

Message from the Head

Dear Valued Reader

I hope that you had a chance to relax over the summer and renew your energy. In this message, I would like to update you about what has been going on in the Department over the last three months. As usual, the great majority of our graduating students have been able to secure employment opportunities in different sectors of Geomatics. Moreover, we had an increase of the number third year students in the internship program (a total of 16 students have

been placed in the internship program).

On another front, we have 59 incoming Second Year Students to the Department of Geomatics Engineering. The Department has welcomed the students through an Open house on August 5th where they had a chance to meet the faculty members, the Geomatics Engineering Student Society (GESS) representatives, and graduate students. The students toured some of the labs in the Department to give them an idea about

what Geomatics Engineering is all about.

Finally, I am pleased to let you know that the Department as a whole has been quite successful in attracting significant funding from competitive sources as well as obtaining prestigious awards from national and international organizations. We will be sharing with you more details about that in different sections of this newsletter.

Dr. Ayman Habib
Professor and Head



GESS Council

Geomatics Engineering Student Society
 Back Row: Miranda Airries (VP Academic) Katey Cairns (President) Alex Liddell (VP External) Tasha Wong Ken (Career Day Commissioner)
 Middle Row: Adam Thomas (Web Master, Switzerland Commissioner) Duncan Ernst (Athletic Commissioner) Tan Varna (Career Day Commissioner) Ryan Horton (Third Year Rep) James O'Neill (Frosh/Engg Week Commissioner)
 Front Row: Kris Locking (VP Events), Adam Hussein (VP Financial)
 Missing: Amy Hamilton (Fourth Year Rep) and Andrew Salmon (Second Year Rep)

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Congratulations

- Congratulations to students who completed their graduate studies: Ki In Bang, PhD; Ivan Detchev, MSc; Tracy Timmins MSc; Chengqian Zhang, PhD; Peng Xie, MSc; Da Wang, MSc; Charles Miller, MSc.

- Dr. Ai Broumandan, who completed his PhD in the PLAN Group in 2009, received the Bradford W. Parkinson Award at the Institute of Navigation-sponsored GNSS 2010 conference held in Portland, OR, for his doctoral thesis on the *Enhanced Narrowband Signal Detection and Estimation with a Synthetic Antenna Array for Location Applications*. The coveted award is presented annually to an outstanding graduate student in the field of Global Navigation Satellite Systems and is open to graduate students worldwide who are student members of the Institute of Navigation. The award was created in 2003 to honor Professor Parkinson for his leadership in establishing both the U.S. Global Positioning System and the Satellite Division of the Institute of Navigation. Dr. Broumandan was supervised by Professors Gérard Lachapelle and John Nielsen (Department of Electrical and Computer Engineering) during his doctoral studies at the University of Calgary. He is the second PhD student from the PLAN Group to receive the Parkinson Award, Dr. Olivier Julien having received it in 2006. Dr.

Broumandan is now a post-doctoral fellow/ Senior Research Associate in the PLAN Group and is conducting research in various areas of GNSS signal processing.

- The GNSS 2010 conference, held in Portland, OR, on 21-24 September, was another successful annual ION GNSS conference for PLAN Group researchers. Two student sponsorship awards were received by PhD candidates Ahmed Kamel (Supervised by Professors G. Lachapelle and J. Nielsen), and Shashank Satyanarayana (Supervised by Professor G. Lachapelle). Their papers are as follows:

Ahmed Kamel, Design and Testing of an Intelligent GPS Tracking Loop for Noise Reduction and High Dynamics Applications

Shashank Satyanarayana, Stationary, Cyclostationary and Nonstationary Analysis of GNSS Signal Propagation Channel

The following three papers also won 'Best Session Presentation Awards'.

M.G. Petovello, K. O'Keefe, B. Chan, S. Spiller, C. Pedrosa, Demonstration of Inter-Vehicle UWB Ranging to Augment DGPS for Improved Relative Positioning

C. Miller, K. O'Keefe, Y. Gao, Operational Performance RTK Positioning when

Accounting for the Time Correlated Nature of GNSS Phase Errors

E. Kahr, K. O'Keefe, S. Skone, Orbit Determination for the CanX-2 Nanosatellite using Intermittent GPS Data

- During the months of June and July, TA Award nominees were collected from each of the departments. We would like to acknowledge the teaching assistants in our department who received awards for their hard work during the year. The awards were handed out by the Dean of the Schulich School of Engineering at the Advanced TA workshop on Friday August 6, 2010. The recipients in our department are:

Geomatics Excellence Awards to *Scott Fraser and Axel Ebeling*

Geomatics Effectiveness Awards to *Axel Ebeling, Feng Xu, Billy Chan, Jacky Chow, Tracy Timmins, Ossama Al-Fanek, Feng Tang, Pejman Lotfali Kazemi, Rajesh Tiwari, and Ehsan Mohammadi*

Other News

- On Friday, September 17, Dr. Jan Skaloud, Senior Research Fellow with the Geodetic Engineering Laboratory at the École Polytechnique Fédérale de Lausanne, Switzerland gave a Graduate Seminar presentation called, "Optimizing Computational Performance for Real-Time Mapping with Airborne Laser Scanning".

