Graduate Seminar
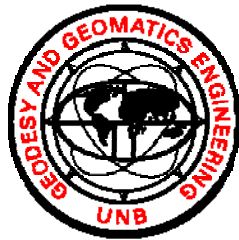# Conference

Thursday, November 29th, 2007

Department of Geodesy and Geomatics Engineering
University of New Brunswick

The organizer would like to welcome you to the
2007 Graduate Seminar Conference

Where: E-11

When: Thursday, November 29th 2007

Please join for refreshments after the Conference in room E-52, GGE Conference Room.

Seminar Organizer
Liliána Sükeová,
with thanks to Sylvia Whitaker

Geodesy and Geomatics Engineering

Geodesy and Geomatics Engineering
Graduate Seminar Conference

E-11
Thursday, November 29, 2007

01:00   Opening Remarks

Session 1   **Remote Sensing, GIS and GPS**
                 Chair: Liliána Sükeová

01:05   Towards Improving Segmentation of Very High Resolution Satellite Imagery
               Ben Wuest
01:25   Mapping and documenting the First Nations traditional activities in Grand Lake
               Meadows
               Stephen Hibbert
01:45   Functional and stochastic modeling of distortion in geodetic reference frames
               Felipe G. Nievinski
02:05   Establishment and maintenance of a new real time geospatial frame - TZRF10 for
               Tanzania
               James Mtamakaya

02:25   **Reception**

Towards Improving Segmentation of Very High Resolution Satellite Imagery

Ben Wuest

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Abstract

High resolution satellite sensors, like QuickBird, have increased the dynamic grey-value variety in satellite imagery. Large scale objects are separable that could not be discriminated in lower resolution imagery, such as that of Landsat TM. Object-oriented classification has shown significant promise as a method for analysis of very high resolution imagery. This approach allows researchers to analyze pixel groupings rather than individual pixels. Consequently, other features, such as texture and shape, can be applied to analysis. Object-oriented classification, however, is highly dependent upon successful image segmentation.

A number of software and algorithmic-based methods have been proposed for the segmentation of high resolution imagery. These methods are generally application specific or accompanied by a plethora of operator dependent parameters. It is difficult to achieve consistent segmentation results using a static parameter set across a variety of high resolution imagery.

This research proposes to investigate segmentation methods, through software and algorithmic approaches, for the purpose of reducing operator dependency and improving segmentation consistency over a variety of high resolution satellite imagery. The focus of this research will be region based unsupervised segmentation methods on very high resolution satellite imagery. Algorithmic approaches and Definiens eCognition will be employed as a basis for this research.

Mapping and documenting the First Nations traditional activities in Grand Lake Meadows

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Abstract

This project proposes to map and document the locations and types of traditional activities undertaken by First Nations groups in the Grand Lake Meadows study area. These traditional activities include; hunting, fishing, gathering of plants for food, medicinal or ceremonial purposes and trapping. Sites of ceremonial or ecological importance such as burial grounds, those relating to Aboriginal legends and animal breeding grounds are also of interest and will be mapped. Grand Lake Meadows is the largest wetland in New Brunswick and is of ecological significance to the region.

The potential benefits of this research include; increased awareness of the traditional activities undertaken by First Nations groups (or members) in living memory in the study area and preservation of some First Nations oral history of the region, which if undocumented, progressively decreases over time with the passing of knowledgeable group members. Primary sources of data will be sought through collaboration with representatives from the Union of New Brunswick Indians and additional information obtained from previous research initiatives undertaken in Grand Lake Meadows.

This research seeks to create a prototype web mapping application, using the Google Maps Application Programming Interface (API) to display the recorded traditional activities, internet links to additional information on these activities and relevant multimedia data sources such as digital photographs. The concept of this project is based on the principles of a Traditional Use Study, which is a research process designed to record the experiences of a people and their connection with the land. In this case, an online mapping service is chosen as the medium for representing the mapped traditional activities.

Functional and stochastic modeling of distortion in geodetic reference frames

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Abstract

Whereas two reference systems (RS), as rigid-body entities, are perfectly transformed one onto another by translations and rotations only, reference frames (RF) have inherent distortions (w.r.t. their corresponding RS), as a result of inaccuracies in the measurement and computation techniques employed in the determination of coordinates.

We provide both functional and stochastic models for distortion. The functional model starts with rotations and translations, in terms of global Cartesian coordinates (X, Y, Z), to account for both the difference in the definition of the two RS and also for any possible non-zero net rotation and translation due to the distortion in the two RF. The functional model is augmented with low order horizontal polynomials (horizontal in the sense that they are function of latitude and longitude) for each of the three types of local coordinates (N, E, U). This trend removal is a requirement for the stochastic modeling that follows. Finally, the random yet correlated portion of the coordinate discrepancies, called "signal," is modeled populating the observations prior covariance matrix employing an empirical covariance function.

The least squares estimation process yields values and their associated uncertainties (in the form of standard deviations) for the functional parameters (rotations and translations and polynomials), as well as for the observation residuals at the observation points. Those estimates are employed subsequently to predict distortion at any other point, e.g., on a regular grid for distribution to end users.

Establishment and maintenance of a new real time geospatial frame - TZRF10 for Tanzania

James Mtamakaya

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Abstract

Tanzania like most of the African countries has an old and convectional Geodetic Network. This network was established and computed by the Directorate of Overseas (DOS) Surveys of the Great Britain way back in 1950. The present network is based on the 30 th arc meridian of the Clarke 1880 modified ellipsoid with its origin at Buffelsfontein-Cape Town in the Republic of South Africa. The current network with two geodetic zones (36 & 37) has never been validated since its establishment to ascertain the extent of distortions in it.

The present network does not satisfy the overgrowing mapping requirements of the country as well as other Geo-related information requirements. These requirements include-homogeneous cross boarder mapping activities (most of the international boundaries have not been physical defined and are in constant disputes), smooth Land regularization projects in new urban areas, production and update of large scale topographical maps in urban areas and homogenous spatial mapping between different regions.

For long Tanzania has tried to establish a new geocentric frame that would be capable of minimizing some of these problems as well as providing ways of establishment of the African Geodetic Reference frame (AFREF). However, lack of appropriate expertise and proper awareness of the concept have been some of the major limiting factors.

Using the UNB knowledge and the expertise of the Canadian Geodetic Survey Division in maintaining the CSRS, I shall develop a conceptual plan towards the realization and maintenance of a new geospatial frame TZF10 in the ITRF system for the Tanzania.

Basing on the technological advancements in satellite positioning, the new frame shall be integrated with the new **'GNSS-RT'** system so as to support to real time applications with minimum latency. A case study shall be established and evaluated for its performance.

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