



Message from the Head

Dear Valued Readers:

Happy New Year! I hope that you had a chance to relax and rejuvenate during the holiday season. Also, I would like to wish you all the best for 2010. Over the fall semester, the department has been busy with several things. As part of our efforts to promote geomatics to high school students and first year engineering students, we developed two new posters. They have already been circulated to math and science teachers in the province. Our incoming second year students had their first course in the department (ENGO 333 – Computing for Geomatics Engineering) and in the

winter semester they will have a chance to know more about Geomatics. Therefore, I would like to take this opportunity to welcome the students and wish them all the best in their new home department, where we will do our best to provide a world-class geomatics education.

The department career day is scheduled to take place on February 4th. I am encouraging all our students to take note of this date since this will be a good opportunity to meet companies and secure a summer or permanent employment. We will be hosting the annual meetings of the Geomatics Engineering Advisory

Committee (GEAC) and the Geomatics Engineering Liaison Committee (GELC) on March 11 and March 12, respectively. I will keep you posted about those meetings in the next newsletter.

Dr. Ayman Habib
Professor and Head

Santa Stuck in the Chimney

A ‘Door Decorating’ contest was held in the Department of Geomatics over the Christmas Season. Judging took place on December 15 and the winners of the contest were, Billy Chan, (pictured), Jared Bancroft and Ali Broumandan. All are graduate students in the Department of Geomatics.

Prizes were awarded at the department Christmas potluck party on Wednesday Dec. 23



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Congratulations

• Congratulations to students who completed their graduate studies: Vidyavathy Renganathan, PhD; Nadezda Sokolova, MSc; Tao Li, MSc; Hang (Terry) Liu, MSc; Florence Macchi, PhD; Cyrille Gernot, PhD. See all thesis publications at:

<http://www.geomatics.ucalgary.ca/graduatetheses>



Cyrille Gernot successfully defended his PhD thesis, *Development of Combined GPS L1/L2C Acquisition and Tracking Methods For Weak Signals Environments and will be available on the PLAN website*

• Dr. Sameh Nassar is this year's recipient of the Teaching Excellence Award for third and fourth year courses in Geomatics Engineering. The award was presented by the University of Calgary Engineering Students Society at their annual Third and Fourth Year Dinner.

• Elizabeth Cannon, Dean of the University of Calgary's Schulich School of Engineering, has received the 2009 ASTech Award for Outstanding Contribution to the Alberta Science and Technology Community, the highest award handed out by the ASTech Foundation.

The awards recognize the accomplishments of the top innovators in the province. "ASTech is committed to inspiring the next generation of innovation," said Martin Kratz, chair of the ASTech Foundation. "ASTech's celebration of the leaders who are making Alberta a better place makes our province more attractive for businesses and students to build their future here. That, in turn, improves our economy and quality of life".

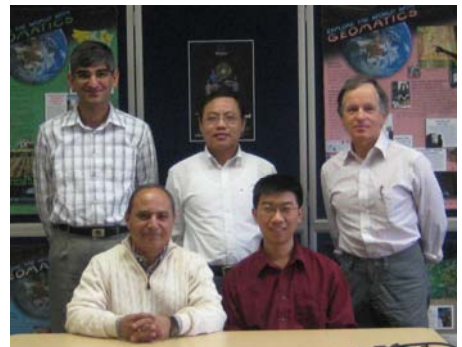
Professor Cannon is part of the Position, Location and Navigation (PLAN) Group at the Schulich School of Engineering, in the Geomatics Department and is known around the world for her expertise in Global Navigation Satellite Systems (GNSS) including GPS.

• The GNSS 2009 conference, held in Savannah, GA, in September, was another successful annual ION GNSS conference for the Department of Geomatics Engineering researchers. Ten awards were received, including seven by PLAN Group researchers. The following six Student Sponsorship Awards were received: Fatemeh Ghafoori, *Correcting the Negative Values of the Retrieved Ionospheric Electron Density Profiles Using the NNLS Algorithm*. Feng Xu. *A Complexity Reduced Frequency Domain Receiver for Galileo and GPS L1 Signals*. Ahmed Adel El-Ghazouly, *The Aid of Wavelets Correlator in Carrier Phase Multipath Reduction and Motion Detection*. Jared Bancroft, *Multiple IMU Integration for Vehicular Navigation*. Aiden Morrison, *Accurate Millisecond Level Oscillator Phase Noise Estimation for Standalone GNSS*. Kannan Muthuraman, *Theoretical Bounds &*

Reliable & C/No Estimation for Modernized GPS Signals.

