Microsoft he was a part of the Windows team developing file systems. During this time he noticed the need to offer more services over the increasing amounts of data and pioneered efforts with the SQL Server team to offer richer services over various forms of data. He subsequently joined the SQL server team and is now leading efforts to extend the Microsoft Data Platform to streaming data.

Mohamed Ali’s main research interests focus on advancing the state of the art in the design and implementation of data stream systems to cope with the requirements of emerging applications. In summer 2006, he visited the database group at Microsoft Research (MSR) where he and his colleagues ramped up the Complex Event Detection and Response (CEDR) project. Few months later, Mohamed joined the SQL Server group at Microsoft Corporation to incubate the CEDR project into Microsoft SQL Server. CEDR has become Microsoft SQL Server StreamInsight. Mohamed is also an active member of the ACM SIGSPATIAL group and is leading the Geo-Streaming efforts at Microsoft StreamInsight.

## **Keynote 2**

10:30AM - 11:15 AM

### **The Senseable City**

*Prof. Dr. Carlo Ratti*

*Director of SENSEable City Lab*

*Department of Urban Studies and Planning, MIT*

The real-time city is now real! The increasing deployment of sensors and hand-held electronics in recent years is allowing a new approach to the study of the built environment. The way we describe and understand cities is being radically transformed - alongside the tools we use to design them and impact on their physical structure. This presentation will address some of these changes from a critical point of view through the work of the SENSEable City Laboratory, a new research initiative at the Massachusetts Institute of Technology.

## **Keynote 3**

11:15 AM - 12:00 PM

### **Geoinformatics Applications - Where to Next?**

*George Percival*

*Open Geospatial Consortium (OGC)*

Geospatial informatics has achieved a level of maturity that is bringing spatial data to ever more applications. Examples include web mapping, 3-D browsers, spatial data infrastructures, sensor webs, and location based services. Key principles to this achievement include: robust open source and proprietary implementations; consistent geospatial concepts across implementations; and standards adopted through open consensus offered freely as in free beer on the web.

Several applications are now ripe for rapid development based on this established baseline of standards, software

# Plenary Sessions

Barracat/Lalique Suite, Crystal Ballroom Level

implementations and deployed systems. The value and use of geospatial information will continue to increase through various systems-of-systems of geospatial services. Beyond traditional SDI communities the Geoscience communities are rapidly developing information systems using OGC and other open standards. The application of geospatial to Business Intelligence is poised for phenomenal growth. The emergence of mobile Internet will result in the second generation of location-based services.

**Tuesday, June 22 9:45 AM – 12:00 PM**

Keynotes Chair:

Prof. Christoph M. Hoffmann  
*Purdue University*

### ***Featured Note 1***

9:45 AM - 10:30 AM

#### **Designing Smarter Cities by Integrating Urban Behavioral and Geometrical Simulation**

*Prof. Dr. Daniel G. Aliaga*

*Department of Computing Science, Purdue University*

This talk addresses the growing desire to design better, smarter, and more efficient cities. Cities are inherently very complex to model because they are simultaneously dense and large, spanning from a few to hundreds of square kilometers, and because their underlying structure is influenced by a very large number of hard-to quantify variables including land policies, economic behavior, transportation infrastructure, governmental plans, and population changes. In this talk, I will provide a brief overview of a new approach that blurs the boundary between behavioral modeling and geometrical modeling of urban spaces. Within computer graphics and visualization research focuses on producing complex and visually appealing 3D geometrical models from images and/or LIDAR, while urban behavioral modeling focuses on accurate urban dynamics and behaviorally-validated simulations using socio-economic data, for example. I will show how our concurrent behavioral and geometrical simulation significantly benefits the design, editing, and prediction of large-scale 3D city models. The result is the ability to generate, in a few minutes, 3D city models that resemble existing locations, to simulate urban behaviors not previously possible, to predict and visualize the outcome of urban policies and regulations, to design cities that best conform to meteorological aspects, and to improve emergency response in current and speculative scenarios (e.g., evacuations, earthquakes, etc). I will present our latest collection of works representing the state of the art and will also inform the audience on the latest related thoughts and approaches in the field.

### ***Featured Note 2***

10:30 AM - 11:15 AM

#### **Seismic Risk Analysis of Highway Systems Using Loss Estimation Methodology with Geospatial Technologies**

*Dr. W. Phillip Yen*

*Seismic Research Program Manager*

*Federal Highway Administration (FHWA) - U.S. DOT*

Effects of earthquake damage to highway components (e.g., bridges, tunnels, roadways, etc.) can go well beyond life-safety risks and costs to repair the damaged components. Such damage can also disrupt traffic flows which, in turn, can impact the region's economic recovery and emergency response. These impacts will depend not only on the seismic performance of the components, but also on the characteristics of the overall highway system such as its network configuration and roadway-link characteristics (e.g., link locations, redundancies, and traffic capacities). Unfortunately, such traffic impacts are usually not considered in seismic risk reduction activities at state transportation departments. One reason for this has been the lack of a technically-sound and practical tool for estimating these impacts. Therefore, since the mid-1990s, the FHWA has sponsored multi-year seismic-research projects at MCEER that have included development and programming of such a tool with geospatial technologies. This has led to new software named REDARS (Risks from Earthquake DAmage to Roadway Systems) that was released for public use in March 2006.

REDARS is a multi-disciplinary tool for seismic risk analysis (SRA) of highway systems nationwide based on geospatial technologies. For any given earthquake, REDARS uses state-of-knowledge models to estimate: (a) the seismic hazards (ground motions, liquefaction, and surface fault rupture) throughout the system; (b) the resulting damage states (damage extent, type, and location) for each component in the system; and (c) how each component's damage will be repaired, including its repair costs, downtimes, and time-dependent traffic states (i.e., its ability to carry traffic as the repairs proceed over time after the earthquake). REDARS incorporates these traffic states into a highway-network link-node model, in order to form a set of system-states that reflect the extent and spatial distribution of roadway closures at various times after the earthquake. Then, REDARS applies network analysis procedures to each system-state, in order to estimate how these closures affect system-wide travel times and traffic flows. Finally, REDARS estimates corresponding economic losses and increases in travel times to/from key locations or along key lifeline routes. These steps can be applied for single earthquakes and no uncertainties (deterministic analysis) or for multiple earthquakes and simulations in which uncertainties in earthquake occurrence and in estimates of seismic hazards and component damage are considered (probabilistic analysis). This presentation will provide the overview of the FHWA seismic risk analysis program, REDARS.

### ***Keynote 4***

11:15 AM - 12:00 PM

#### **Consuming the Geospatial Substrate: The next generation of applications, analytics and tools**

*James Steiner*

*Senior Director in Oracles Server Technologies Division*

# Plenary Sessions

Barracat/Lalique Suite, Crystal Ballroom Level

As more and more organizations implement and embrace the geo-enabled enterprise, it has become possible not just to incorporate maps and geospatial analysis into applications, but to create a new class of solutions that implicitly and inherently rely on the geospatial substrate that is part of today's information systems. Critical applications -- business Intelligence and analytics, operational systems, web and cloud services are more targeted, more context-appropriate, and incorporate more relevant information because the data infrastructure increasingly understands and delivers location, sensor and tagged content from devices through standard interfaces. This presentation will describe how the base components of the IT infrastructure comprise a complete geospatial substrate and how applications, BI, analytic technologies and tools incorporate these capabilities and the new classes of applications that will soon be possible through the synthesis of 3D modeling, augmented reality, and operational data.

### *Short Biography*

James Steiner currently serves as Senior Director in Oracle's server technologies division. Since 1996, he has been responsible for Oracle's business management and product strategy for geospatial, location-services and rich media technologies including market development, product direction, and partner strategy and relationships. During his tenure, Oracle spatial technology became part of the core software development organization and was incorporated in every major technology Oracle offers. It has become the most widely adopted spatial database offering in the world according to repeated IDC studies. Over the past 10 years, the infrastructure-oriented geospatial approach championed by Mr. Steiner and his organization has transformed numerous aspects of the market, expanding the use and accessibility of open, location and geographic data to enterprise and operational systems.

Prior to entering the software industry, Mr. Steiner worked for Columbia Pictures International Corporation and 20th Century Fox. He is currently on the Board of Directors of the Southern New Hampshire Medical Center and Foundation Medical Partners and is a former Board member of the Greater Nashua Chamber of Commerce. He was graduated from Brown University.

**Wednesday, June 23 9:45 AM -12:00 PM**

Keynotes Chair:

Prof. Simon Y. Berkovich

*George Washington University*

### **Keynote 5**

9:45 AM - 10:30 AM

#### **Developing a National Lidar Dataset for Detailed Landscape Modeling**

*Gregory I Snyder*

*Manager, LIDAR Program Development, Land Remote Sensing Program, USGS*

There has never been a greater national need for consistent 3D models of the landscape to address pressing resource management, conservation, natural hazards and economic issues. The government is considering a program to enhance the quality, consistency and availability of 3D landscape information using lidar and related measurement technologies. This presentation will introduce lidar technology and outline the concept of a national program, including science and operational applications, benefits and the challenges of creating a national lidar data layer applicable to many government and other national business uses.

### **Keynote 6**

10:30 AM - 11:15 AM

#### **Applications for Cloud Computing**

*Mark Eisenberg*

*Microsoft Azure Solution*

With all of the hype around cloud computing it is reasonable for decision makers to ask "yes, but what is really good for?". This talk will establish a baseline for discussions around what cloud computing is, what it isn't and how it should be applied to real world applications. Successful deployments over the past year will be shared along with generic examples of applications that can definitely benefit from the cloud paradigm. Finally, a brief overview of Microsoft's cloud offerings with emphasis on the cloud development platform will be provided.

### **Featured Note 3**

11:15 AM - 12:00 PM

#### **Development of High Resolution Population and Social Dynamics Models and Databases**

*Dr. Budhendra Bhaduri*

*Leader in Geographic Information Science and Technology Group*

*Oak Ridge National Laboratory (ORNL)*

High resolution population distribution data is critical for successfully addressing critical issues ranging from energy and socio-environmental research to public health to homeland security. Commonly available population data from Census is constrained both in space and time and does not capture the population dynamics as functions of space and time. This imposes a significant negative consequence on the fidelity of event based simulation models with sensitive space-time resolution. Such limitations, to a large degree, can be overcome by developing population data with a finer resolution in both space and time at sub-Census levels. Geodemographic data at such scales will represent a more realistic non-uniform distribution of population. Using an innovative approach with Geographic Information System and Remote Sensing, Oak Ridge National Laboratory (ORNL) has made significant progress towards solving this problem. ORNL, as part of its LandScan global population project, has developed the finest resolution global and US population distribution models. This talk will describe ongoing development of the computational framework for spatial data

# Plenary Sessions

Barracat/Lalique Suite, Crystal Ballroom Level

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integration and modeling framework for LandScan. Discussions will cover development of algorithms to utilize population infrastructure datasets (such as residences, business locations, academic institutions, correctional facilities, and public offices) along with behavioral or activity-based mobility datasets for representing temporal dynamics of population. In addition, we will discuss development and integration of transportation, physical and behavioral science computational algorithms; the integration of these models that address different scales and different time frames; and the development of dynamic optimization routines to take advantage of real-time data from sensor networks.

# Full Paper Sessions

## ***Full Paper Session I***

**Monday, June 21 1:15 PM – 2:15 PM**

Barracat Suite, Crystal Ballroom Level

Session Chair:

*Michael Kallay, Microsoft Corporation*

### **Fast Forensic Video Event Retrieval Using Geospatial Computing**

*Hongli Deng, Mun Wai Lee, Asaad Hakeem, Omar Javed, Weihong Yin, Li Yu, Andrew Scanlon, Zeeshan Rasheed, and Niels Haering  
ObjectVideo, Inc.*

This paper presents a fast forensic video events analysis and retrieval system in a geospatial framework. Starting from tracking targets and analyzing video streams from distributed camera networks, the system generates video tracking metadata for each video, maps and fuses them in a uniform geospatial coordinate. The combined metadata is saved into spatial database where target trajectories are represented in geometry and geography data type. Powered by spatial functions of database, various video events such as crossing a line, entering an area, loitering and meeting, are detected by executing stored procedures that we have implemented. Geographic information system (GIS) data of Tiger- Line1 and GeoNames2 are integrated with this system to provide contextual information for more advanced forensic queries. A semantic data mining system is also attached to generate text descriptions of events and scene contextual information. The NASA World Wind3 is the geobrowser used to submit queries and visualize result. The main contribution of this system is that it initiates in running video event retrieval using geospatial computing techniques. This interdisciplinary combination makes this system scalable and manageable for large amount of video data from distributed cameras. It also makes the online video search possible by filtering tremendous amount of data efficiently using geospatial index techniques. From the application point of view, it extends the frontier of geospatial application by presenting a forward-looking application model.

