

Message from the Head

Dear Valued Reader

I hope that you had a chance to enjoy your summer and renew your energy. In this message, I would like to update you about the latest developments in the Department since the last newsletter. As in previous years, the great majority of our graduating students have been able to secure employment opportunities in different sectors of Geomatics. Our graduate program has been steadily growing. Our faculty members have been quite busy with their research and preparing for the Fall Semester. The Department success and growth would not have been possible without the dedication of our faculty, staff, and students. Therefore, I would like to take this opportunity to thank them for their hard work.

On another front, we have 62 incoming Second Year Students to the Department. The Department together with the Geomatics Engineering Student Society (GESS) will formally welcome these students in their first class in Geomatics – ENGO 333, Computing for Geomatics Engineers. This Fall semester, we will continue with the free-lunch series to highlight the career opportunities in Geomatics Engineering. On November 21st, Steve Coast, the principal architect for Microsoft’s Bing Mobile, will provide a presentation to First Year Engineering Students about Geomatics in Microsoft. Finally, I am pleased to let you know that the Department has welcomed new faculty and staff members. Dr. Ruisheng Wang and Mr. Steve Lam joined the Department this summer. Before joining

the Department, Dr. Wang was working at NOKIA Corporation in Chicago, IL, USA. Dr. Wang’s research is in the area of Digital Imaging System. Mr. Lam will be our new Survey Technologist and he comes with an extensive experience in boundary and reconstruction surveying as well as student training. Please, join me in welcoming Ruisheng and Steve to our Geomatics Team. On another note, Mr. Garth Wannamaker, our technical manager, has retired after twenty-seven years of distinguished service to the department. Garth will be greatly missed and we wish him all the best.

Dr. Ayman Habib
Professor and Head

Survey Camp—August 2012



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Congratulations

- Congratulations to students who completed their graduate studies: Seyed Nima Sadrieh, PhD; Sina Taghvakish, PhD; Fatemeh Ghafoori, PhD; Melania Susi, MSc; Tao Li, PhD.

- Dr. Steve Liang was appointed Member of the Council of Canadian Academies Expert Panel on Innovative ICT Uses for Greening Canada. The Council of Canadian Academies has established a Panel of Experts to conduct an evidence-based assessment of the potential for new and innovative uses of information and communication technologies (ICTs) for Greening Canada. The expert panel was constituted upon a formal request by the Minister of the Environment to the Council

of Canadian Academies. This assessment, once complete, will provide an in-depth and balanced report on the potential for new and innovative uses of ICTs to contribute to a greener Canada. Additional information and updates on the work panel can be found at www.scienceadvice.ca

- Dr. Ayman Habib has received the President's Citation Award from the International Society for Photogrammetry and Remote Sensing (ISPRS) for his four-year service as the Chair of Working Group I/3 – Multi-sensor multi-platform inter-calibration. The citation is awarded in recognition of special, personal and meritorious contributions to the operation of the working group's activities and advancement of its interests.

- Dr. Mark Petovello has been elected Treasurer of the Institute of Navigation's (ION) Satellite Division at the ION. He will serve for two years.

The purpose of the ION Satellite Division is to encourage the development, operation, and use of navigation and position determination systems incorporating satellite based elements.

- Ting On Chan, PhD student in the Department of Geomatics Engineering, was the recipient of a Best Poster Paper Award at the XXII Congress of the International Society of Photogrammetry and Remote Sensing (ISPRS) in Melbourne, Australia.

Other News

- The Department is pleased to announce the appointment of Dr. Ruisheng Wang as an Assistant Professor in the Department of Geomatics Engineering. Dr. Wang holds a PhD in Electrical and Computer Engineering from McGill University, an M.Sc.E in Geomatics from the University of New Brunswick, and a B.Eng. in Geomatics Engineering from Wuhan University, China. His most recent work has been in research and development with NOKIA Corporation in

Chicago, IL., USA. His area of research is in the area of Digital Imaging Systems.



Department BBQ picnic held on September 08, 2012 at Edworthy Park. A good time was had by all!