Messrs Bancroft, Morrison and Muthuraman also won Best Session Presentation Awards for their contributions. Mr. Morrison's paper was selected for publication in GPS World. A 4th Best Session Presentation Award was also received by Dr. Cillian O'Driscoll, Senior Research Engineer in the PLAN Group.

GNSS 2009 is the major Global Navigation Satellite System conference of the year and attracted 1,500 participants. The University of Calgary had a strong presence with eight faculty members from the Geomatics and Electrical & Computer Engineering departments and some 30 graduate students. The Technical Program Chair was Professor Naser El-Sheimy.



Hang (Terry) Liu successfully defended his MSc thesis, *Optimal Smoothing Techniques in Aided Inertial Navigation and Surveying Systems*

Student News

• Dr. Blais is offering ENGO 699.30 *Estimation and Computational Analysis* this winter. Basic concepts from linear algebra. Convolutions and correlations. Least-squares estimation and analysis. Single value decomposition and applications. Radial basis functions and applications. Empirical orthogonal functions and applications. Stochastic processes, empirical modeling and Monte Carlo simulations. Fourier and parametric spectrum estimation. Spherical harmonic

transforms and applications. Multiresolution wavelet analysis and synthesis. Current research activities.

• Geomatics Engineering has started a new Geomatics Seminar Series, where faculty members give a brief overview of their ongoing research.

Our first seminar was on Friday November 06, and Dr. Danielle Marceau from 'GIS and Land Tenure' spoke on *'What Do We*

Do in the Geocomputing Lab?' The second seminar was on Friday, December 11, and Dr. Ayman Habib from 'Digital Imaging Systems' spoke on *'Framework for the Integration of Airborne Imagery and LiDAR Data for Urban Mapping'*. The third seminar is scheduled for Jan 29 with Dr. Kyle O'Keefe.

Please mark your calendars and plan to attend. You're welcome to bring your lunch with you.

Research Spotlight

Integration of GNSS, INS and other Sensors

Article by Dr. Mark Petovello (Positioning, Navigation and Wireless Location)

My research over the past twelve years has focused generally on the integration of GNSS, INS and other sensors, with specific focus on high-accuracy (centimetre-level) positioning. More recently, I have become involved with GNSS software receiver development. Although the latter involves many aspects of electrical engineering, I have nevertheless stayed true to my geomatics roots. As a first example, my work with ultra-tight integration of GNSS and inertial data has demonstrated that using such an approach allows the highest positioning accuracies to be maintained with signals that are approximately five times weaker than is possible with traditional receivers. This level of improvement will undoubtedly open up many more GNSS applications in the future.

Another related project is looking at how multiple nearby GNSS receivers can work together to collaboratively position themselves more accurately than any single receiver alone. Preliminary work has focused on assessing the similarity of

GNSS signals received at nearby users and investigating how these similarities can be used to improve signal acquisition and tracking. Future work will look at measuring distances between users to augment the GNSS data, thus providing more measurements with which to compute a solution.

Dr. Steve Liang to Help Create a Geospatial-Enabled Social Networking Site for Biogeoscience Research Community

Article by Dr. Steve Liang (GIS and Land Tenure)

The Geospatial Cyberinfrastructure for Environmental Sensing (GeoCENS) project is supported by Canada's Advanced Research and Innovation Network (CANARIE) and Cybera (Alberta Cyberinfrastructure for Innovation).

GeoCENS is an interactive web-based portal used for scientific analysis and social networking within the biogeoscience community. Partnering with U of C's Biogeoscience Institute (BGS), GeoCENS will build an interactive two and three-dimensional geographical interface to enable scientists to collaborate

on a scale not currently possible, and to share and access sensor data in a way not currently possible.

"We will build a type of social network for biogeoscience researchers, so they can collaborate with each other effortlessly", says Dr. Steve Liang, Assistant Professor, Department of Geomatics Engineering, Schulich School of Engineering, University of Calgary, and Principal Investigator, GeoCENS. "It is like Facebook, but for a targeted group of scientists."