**Keywords:** Video analysis, Video retrieval, Video event search, Spatial database, Video surveillance

### **Participatory Integration of Live Webcams into GIS**

*Austin Abrams, Nick Fridrich, Nathan Jacobs, and Robert Pless  
Washington University in St. Louis*

Global satellite imagery provides nearly ubiquitous views of the Earth's surface, and the tens of thousands of webcams provide live views from near Earth viewpoints. Combining these into a single application creates live views in the global context, where cars move through intersections, trees sway in the wind, and students walk across campus in realtime. This integration of the camera requires registration, which

takes time, effort, and expertise. Here we report on two participatory interfaces that simplify this registration by providing applications which allow anyone to use live webcam streams to create virtual overhead views or to map live texture onto 3D models. We highlight system design issues that affect the scalability of such a service, and offer a case study of how we overcame these in building a system which is publicly available and integrated with Google Maps and the Google Earth Plug-in. Imagery registered to features in GIS applications can be considered as richly geotagged, and we discuss opportunities for this rich geotagging.

**Keywords:** Camera calibration, Geospatial web services, Participatory GIS, Social computing, Voluntary geographic information, Web 2.0 & GIS, Webcams

### **Mobile Awareness and Participation in Community Oriented Activities**

*Craig H. Ganoë, Harold R. Robinson, Michael A. Horning, Xiaoyan Xie, and John M. Carroll  
Pennsylvania State University*

We describe the iterative design of a location-sensitive mobile application for community engagement and its use at two consecutive community-oriented "First Night" (New Year's Eve) events. Based on initial analysis of personal status posts, blog posts, and semi-structured interviews, we show that providing users with mobile tools relevant to time and locational contexts in their community can scaffold engagement within a community. In the second year of the study we draw from server log data after the event was promoted for public use. Enhancements to the design are discussed to further support civic participation in distributed community contexts, and design lessons are drawn.

**Keywords:** Civic engagement, Civic participation, Mobile blogging, Location sensitive applications

## ***Full Paper Session II***

**Monday, June 21 2:30 PM – 4:30 PM**

Barracat Suite, Crystal Ballroom Level

Session Chair:

*George Percivall, Open Geospatial Consortium, Inc.*

### **PerPos: A Platform Providing Cloud Services for Pervasive Positioning**

*Henrik Blunck, Mikkel B. Kjærgaard, Torben Godsk<sup>1</sup>, Jakob L. Jensen, Kaj Grønbaek, Tejs Scharling<sup>2</sup>, Kari R. Schougaard, and Thomas Toftkjær<sup>3</sup>  
Aarhus University, <sup>1</sup>DAAS, National Centre, <sup>2</sup>Alexandra Institute A/S, <sup>3</sup>Systematic A/S*

This paper describes the PerPos platform and the services it provides for positioning and location-based applications. The services provided range from specific utility services to full

# Full Paper Sessions

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applications that can be deployed in several ways, e.g. integrated in special purpose applications on mobile devices or as full applications running on ordinary Web-browsers. PerPos furthermore provides APIs for developing positioning utilities and location-based applications. An example of a utility service is a power reduction service for mobile devices, and an example of a SaaS application is a Webbased building model manager that allows users to manage building models stored in the PerPos cloud for annotation, logging, and navigation purposes. A core service in the PerPos platform is sensor fusion for positioning that makes it seamless and efficient to combine a rich set of position sensors to obtain more reliable position and movement data particularly in indoor environments. The PerPos platform and examples of its services are discussed together with the initial experiences with applying those services in application domains such as firefighting, tracking the behavior of livestock, and indoor navigation support.

Keywords: Cloud services, Pervasive positioning

## **Sensor Bus: An Intermediary Layer for Linking Geosensor Networks and the Sensor Web**

*Arne Broering<sup>1</sup>, Theodor Foerster<sup>2</sup>, Simon Jirka<sup>3</sup>, and Carsten Priess<sup>2</sup>*

<sup>1</sup>University of Twente Enschede Netherlands,

<sup>2</sup>University of Münster Germany, <sup>3</sup>52° North, Initiative for Geospatial OpenSource Software Germany

In recent years, the standards of OGC's Sensor Web Enablement (SWE) initiative have been applied in a multitude of projects to encapsulate heterogeneous geosensors for web-based discovery, tasking and access. Currently, SWE services and the different types of geosensors are integrated manually due to a conceptual gap between these two layers. Pair-wise adapters are created to connect an implementation of a particular SWE service with a particular type of geosensor. This approach is contrary to the aim of reaching interoperability and leads to an extensive integration effort in large scale systems with various types of geosensors and various SWE service implementations. To overcome this gap between geosensor networks and the Sensor Web, this work presents an intermediary layer for integrating these two distinct layers seamlessly. This intermediary layer is called the Sensor Bus as it is based on the message bus architecture pattern. It reduces the effort of connecting a sensor with the SWE services, since only the adaption to the Sensor Bus has to be created. The communication infrastructure which acts as the basis for the Sensor Bus is exchangeable. In this work, the Sensor Bus is based on Twitter. The involved SWE services as well as connected geosensors are represented as user profiles of the Twitter platform.

Keywords: Sensor web, Geosensor networks, SWE, Twitter

## **A Hybrid Approach to Segment-Type Coding of New York City Traffic Data**

*Jianting Zhang<sup>1</sup>, Simin You<sup>1</sup>, Li Chen<sup>1</sup>, and Cynthia Chen<sup>2</sup>*

<sup>1</sup>City University of New York, University of Washington Seattle<sup>2</sup>

Many types of traffic data are often recorded as (Main street, From street, To street) triples. All the segments between the intersection pairs of (Main street,From street) and (Main street,To street) need to be geocoded, with additional directional constraints. We term this new type of geocoding task as segment-type geocoding in contrast with classic geocoding that takes a street address or intersection and converts the address to a pair of coordinates. Most of the existing geocoding software does not have the capability to handle such segment-type geocoding. This motivates us to develop algorithms and programs for the new type of geocoding in the context of the Effectiveness of Traffic Calming study sponsored by the New York City Department of Transportation (NYCDOT). Due to the level of complexity of the New York City street network, we have adopted a hybrid approach. The hybrid approach includes several algorithms to automatically geocode well-formed traffic records and a software tool built on top of ESRI ArcMap to facilitate manual geocoding of ill-formed traffic records. The hybrid approach has achieved desired accuracies with reasonable manual involvements. We believe the approach is applicable to similar projects that involve segment-type geocoding tasks.

Keywords: Geocoding, Street segments, Traffic data, NYC

## **Using Geographic Information Systems for Enhanced Network Security Visualization**

*David Shelly, Matthew Dunlop, Randy Marchany, and Peter Sforza*

*Virginia Polytechnic Institute and State University*

The sheer volume of information that floods a network makes it difficult for network analysts to identify and isolate network security threats. This difficulty is compounded by the fact that the tools available to accomplish this task lack usability and are primarily text-based. Our goal is to design a network security visualization tool that leverages geographic information system (GIS) technology. This tool will provide enhanced usability and meet the needs of the network security community. In this paper, we present the results of a survey designed to gather current security analysis methodologies, as well as determine the existing gaps. We design a GIS-based security visualization prototype from this input.

Keywords: Security, Design, Human Factors, Management

## **Synthesizing High Fidelity 3D Landscapes from GIS Data**

*Pedro Maroun Eid and Sudhir Mudur*  
*Concordia University*

Military, simulation and gaming applications are increasingly using digitally synthesized visuals of real world landscapes. Such applications require high fidelity digital 3D representations of landscapes to be generated in low turn-around time after acquiring the necessary initial data.

# Full Paper Sessions

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Geospatial or GIS databases, which are a primary resource for the initial data include three main components, namely, elevation data, imagery and feature data. While, the first two are easily available, feature data (also known as vector data) and sometimes the associated 3D models are not. This paper presents the progress achieved in developing a semantics driven system that addresses the problem of generating high fidelity 3D landscapes. For instance, given initial geographical source data layers consisting of elevations, road surface features and imagery, many techniques would only render road texture over steep terrain. Whereas, a human would immediately distinguish this as improbable by collectively looking at the data layers and note a missing element, an overpass or tunnel. Our system uses deductive reasoning, through Description Logic reasoners, in conjunction with specialized per-element spatial tests and applies it to the GIS data to extract, identify and classify individual spatial elements along with values for their properties needed for 3D rendering. Semantic Web technology inherently supports the analysis on collective data by separating formal knowledge definition from actual data and abstracting actual instance data handling.

**Keywords:** 3D GIS detail, Landscape visualization, Semantic web, Automated reasoning

## Normative Reasoning with Geo Information

*Radboud Winkels<sup>1</sup>, Rinke Hoekstra<sup>2</sup>, and Erik Hupkes<sup>1</sup>*  
<sup>1</sup>Universiteit van Amsterdam, <sup>2</sup>Vrije Universiteit Amsterdam

Land use regulations are an important but often underrated legal domain. In densely populated regions such as the Netherlands, spatial plans have a profound impact on both (local) governments and citizens. This paper describes our work on improving access to legislation with a spatial extension. Using Semantic Web technology we combine distributed geospatial data, textual data and controlled vocabularies to support users in answering questions such as "What activity is allowed here?". Spatial norms are represented using OWL 2 in a way that enables intuitive visualization of their effects: map based legal case assessment. Users can represent a (simple) case by selecting or drawing an area on the map. Given a designation for that area, the system can assess whether this is allowed or not. The same solution also enables the comparison of two or more sets of spatial norms that govern the same region.

**Keywords:** ontology, OWL, SKOS, Semantic web, Spatial planning, Legal assessment, Law, Google maps, Legal atlas, Norm, Reasoning

## Full Paper Session III

Tuesday, June 22 8:30 AM - 9:30 AM

Waterford Suite, Crystal Ballroom Level

Session Chair:

*Dr. Thomas Moelhave, Duke University*

## Reverse Ranking Query over Imprecise Spatial Data

*Ken C. K. Lee<sup>1</sup>, Mao Ye<sup>2</sup>, and Wang-Chien Lee<sup>2</sup>*

<sup>1</sup>University of Massachusetts Dartmouth, <sup>2</sup>Pennsylvania State University

The reverse rank of a (data) object  $o$  with respect to a given query object  $q$  (that measures the relative nearness of  $q$  to  $o$ ) is said to be  $k$  when  $q$  is the  $k$ -th nearest neighbor of  $o$  in a geographical space. Based on the notion of reverse ranks, a Reverse Ranking (RR) query determines  $t$  objects with the smallest  $k$ 's with respect to a given query object  $q$ . In many situations that locations of objects and a query object can be imprecise, objects would receive multiple possible  $k$ 's. In this paper, we propose a notion of expected reverse ranks and evaluation of RR queries over imprecise data based on expected reverse ranks.

**Keywords:** Reverse Ranking (RR) queries, Imprecise spatial data, Algorithms

## Failed-Tuple Triggered Blocking Strategy for Managing Near Real-Time Spatial Data Replication

*Kalyan K. Janakiraman<sup>1</sup>, Lars Hansen<sup>2</sup>, and Mehmet A Orgun<sup>1</sup>*

<sup>1</sup>NSW Department of Lands, <sup>2</sup>Macquarie University

Federal, state and local government agencies develop, exchange and maintain geospatial information for the purpose of land-related legislation and administration. Geospatial information change continually and geospatial datasets become outdated and hence unsuitable for decision support because of inadequate quality of data, and are costly to maintain. There is a growing demand for accurate and consistent geospatial information in critical sectors such as emergency response. Examples of such geospatial information include the address locations, cadaster (land titles/lots), Environmental Planning Instruments (EPI), and roads and administrative boundaries. Often geospatial data are not synchronized within an agency or across agencies, leading to inaccurate data in repositories and infrequent updates (if at all). Vendor software, such as ArcGIS provides a basic replication solution. However such solutions are vendor environment dependent. Furthermore, real world spatial enterprises have many complexities that lead to replication interruption leaving replicated databases in spatially inconsistent states. In this paper we use a near real-time event driven asynchronous replication mechanism for selective heterogeneous geospatial data based on a mediation framework. Within this framework, we have introduced a failed-tuple blocking strategy that overcomes some of the limitations faced in the real-time operation of the framework. The proposed method was applied to synchronizing cadastral geospatial information across multiple repositories, including a repository that stores data spatio-temporally. The repositories are used in near real-time Internet and other mapping applications. The result of this application is briefly discussed.

# Full Paper Sessions

**Keywords:** Near real-time geospatial database replication management, Spatial integrity management

## **Dynamic Tiled Map Services: Supporting Query-Based Visualization of Large-Scale Raster Geospatial Data**

*Jianting Zhang and Simin You*

*City College of New York*

Query based visual explorations of raster geospatial data plays an important role in stimulating scientific hypothesis and subsequently seeking casual relationships. While it is desirable to enable visual explorations of large-scale raster geospatial data in a Web environment, improving the end-to-end performance between query backend and the client applications remains a challenging technical issue. Techniques for providing tiled map services that are adopted by major commercial Internet maps APIs have been successful in handling static geospatial data. Motivated by the practical needs of supporting query-based visual explorations in a Web environment, we have proposed a dynamic tiled map services approach that integrates and extends existing Web-based standards and best practices in serving tiled images for static raster geospatial data. The approach includes quadtree-based indexing and query processing at the server side and a middleware to efficiently convert quadrants of dynamic query results into tiled images. A prototype system has been developed to demonstrate the feasibility of the proposed approach. Experimental results have showed that the prototype system achieves an end-to-end performance in the order of sub-second for 1024\*1024 pixels display area consisting of multiple tiles.