- The Government of Alberta has provided a University of Calgary multidisciplinary team a three - year, \$1M grant to test and assess electronic monitoring technology to monitor dangerous offenders. The team is headed by Professor Erin Gibbs van Brunshot, Department of Sociology, with Professor Lachapelle acting as co - investigator. The research involves criminology investigations, which is the area of

expertise of Professor van Brunshot, and research on the ultimate performance of standalone and aided GNSS systems. The latter will be conducted by a PLAN Group team consisting of Professor Lachapelle, Jared Bancroft, Aiden Morrison and selected graduate students. Collaboration will extend to police services in the Province and other groups involved with the safety of individuals. "The ultimate goal here is to determine if this technology, when used properly, can help keep Alberta communities safe," said Minister of Justice and Attorney General Alison Redford. "This research will help us to answer questions about how this evolving technology may serve as another tool to further enhance the supervision of offenders in our communities," said Frank

Oberle, Solicitor General and Minister of Public Security. "We want to ensure that police and our correctional services have the most effective tools possible as they manage offenders and work to keep our communities safe." The Calgary Police Service welcomes the research that will allow them to monitor offenders with more accuracy. "Unlike standard electronic monitoring, GPS tracks people in real time, by longitude, altitude and even speed. When you can get this real time information on people proven to be a risk to the community, it gives us another great tool to improve public safety," says Chief Rick Hanson. The grant is being provided under the Alberta government's Safe Communities initiative.

Research Spotlight

Optimization of Preventive Health Care Facility Locations

Article by Xin Wang (GIS and Land Tenure)

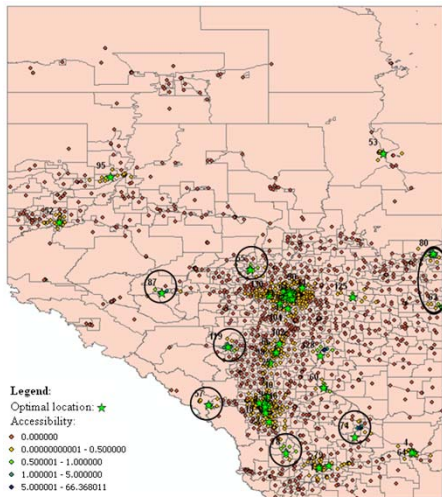


Figure 1 Accessibility measurement on the optimal clinic configuration

Preventive health care programs can save lives and contribute to a better quality of life by diagnosing serious medical conditions early. The Preventive Health Care Facility Location (PHCFL) problem is to identify optimal locations for preventive health care facilities so as to maximize participation. When identifying locations for preventive health care facilities, we need to consider the characteristics of the preventive health care services. First, people should have more flexibility to select service locations.

Alumni Voice

In 1999 I had a scholarship from the Jordanian government to pursue my Masters and Doctoral degree in Geomatics. My trip started at The Ohio State University where I obtained my Masters degree in Geosciences. The real delight of Geomatics started with the digital photogrammetry courses that I took with Dr. Ayman Habib. I cannot forget that fantastic period in 2002 when I decided to move with Dr Habib and join the Geomatics Department at University of Calgary. No doubt that the experience, knowledge, and research skills that were gained by that time enriched me with an invaluable treasure. The fabulous time I spent is not only related to the academic side but also to the spirit of the place and

Second, each preventive health care facility needs to have a minimum number of clients in order to retain accreditation.

Our study presents a new methodology for solving the PHCFL problem. In order to capture the characteristics of preventive health care services, we define a new accessibility measurement that combines the two-step floating catchment area method, distance factor, and the Huff-based competitive model. Based on the new accessibility measurement, the PHCFL problem is formalized as a bi-objective model based on efficiency and coverage. The bi-objective model is solved using the Interchange algorithm. In addition, in order to measure the spatial barrier between clients and preventive health care facilities accurately and dynamically, we estimate travelling distance and travelling time by calling the Google Maps Application Programming Interface (API).