Biogeoscience researchers use their own ground based sensors to collect data for analysis and to monitor changes in all forms of environment, including climate, water, and biological species. The GeoCENS portal will let them contribute data and knowledge into a combined system and free up time to analyze and re-purpose the shared data. Various data sources will be accessible in historical and real-time, and users will be able to compare, remotely control, and analyze data sources from specific geographical areas. Eventually, Dr. Liang says, the portal will be made available to anyone with an interest in biogeoscience, such as school groups. The public will be able to log into the portal and use a three

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Alumni Voice

When Dr. Habib contacted me about providing an Alumni Voice for the Geomatics department newsletter, he reminded me that I had been the first Alumni Voice back in fall of 2003. Has it been six years already? I joined NovAtel's research group in 2004, to work on their GPS/INS system. I actually spent my first few months working on high accuracy static GPS positioning under heavy foliage, which was an excellent refresher on GPS after spending a year and half working in on an INS only application (inertial surveying in a pipeline inspection tool). In 2005, NovAtel's GPS/INS system left the research department and became a product branded as SPAN. I followed SPAN into the engineering department, entering a world of production schedules

and customer requirements, and leaving the more leisurely pace and contemplative environment of research behind. I am an engineer, not a scientist, at heart, and found the applied nature of working on a product used by actual people more rewarding than blue sky dreaming. The last 6 years have been very interesting times for commercial uses of GPS/INS – in that there are commercial uses for GPS/INS now! Starting in 2007, I became the functional manager of the SPAN group, and the group started to grow as we expanded our product line, first to include more supported IMUs and then to build new systems to support more functionality. Geomatics knowledge is still my core technical competency, but I've learned a lot about HW, electronics, low level programming, and even

mechanical engineering concepts like vibration. I've also learned a lot about robust product design and test, customer expectations, and managing people. It's still fun and challenging, and I can't wait to see what the next 6 years will bring.



Sandy Kennedy, MSc.



DEPARTMENT OF GEOMATICS ENGINEERING

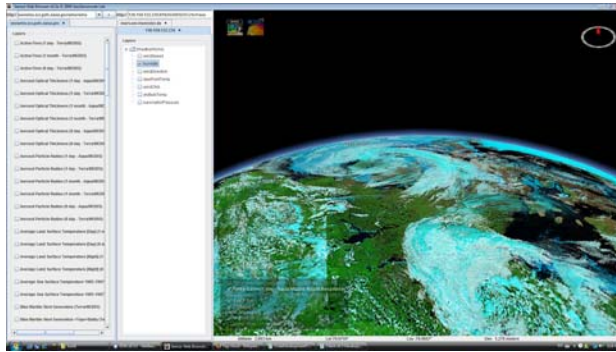
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dimensional virtual globe system (similar to Google Earth) to browse the areas scientists are studying.

Other partners of the GeoCENS project include:

- California Biodiversity Centre, University of California, Berkeley
- CANARIE
- Centre for Hydrology, University of Saskatchewan
- Cybera
- Department of Biological Sciences, University of Cincinnati
- National Ecological Observatory Network (NEON), Boulder, CO
- Open Geospatial Consortium

Department Activities



- The Geomatics Graduate Group (G³) won **FIRST PLACE** at the GSA Halloween costume contest. Congratulations to G³, and thank you everybody who participated and/or

helped. Thank you Edward for coming up with the theme and Erin for organizing everything.

- Dr. Alexander Braun has left his position in the Department to pursue a new opportunity as an associate professor in the Department of Geosciences at the University of Texas at Dallas. Alex started his new position on December 1, 2009. Alex joined Geomatics Engineering in September 2004, and he has made a very significant contribution to the Department at all levels of teaching, research and service. We wish him the very best in this new position.



Dr. Alexander Braun and Dr. Ayman Habib

Coming Events

Career Day—Feb 4, 2010. Contact Janice and Katey at geomatic@ucalgary.ca

Awards Night—March 11, 2010 from 5:30—8:00 pm

GEAC—March 11, 2010 from 8:30—4:30 pm

GELC—March 12, 2010 from 9:00—12:00 pm

Strategy Meeting - Friday, June 4, 2010

Sites to Visit:

- <http://plan.geomatics.ucalgary.ca/>
- <http://www.astech.ab.ca/>
- <http://www.gnssolutions.com/index.html>
- <http://sensorweb.geomatics.ucalgary.ca/>
- <http://www.novatel.com/>