**Keywords:** Geospatial data, Visual exploration, Tiled map, Web services

## **Full Paper Session IV**

**Tuesday, June 22 1:15 PM - 2:15 PM**

**Barracat Suite, Crystal Ballroom Level**

Session Chair:

*Prof. Daniel Aliaga, Purdue University*

## **Scalable Algorithms for Large High-Resolution Terrain Data**

*Thomas Molhave<sup>1</sup>, Pankaj K. Agarwal<sup>1</sup>, Lars Arge<sup>2</sup>, and Morten Revsbæk<sup>2</sup>*

*Duke University<sup>1</sup>, Aarhus University<sup>2</sup>*

In this paper we demonstrate that the technology required to perform typical GIS computations on very large high-resolution terrain models has matured enough to be ready for use by practitioners. We also demonstrate the impact that high-resolution data has on common problems. To our knowledge, some of the computations we present have never before been carried out by standard desktop computers on data sets of comparable size.

**Keywords:** Scalable algorithms, Large high-resolution terrain data

## **Georeference, Rainfall-Runoff Modeling and 3D Dynamic Simulation: Physical Influence, Integration and Approaches**

*M. Y Izham<sup>1</sup>, U Md.Uznir<sup>2</sup>, A. R Alias<sup>2</sup>, and K Ayob<sup>2</sup>*

*<sup>1</sup>Universiti Sains Malaysia, <sup>2</sup>Universiti Teknologi Malaysia*

Current 2D-GIS based rainfall-runoff modeling provides very little evidence regarding the influence of georeference and its transformation while modeling flow direction and runoff volume. Within GIS, all stream networks, surface structures and its properties must be assigned and preserved within appropriate projection plane characteristics. In addition, the inability of GIS to realistically explore the momentum and continuity aspects of overland flow and runoff process has been proven to be the shortcomings of the system. Inclusion of volumetric soft geo-objects (VSG) would offer substantial effort towards representing 3D dynamic stormwater flow that hits the flood-plain areas, estimating infiltrated and saturated stormwater to reduce flash flood and preventing landslide disaster realistically. This study aims to visualize the influence of georeference towards determining areas prone to runoff and its volume using 3D VSG data model for empirical based Soil Conservation Service – Curve Number (SCS-CN) method. Runoff and overland flow generated from these methods are analyzed by focusing on spatial object preservation techniques of currently implementing conformal based Malaysian Rectified Skew Orthomorphic (MRSO) and equidistant based Cassini-Soldner projection. Land use of Industrial, Infrastructure and Grass / Pasture distributes high differential computation of surface runoff volume with 10.86 percent, 16.98 percent and 13.48 percent respectively due to different projection plane.

**Keywords:** 3D Simulation, Dynamic, GIS, Map projection, SCS-CN and visualization.

## **Analyzing Change in Spatial Data by Utilizing Polygon Model**

*Vadeerat Rinsurongkawong, Chun Sheng Chen, Christoph F. Eick, and Michael D. Twa*  
*University of Houston*

Analyzing change in spatial data is critical for many applications including developing early warning systems that monitor environmental conditions, epidemiology, crime monitoring, and automatic surveillance. In this paper, we present a framework for the detection and analysis of patterns of change; the framework analyzes change by comparing sets of polygons. A contour clustering algorithm is utilized to obtain polygon models from spatial datasets. A set of change predicates is introduced to analyze changes between different models which capture various types of changes, such as novel concepts, concept drift, and concept disappearance. We evaluate our framework in case studies

# Full Paper Sessions

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that center on ozone pollution monitoring, and on diagnosing glaucoma from visual field analysis.

**Keywords:** Change analysis, Polygon models, Density-based clustering, Concept drift, Novelty detection, Spatial data mining.

## ***Full Paper Session V***

**Wednesday, June 23 8:30AM - 9:30 AM**

**Waterford Suite, Crystal Ballroom Level**

Session Chair:

*Prof. Ge Jin, Purdue University Calumet*

### **A New Multi-Core Pipelined Architecture for Executing Sequential Programs for Parallel Geospatial Computing**

*D. Liao and S. Y. Berkovich*

*George Washington University*

Parallel programming on multi-core processors has become the industry's biggest software challenge. This paper proposes a novel parallel architecture for executing sequential programs using multicore pipelining based on program slicing by a new memory/cache dynamic management technology. The new architecture is very suitable for processing large geospatial data in parallel without parallel programming. This paper presents a new architecture for parallel computation that addresses the problem of needing to relocate data from one memory hierarchy to another in a multi-core environment. A new memory management technology inserts a layer of abstraction between the processor and the memory hierarchy, allowing the data to stay in one place while the processor effectively migrates as tasks change. The new architecture can make full use of the pipeline and automatically partition data then schedule them onto multi-cores through the pipeline. The most important advantage of this architecture is that most existing sequential programs can be directly used with nearly no change, unlike conventional parallel programming which has to take into account scheduling, load balancing, and data distribution. The new parallel architecture can also be successfully applied to other multi-core/many-core architectures or heterogeneous systems. In this paper, the design of the new multi-core architecture is described in detail. The time complexity and performance analysis are discussed in depth. The experimental results and performance comparison with existing multi-core architectures demonstrate the effectiveness, flexibility, and diversity of the new architecture, in particular, for large geospatial data parallel processing with the examples of Digital Elevation Model (DEM) generation from Light Detection And Ranging (LIDAR) dataset.

**Keywords:** Multi-core architecture, Pipelining, Sequential program, Parallel computing, Geospatial data, LIDAR, DEM

### **Collecting and Visualizing Wireless Geosensor Data Using Mobile Device**

*Kirsti Säaskilähti, Riitta Kangaskorte, Mika Luimula, and Juha Yli-Hemminki*

*RFMedia Laboratory*

Monitoring the state of the environment has traditionally based on remote monitoring systems maintained by official organizations and institutions. A development of mobile and ubiquitous computing opens new possibilities to collect geosensor data directly from user's environment as in situ measurements. In the current paper, we describe a geosensor network (GSN) solution between mobile devices and wireless geosensor nodes based on usability criteria. The results showed that it is possible to create in situ measurements which are reliable and robust enough even in extreme conditions such as low temperatures with ice and snow. Users experienced that the developed GSN solution was easy to use and the visualization of the collected data on the small screen of mobile device was evaluated as a level of satisfactory. The amount and speed of feedback about user's actions was found important in this data gathering system. In addition, the overall usability of the system correlated with system feedback. As a result, we suggest that this solution is usable and robust even in extreme winter conditions. The challenge is still in energy consumption which was not in the centre of this research.

**Keywords:** Environmental monitoring, Wireless sensor networks, Visualization, Mobile devices, Experimental evaluation

### **A Pseudo-Physical Approach Toward Real Time Automated Cartographic Generalization**

*Jacqueleen Joubran Abu Daoud, and Yerach Doytsher Technion I.I.T.*

In this paper a new pseudo-physical model for urban maps generalization is presented. The aim of this model is to provide specific views of maps in different scales, while responding to the needs of different users with their different interests to viewing the geospatial information. The paper presents the developed method followed by graphical results of real data.

**Keywords:** Automated generalization, Real time, GIS, Modeling, Neural network

### **Demo Talks:**

#### **CityMaker Product Introduction**

*Chi Wei*

*Chairman, GviTech*

#### **ESRI – The New ArcGIS 10 System Transforms the Way You Use GIS**

*Jon Nystrom and Bonnie Stayer*

*ESRI*

# Short Paper Sessions

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## **Short Paper Session I**

*Monday, June 21 8:30 AM - 9:30 AM*

Waterford Suite, Crystal Ballroom Level

Session Chair:

*Dr. Cynthia Kuo, Nokia Research Center*

### **ArchaeoGIS: Using Geographic Information Systems to Support Archaeological Research**

*José Ferrandis Montesinos<sup>1</sup>, Carlos Lamas López<sup>2</sup>, and Francisco M. Rangel Pardo<sup>3</sup>*

*<sup>1</sup>Forum UNESCO-UPV, <sup>2</sup>T-Systems Iberia, <sup>3</sup>Corex Soluciones Informáticas*

The archaeological study of the evolution of a city throughout history, due to the accumulation of cultural layers, is particularly complex because the archaeological site is presented with an overlay of traces that do not make feasible a single reading of it. This paper describes a geographical information system architecture to support archaeological research, where we use this type of systems to catalogue, to inventory and to allow navigation between these cultural strata in a simple, visual and organized way, and allowing spatial intersection of information to open new possibilities to archaeological research.

Keywords: Geographic Information Systems (GIS), Archaeology, Archaeological research

### **Open Solutions to Regional Observing System**

*Jeremy Cothran*

*Southeast Coastal Ocean Observing Regional Association (SECOORA)*

Recent near real-time in-situ observations are aggregated to a 'Xenia' schema relational database (RDB) via its import XML format 'ObsKML' schema or direct SQL. From this database of recent observations a variety of file formats, web services and applications can be driven. By suggesting a minimally common observation oriented XML and RDB schema, developed scripts and products can benefit from and build around these shared schema. This server production environment has also been virtualized and is openly available for testing or use as a VMware or Amazon Web Services(EC2) server image.

Keywords: Databases, Postgresql, KML, Virtualization, Geospatial, Observing systems, Open-source, OGC, Web services

### **GeoBrowser Deployment in the USDA Forest Service: A Case Study**

*Charlie Schrader-Patton<sup>1</sup>, Alan Ager<sup>2</sup>, and Alan Ager<sup>3</sup>*

*<sup>1</sup>USDA Forest Service Remote Sensing Applications Center, <sup>2</sup>USDA Forest Service Western Wildland Environmental Threat Center, <sup>3</sup>Kingbird Software, LLC*

Web mapping technology has revolutionized the way we distribute and interact with geospatial information. With minimal software and a PC, users can now dynamically interact with map displays and discover relationships in map data that previously required expensive software and expertise. Land management agencies produce many geospatial datasets in the course of their activities and research. Web-based GeoBrowsers are an effective way to expose these datasets. In this paper we describe our efforts to meet a mission goal of the USDA Forest Service Western Wildland Environmental Threat Center (WWETAC) by creating a system where users can explore multiple threats (insects and disease, fire hazard, etc) in a dynamic map display. Users can access this system from the WWETAC web site which is here: [www.fs.fed.us\wwetac](http://www.fs.fed.us\wwetac).

Keywords: USDA Forest Service, GeoBrowser, Environmental Threat Assessment Center, ArcGIS Server, Web map, GeoServer, WMS

### **A New Paradigm for Integrated Environmental Monitoring**

*Kevin Montgomery<sup>1</sup>, Carsten Mundt<sup>2</sup>*

*<sup>1</sup>Stanford University, <sup>2</sup>Intelesense Technologies*

The vision of an integrated Earth observation system to help protect and sustain the planet and its inhabitants is significant and timely, and thus has been identified recently by many organizations. Clearly, the societal benefits of global integrated monitoring are many: to understand how environment and humans are linked, to protect and monitor resources (water supply, weather, oceans) and predict and adapt to their change, to provide for sustainable development, and to reduce costs/impacts of disasters and provide for an effective and intelligent response. The requirements of such a system are that it be able to collect observations (remote sensing/satellite data and in-situ sensors), manage data<sup>1,3</sup> (archive, model), interface with users (user- and context-specific display), and that it enhance human capacity by providing for research/training, collaboration and ultimately decision support. Further, in order to be effective, it must also be easily usable by a wide cross section of users, provide for advanced analysis and visualization with interaction and collaboration tools over the Internet; be open source, protocol, and information; and future-proof, modular and extendable as new needs and technologies arise. Intelesense Technologies was spun off from Stanford University to provide worldwide integrated monitoring of the environment and its' inhabitants, to understand their interrelationships and improve our ability to protect the planet and its people. A global network of wireless sensor devices transmit their data to gridbased computing servers where they are integrated with hundreds of thousands of other data sources to help to better understand their interrelationships. This data, along with thousands of sources from NASA, USGS, Google, and others are provided within a federated, open system of systems, with a collaborative, worldwide GIS portal to provide interactive exploration of the world and its data. The goal is

# Short Paper Sessions

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to collaborate across government, academia, and with industrial partners to empower the researcher, scientist, and policymaker with data, analysis, and information leading to a better understanding.