The methodology is applied on a real application: optimizing the configuration of breast cancer screening services in Alberta, Canada. The results show that it would give an optimal configuration of screening clinics (as shown in Figure 1) which increases the accessibility of breast cancer screening services in the province. In Figure 1, the accessibility values of population centers range from 0 to 66.37. Compared with the existing facility configuration, the accessibility values in seven areas under the optimal facility

configuration (shown in the circles in Figure 1) dramatically higher. In addition, all of the facilities have sufficient clients. The optimal facility configuration increases the average accessibility from 0.35 to 0.40 and improves the coverage from 78.42% to 81.86%.

In order to understand more details, we refer the readers to the following article:

Gu, W., Wang, X., and McGregor, S.E., Optimization of Preventive Health Care Facility Locations, International Journal of Health Geographics, Vol. 9, No. 17, 2010, available at

<http://www.ij-healthgeographics.com/content/9/1/17>.

First Successful Operation of a Commercial Off-the-shelf Dual-Frequency GPS Receiver Onboard a Low-Earth Orbiter

Article by Susan Skone (Positioning, Navigation and Wireless Location)

Members of the PLAN group recently demonstrated the first successful operation of a commercial off-the-shelf dual-frequency GPS receiver onboard a low-Earth orbiter. The GPS payload, led by University of Calgary, is a component of the CanX-2 nanosatellite mission. The satellite was built by the University of Toronto Institute for Aerospace Studies and launched 28 April 2008 into a sun synchronous orbit at 635 km altitude. Due to the small dimensions (10 cm x 10 cm x

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the gentleness of my colleagues and friends whom I used to live with.

Over the past six years, I joined Al-Balqa' Applied University (BAU) in Jordan as an assistant professor in the faculty of engineering, department of surveying and geomatics engineering, teaching classes in surveying, photogrammetry, spatial database design and remote sensing and at the same time conducting research with prestigious international grant funding agencies. The research included mapping earthquake faults hazard mapping for Monitoring Sinkholes along the Dead Sea shoreline. Recently, I have been assigned the principle investigator for creating an archaeological database system in Jordan. I was highly qualified to rank the position of

the Vice Dean, for the scientific research deanship at BAU. Currently I am on a sabbatical leave for two years at the University of Bahrain.

I would say that the Calgary days were spectacular and those were the golden days of my life that I will never forget. They will always be in my heart and my mind.



Rami Al-Ruzouq, PhD 2004



**DEPARTMENT OF GEOMATICS
ENGINEERING**

Schulich School of Engineering
University of Calgary
2500 University Dr. NW
Calgary, AB Canada T2N 1N4

Phone: 403 220 5834
Fax: 403 284 1980

Email: geomatics@geomatics.ucalgary.ca

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**We're on the web:
geomatics.ucalgary.ca**

35 cm) and limited power available, a lightweight low-power GPS receiver was required. A NovAtel OEM4-G2L card was chosen, with no specialized firmware modifications and no radiation-hardening considerations. In order to minimize power requirements the receiver is only operated intermittently. Warm starts are facilitated by assigning channels appropriate Doppler values based on orbit and constellation predictor software developed at University of Calgary. The scripts are generated periodically and uploaded to the satellite.



Over the past 18 months, raw GPS observations have been collected for various tests: these include 50-minute datasets for orbit determination and shorter datasets with higher sample rate for radio occultation (atmospheric profile) processing. The CanX-2 GPS payload has generated international attention and has been recognized with several awards. Specialized space-hardened GPS receivers for low-Earth orbiters are generally too expensive and too large for nano- and cube-satellite missions. The CanX-2 mission has demonstrated potential of a low-cost solution for small satellite missions such as constellations of nanosatellites for communication and remote sensing applications. The PLAN team consists of Drs. S. Skone and K. O'Keefe, and MSc students Erin Kahr and Michael Swab.

Department Activities



Survey Camp August 2010

Coming Events

- Reading Days (No lectures) - November 11—14
- Fall Term Lectures End—December 10/Final Exams start—December 13.
- GELC Meeting - Wednesday afternoon, February 2, 2011
- ALSA Beef on a Bun night - Wednesday, February 2, 2011
- Geomatics Career Day - Thursday, February 3, 2011. Contact Tan or Natasha at geomatics.career.day.2011@gmail.com for more information
- Geomatics Awards Night - Wednesday, March 16, 2011 5:30 - 8:00 pm in MacEwan Student Centre Cassio A & B
- GEAC Meeting - Thursday, March 17, 2011 8:30 am - 4:30 pm

Sites to Visit:

- <http://gess.geomatics.ucalgary.ca/>
- <http://www.ucalgary.ca/wangx/>
- <http://www.bau.edu.jo/>
- <http://www.uob.edu.bh/english/>