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FALL 2008

GEOMATICS ENGINEERING

SCHULICH School of Engineering

UNIVERSITY OF CALGARY

DEPARTMENT OF GEOMATICS ENGINEERING

Geomatics News

Message from the Head

Dear Readers,

Happy new year to you all.

With the start of 2009, I would like to begin by thanking our faculty, support and technical staff, and our students for their services, contributions and continued commitment to the Department - without you all, this will not be possible.

We have a busy year in front of us. Many activities will be taking place in the next few months. Our Department Career day will take place on February 12th. Students, please take note of this event; it is an excellent opportunity to secure summer or permanent employment.

Finally, I would like to welcome our new 2nd year Undergraduate students and wish them all the best in their new home department. You are in good hands here; and we look forward to helping you be successful in your studies, and ultimately helping our profession.

Dr. Naser El-Sheimy, P.Eng, CRC
Professor and Head

2009 List of 20 Compelling Calgarians

Dr. Susan Skone, figures prominently in the 2009 list of 20 Compelling Calgarians. The Calgary Herald newspaper compiles this annual list of Calgarians who stand out in their fields and will make significant contributions to the community.

Dr. Skone is working to improve the accuracy and timeliness of weather forecasts. “We’re engineers, so we develop the tools and the methods for measuring the information meteorologists require,” explains Skone, whose research focuses on satellite navigation and Global Positioning System (GPS) applications as they relate to meteorology. “We develop the probes or systems that will measure temperature, humidity and winds for meteorologists to use in their weather models.”

Environment Canada wants to improve weather forecasts by implementing an Aircraft Meteorological Data Relay System. Skone and colleague Naser El-Sheimy are developing a meteorological aircraft probe along with industry partner AeroMechanical Services Ltd. of Calgary. For more information, please review the following websites/links:

www.ucalgary.ca/innovators/2/skone

www.calgaryherald.com/Technology/Prof+Giving+Weather+Direction/1131780/story.html

Inside this issue:

Congratulations

- Congratulations to students who completed their graduate studies: Ashkan Izadpanah, MSc; Chang-Jae Kim, PhD; Sidney Kwakkel, MSc; Anna Jarvis, MSc; Zainab Syed, PhD; Chris Goodall, PhD; Nazila Salimi, MSc; Mohammed Sadeque, MSc; Abdel Muhsen, MSc; David Chiu, MSc; Mohamed Youssef, PhD.

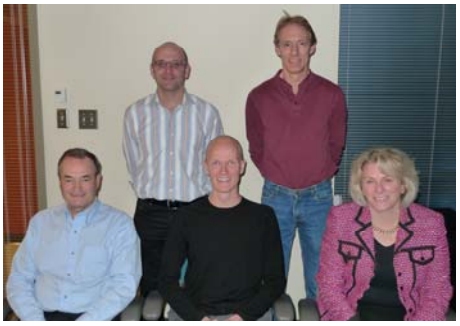
- Dr. Andrew Hunter is this year's recipient of the Teaching Excellence Award for third and fourth year courses in Geomatics Engineering. The award was presented by the University of Calgary Engineering Students Society at their annual Third and Fourth Year Dinner.

- Dr. Chaminda Basnayake received the 2008 GM R&D's Charles L. McCuen Award for the development of a system that will full production in 2009. Dr. Basnayake, a Senior Research Engineer at GM R&D since 2005, studied in the PLAN Group from 2001 to 2004 and received his doctorate from the University of Calgary under the supervision of Professor G. Lachapelle. This is third award received by Dr. Basnayake since joining GM in 2005. He received the 2006 Charles L. McCuen Award for contributions to the V2V technology R&D, and the 2007 OnStar President's Award for successfully prototyping and demonstrating a sensor integration algorithm that replaces a critical navigation component with software and other existing sensors yielding a significant cost saving for GM. The Charles L. McCuen Award is the highest award offered by GM R&D.