**Keywords:** Sensors, Environmental Monitoring, Data Integration, Modeling and simulation, Cloud Computing, Visualization

## **Short Paper Session II**

**Monday, June 21 2:30 PM - 4:30 PM**

**Lalique Suite, Crystal Ballroom Level**

Session Chair:

*Dr. Ray Renner, Northrop Grumman*

### **Conversion of Cadastral Data to KML File Type for Use in Google Earth and Google Maps for Mobile as a Land Information System**

*Stacey D. Lyle<sup>1</sup> and Nathan Eby<sup>2</sup>*

<sup>1</sup>Texas A& M University Corpus Christi, <sup>2</sup>Utech

Real-time geographic information systems (GIS) mapping is possible with online suppliers for application in surveying and mapping projects. Keyhole Markup Language (KML) is the format used to display geospatial points in Google Earth, Google Maps, and Google Maps for Mobile. Some tags are optional for programming with KML. Because this is a markup language, key words or tags are used to generate geographic features and map elements. In each element, the tags must be in a specific order within the KML. When Google Maps is generating a map within the KML the features and elements are drawn within a linear progression through the coded file. Utilization of this KML data for real-time mapping activities on land surveying and engineering projects is investigated in this research. This research will show how producing database files in the office or field and making the data available to users in real-time.

**Keywords:** Keyhole Markup Language (KML), Geographic Information System (GIS), Global Positioning Systems (GPS), Surveying

### **Towards Designing Better Map Interfaces for the Mobile: Experiences From Example**

*Vidya Setlur, Cynthia Kuo, and Peter Mikelsons*

*Nokia Research Center*

Creating user friendly map interfaces for the mobile platform presents several challenges that are uniquely different from those of their desktop counterparts. High resolution, photo realistic maps can now be displayed on mobile phones. While these graphics are visually pleasing, they do impact the user's cognitive load. Further, small displays and limited interaction capabilities often make mobile map-based systems difficult to design and frustrating to use. In this paper, we discuss lessons learnt from designing and implementing mobile map interfaces through two examples: tourist maps and traffic

maps. In particular, we discuss the rendering, user interaction, and system adaptations required for these mobile map interfaces.

**Keywords:** Maps, Mobile, Design, Interaction, Optimization

### **A Simple Framework to Generate Parallel Application for Geospatial Processing**

*Hélène Coullon, Sébastien Limet, and Emmanuel Melin*

*Université d'Orléans Rue Léonard de Vinci, B.P. France*

GIS processing of large sets of geo-referenced tiles is usually very time-consuming for users. These computations rarely take benefits of PC clusters or Grid computing and are too often run onto simple desktop PC. This is mainly due to the difficulty of parallel programming. In this paper we propose an easy way to greatly accelerate this process for the class of GIS computations which involve local data accesses. For the moment, our framework deals with non-communicating parallel processes.

**Keywords:** Parallel computation, Cluster, GIS

### **GIRPharma: A Geographic Information Retrieval Approach to Locate Pharmacies On Duty**

*Francisco Manuel Rangel Pardo<sup>1</sup>, María Dolores Rangel Pardo<sup>1</sup>, Davide Buscaldi<sup>2</sup>, and Paolo Rosso<sup>2</sup>*

<sup>1</sup>Corex Soluciones Informáticas Grupo Fivasa / TIC Sinergies Spain, <sup>2</sup>ELiRF Research Group

This paper describes an approximation based on geographic information retrieval with the purpose to give some solutions to the problem of searching pharmacies on duty in the Spanish territory. It is a novel investigation, which requires collaboration between multidisciplinary teams and that is beginning to show the first progress.

**Keywords:** Geographic Information Retrieval (GIR), Geographic Information Systems (GIS), Toponym disambiguation

### **GIS in the Cloud: Implementing a Web Map Service on Google App Engine**

*J. D. Blower*

*University of Reading, United Kingdom*

Many producers of geographic information are now disseminating their data using open web service protocols, notably those published by the Open Geospatial Consortium. There are many challenges inherent in running robust and reliable services at reasonable cost. Cloud computing provides a new kind of scalable infrastructure that could address many of these challenges. In this study we implement a Web Map Service for raster imagery within the Google App Engine environment. We discuss the challenges of developing GIS applications within this framework and the performance characteristics of the implementation. Results show that the application scales well to multiple simultaneous users and performance will be adequate for many applications, although concerns remain over issues such as latency spikes.

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We discuss the feasibility of implementing services within the free usage quotas of Google App Engine and the possibility of extending the approaches in this paper to other GIS applications.

**Keywords:** Geographic Information Systems (GIS), Open Geospatial Consortium (OGC), Service-Oriented Architecture (SOA), Web /Map Service (WMS), Raster, Cloud computing, Scalability

## **Up in the air: Adventures in Serving Geospatial Data Using Open Source Software and the Cloud**

*Ken Bunzel<sup>1</sup>, Alan Ager<sup>2</sup>, and Charlie Schrader-Patton<sup>2</sup>  
<sup>1</sup>Kingbird Software, LLC, <sup>2</sup>USDA Forest Service*

In recent years GIS and web technologies have advanced to allow the sharing of geospatial data on the web. Land management agencies sometimes have a need to simply post GIS datasets on the web and don't always require advanced GIS modeling capabilities on the server. There are many products available to serve geospatial datasets on the web, but many of these have a complicated setup, costly license fees, and provide more capabilities than are needed in some use cases. There is also a need to simplify web server setup. In this paper we describe an inexpensive and simple solution for agencies to post and share GIS data on the web using open source map servers and open source GIS clients deployed on a virtual cloud server.

**Keywords:** GIS, Geospatial, Land management, Western Wildland Environmental Threat Assessment, GeoServer, MapServer, OpenLayers, GeoExt, Ext JS, WMS, Amazon Web Services, Cloud Computing, Virtual Server, EC2

## **Modeling the Severe Acute Respiratory Syndrome (SARS) Outbreak in Beijing – An Agent-based Approach**

*Yuxia Huang*

*Texas A&M University – Corpus Christi*

The spread of Severe Acute Respiratory Syndrome (SARS) is an intrinsic spatial and temporal process. This paper reports the use of an agent-based approach to model the spread of SARS in Beijing and to examine the effectiveness of intervention strategies. A case study of simulation of SARS epidemic in Beijing, China in 2003 has been conducted by tracing close contacts of cases. Based on comparison of the simulation results with the actual cases, it was found that the agent-based approach can capture the SARS transmission from individual to individual and can demonstrate the public-health efforts in the control of SARS.

**Keywords:** SARS, Agent-based model, Spatial-temporal simulation

## **Internet Map Services: New Portal for Global Ecological Monitoring, or Geodata Junkyard?**

*Alan Ager<sup>1</sup>, Charlie Schrader-Patton<sup>1</sup>, Ken Bunzel<sup>2</sup>, and Brett Colombe<sup>3</sup>*

<sup>1</sup>USDA Forest Service, <sup>2</sup>Kingbird Software, LLC, <sup>3</sup>Microlimages

Systematic data mining of geospatial and other data available on the internet may provide a novel means for early detection and assessment of ecosystem change and impending natural disturbances. Exploring the possibilities and limitations of systematic geodata mining of the internet has just begun. Webcrawlers to locate, assess, and connect to these data are beginning to appear within experimental domains. In this project, we built a geodata webcrawler and post processor and then integrated it within a virtual earth viewer and a web interface to assess current data availability for several key topic areas for wildland ecological assessments. The work is part of a larger project at the Western Wildland Environmental Threat Assessment Center to build an early warning and monitoring system for specific wildland threats to human and ecological values.

**Keywords:** Forest Service, Geodata Webcrawler, ArcGIS Server, Web mapping service, WMS, WFS, OGC

## **Short Paper Session III**

**Tuesday, June 22 1:15 PM - 2:15 PM**

Lalique Suite, Crystal Ballroom Level

Session Chair:

*Prof. Ge Jin, Purdue University Calumet*

## **P-DBSCAN: A Density Based Clustering Algorithm for Exploration and Analysis of Attractive Areas Using Collections of Geo-Tagged Photos**

*Slava Kisilevich, Florian Mansmann, and Daniel Keim  
University of Konstanz*

The rapid spread of location-based devices and cheap storage mechanisms, as well as fast development of Internet technology, allowed collection and distribution of huge amounts of user-generated data, such as people's movement or geo-tagged photos. These types of data produce new challenges for research in different application domains. In many cases, new algorithms should be devised to better portray the phenomena under investigation. In this paper, we present P-DBSCAN, a new density-based clustering algorithm based on DBSCAN for analysis of places and events using a collection of geo-tagged photos. We thereby introduce two new concepts: (1) density threshold, which is defined according to the number of people in the neighborhood, and (2) adaptive density, which is used for fast convergence towards high density regions. Our approach is demonstrated on the area of Washington, D.C.

**Keywords:** Density based clustering, Geo-tagged photos, Attractive places

## **Discovering Spatio-Social Motifs of Electoral Support Using Discriminative Pattern Mining**

*Tomasz F. Stepinski<sup>1</sup>, Josue Salazary<sup>1</sup>, and Wei Ding<sup>2</sup>*

# Short Paper Sessions

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<sup>1</sup>Lunar and Planetary Institute, <sup>2</sup>University of Massachusetts Boston

Association analysis provides a natural, data-centric framework for the discovery of patterns of explanatory variables that are linked to a certain outcome. In this paper we demonstrate how such a framework can be applied for political analysis, using an expository example of discovering different spatio-social motifs of support for Barack Obama in the 2008 presidential election. Election results and thirteen different socio-economic explanatory variables, tabulated at the county level, are used as an input for calculating a collection of discriminative patterns having disproportionately large support within the counties won by Obama. These patterns are synthesized into a small number of larger socio-economics motifs using a novel pattern similarity measure that outputs a concise summary readily interpretable in terms of political analysis. The method discovers two major Obama constituencies that differ in their socio-economic makeup and in their geographical distributions. The larger constituency can be further divided into more narrowly defined motifs.

Keywords: Discriminative pattern mining, Political analysis, Summarization, Visualization

## **Sensing the Schoolyard: Using Senses and Sensors to Assess Georeferenced Environmental Dimensions**

*Maria João Silva<sup>1</sup>, João Correia Lopes<sup>2</sup>, Pedro Moreira Silva<sup>2</sup>, Maria José Marcelino<sup>3</sup>*

<sup>1</sup>Instituto Politécnico do Porto, <sup>2</sup>Universidade do Porto, <sup>3</sup>Universidade de Coimbra, Portugal

This paper presents the UseSense2Learn platform, a platform designed and implemented to enable children and teachers to use georeferenced multisensory information together with information acquired by sensors. UseSense2Learn places the creation of content in the hands of children. While using UseSense2Learn, mobile sensors can be held across the exploration area and provide georeferenced environmental information such as air temperature and humidity. Using multimedia (video, image, sound and text) teachers and children can bring the outside world into their classroom and share it with other classrooms across the globe. Having the limited schools' budgets in mind, content creation can be made anywhere without communication costs. Internet connection is only required, together with Google Earth, for visualization. The UseSense2Learn platform was successfully used in a curricular context, engaging children and teachers in meaningful environmental education activities.

Keywords: Multisensory georeferenced information; mobile learning

## **Geospatial Data and Server on USB**

*Stacey D. Lyle<sup>1</sup>, Richard Smith<sup>1</sup>, and Cynthia M. Lyle<sup>2</sup>*

<sup>1</sup>Texas A& M University Corpus Christi, <sup>2</sup>GRID

Individuals along the Gulf of Mexico search for information to make decisions during hurricane preparation or evacuations.

Some data that is necessary for decision making is static in content, but must be harvested from the web. If a web connection is not available, then the individual is unable to acquire key information such as evacuation routes, contact numbers, home preparedness, and other decision driven information. The geographic extent of such information often spans from a regional to state area. A "Portable Gulf of Mexico Geospatial Data Solution" was developed for NASA John C. Stennis Space Center (NASA SSC) which provided static maps, contact information, and hurricane preparedness plans. This portable system was designed to be produced on 500 USB drives and distributed to the employees of NASA SSC. Results will show the methods of data sharing and the ontologies of the user's interaction with Gulf of Mexico through the portable solution and the online solution at <http://www.gulfstorm.org>.

Keywords: Keyhole Markup Language (KML), Geographic Information Systems (GIS), Global Positioning Systems (GPS), Surveying

## **Disaster Assessment with Parallel Image Processing for GIS Based Local Area Disaster Decision Support System**

*Barbara Nicolai, Ge Jin, Keyuan Jiang, Charles Winer  
Purdue University Calumet*

Natural disasters, such as hurricanes, tsunamis and earthquakes cause huge loss of life, enormous amounts of property damage, and lengthy recovery times. Although it is impossible to avoid the costs of disasters, human sufferings can be minimized through effective disaster management and decision support system that can facilitate and expedite the resource distribution process more efficiently and effectively. This paper is to present the design of GIS based disaster data management, visualization and decision support system for North West Indiana region utilizing grid computing and visualization resources at Purdue University Calumet (PUC). One of the key factors in the disaster management system is to provide damage assessment maps in timely manner. We propose a parallel image processing algorithm utilizing computational grid to compute the disaster damage assessment map from pre- and post- disaster satellite images. Disaster decision support system will compute the effective resource distribution strategy and prioritize the rescue areas by utilizing disaster specific geospatial information system. This research will lay a foundation for disaster preparedness, management and decision support system at local government agency level.

