Graduate Seminar Conference

Thursday, November 26th, 2009

Department of Geodesy and Geomatics Engineering
University of New Brunswick

The organizer would like to welcome you to the
2009 Graduate Seminar Conference

Where: C-11

When: Thursday, November 26th 2009

Please join for refreshments after the Conference in room E-4, GGE Conference Room.

Seminar Organizer
Botshelo Sabone,
with thanks to Sylvia Whitaker

Geodesy and Geomatics Engineering

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2:30	Opening Remarks
Session 1:	**GIS and GPS** Chair: Botshelo Sabone
2:35 pm	Assessment of EM3002D Water Column Imaging for mast tracking *Auke van der Werf*
2:55 pm	Oceanographic Circulation of the Port of Saint John over tidal and seasonal timescales *Reenu Toodesh*
3:15 pm	Seamless Online Distribution of Amundsen Multibeam Data *James Muggah*
3:35 pm	**Short Break**
Session 2:	**GIS and GPS** Chair: Botshelo Sabone
3:45 pm	GNSS-based Time Transfer Techniques *Carlos Alexandre Garcia*
4:05 pm	Handling of Cycle Slips in GPS Data During Ionospheric Plasma Bubble Events *Simon Banville*
4:25 pm	Assessing Credibility of VGI Contributors and Trust in their Contributions *Nyaladzani Nkhwanana*
4:45pm	The Importance of User Requirements for Project Development *Silvane Paixao*
5:05 pm	**Reception**

Assessment of EM3002D Water Column Imaging for mast tracking

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Abstract

When a wreck or other hazard of navigation is found, it is necessary to determine the least depth above it to ensure safety of navigation. For objects with a high aspect ratio such as masts this is particularly difficult. Single beam, lidar and even conventional multibeam bottom detection routinely fail to detect these. In these instances the IHO require that the position and least depth has to be determined with an alternate method. The Dutch Navy (and others) currently have to use a mechanical bar sweep which is extremely expensive.

Previous trials of the Ocean Mapping Group have demonstrated that multibeam Water Column Imaging (WCI) has the potential to reveal mast-like objects in the water column. The difference with conventional multibeam measurements is that WCI records the signal for each physical beam along the whole water column. WCI was originally designed for fish finding not for depth measurements. The current output is an image rather than a discrete solution. The challenge is to convert this image data into robust depth detection. Two steps are involved: (1) we have to select the most likely echo candidate in the imaging space and (2) we have to transform to a depth in the geographic frame. The first issue can be dealt with using operator selection or image analysis. The problem is that the features are ambiguous (otherwise bottom detection would have succeeded in the first instance). For the second issue we need to re-point the angle and range from (1), then we have to recreate the sounding geometry at transmit and receive in order to determine the beam's geographic launch angle, perform a ray trace, and reduce the solution to the vessel reference point. While these transformations are well understand for conventional bottom detections incomplete information is currently retained for the water column data structure.

Oceanographic Circulation of the Port of Saint John over tidal and seasonal timescales

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Abstract

As part of the sustainable management of the Port of Saint John there is a critical need to maintain sufficient under keel clearance for the various container and tour ship traffic in and out of the harbour. Because of the high and variable sedimentation, annual maintenance dredging is necessary to keep access to the port open and to provide sufficient depth at the berths for ships using the harbour.

The Port of Saint John lies at the mouth of the Saint John River on the north side of the macrotidal Bay of Fundy. Because of this, the harbour sedimentation is influenced by two major sources of siltation. From the river, the sediment flux is strongly modulated by the seasonal variations in river discharge. From the ocean, there is significant resuspension of offshore marine sediments which occurs in response to pseudo random storm events and seasonal meteorology.

To better understand this complex interaction which occurs over tidal periods, high density oceanographic observations over a tidal cycle have been collected at four river level stages (winter minimum, spring freshet, summer minimum and fall freshet). Oceanographic profiles of temperature and salinity were collected using the towed survey sensor and currents magnitude, direction and acoustic backscatter with use of the Acoustic Doppler Current Profiler. Also, short wavelength variability in the halocline was observed using the 200kHz volume backscattering echosounder.

To better predict future dredging volumes and hence improve the budgeting process for the Port of Saint John, the estuarine circulation of the harbour is being analyzed to better quantify the relative importance of the offshore sediments that contribute to the high dredging volumes in the Saint John harbour.

Seamless Online Distribution of Amundsen Multibeam Data

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Abstract

Since 2003, all underway multibeam and sub-bottom data from the CCGS Amundsen has been posted online within approximately 6 months of the end of each cruise. A custom interface allowing the user to access and download 15' latitude x 30' longitude bathymetric and backscatter mapsheets was implemented in 2006. While this interface matched the underlying data management scheme implemented at UNB, the zoom and pan capability was at a fixed scale with limited contextual data.

