



GEOMATICS
ENGINEERING

SCHULICH
School of Engineering



DEPARTMENT OF GEOMATICS ENGINEERING

Geomatics News

Message from the Head

This Newsletter is the last for this academic year, 2007. Our faculty, support and technical staff, and our students have yet again, pulled off a stellar and prosperous year. Thank you - I am very proud of you and very grateful to be part of this success. Speaking of success, we have added two new faculty members – Drs. Jeong Woo Kim (Geodetic Earth Observation) and Xin Wang (Geospatial Information Systems). Welcome to our Department Drs. Kim and Wang and we are pleased that you have joined us!

But our true pride and joy remains to be our students. To the fourth year students and graduate students who have graduated this year: you have graduated from one of the best institutions of Geomatics in North America. As you begin your careers, we will work with you to protect and maintain your investment in your skill set; and when possible, offer you opportunities to further your knowledge. Our commitment to you is this: we will stay true to the course and work hard to ensure that the reputation and rank of this institution is maintained, and hence

the value of your degree is as good as the day you left. But do please continue your dialog with us. Let us know your about achievements, your views, your opinions, and the industrial challenges you are facing; we might have a solution, or we might be able to work with you in finding a solution to give us all a much needed competitive edge.

Naser El-Sheimy
Professor and Head



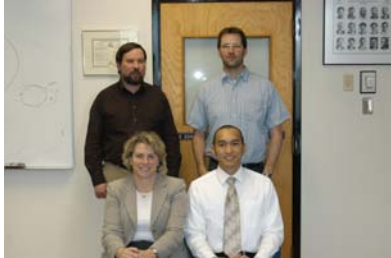
Inside this issue:

Congratulations	2
Student News	2
Visits	2
Research Spotlight	3
Alumni Voice	3
Department Activities	4
Coming Events	4

Strategic Meeting held June 19 at Valley Ridge Golf Course
 Back row L to R:
 Michael Barry, Yang Gao, Danielle Marceau, Naser El-Sheimy, Gérard Lachapelle, Susan Skone, Bill Teskey
 Front row L to R:
 Michael Sideris, Alexander Braun, Kyle O’Keefe, Isabelle Couloigner, AymanHabib

Congratulations

- Congratulations to students who completed their graduate studies: Jianchen Gao, PhD; Raymond Tsoi, MSc; Teresa Anderson, MEng.



Raymond Tsoi successfully defended his MSc exam.

- Dr. Michael G. Sideris, has been elected President of the International Association of Geodesy (IAG) for the period 2007 to 2011.
- Professor Lachapelle, received the Alberta Ingenuity Fund Research Excellence Award at the Association of Professional Engineers, Geologists, and

Geophysicists of Alberta (APEGGA) Summit Awards Gala.

- Mr. Wouter van der Wal won the 2007 Canadian Geophysical Union (CGU) Best Student Paper Award for his oral presentation entitled "*Secular geoid rate in North America from GRACE: methodology, accuracy and interpretation.*", which was co-authored by PhD candidate E. Rangelova and Wouter's co-supervisors, Drs. M.G. Sideris and P. Wu.

- Mr. Surendran Shanmugam has won a student sponsorship award from the Swiss Institute of Navigation to present a research paper titled, "*Narrowband Interference Suppression Performance of Multi-Correlation Differential Detection*". at the European Navigation Conference-GNSS 2007 in Geneva, Switzerland.

- Professor Yang Gao has been awarded Changjiang Chair Professorship at Wuhan University by the Chinese Ministry of Education and Li Ka-Shing's Foundation.

- Dr. Mark Petovello, a Senior Research Engineer in the PLAN group, has been awarded the U.S. Institute of Navigation's (ION) Early Achievement Award. The award, presented at the ION's Annual Awards Banquet in Cambridge, MA, recognizes an individual early in his or her career who has made an outstanding achievement in the art and science of navigation. The citation of Mark's award reads "For sustained technical and professional contributions to GNSS and navigation".