Keywords: Disaster Management and Communication, GIS, Grid Computing, Visualization

# Tech Talk/Demo Talk Sessions

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## *Session I*

*Monday, June 21 1:15 PM - 2:15 PM*

Lalique Suite, Crystal Ballroom Level

Session Chair:

*Dr. Kevin Montgomery, Stanford University*

### **Tech Talks:**

#### **High Performance Mobile 3D GIS- IVJ/WorldWind-Java on Android**

*Kevin Montgomery<sup>1</sup>, Carsten Mundt<sup>2</sup>*

*<sup>1</sup>Stanford University, <sup>2</sup>Intelesense Technologies*

This presentation demonstrates an early prototype of a novel technical approach to the display of real-time 3D interactive GIS visualization on mobile devices. The system provides a fully functional version of InteleView (which is built on the NASA WorldWind-Java platform), including access to all 315,000 layers of satellite and aerial imagery, GIS data, live sensor data, and other information from an Android mobile device, running over 3G cellular or WiFi networks with fully interactive, highperformance 3-D graphical response. This will be the first presentation of the research prototype system at a conference and will demonstrate that 3-D, interactive GIS visualization is real, practical, attainable, and soon available.

#### **Computer Vision for Geo-Location, Awareness & Detail**

*John Zelek, Ehsan Fazl, Daniel Asmar, Adel Fakih  
University of Waterloo*

Computer vision (i.e., image understanding) involves understanding the 3D scene creating the image. Computer vision is challenging because it is the computer that decides how to act based on an understanding of the image. Key image understanding tasks include depth computation, as well as object detection, localization, recognition and tracking. Techniques up to now have not been able to perform any of these tasks robustly with the precision and accuracy demanded by many real-world applications. Additional complications include operational and environmental factors. For humans, visual recognition is fast and accurate, yet robust against occlusion, clutter, viewpoint variations, and changes in lighting conditions. Moreover, learning new categories requires minimal supervision and a very small set of exemplars. Achieving this level of performance in a wearable portable system would enable a great number of useful applications especially for enhancing mobile cell phone and camera operation. We demonstrate some of the computer vision techniques that we have developed and tested in real environments for applications in the field of automotive navigation, personal navigation, assistive devices and augmented reality. Some of the techniques include object detection and recognition, depth from motion, context recognition and the general task of mapping and localization. Our object detection techniques have shown to have performance close to 100%. We have actually shown that we can triangulate based on objects in the environment using

only a camera; which can aid when GPS drops out such as in urban canyons and indoor environments. We argue that all of this potential can be packaged within a smart phone like an iphone.

#### **Access Control Systems for Spatial Data Infrastructures and their Administration**

*Jan Herrmann*

*Technische Universität München*

Today sophisticated concepts, languages and frameworks exist, that allow implementing powerful fine grained access control systems for protecting Web Services and spatial data in SDIs. Especially rule based access control systems provide the capabilities to define and enforce expressive, fine grained access rights or restrictions respectively. Having powerful and complex access control policies in place introduces a new challenge. It is essential that the policy defining the semantics of an access control system can be easily and securely administrated. In this paper a very general and powerful administrative model, the Layered Administration Model (LAM), will be introduced. The LAM intends to support an easy, secure and tractable administration of complex spatial access control policies as found in SDIs.

### **Demo Talks:**

#### **Open, Distributed, Geostreaming Using Wave Federation Protocol**

*Tish Shute*

*ARWave*

The talk will include a demo and introduction to an open framework for realtime permission based, geostreaming using Wave Federation Protocol - ARWave.

See demo here: <http://www.arwave.org/>

The first part of the talk will introduce the audience to an end to end open federated approach to geostreaming, and real time collaboration on geolocated data, that aims to make location based mobile, social interaction, and augmenting reality, as easy as contributing to a wiki or a wave.

This open framework, built on Wave Federation Protocol, allows anyone to create content, a browser, or a server and define the data handshakes they want to make with others on a federated network. An overview of the general principles behind this approach & practical design challenges will be presented, and the new participants, roles, digital objects, and agents this open framework brings to the table will be discussed.

The talk will conclude with a look at the augmented real time view as a new metaphor for communication, and what frameworks of participation a shift to the physical world platform requires. As the amount of data being streamed from sensors everywhere explodes, a social commons, and architecture of participation, will be key to making sense of our new augmented realities. This collective enterprise is one of the great challenges of our time!

#### **ESRI – ArcGIS.COM – A New Web-Based Gateway into the ArcGIS System**

*Jon Nystrom and Bonnie Stayer, ESRI*

# Tech Talk/Demo Talk Sessions

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ArcGIS.com is a new web site for experiencing ESRI's ArcGIS System online. Visit the site to create maps; find and use maps, applications, and tools; and share your maps and applications with others. Within the site, you will find applications for building and sharing maps. You will also find a wide variety of basemaps, specialty layers, applications, and tools that you can view and use. You can also find, form, and join Community Groups within which to collaborate and share Geographic Information. From ArcGIS.COM, you can launch the new ArcGIS Explorer Online - a rich Microsoft Silverlight based internet application for using, creating, and sharing information. Attend this Demo Talk to find out how you can change the way you use GIS – with ArcGIS.COM, use Geographic Information everywhere!

## **Gvitech Development Strategy**

*Kandy Hsu*

*Deputy General Manager, Gvitech*

Since founded in 1998, Gvitech Technologies and the Digital City Research Center of THUPDI have been focusing on the research and development in 3D GIS visualization technology. Tapping into the research capacity and interdisciplinary scientific background of the academia, Gvitech Technologies is a leader in the field of 3D GIS platform. Gvitech Technologies has always been leading the trend of 3D visualization technology applications in the field of digital city. It introduced the first 3D GIS software for urban management, the first 3D design and decision-assistive software for urban planning and architecture, the first Internet-based digital earth platform in China (diciti.com), as well as high-performance graphics computing cluster and multi-channel large screen projection system.

## **Session II**

**Tuesday, June 22 1:15 PM - 2:15 PM**

**Waterford Suite, Crystal Ballroom Level**

Session Chair:

*Dr. Barry L. Roberts, Sandia National Laboratories*

## **Tech Talks:**

### **Spatio-temporal Labor Market Analytics: Building a National Web-based System**

*Robert K. Pitts*

*New Light Technologies Inc.*

As the U.S. economy undergoes rapid and significant change, at micro and macro levels, developing an understanding of the specific forces at work, and their causes, is a challenge. Interest in understanding the dynamics of the labor market, at the local level, specifically has increased. To meet this growing need, The U.S. Census Bureau's Longitudinal Employer-Household Dynamics Program produces OnTheMap, a unique web-based mapping and reporting application that provides tools for quantifying and visualizing spatio-temporal labor market dynamics with specificity previously unavailable. This paper discusses the development of OnTheMap including

its analytical capabilities and data and computing infrastructures.

### **Defining Circular Arcs on a Round Earth**

*Michael Kallay*

*Microsoft Corporation*

Circular arcs are commonly used for modeling geospatial data in planar map projections. This paper proposes a definition of circular arcs in geodetic coordinates on ellipsoid earth models.

### **Merging Web 2.0 Technologies with Cloud-Based Web Services to Address Ocean and Coastal Geospatial Applications**

*Eoin Howlett, David Stuebe, Kyle Wilco, and Charlton Galvarino*

*Applied Science Associates, Inc.*

A number of rapidly evolving ocean observing initiatives including NOAA's Integrated Ocean Observing System (IOOS) and NSF's Ocean Observatories Initiative (OOI) are focused on the integration of disparate time-varying geospatial data collected by satellites, in-situ measuring devices, radar, with data generated by numerical models. This paper studies the use of a wide variety of open source tools used in the metocean community and how these tools can be integrated with Web 2.0 technologies such as Google Search to allow users to publish and discover metocean science data. Once discovered, the real challenge is true interoperability of different data, even though the data is delivered with open standards, in most cases OGC standards. The authors will look at the challenges faced with correct implementation of the standards and practical limitations of the standards for operational mission-critical applications. The authors will present a prototype tool that leverages a number of OGC standards to deliver high speed access to time-varying data, and will provide conclusions on the use of the cloud to host these services.

### **Mobile Geospatial Applications for Android to aid in GeoCollaboration**

*Zohra Hemani, David Culverhouse, Ray Renner, Harold Scott Pio*

*Northrop Grumman*

Northrop Grumman is developing Mobile Geospatial Applications for the Android platform. With the increasing need for communication with in-the-field personnel, Northrop Grumman is developing the capability to collaborate and communicate among multiple mobile devices and also between workstations, servers, and mobile devices. Initially, we are using the Android platform as the prototype mobile device. The GeoCollaboration capability allows users to share live geospatial information simultaneously with other connected users whether they be on a mobile device or on a computer. Users are able to view a common map display and follow synchronized map movements such as panning and zooming. Users can also share real-time "scene markups" such as drawing lines, icons etc on the map. The ability to share Spot Reports allows mobile users to send back

# Tech Talk/Demo Talk Sessions

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geotagged images, videos and text. Additionally, we are investigating the ability to live stream geolocate video from Android devices. Mobile users in a disconnected mode can save the geotagged images, videos, text, map markups and share when they are able to connect. Users can collaborate in connected or disconnected mode and have alternatives when working in a poor comms environment.

## **Munitions Related Feature Extraction from LIDAR Data**

*Barry L. Roberts*

*Sandia National Laboratories*

The characterization of former military munitions ranges is critical in the identification of areas likely to contain residual unexploded ordnance (UXO). Although these ranges are large, often covering tens-of-thousands of acres, the actual target areas represent only a small fraction of the sites. The challenge is that many of these sites do not have records indicating locations of former target areas. The identification of target areas is critical in the characterization and remediation of these sites. The Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) of the DoD have been developing and implementing techniques for the efficient characterization of large munitions ranges. As part of this process, high-resolution LIDAR terrain data sets have been collected over several former ranges. These data sets have been shown to contain information relating to former munitions usage at these ranges, specifically terrain cratering due to high-explosives detonations. The location and relative intensity of crater features can provide information critical in reconstructing the usage history of a range, and indicate areas most likely to contain UXO. We have developed an automated procedure using an adaptation of the Circular Hough Transform for the identification of crater features in LIDAR terrain data. The Circular Hough Transform is highly adept at finding circular features (craters) in noisy terrain data sets. This technique has the ability to find features of a specific radius providing a means of filtering features based on expected scale and providing additional spatial characterization of the identified feature. This method of automated crater identification has been applied to several former munitions ranges with positive results.

Sandia National Laboratories is a multi-program laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin company, for the U.S. Department of Energy's National Nuclear Security Administration under contract DEAC04-94AL85000.

## **Building Augmented Reality Environments**

*Martin Lechner*

*CTO, Mobilizy GmbH*

In this Tech Talk, Martin Lechner, CTO of Mobilizy, the company behind the leading Augmented Reality platform Wikitude, will explain how one can build an Augmented Reality platform using the example of the Wikitude platform. He will focus on what components are necessary for a

successful AR ecosystem, how these components can interact and work together and what needs to be particularly considered when creating a great AR experience for all kinds of users.

## ***Combined Session***

*with Full Paper Session V*

**Wednesday, June 23 8:30 AM-9:30 AM**

**Waterford Suite, Crystal Ballroom Level**

## **Demo Talks:**

### **CityMaker Product Introduction**

*Chi Wei*

*Chairman, Gvitech*

Gvitech CityMaker is a 3D GIS platform independently developed by Gvitech, which has been widely used in urban planning, municipal pipelining, land resource administration, surveying and mapping, emergency response, transportation, housing administration, power and utilities, petroleum and petrochemical industries, among other fields. Currently, the platform has been applied in hundreds of major projects and organizations and for cities in China and abroad, such as Digital Beijing, Digital Macao, 2010 World Expo Shanghai, Virtual Yuanmingyuan Park, Digital Chongqing, Digital Wuhan, Digital Nanning, Hangzhou Qianjiang Newtown and the VR Urban Management System for Stuttgart, Germany. In addition, we have helped build digital city labs for and offered technological support in software and hardware to Tsinghua University, Tongji University, China Central Academy of Fine Arts and many other prestigious institutions.

### **ESRI – The New ArcGIS 10 System Transforms the Way You Use GIS**

*Jon Nystrom and Bonnie Stayer*

*ESRI*

Scheduled for release in June 2010, the newest version of ESRI's ArcGIS System will improve the way that desktop, mobile and server based GIS applications can be used to leverage geographic information throughout your enterprise. Users will be able to use the power of GIS everywhere: via Web-extended desktops, Web-hosted applications, and cloud GIS. Take advantage of an expanded set of geospatial analysis tools for in-depth analysis of data. Model, edit, visualize, and analyze data in both 2D and 3D environments. Extend mobile applications to the iPhone. Develop a wide variety of tools and applications using Python, Web API's, and streamlined software developer kits (SDKs). Use ArcGIS Server on the Amazon cloud. Take advantage of a wide variety of online maps and tools that are now a built-in part of ArcGIS across desktop, mobile, and browser based applications. Find, share, organize, and use maps, applications, and other resources via ArcGIS.com—a Web-based gateway into the ArcGIS system. Discover, share, and present geographic information using ArcGIS Explorer Online, a new browser-based version of

# Tech Talk/Demo Talk Sessions

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ArcGIS Explorer. In this session, you will learn more about the many new ways to create, maintain, analyze, visualize and share Geographic Information using the ArcGIS System.