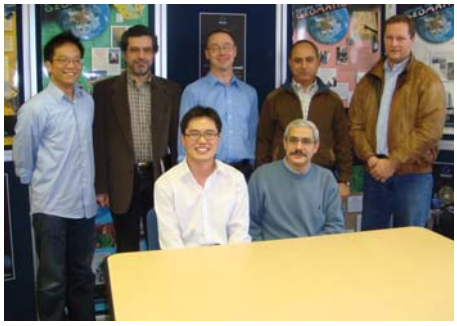
Chris Goodall successfully defended his PhD thesis

Anna Jarvis successfully defended her MSc thesis

Mohamed Youssef successfully defended his PhD thesis



Sidney Kwakkel successfully defended his MSc thesis



Chang-Jae Kim successfully defended his PhD thesis

Zainab Syed successfully defended her PhD thesis

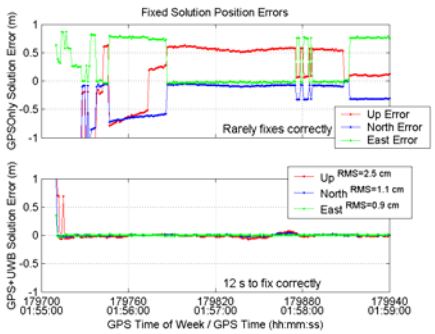
Research Spotlight

Tightly-Coupled GPS-UWB Integration for Improved RTK Surveying

Article by Dr. Kyle O'Keefe (Wireless Location)

UWB ranging radio and a GPS receiver on a co-axial mount.

Ultra-wideband radio (UWB) is a relatively new radio technology that allows for extremely high data-rate communication over relatively short distances by using very low power, high bandwidth signal. While most UWB applications involve communication systems, the high bandwidth of UWB means that it can be used to obtain very precise two-way range measurements. Over the past two years my research team has been working on the development of a tightly coupled integration of UWB and GPS for surveying applications. The idea is to use ground-based UWB ranges to augment RTK surveying applications. The addition of precise ground-based ranges helps both with ambiguity resolution, and with maintaining and RTK solution in areas GPS signals are obstructed. Our goal is to develop a fully operational system where a user would use RTK GPS to deploy several reference UWB transceivers at locations with good GPS coverage before starting to survey in an area with poor GPS availability. The rover receiver then makes GPS and UWB observations which are used to estimate the rover position and the GPS carrier phase ambiguities. Our initial tests of this concept have demonstrated improved ambiguity convergence times and the ability to continue surveying in very poor GPS conditions and we are very excited about the potential of this technology in urban and indoor positioning, location and surveying applications.



GPS only vs. GPS+UWB fixed position errors in an urban area (4 GPS satellites, 3 UWB ranges)

A Multi-Agent System to Simulate the Decision Process of Stakeholders Involved in a Land Residential Project in the Calgary Region

Article by Michael Kieser and Dr. Danielle Marceau (GIS and Land Tenure)

The objective of this project is to build a multi-agent system to simulate the decision making process of stakeholders in a residential land development project and the influence of such decisions on land-use resources in the Town of Strathmore, Alberta. A multi-agent system (MAS) simulates a community of agents making decisions and taking actions on an environment. The environment is represented by a series of raster-based maps at 4 m spatial resolution including the land-use designation, the cadastral base, and the land use. The stakeholders include the town planner (also representing the town council), the land developer and the citizens. Structured interviews with representatives of each agent type were performed and the information was compiled to determine their goals, how they make decisions, the factors that influence their decisions, and how they communicate with each other. A decision module was built to simulate the intricate process of negotiation and decision of these interacting agents. The model was programmed in Java and simulates agent-environment interactions that occur when agents "see" the environment over which they make decisions, and agent-agent interactions that are defined as logical rules and communication between agents. The model involves three components: 1) a simulation module of the agent goals,