ION President Mr. John Lavrakas (left) and Dr. Mark Petovello

Student News

- Mr. Sidney Kwakkel, an undergraduate student in Geomatics engineering, will be the first graduate of the Biomedical Engineering Specialization (BMES) in the Schulich School of Engineering this Spring.

The Biomedical Engineering Specialization is completed in addition to a department's curriculum, and was designed to give undergraduate students

courses in biomedical relevant topics, as well as a capstone research project. Sidney's undergraduate biomedical research thesis was titled "*Foot and Ankle Kinematics Using A Foot Mounted Inertial System*", and was successfully defended on April 3. Sid started his research in the PLAN Group in Summer 06 under the supervision of Professor Lachapelle and with the help of and

technology developed previously by Saurabh Godha, MSc, research engineer in the PLAN Group.

Sidney's thesis will be available on Project #19 of the PLAN Group website by mid April.

Sidney will joined the PLAN Group in May to begin his graduate studies in Geomatics engineering.

Visits

- On April 24 during our Lallygag Lunch, Dr. Caterina Valeo gave a splendid presentation on her two-month visit to Fiji. Her beautiful pictures and her enjoyable talk were enthusiastically enjoyed by all who attended. During her Fiji visit, Dr. Mele Rakai (former Professor in our department) and Dr. Valeo were collaborating on research leading to effective use of traditional knowledge (specific to native groups of the South Pacific) in modern environmental impact assessments of



water resources projects in the South Pacific. Comparisons would be made to the type of traditional knowledge used by native communities in Alberta.

- Special Presentations were given in the department by Mr. Fabio Ayres, Department of Electrical Engineering; Dr. Neculai Archip, Harvard Medical School; Dr. Derek Lichti, Curtin University of Technology; Dr. Naga Mudigonda, General Dynamics Canada Ltd.; Mr. Nezam Kachouie, University of Waterloo.

Research Spotlight

Satellite Geophysics and Radar Remote Sensing

Article by Dr. Jeong Woo Kim (Geodetic Earth Observation)

Dr. Kim's current research mainly focuses on integrating state-of-the-art geophysical and geodetic techniques for geohazard analysis and geodynamics. He is interested in monitoring and predicting geologic hazards such as earthquakes, volcanic eruptions, landslides, and subsidence through optimal fusion of various deformation measurements particularly from superconducting and satellite gravimeters, seismometer, and InSAR. His recent research also focuses on modeling time-variable components from satellite gravity and magnetic anomalies for regional and global geodynamics. He analyzes GRACE gravity to model seasonal water thickness variations over the Amazon basin. He is also interested in modern satellite geopotential anomalies for global harmonic and regional crustal modelings. In the field of radar remote sensing, besides InSAR for the surface deformation analysis, he is also interested in satellite radar altimetry for gravity, bathymetry, and polar ice analyses. He develops data processing techniques to calculate geoid and gravity anomalies as well as bathymetry from the accurate sea surface height estimation. Combined with radar and laser altimeter data, he also analyzes scatterometer and radiometer data to for Arctic and Antarctic sea ice analysis.

Taking GPS Indoors with Improved Oscillator Technologies

Article by Rob Watson (PLAN Group)

New techniques to integrate GPS and inertial navigation systems (INS) are now being developed to improve both the accuracy and availability of navigation indoors. In an integrated system, the improvement over stand-alone GPS techniques can potentially allow positioning with signal strengths as much as 40 dB below nominal levels, greatly increasing the number of places where inexpensive navigation systems will work.

A critical factor affecting performance of an integrated GPS/INS system is the stability of the reference oscillator used within, which is used to generate timing signals and to synthesize RF carriers used in



Mark Petovello, Senior Research Engineer in the PLAN Group, tests a GPS/INS combination on the CCIT rooftop

downconversion. The PLAN group has been testing the stability of a variety of oscillators to better understand how instabilities reduce the maximum achievable sensitivity. In a GPS/INS system with a "perfect" inertial unit, additional processing gain (above nominal levels) varying from 33 dB to 42 dB has been achieved with oscillator units ranging from a relatively inexpensive temperature-compensated crystal oscillator (TCXO) to an ultra-stable ovenized crystal oscillator (OCXO) costing over \$6,000. These results are now providing a point of reference with which to analyze GPS/INS system performance using non-ideal inertial sensors, which impose their own limit on sensitivity that can be achieved.