## **Session III**

Wednesday, June 23 1:15 PM - 2:45 PM

Waterford Suite, Crystal Ballroom Level

Session Chair:

*Helenmary Hotz, University of Massachusetts Boston*

### **Tech Talks:**

#### **Watershed Modeling for Education**

*Eric Russell, National Geographic Society Colleen Buzby, Uri Wilensky, Northwestern University*

We present two models of water runoff processes designed to teach grade 6-12 students what a watershed is and some aspects of how it behaves. The first model animates the process of watershed delineation, and demonstrates the significance of watershed boundaries by simulating rainfall and runoff interactively. The model uses the same delineation algorithm as the Hydrologic Engineering Center Preprocessor (HEC-PrePro). The second model examines the effect of land cover change on storm hydrograph response, using a case study watershed in the Des Plaines subbasin in the Western suburbs of Chicago. The model allows students to draw their own land cover scenarios, or to load land cover data from the 1992 or 2001 editions of the National Land Cover Dataset. The watershed underwent significant land cover change between 1992 and 2001, mostly through the conversion of agricultural land to housing. The model's behavior compares favorably to the storm response of USGS Gage 05540095, several miles downstream of the study area. We will discuss the design goals of the models, why we chose the NetLogo modeling environment, strengths and weaknesses of the implementation, and lessons learned from early classroom pilot testing of the models.

#### **A new method in volcano-morphology to investigate the tectonic constraints on the volcanism, case study of Harrat Al Sham volcanic field, Arabia plate: the interest of GIS and Relational Database.**

*Mohamad Amer AL Kwatli, Pierre Yves Gillot, Université Paris Sud XI*

The volcanic activity of Arabian plate offers an attractive example of intraplate volcanism constrained by a complex tectonic setting. Harrat Ash Shaam volcanic field (HASV) is a basaltic province, extends widely at Arabian plate (over 50 000 km<sup>2</sup>), covers south of Syria, northeast of Jordan, north of Saudi Arabia, and contains hundreds of well- preserved monogenic volcanic cones. Our method aims to identify those cones volcanic, calculate its morphological parameters (heights, slopes, surfaces, volumes...etc.), and study their correlation. The farther intention of this study is to investigate the consequence of the tectonic events on the

volcanic activity by testing the relations between the volcano-morphological parameters and the structure of the lithosphere (basement and moho surfaces).

#### **Is the GEO Perspective Really General? A Unifying View**

*Jorge Xavier da Silva, Tiago Badre Marino, Universidade Federal Rural do Rio de Janeiro*

Concerns about the best insertion of "Geo" concepts, methods and techniques into the scientific mainstream are made in this talk. No claims of precedence about opinions and suggestions are made. Analogies among different fields of research, pointing out procedural and structural similarities, intend to call attention to needs and uses of a unified view in research fields directly associated to digital data processing. Conclusions are provocative.

#### **The Use of Geospatial Information in Securing Modern Mobile Architectures**

*Jason H Christensen, Intelligence In Motion.com*

Modern mobile architectures are utilized to address needs and intrinsic of this new "modern" era of mobile computing. We have transcended the phone/text/email paradigm into a new era where we can execute applications and business functions anywhere. While this is convenient, the problem is we can execute applications, view proprietary documents, and perform business functions anywhere. We will present a set integrations between geospatial information, location-based context awareness and cryptology and key management that can address current pain points in modern mobile architectures.

#### **Constructing a GIS Geodatabase to Assess and Analyze the Factors Enabling Proliferation of a Noxious Seaweed along the South-facing Coast of Harwich, Cape Cod, Massachusetts**

*Helenmary Hotz, University of Massachusetts Boston*

Presently, there is a paucity of knowledge about *Pilayella littoralis* and the factors influencing its proliferation on the southern facing coast of Cape Cod, MA. Over the past 20 years, the seaweed has moved along the coast from Falmouth to Chatham, and there is concern for the effects on onshore and nearshore habitats. The goal of this research project is to provide a science-based mapping methodology for analyzing spatially referenced coastal phenomena, specifically, coastal distributions of *Pilayella littoralis* and associated seaweed assemblages, to identify areas of proliferation and accumulation of these seaweeds, and to obtain a detailed timeline of anthropogenic construction along the coast necessary for the analysis of possible causes of the phenomena. This project uses Geographic Information System (GIS) to produce a temporal and spatial framework for quantifying the accumulation and proliferation of distributions of *Pilayella littoralis* and associated seaweeds along the coast, with respect to natural and human constructed rocky features. The GIS database framework consists of: 1) Bathymetry (accomplished from raster

# Tech Talk/Demo Talk Sessions

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application); and 2) Data layers, including aerial photos, maps, charts, and other existing GIS data layers. GIS database construction and data integration are accomplished using ESRI ArcGIS 9.3.1. ArcSDE and SQL. The database implements data layers based on: 1) historical aerial photographs; 2) bathymetry; 3) and digital maps documenting the construction and timeline of human constructed defenses along the study site. GIS modeling and analysis is performed using the geodatabase to construct models of compartments formed by natural and human rocky structures along the coast where the algae flourish. In addition, GPS data collection and remote sensing field survey (via Hyperspectralradiometry) is applied to obtain spatial event information and to estimate biomass and to estimate biomass and productivity in aquatic vegetation.

## Demo Talks:

### Defining the World's Cities Through Neighborhoods

*Bernt Wahl, University of California, Santa Cruz*

This presentation will outline a process used for breaking down cities and towns into alternative regions structured on name recognition: neighborhoods, districts or other local areas. Based on the demographic data gathered using these techniques - collected from the 350 largest U.S. cities' neighborhoods - evidence will be given to support the potential benefits to quantifying city data based on neighborhood names and their accompanying structures rather than traditionally used U.S. Census regions. The process defines neighborhood boundaries based on commonly recognized characteristics such as widespread reference by community, as well as natural and human demarcations. Through defined neighborhood datasets and boundaries, the study will attempt to show that locally correlated attributes with recognizable names can provide cohesive information for a given region. The analysis hopes to convince the reader that neighborhoods, with their flexibility to form organically, prove in many cases to be a better solution to collecting demographic data than census measurements, which are often confined to a fixed quantity amalgamation of census tracts, units that are generally restricted to a set population for a given region.

### Spatial Data Mining

*Vadeerat Rinsurongkawong, Chun Sheng Chen, and Christoph F. Eick, University of Houston*

Due to the advances in technologies, such as sensor networks and satellite systems, large amounts of spatial data are created every day. Therefore, tools and techniques to automatically extracting meaningful information from spatial data have gained importance. Analyzing spatial data is more difficult than analyzing the traditional data due to the complexity of spatial data types, the high frequency of spatial patterns, the continuous nature of space, and spatial autocorrelation. The Data Mining and Machine Learning (DMML) group at the University of Houston aims at the development of data analysis, data mining, and machine-learning techniques and to apply those techniques to

challenging problems in geology, astronomy, environmental sciences, social sciences and medicine. In general, our research group has a strong background in the areas of clustering and spatial data mining. Areas of our current research include: repository and correspondence clustering, density-based clustering and clustering with plug-in fitness functions, association analysis, geo-regression techniques, change analysis, and trajectory and polygon mining. We designed and implemented several unique spatial clustering algorithms and an open source development framework called Cougar<sup>2</sup> to facilitate the analysis of spatial datasets.

### The Potential of Open-Source Internet GIS as a Communication Interface in Regional Environmental Management: Exemplification from Phillip Island, Victoria, Australia

*Jim Peterson, Monash university, Sultana Nasrin Baby, Bass Coast Shire Council, Australia*

It is shown that the potential for implementation of open-source internet GIS to advance the rate of diffusion and adoption of GIS can be realized in regional environmental management if the in-house spatial database is made coherent. After imposing such coherence on the spatial data sets used by environmental managers on Phillip Island, Victoria, Australia it is shown that all stakeholders can share data that can be imported into open-source software possessed of the requisite functionality, it is shown that: a) Adoption of open-source internet GIS overcomes the constraints imposed by proliferating software costs in the hope of increasing GIS adoption, and b) The visualization functionality of the most suitable open-source software attracts staff members, hitherto reluctant to engage in digital spatial query, to become "naive users", thereby more than doubling the in-house GIS users and greatly increasing in-house communication of information and setting the scene for communication among stakeholders. This is very advantageous because, in most of the agencies using GIS, there is, otherwise, a lack of critical mass among GIS users. The exemplification offered here refers to datasets and challenges common to all Victorian regions. Accordingly, it can be argued that if the approach developed in this study is widely adopted in Victoria the community of naive GIS users will increase in ways that enhanced the rate of diffusion and adoption of GIS to rates originally envisaged by public polices first announced during the analogue-to digital conversion of mapping activity two decades ago. To advance the stalled adoption of digital spatial data handling in regional GIS Labs by making the power of GIS available, not only to those who should maintain and process the data, but also to the much larger body of "naive users", many of whom work in the public sector and need more access to data, and most of whom represent stakeholder interests and recognize the potential offered by spatial data access and visualization for advancing transparency in government. The assumptions underlying the idea that adoption of GIS can be promoted to a new stage of utility are: a) Constraints in diffusion and adoption by regional spatial data can be identified and overcome b) The achievement will support visualization.

# Invited Sessions

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**Tuesday June 22 2:30PM - 4:30PM**

Baccarat Suite, Crystal Ballroom Level

## **Geospatial Technology Research for Law Enforcement and Criminal Justice**

Organizers:

Ronald Wilson

*Program Manager*

*Mapping and Analysis for Public Safety (MAPS) program & Data Resources Program at National Institute of Justice (NIJ)*

*United States Department Of Justice (U.S. DOJ)*

Timothy Brown

*Senior Consultant, Booz Allen Hamilton*

*Research Associate, MAPS Program at National Institute of Justice (NIJ)*

*United States Department Of Justice (U.S. DOJ)*

## **Bringing Geography to the Practice of Analyzing Crime through Technology**

Ronald Wilson and Timothy Brown

*NIJ - U.S DOJ*

The automation of geography through the continued development of software has allowed for advancements in the study of the spatial aspects of crime. The Mapping and Analysis for Public Safety (MAPS) Program at the National Institute of Justice (NIJ) continues to work toward the integration of geographic theories and principles into the technologies used to study crime. Specifically, the MAPS Program promotes advancement in the field through its grant-funded research on geospatial technologies. The main focus of future solicitations will be the development of cutting edge geospatial software, but also with an increased interest in geospatial sensor technologies, spatial cognition technologies, and location-based technologies and analysis.

## **Implementing a Bayesian approach to criminal geographic profiling**

*Mike O'Leary*

*Towson University*

The geographic profiling problem is to create an operationally useful estimate of the location of the home base of a serial criminal from the known locations of the offense sites. We have developed and released new software based on Bayesian methods that attempts to solve this problem. In this paper, we discuss some of the geographic and computational challenges in implementing this new method.

## **The Development of Urban Crime Simulator**

*Jay Lee and Chaoqing Yu*

*Kent State University*

Based on routine activities theory, deviant places theory, and neighborhood life cycle concepts, an Urban Crime Simulator was developed to allow estimation for changes in crime rate in urban neighborhoods to be made when changes in the characteristics of the neighborhoods are known or can be projected. The developed simulator is fully integrated with GIS-formatted data and operational environment. It enables users the flexibility of choosing neighborhood attributes that best fit their experience and knowledge of local neighborhoods. In addition, the selection of neighborhood attributes to be included in the simulation can be made based on localized trends that best fit routine activities and deviant places theories.

## **New Tools for Statistical Point Pattern Analysis on Networks with Large Datasets**

*Luc Anselin, Serge Rey, and Andrew Winslow*  
*Arizona State University*

This paper presents preliminary results from a multi-year research project on "Flexible Geospatial Visual Analytics and Simulation Technologies to Enhance Criminal Justice Decision Support Systems." We discuss and apply several new geospatial technology tools for exploratory spatial data analysis developed at the GeoDa Center for Geospatial Analysis and Computation. The focus of this paper is on local crime hotspot analysis that takes network structures (such as streets) into account. The incorporation of networks overcomes the limitation of traditionally applied cluster methods, which assume that an event can be located anywhere. However, in practice, there are often limitations to the possible locations of crimes that are constrained by or related to street networks. Further, the featured tools work efficiently with large datasets, leverage the parallel architecture of modern desktop CPUs, work on Windows and Mac platforms, are user-friendly and do not require the installation of additional software. The benefits of taking networks into account for hotspot analysis are illustrated in case studies using crime data from police departments of the City of Mesa, AZ and Tempe, AZ.