Alumni Voice

I started into Engineering in 2003 at the U of C without really knowing what I wanted to do, or where I wanted to go. My Dad took Electrical Engineering at the U of C and it seemed like a good fit for me too. I was wooed by the Geomatics Department in an information session during 1st year, and decided I would give it a shot. I found a summer job as a survey assistant and worked for 2 summers. I thought I wanted to be a surveyor. I was excited about quickly becoming an ALS and making the big bucks. After much reflection, and after taking the 3rd year GPS course with Dr. Cannon, I decided to follow a new-found passion in GPS. I started working at

NovAtel in 2007, after I graduated from the U of C, and I have not looked back. NovAtel has been great to me, and I love my job. Recently, I had the unique opportunity to combine two of my passions in life: skydiving and GPS technology. I had a crazy idea one night to try to do some Wingsuit skydives with our GPS products. I put together a proposal and submitted it to our Marketing department, and they loved it. Lots of work and about a year later, the results can be seen in the following links:
Article: <http://www.insidegnss.com/node/2895>
PDF of article: <http://www.insidegnss.com/auto/IGM-janfeb12-Wingsuit.pdf>.
More information on the project: <http://www.novatel.com/wingsuit/overview>

Video: <http://www.youtube.com/watch?v=L1DdR0ztkk>



Andrew Levson, BSc 2007

Research Spotlight

Close-Range Measurement Applications with Range Cameras

Article by Derek Lichti (Digital Imaging Systems)

What is a Range Camera?

A range camera (Figure 1) is an active imaging sensor that measures range at



Figure 1 SR4000 Range Camera

every pixel location by reflectorless phase difference ranging. A set of integrated LEDs floods the scene to be measured with amplitude modulated (at radio frequency) NIR light. The backscattered light is focused by a lens onto a solid-state detector array where the signal is demodulated at every detector site. They are very attractive for many measurement applications since pattern projection and targets are not required, as is the case with photogrammetry and coded light systems, and, unlike laser scanners, they can capture full frame 3D data at video rates (up to 50 Hz) without any scanning mechanisms. These cameras are, however, of low resolution (25k – 40k pixels²) and the range data are noisy (several mm to cm level) and are prone to many biases and artefacts. These drawbacks can be overcome with innovative sensor and data modelling techniques to make range cameras very versatile measurement tools for a variety of applications such as those conducted by my research group and briefly described below.

Structural Deflection Measurement Under Fatigue Loading Conditions

MSc student Xiaojuan Qi; Collaboration: Dr Mandouh El-Badry, Department of Civil Engineering

The objective of Xiaojuan's research is to develop a range camera system for the measurement of the dynamic response of concrete beams subjected to periodic

loading conditions in a structural testing laboratory. The periodic loading regime models the repeated loading and unloading of traffic and is important for assessing the impact of fatigue in reinforced concrete beams. Range cameras have been investigated as a means to provide wide-area coverage of beam displacements as a function of time. Figure 2 shows an experiment set up in which the hydraulic ram mounted to the red frame applies the load to the whitewashed concrete beam via the yellow spreader beam. The red-and-black range camera is mounted in the scaffold assembly about 2 m above the concrete beam. Several thin aluminum plates mounted to the left side of the beam were installed as 'targets' to allow measurements to be captured along the entire length of the beam because much of its top surface was occluded by the spreader beam. Range camera measurements of small (4 mm) beam displacement have been made with sub-millimetre accuracy at 1 Hz and 3 Hz loading frequencies. Figure 3 shows the 20 Hz measurement data and reconstructed displacement signal for the central aluminum plate moving at 1 Hz.

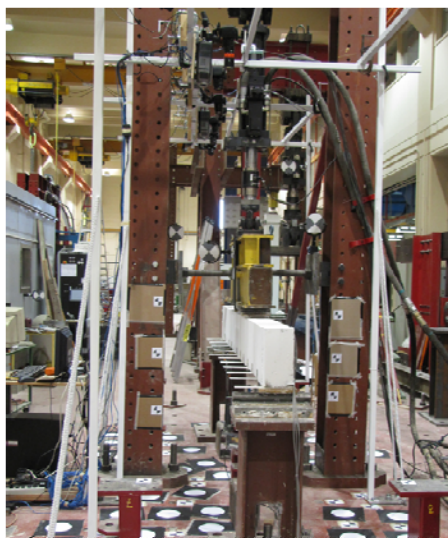


Figure 2 Fatigue load testing setup.