As the PLAN group now develops its own GPS/INS hardware and software, results from the above oscillator tests are being used to ensure that the selected hardware elements are capable of performing up to the capabilities of new software algorithms. As development proceeds, the impact of design decisions will be constantly evaluated in terms of the indoor navigation performance that can be achieved under common circumstances that will be encountered by consumers for years to come.

Alumni Voice

It was 1996 when I initiated the idea of studying abroad for a doctoral degree. The geomatics engineering graduate program at the University Calgary first caught my attention for its beautiful dormitories. I started putting my thoughts into action by applying to several geomatics programs all over the world. I was accepted from all the programs I applied to, but I decided to go to Calgary based on three reasons: the beautiful scenery, the research activities, and the VISAT van developed by my supervisor, Dr. Naser El-Sheimy.

Working with Dr. El-Sheimy would be the most important turning point in my professional life. The suggestion he made for me to change my research work from image processing to INS/GPS integration

was good for my professional career. Now I am one of the few people involved in this research topic for civilian purpose in Taiwan. The professional training I received and the experts I met, contributed to the academia career path I am now taking as an Assistant Professor at the Department of Geomatics at the National Cheng Kung University in Taiwan. Owing to my living experience and the professional training I had in Calgary, most of the students in my department who plan to study overseas now consider Calgary as their first choice.

The Calgary experience also fulfills the dream I left behind. When I was a high school graduated student, I was hoping to major in the Aeronautics and Astronautics program in the same university, however, I did not make it during the university

entrance examination thus the surveying engineering program became an alternative option to me. However, the research topics I am currently involved in are not different from some of the aeronautical people. In fact, some of my colleagues in that department once asked me if I applied for the wrong department. To sum up, come to Calgary to fulfill your dream. It happened for me, and can happen for you too.



Kai-Wei Chiang, PhD 2005



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

A Passion for Excellence

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

Department Receives Donation



L to R: Gérard Lachapelle, Ed Scovill, Kirk Collins

Ed Scovill, retired SAIT surveying instructor, has generously donated a Troughton & Simms transit to the Department of Geomatics Engineering. Dr. Gerard Lachapelle and Kirk Collins are seen above recently accepting this equipment from Ed. In addition the department also received a number of valuable historical surveying texts and a copy of a township plan for the Town of Calgary dated 1895. The Department wishes to thank Ed for this kind donation.

Department Activities



- Farewell to Dr. Caterina Valeo. On July 01, Caterina will be leaving her

position in the Geomatics Department to join Civil Engineering as Associate Professor. We wish her the very best!

- The Department is please to announce that Dr. Xin Wang has accepted the position of Assistant Professor in the area of Geospatial Information Systems. Dr. Wang's position will commence on July 1, 2007.
- The Schulich School of Engineering Graduate Student Research Conference was held on April 30 and May 1.
- Congratulations to Dr. Kyle O'Keefe and his wife Kim, daughters Amelia and Cora, on the birth of Samuel David Brian

O'Keefe, born on Saturday, March 31 weighing in at 8lbs 6.5 oz.



Coming Events

- Graduate Courses, Upcoming Tentative Spring/Summer 2007 Schedule: ENGO 638: GNSS Receiver Design; ENGO 699.57: Advanced Kalman Filtering Applied to Navigation; ENGO 699.64: Integrated Navigation Systems.
- ENGO 501: Field Survey Camp, August 20—August 30, 2007.
- Fall 2007 classes resume on Monday, September 10, 2007

Sites to Visit:

- <http://www.iag-aig.org/>
- <http://www.apegga.com/>
- <http://www.cgu-ugc.ca/>
- <http://www.ion.org/>
- <http://plan.geomatics.ucalgary.ca/>