## **Mobile Application for First Response and Emergency Evacuation in Urban Settings**

*William Ribarsky, KR Subramanian, Jianfei Liu, Onyewuchi Obirize, and Jack Guest*  
*The University of N. Carolina at Charlotte*

This work builds on a system we have developed for situation-aware mobile routing and response in an urban environment. The system permits police or other first responders to carry models of collections of often large scale, multi-floor urban buildings they encounter in urban environments. The responders must enter, find their way around, and coordinate activities with other responders and command personnel. Coordination requires overall understanding by command personnel of where first

# Invited Sessions

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responders are (including directing these personnel), where occupants or victims are, where they are going, and what they might do. In addition, coordination may need to take into account response to the actions of perverse independent agents, such as shooters or other criminals. The system supports all this in multiple ways including permitting the responder or commander to determine shortest path 3D routes between floors in real-time, including updates of routes when path-blocking obstacles are present, locations of other responders, and locations of things of interest with respect to the responders current position (e.g., victims, flammable or dangerous materials, etc.). This paper will present some first results for this mobile system in terms of two real-world cases involving police responders: (1) response to a shooter or potential shooter in one or more large urban structures; (2) emergency evacuation in a large urban structure. The real world cases are developed as exercises with police and homeland security personnel. The paper demonstrates the need for tight integration of information provided or displayed through the command interface and the mobile interfaces. The command interface, in particular, must organize and disseminate a substantial amount of information in a timely manner. The paper will also describe initial evaluations of the interfaces and plans for improvement.

# Panels / Panels+

## ***Panel I***

*Monday June 21 1:15PM - 2:15PM*

Waterford Suite, Crystal Ballroom Level

### **Loss Estimation Applications within the Federal Government**

Moderator:

Eric Berman

*HAZUS Program Manager*

*Federal Emergency Management Agency (FEMA)*

Panelists:

Doug Buzalsky, Program Analyst, Applicant Services and  
Mike Greer

*FEMA National Processing Service Center*

Krishna Banga, Structural Engineer

*Veterans Administrations*

Eddie Pool, Senior Technical Advisor to the Associate  
Administrator

*Small Business Administration (SBA)*

HAZUS is nationally applicable standardized methodology that combines science, engineering and mathematical modeling with GIS technology to estimate losses of life and property—and shows those losses on a map. Developed by FEMA, HAZUS-MH operates as an extension of ESRI's ArcGIS software to map and display region-specific hazard data along with the results of loss and damage assessments. HAZUS estimates impacts to the physical, social and economic vitality of a community from earthquakes, hurricane wind and floods to help save lives and protect property. The panelists representing the SBA, the VA and FEMA will each discuss how they use the geospatial technologies within HAZUS to estimate losses for disaster assistance.

Small Business Administration (SBA) –The SBA's Office of Disaster Assistance uses HAZUS to estimate pre and post disaster losses related to the delivery of the Federal disaster loan program. Veterans Administration (VA) – The VA uses HAZUS to do earthquake assessments for all VA structures across the nation. FEMA Individual Assistance Center – FEMA IA uses HAZUS' geospatial technologies to assist with planning and scheduling of resources to help homeowners and renters affected by disasters with their housing needs and necessary expenses.

Organizer:

Rebecca Blankenship, CGMP

*Outreach Process Partners, FEMA HAZUS Program*

Biographies: Mr. Eric Berman is FEMA HAZUS Program Manager. He has approximately 20 years of hazard identification studies and mapping experience with an emphasis on GIS. He holds a bachelor's degree in Civil Engineering from Tennessee Technological University and

represents the Department of Homeland Security on the U.S. Board on Geographic Names.

## ***Panel+ II***

*Tuesday June 22 2:30PM - 4:30PM*

Lalique Suite, Crystal Ballroom Level

### **Geostreaming: We Can See the Light at the End of the Tunnel**

Moderator:

Mohamed Ali

*Software Design Engineer, Microsoft SQL Server*

*Microsoft Corporation*

Panelists:

Balan Sethu Raman

*Distinguished Engineer in the Database Systems Group*

*Microsoft Corporation*

Ed Katibah

*Principal Program Manager at Microsoft SQL Server*

*Microsoft Corporation*

Erik Hoel

*Computer Scientist, Geodatabase Development Lead*

*ESRI*

Farnoush Banaei-Kashani

*Research Associate, Information Laboratory (InfoLab)*

*University of Southern California (USC)*

"We still have a long way to go! But we can see the light at the end of the tunnel!" This statement represents a vision that has brought together Microsoft SQL Server, ESRI, and the University of Southern California's Information Laboratory (USC InfoLab) to sketch the road map of an end-to-end solution in geostreaming. Geostream data refers to the datasets that are acquired continually over time and needed to be processed and/or visualized on-the-fly. These datasets include geographical extents such as geographical coordinates of a point, a line, or a polygon. The coordinates may or may not change over time.

Microsoft SQL Server StreamInsight is a powerful platform for developing and deploying complex event processing (CEP) applications. Its high-throughput stream processing architecture and familiar .NET-based development platform enable developers to quickly implement robust and highly efficient event processing applications. With its extensibility infrastructure, Microsoft SQL Server StreamInsight enables developers to integrate their domain expertise within the query pipeline as user defined operators and aggregates. Also, the Microsoft SQL Server Spatial Libraries deliver comprehensive spatial support that enables organizations to seamlessly consume, use, and extend location-based data through spatial-enabled applications which ultimately helps end users make better decisions. ESRI is the world leader in

# Panels / Panels+

GIS (geographic information systems), spatial modeling, and mapping software. ESRI's long experience and sound technologies add the necessary domain expertise to the data streaming platform provided by Microsoft StreamInsight. The applied information management research at the USC InfoLab and its domain expertise in two areas of smart oil field technologies (through its projects with USC's CiSoft center) and transportation systems (through its projects with USC's METRANS transportation center) bridge the gap between academia and industry, and brings the latest technologies in managing unconventional data types to CiSoft and METRANS end users: Chevron, USDOT and Caltrans.

This special session covers geostreaming from various angles and brings together experts in the field from academia, industry, and research labs to discuss the lessons they have learned over the years, demonstrate what they have achieved so far, and listen to the geospatial community so we can build the future of our community hand-in-hand.

## **Panel+ III**

*Wednesday June 23 1:15PM - 4:30PM*

Baccarat Suite, Crystal Ballroom Level

### **Emerging Geospatial Science and Technology for Sustainable Bioenergy**

#### Panel Members:

- Dr. Robert Tetrault  
*Program Manager*  
*United States Department of Agriculture (USDA)*
- Dr. Brad Doorn  
*President of ASPRS and Manager of Agriculture and Water Applied Science*  
*National Aeronautics and Space Administration (NASA)*
- Dr. Alison Goss Eng  
*Manager, Sustainable Bioenergy Production*  
*United States Department of Energy (U.S. DOE)*
- Dr. Alex Philp  
*CEO and Chairman*  
*Rocky Mountain Supercomputing Center, Inc. USA (RMSC)*
- Dr. Budhendra Bhaduri  
*Group Leader, GIST, Computational Sciences and Engineering Division*  
*Oak Ridge National Laboratory (ORNL)*
- Dr. Ranga Raju Vatsavai  
*Research Scientist, GIST, Computational Sciences and Engineering Division*  
*Oak Ridge National Laboratory (ORNL)*

With recent national emphasis on increasing biofuel development for reducing dependency on foreign oil and reducing carbon emissions from energy production and consumption, the agricultural land cover and land use patterns in the United States and many other regions of the world are expected to change in the coming years. Although remote sensing data analysis is a well-recognized approach for addressing bioenergy sustainability, biomass monitoring over large geographic regions using remote sensing images poses several scientific and technical challenges.

**Data Challenges.** There is great need for continuous coverage of high-temporal data with moderate to fine spatial resolution. Panel will discuss data challenges in monitoring biomass at regional and global scales, takes a view on current and future satellite programs.

**Analytical Challenges:** Conventional techniques are either inadequate or do not scale well for continuous biomass monitoring over large geographic regions. Panel will discuss the recent advances in spatiotemporal data mining, especially the techniques that exploit the subtle multidimensional signals through the joint use of high temporal resolution (MODIS) data and moderate- and fine-spatial resolution satellite images for extracting multi-temporal biomass change information, including crop types and their conditions.

**Computational Challenges:** Scaling spatiotemporal data mining techniques for large geographic regions is a computationally challenging task. Panel will discuss the challenges in embracing modern computing infrastructure, especially distributed and cloud computing for biomass and bioenergy monitoring and simulation needs.

In addition, this panel discusses recent government programmatic initiatives in the area of biomass and bioenergy.

## **Panel+ IV**

*Wednesday June 23 1:15PM - 4:30PM*

Lalique Suite, Crystal Ballroom Level

### **Windows Azure Platform and Application Development**

#### Moderator:

Dr. Zhiming Xue  
*Senior Architect Evangelist*  
*Microsoft Corporation*

#### Panelists:

Wayne Beekman  
*Co-Founder of Information Concepts*  
*Information Concepts*

Vishwas Lele  
*Chief Technology Officer*  
*AIS*

# Panels / Panels+

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Mark Eisenberg

*Windows Azure Solutions Specialist*

*Microsoft Corporation*

During this interactive panel discussion we will share our thoughts about the Microsoft's cloud computing platform, discuss application development and deployment with Windows Azure and SQL Azure, and answer your questions regarding Windows Azure and cloud computing.

## Biographies:

Wayne Beekman is a Co-Founder of Information Concepts. Wayne started Information Concepts with his partner, Cary Toor in 1982. Wayne oversees the development of new business and technical direction for Information Concepts. He is a charter member of Microsoft's .Net Partner Advisor Board, which began in 1999. He holds both a Bachelor of Science and a Master of Science degree in Science of Information Systems from George Washington University.

Wayne was recently featured in several tech publications for his work in Cloud Computing:

"Making a Cloud Play" (Redmond Channel Partners, October 2009)

"It's Time to embrace Cloud-Based Development" (CXO Magazine, August 2009)

"Cloud computing has appeal for Web applications" (Government Computer News, May 2009)

Vishwas Lele is an AIS Chief Technology Officer and is responsible for the company vision and execution of creating business solutions using .NET technologies. Vishwas brings close to 20 years of experience and thought leadership to his position, and has been at AIS since 1994. A noted industry speaker and author, Vishwas is the Microsoft Regional Director for the Washington, D.C. area and a member of the Connected Systems Division Advisors group. Additionally, Vishwas has received an MVP (Most Valuable Professional) for Solution Architecture award for both 2006 and 2007. Prior to joining AIS, Vishwas worked for Tata Unisys and Microstrategy. Vishwas received his Bachelor's degree in Electronics Engineering from Nagpur University in India and his Master's degree in Computer Science from Johns Hopkins University.

Mark Eisenberg is a Solutions Specialist focused exclusively on the Windows Azure Platform. With his software architecture and development background he was able to immediately see the potential impact for Windows Azure on all flavors of organizations that rely on computing technology. Bringing over twenty years of high-tech sales experience and over a decade in design and development he is well equipped to spot significant new trends. He holds a BS degree in Electrical Engineering from the George Washington University in Washington, DC.

Zhiming Xue "Z" is a senior Microsoft Architect Evangelist with DPE US based in the Mid-Atlantic area. While working with customers to help architect enterprise solutions, he is passionate about both smart client and web technologies and an active blogger on Microsoft MSDN site. During his tenure

with Microsoft Services, he played technical and architectural roles on many consulting projects for large enterprise customers in both the commercial sector and the public sector. He has presented various topics at Microsoft events including TechEd China and local community events. He holds a Ph. D. in Management Science from the Isenberg School of Management at the University of Massachusetts at Amherst, a professional certification from American Production and Inventory Control Society (APICS), and several Microsoft certifications.

# Courses

**Monday June 21 2:30PM - 4:30PM**

Waterford Suite, Crystal Ballroom Level

## **Course I**

Microsoft

### **An Introduction to Microsoft SQL Server StreamInsight**

Dr. Mohamed Ali

*Design Engineer, Microsoft SQL Server*

Microsoft StreamInsight is a powerful platform that you can use to develop and deploy complex event processing (CEP) applications. Its high-throughput stream processing architecture and the Microsoft .NET Framework-based development platform enable you to quickly implement robust and highly efficient event processing applications. Event stream sources typically include data from manufacturing applications, financial trading applications, Web analytics, and operational analytics. By using StreamInsight, you can develop CEP applications that derive immediate business value from this raw data by reducing the cost of extracting, analyzing, and correlating the data; and by allowing you to monitor, manage, and mine the data for conditions, opportunities, and defects almost instantly.

By using StreamInsight to develop CEP applications, you can achieve the following tactical and strategic goals for your business:

- Monitor your data from multiple sources for meaningful patterns, trends, exceptions, and opportunities.
- Analyze and correlate data incrementally while the data is in-flight -- that is, without first storing it--yielding very low latency. Aggregate seemingly unrelated events from multiple sources and perform highly complex analyses over time.
- Manage your business by performing low-latency analytics on the events and triggering response actions that are defined on your business key performance indicators (KPIs).
- Respond quickly to areas of opportunity or threat by incorporating your KPI definitions into the logic of the CEP application, thereby improving operational efficiency and your ability to respond quickly to business opportunities.
- Mine events for new business KPIs.
- Move toward a predictive business model by mining historical data to continuously refine and improve your KPI definitions.