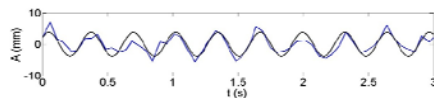


Figure 3 Thin plate amplitude (A) vs. time. Blue: measurement data. Black: reconstructed plate displacement.

Markerless Human Motion Capture

MSc student Tanvir Ahmed; Collaboration: Dr Reed Ferber, Faculty of Kinesiology



Figure 4 Treadmill for marker-less motion capture system testing.

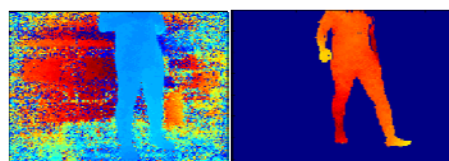


Figure 5 Left: raw range image of Tanvir standing on the treadmill. Right: segmented data of Tanvir walking on the treadmill.

Motion capture systems are used to capture a time series of 3D data of a human subject performing some motion from which gait parameters can be inferred. These are in turn used to aid in clinical diagnoses, to provide a more sound understanding of a human movement process or to improve performance. Numerous applications exist including: the analysis of human gait; the design of prosthetics and orthotics; patient rehabilitation; ergonomic design; surveillance; entertainment (gaming, movies) and sports science to improve athlete performance. The current state-of-the-art uses a network of video cameras and retro-reflective markers attached to the subject. However, the development of marker-less motion capture systems has been driven by numerous shortcomings in this technique such as skin motion, the invasive nature of the markers and the large time commitment required for marker placement. Tanvir's research aims at developing a new marker-less motion capture system that uses multiple, synchronized range cameras. Figure 4 shows the experiment set-up for data capture on a treadmill. Figure 5 shows range range images of Tanvir standing and walking on the treadmill. The high level of noise is noticeable in the background, but the data quality on the body is much

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higher. The result of Tanvir's segmentation algorithms to extract the body from a 3D video sequence of data is also shown.

Measurement of Antler Growth in Reindeer

BSc student Jeremy Steward; Collaboration: Dr John Matyas, Faculty of Veterinary Medicine

Antlers are the only mammalian organ that completely regenerates. They can grow at an incredible rate that is measurable in centimetres per day and they do so annually with a remarkable memory in terms of their form. In their seasonal regeneration the antler core, which includes bone, cartilage, and marrow, as well as the overlying integument, which includes vessels, nerves, and hair-bearing skin, completely re-grow. This remarkable behaviour makes antler growth a good model to obtain a deeper understanding of mammalian tissue regeneration. Jeremy's summer research project focused on developing a range camera solution to measuring reindeer antler growth. Figure 6 shows a photographic image of one of the reindeer and one of Jeremy's 3D point cloud datasets.



Figure 6 Left Reindeer. Right: point cloud of the reindeer head and antlers

Department Activities



Farewell to Garth Wanamaker who retired after 27 years of committed service to the department and university. He will be greatly missed.



Welcome to Steve Lam who joined the department this summer as our new Survey Technologist.

Coming Events

- Come have lunch with Microsoft's Steve Coast—November 21, 2012. Hosted by TECTERRA—You must be registered to gain admittance.
- Fall Term Lectures end—December 07, 2012
- Geomatics Career Day - Thursday, January 31, 2013.
- GEAC Meeting - Thursday, March 14, 2013, 8:30 am—4:30 pm
- Geomatics Awards Night—Thursday, March 14, 2013, 5:30 pm, Cassio A&B, MacEwan Student Centre.

Sites to Visit:

- <http://www.scienceadvice.ca>
- <http://www.novatel.com/>
- <http://www.ucalgary.ca/lichti/>
- <http://www.tecterra.com>