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Alumni Voice

My academic background before joining the University of Calgary was in surveying engineering, mainly dealing with accurate positioning of static targets. An era of transition had come with the popularity of the GPS surveying instruments, a transition from static to kinematic and a transition from local to global. It was around the time that I studied for the master's program in Korea. During my study at the U of C, I was fascinated by the field of integrated navigation. There might be some reasons for this. It has long history and it continuously evolves with the invention of new technologies or sensors. It primarily deals with positioning of moving objects. Like the film making is a synthesis of arts, a modern integrated navigation system can only be built with the synthesis of knowledge from many different disciplines: for instance, Applied Mathematics, Earth Science, Electric Engineering, Information Technology and more. Looking back to those days, I remember that the university was a kind of port through which knowledge and people were flowing all the time. Particularly, the Geomatics department had the international lecture series program, where many world-renowned scholars were invited to give short lectures covering various fields and spectrum. I think it kept my eyes open to how the other world is doing and the knowledge gained during that time still helps me working as a navigation analyst.

Dr. Eun-Hwan Shin
PhD 2005

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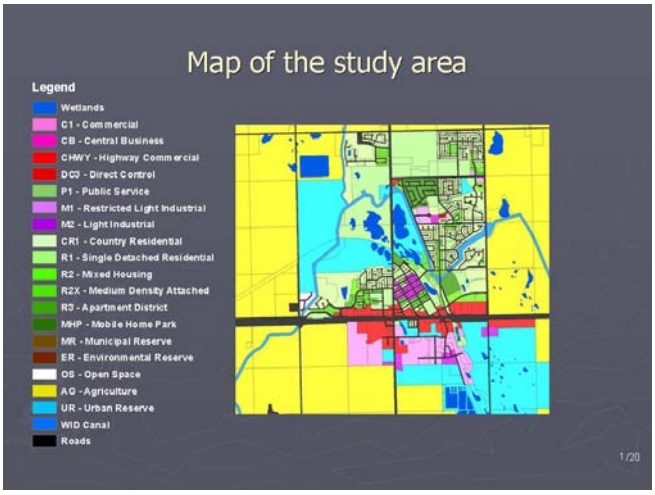
interactions and decision making that creates the development scenarios, 2) a module that changes the land use based on development scenarios and neighboring existing land use, and 3) the combination of the two modules that takes the agents' decisions in a development scenario and applies them to the environment. Simulations were run for a period of 30 years, which lies within the future plans of the Town, with a one year incremental step. Several different development scenarios were performed using the model to visualize the impact on the development of Strathmore, including: increasing and decreasing residential density, allowing, forbidding, or compensating any impact on wetlands present in the proposed development area, and decreasing the average household size. The model generates a series of raster-based land-use maps showing the change of the environment based on the goals and decisions made by the agents. The results are validated through meetings with the stakeholders who are asked if they accurately portray the intentions of the actual decisions made on the land development project. This model could potentially lead the stakeholders to achieve a beneficial outcome in the best interest of everyone when facing the challenge of new urban development.



Department Activities

- Fall session exams ended Dec 17. 2008.
- Dr. Yang Gao is on sabbatical from Jan 01, 2009—June 30, 2009.
- Dr. Blais is offering ENGO 699.10 "Estimation and Computational Analysis" for the winter session. If you are interested in taking this course, the first meeting will be held on January 09 at 11:00am in EN E 224 Reading Room. This class is on the web and available for registration. Please pass this on to students you may know, who would be interested in this course.
- Geomatics Pot Luck Christmas Party was held on December 15, 2008. Lots of international and local goodies!

Christmas 2008 Pot Luck

Coming Events

- Career Day—February 12, 2009
- Awards Night—March 12, 2009
- Geomatics Engineering Advisory Committee (GEAC) meeting—March 12, 2009 from 8:30am—4:30pm
- Geomatics Engineering Liaison Committee (GELC) meeting—March 13/2009 from 9:00am—12:00noon

Sites to Visit:

- *http://www.ucalgary.ca/innovators/2/skone*
- *http://www.calgaryherald.com/Technology/Prof+Giving+Weather+Direction/1131780/story.html*
- *http://plan.geomatics.ucalgary.ca/*
- *http://www.ucalgary.ca/~kpgokeef/*
- *http://www.ucalgary.ca/gcl/*