This course covers the key concepts in Microsoft StreamInsight and provides developers with a step-by-step guidance to build their first data streaming applications. The course is expected to run for two hours and is expected to cover the following topics:

20 minutes - Welcome and Introductions

20 minutes - StreamInsight use cases, architecture and demo

20 minutes - Getting the data in and out: writing adapters for StreamInsight

20 minutes - StreamInsight queries: writing continuous queries and analytics for StreamInsight in LINQ

20 minutes - Building rich StreamInsight applications

20 minutes - Deploying and managing StreamInsight applications

**Tuesday June 22 2:30PM - 4:30PM**

Waterford Suite, Crystal Ballroom Level

## **Course II**

Oracle

### **Integrating Maps into Oracle Business Intelligence**

Dr. Jayant Sharma

*Technical Director, Spatial Oracle Product Development*

In this session we will demonstrate the integration of Oracle's geospatial and enterprise business intelligence technologies. Oracle Spatial, a feature of the Oracle database, contains a wealth of capabilities for geospatial data management, analysis, and provisioning. Oracle MapViewer is a feature of Oracle Fusion Middleware providing light-weight interactive mapping for integration with enterprise applications. Oracle Business Intelligence Suite Enterprise Edition Plus (Oracle BI EE Plus) is a comprehensive suite of enterprise BI products that delivers a full range of analysis and reporting capabilities. Featuring a unified, highly scalable, modern architecture, Oracle BI EE Plus provides intelligence and analytics from data spanning enterprise sources and applications—empowering the largest communities with complete and relevant insight. By locationenabling the BI platform, we are able to enhance traditional BI interactions with location-aware analytics, cartographic views of analytic results, and geography-based drilling and analyses. As opposed to rigid, static integrations, we will demonstrate a highly interactive, customizable, and fully-embedded geospatial BI solution.

#### SYLLABUS

##### *Course Objective*

- Provide attendees with technical and strategic insight into Oracle's Spatial-Business Intelligence integrations
- Provide practical understanding of the integrations through use cases and associated solution methodologies
- Conduct live demonstrations of integration techniques

##### *Agenda*

- Live demonstration and explanation of finished Spatial-BI solution.
- Review and demonstration of associated Oracle Spatial and BI technology components
- Explanation and demonstration of Spatial-BI integrations:
  - Location analysis at physical data source level
  - Location analysis at logical (semantic) layer
  - Location analysis at presentation level
  - Map visualization at presentation level
- Summary and Q&A

# Focus Groups

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COM.Geo provides some meeting spaces for the attendees who are interested in discussing anything related to the COM.Geo conference topics based on the focus groups, such as Developer, System Administrator, Decision Maker, or Government Agency, University, Company, or any others.

## Microsoft Focus Group

Monday June 21

1:15PM - 4:30PM

Diplomat/Ambassador Room, Meeting Room Level

Tuesday June 22

1:15PM - 4:30PM

Cartier/Tiffany Salon, Crystal Ballroom Level

Wednesday June 23

1:15PM - 4:30PM

Cartier/Tiffany Salon, Crystal Ballroom Level

In Microsoft Focus Groups, you'll have opportunities to discuss with Microsoft Team about several geospatial directions and technical insights into SQL Server Spatial, Bing Maps, SQL Server, Business Intelligence (BI), and SQL Spatial Library, etc.

If interested in Microsoft Focus Group / Interview, please

**Sign Up** by filling out **Microsoft Cloud Computing Survey**:

<http://www.surveymonkey.com/s/com-geo-cloud-computing>

Please take this opportunity to help shape future cloud computing services by taking this short online survey by the Microsoft Business Platform Division. Also, you will have an opportunity to participate in an in-person interview and discussion on cloud computing with Microsoft Development/Product Team while at the conference.

## GviTech Focus Group

Tuesday June 22

1:15PM - 4:30PM

Old Georgetown Room, Meeting Room Level

Wednesday June 23

1:15PM - 4:30PM

Congressional Room, Meeting Room Level

In GviTech Focus Groups, you'll have opportunities to participate in an in-person interview and discussion with GviTech Team about several 3D GIS and urban planning applications.

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# Exhibitors, iExhibits, Posters, Jobs

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## ***Booth Exhibitors***

Haverford Suite, Crystal Ballroom Level

*June 21, Monday 1:00 PM – 4: 30 PM*

*June 22, Tuesday 8:30 AM – 4: 30 PM*

*June 23, Wednesday 8:30 PM – 4: 30 PM*



Microsoft

[www.microsoft.com](http://www.microsoft.com)

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ESRI

[www.esri.com](http://www.esri.com)

ESRI's geographic information system (GIS) software allows you to collect, manage, and analyze spatial information and present the results in an easy-to-understand map



Infogroup

[www.infogroup.com](http://www.infogroup.com)

## ***iExhibits***

Cartier/Tiffany Salon, Crystal Ballroom Level

*June 21, Monday 1:00 PM – 4: 30 PM*

Texas A&M University Corpus

<http://gisc.tamucc.edu>

**Online Geospatial Intelligence Degree Certificate**

SECOORA

<http://code.google.com/p/xenia>

**Virtual Server Appliances and Open Solutions to Observing System**

University of Houston Data Mining and Machine Learning Group

<http://www2.cs.uh.edu/~UH-DMML>

**Spatial Data Mining**

*June 22, Tuesday 8:30 AM – 12:00 PM*

ObjectVideo

[www.objectvideo.com](http://www.objectvideo.com)

**Intelligent Retrieval of Imagery, Maritime Survey**

The City College of the City University of New York

**Web-based Visual Explorations of Large-scale Raster Data**

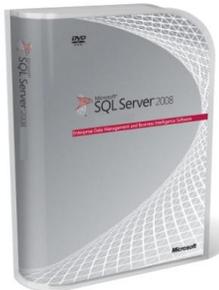
## ***Posters***

Haverford Suite, Crystal Ballroom Level

## ***Jobs***

Haverford Suite, Crystal Ballroom Level

# Microsoft® StreamInsight

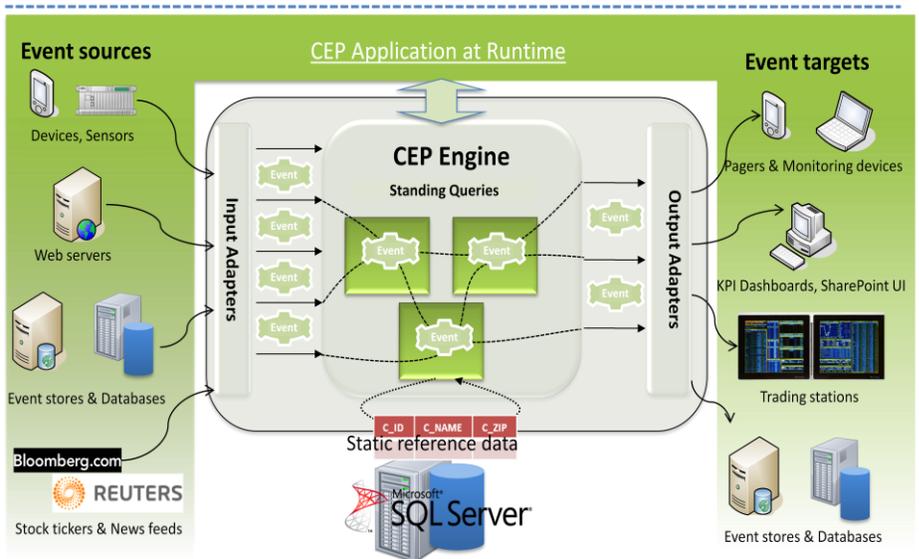


*Enabling organizations to derive insights from streaming information in near real-time*



## Key Features

- Process large volume of events across multiple data streams in less than a second
- Better manage your business through historical data mining and continuous insights
- Provides built-in support for different types of event handling and rich query semantics
- Reduce development costs by utilizing existing skill sets and investments in Microsoft development platform
- Reduce cost and complexity of management with a platform that is easy to manage and support
- Extend the benefit of near real-time event processing to Microsoft® SQL Server® data platform
- Tailor to needs of the business with flexible deployment options



Data volumes are exploding with event data streaming from sources such as RFID, sensors, and Web logs, across industries such as manufacturing, financial services, and utilities. The size and frequency of the data make it challenging to store for data mining and analysis. With the complex event processing technology from Microsoft, the ability to monitor, analyze, and act on the data in motion provides significant opportunity to make more informed business decisions in near real-time.

**Process large volume of events across multiple data streams in less than a second**

Process events with low latency so that action can be taken immediately based on the insights derived.

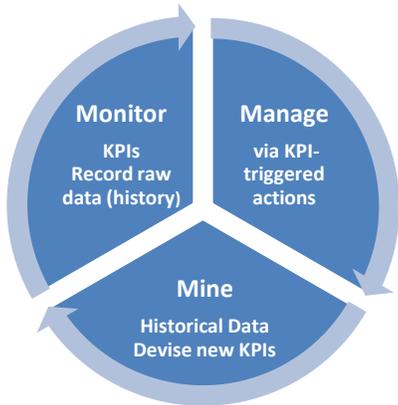
Process high volumes of data and scale the processing of events and the number of queries to process these streams. Derive insights by correlating multiple event streams from multiple sources with near-zero latency for improved business decisions.

Combine real-time event streams with historical data seamlessly using the same queries for better insights. Gain better insights by enriching “standing queries” with static reference data. Generate new event streams from large data warehouses for more focused data analysis and mining.

**Better manage your business through historical data mining and continuous insights**

Mine KPIs from historical data to gain greater insight into your business. Monitor effectiveness of these KPIs using the data from event streams.

Create new KPIs and continuously refine your existing KPIs by mining historical and current data streams using the same query.



**Provides built-in support for out-of-order event handling and rich query semantics**

A rich, extensible query language is provided with built-in support for point-in-time and interval event types, including intervals of unknown duration; and temporal operators, including the correct handling of missing events and events that arrive out of order. For example, events are processed correctly even when the order of event arrival is different from the order of event generation.

Queries are composable, enabling complex queries to be quickly and easily assembled from multiple simple queries. The ability to derive meaningful and relevant information depends on the ability to identify complex patterns in the data/events streams. These complex patterns can be defined using query languages such as Language Integrated Query (LINQ) and other operators provided. The language facilitates complexities while providing a very easy way to

define these queries in a manner consistent with the domain needs.

**Reduce development costs by utilizing existing skill sets and investments in Microsoft development platform**

Benefit from increased productivity, ease of development and faster time to market with LINQ, C#, and Microsoft Visual Studio. Use extensions to Microsoft .NET Framework to express queries in native C# syntax. Events are expressed in the .NET data types and can be extended to create new domain specific types and operators.

Reduce development time and cost by utilizing existing .NET skills and Visual Studio as the integrated development environment. Easy availability of Microsoft developer platform skills will allow customers, solution developers and adapter developers to take advantage of the platform faster and in a more cost effective way.

Third-party adapters will help you increase the time-to-market, and enable easier and quicker integration. Realize value from existing investments in Microsoft platforms and gain better insights from integration with existing data stores and enterprise event sources and targets.

Use the adapter development kit to develop your own custom adapters or third-party adapters from one of the many Microsoft partners with specialized industry solutions. Take advantage of an open and active collaborative environment to drive the adapter ecosystem

**Easy to manage and support**

Use the query debugger to identify, fix, and test problems quickly and easily. The replay capabilities can help troubleshoot and tune queries

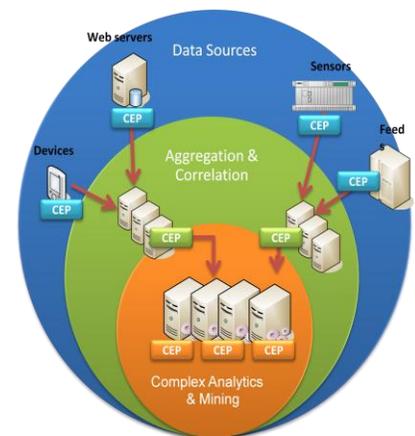
for optimum resource utilization and predictable performance.

Have confidence in reliable access to worldwide Microsoft support and an extensive ecosystem of Microsoft partners with specialized knowledge and solution offerings.

**Flexible deployment options**

Take advantage of flexible deployment options to scale your processing needs and use the deployment option that best suits the diverse processing needs of your business.

Use the embedded options to pre-process on the edge, e.g., in sensors and other devices. Use a regional hub for local processing of event streams from embedded engine, e.g., aggregation and correlation. Run complex analytics and mine insights with centralized processing, using feeds from regional hubs to create a unified view.



CEP	CEP for lightweight processing and filtering
CEP	CEP for aggregation and correlation of in-flight events
CEP	CEP for complex analytics including historical data

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City Planning



Emergency Response



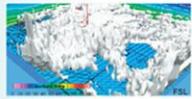
Drainage Management



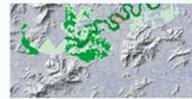
City Services



Real Estate



Telecommunication



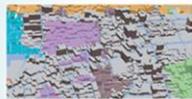
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Land Using

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