In the past few years, with the introduction of web-based Geographic Information Systems (e.g. Google Maps, Yahoo Maps, Microsoft's Virtual Earth), there have been thousands of maps published online. These online GIS programs are a suitable platform to display the 6 years of Amundsen coverage within the context of the GIS-served satellite imagery and allow the user to freely browse all data in a familiar interface. The challenge, however, for serving up third party data through these map engines is to efficiently cope with the multiple zoom levels.

Custom tiling software was developed to take all the raw data from the 6 years of Amundsen multibeam coverage and convert it into multiple scale resolution images suitable for interpretation by Google Maps. The images were stored in a pyramid structure utilizing Google's Map projection and uniquely named to reflect their georeferencing and resolution. This multi-resolution data is served up on demand from the University of New Brunswick for dynamic overlay on Google's satellite data. This project will allow scientists and other interested parties to more easily access and utilize Arctic multibeam data.

GNSS-based Time Transfer Techniques

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Abstract

Time Transfer makes use of mechanisms for comparing measurements of clocks located in different time laboratories. It is commonly used for creating and distributing standard time scales such as International Atomic Time (TAI). During the last two decades, the timing community has been using the Global Navigation Satellite System (GNSS) to develop new Time Transfer methods. GNSS is a generic term for satellite navigation systems that provide geospatial positioning with global coverage. Each GNSS satellite contains several atomic clocks and continually broadcasts the time and its positions. As a result, GNSS has become the primary system to compare remote clocks and create a time scale. Clock data of the laboratories that currently contribute to TAI use the GNSS common view method. New methods using GNSS have been developed in many laboratories; an example is the Royal Observatory of Belgium (ROB).

This graduate seminar will provide a briefly understanding of Time Transfer concepts and about the GNSS-based Time Transfer techniques in use and development.

Handling Cycle Slips in GPS Data During Ionospheric Plasma Bubble Events

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Abstract

During disturbed ionospheric conditions such as the occurrence of plasma bubbles, the phase and amplitude of the electromagnetic waves transmitted by GPS satellites occasionally undergo rapid fluctuations called scintillation. When this phenomenon is observed, GPS receivers are more prone to signal tracking interruptions, which prevents continuous measurement of the total electron content (TEC) between a satellite and the receiver. In order to improve TEC monitoring, a study was conducted with the goal of reducing the effects of signal tracking interruptions by correcting for "cycle slips", an integer number of carrier wavelengths not measured by the receiver during a loss of signal lock.

In this paper, I review existing cycle-slip correction methods, showing that the characteristics associated with plasma bubbles (rapid ionospheric delay fluctuations, data gaps, increased noise, etc.) prevent reliable correction of cycle slips. A new approach for ionospheric delay estimation with instantaneous cycle-slip correction capabilities is then described. This method relies on geometric information, as opposed to the "geometry-free" technique conventionally used for ionospheric studies with GPS. The performance of this approach is tested using data collected at Okinawa Island in Japan during a plasma bubble event in 2004. While promising results are obtained when few cycle slips contaminate the observations, further work needs to be done to accommodate data gaps exceeding a few seconds on both frequencies simultaneously.

Assessing the Credibility of VGI Contributors and Trust in their Contributions

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Abstract

There has been a substantial growth of the availability of user generated Geographic Information (GI) over the internet. This has been termed Volunteered Geographic Information (VGI). The availability of VGI has raised a number of questions mainly about its quality, credibility and also the motivations behind its production. There remains the need to address these early questions – particularly those of assessing the reliability and credibility of VGI contributions.

This research examines existing trust approaches in online systems, and determines to what degree they can be applied to VGI for use in authoritative databases. It goes further to examine the use of a reputation system in order to distinguish reliable and unreliable contributors. Three (3) trust approaches used in e-Commerce and other online social networks were selected and compared to determine their suitability for use with VGI.

The Importance of User Requirements for Project Development

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Abstract

The determination of user requirements is one of the most important phases in system development because it defines what the system will do without describing exactly how it will be accomplished. Requirements engineering, the description of these services and constraints and the process of analyzing, documenting and checking them, helps the system developer to understand the problems that may be incurred in the system development project through incompleteness, errors, and lack of satisfaction for the users. It also brings both users and developers to an agreement about their real needs. Moreover, it provides a starting point for project management activities by scoping the costs, time and resources needed.

This paper contains factors that affirm why user requirements assessment is considered a magic bullet for system developers of geographic information system (GIS), land information system (LIS) or any other type of projects in the geomatics field. It also summarizes the types of techniques used to gather the information needed for the requirements determination and to minimize the gap between the developer and the users' point of view. Finally this paper briefly overviews the types of requirements determination processes, highlighting their importance in the requirements engineering.

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