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FALL 2012

GEOMATICS ENGINEERING

SCHULICH School of Engineering

UNIVERSITY OF CALGARY

DEPARTMENT OF GEOMATICS ENGINEERING

Geomatics News

Message from the Head

Dear Valued Reader

Happy New Year, I hope that you had a chance to enjoy the holiday break. Also, I wish you all the best for 2013. Last Fall, we welcomed the incoming second year students to 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 the department. We will do our best to provide you with a world-class geomatics education.

In an effort to promote Geomatics Engineering to first year engineering students, Tecterra sponsored a lunch with Microsoft event on November 21st. Steve Coast, the Principal Architect for Microsoft's Bing Mobile, provided an excellent presentation that was attended by more than 120 participants including close to 100 first year engineering students. More details about his talk are provided in a later section of this newsletter.

This year, the department career day, whose name has been changed to "Geomatics Exposition Day", is scheduled to take place on January 31st. This year, we are expecting more than 40 companies to participate in this event. This is the largest number of companies we had so far. The Geomatics Exposition Day will be a good opportunity for our undergraduate students to meet companies and secure summer and/or permanent employment. Similar to previous years, this event will be also announced to first year engineering students. On behalf of the department, I would like to thank the Geomatics Engineering Student Society (GESS) and Geomatics Exposition Day Commissioners for their hard work and dedication in preparing for this event. This Winter, we will be hosting the annual meetings of the Geomatics Engineering Liaison Committee (GELC) and the Geomatics Engineering Advisory Committee (GEAC) and on January 30th and March 14th, respectively. Also, we will be hosting a information night about Geomatics to the first year engineering students on March 5th. An update regarding those meetings will be provided in the Winter Newsletter.

Dr. Ayman Habib
Professor and Head

Steve Coast
Principal Architect
Microsoft Bing Mobile
November 2012

Inside this issue:

Congratulations

- Congratulations to students who completed their graduate studies: Ahmed Shawky Khalil el-sharkawy, PhD; Sibel Canaz, MSc; Ben Charles Knoechel, MSc; Naif Alsubaie, MSc; Tina Mosstajiri, MSc; Bassem Ibrahim Mahmoud Sheta, PhD; Fang Wang, PhD; Junbo Shi, PhD; Billy Cheuk Wai Chan, MSc; Erin Kahr, PhD; Tiantong Ren, PhD
- Dr. Michael Barry won the Teaching Excellence Award for third and fourth year courses. The award was presented by the University of Calgary Engineering Students Society at their annual Third and Fourth Year Dinner.
- Monica Barbaro was selected to receive the 2012 Schulich School of Engineering Donna Geekie Service Award.
- Dr. Andrew Hunter won the SSE Geomatics Engineering Teaching Award of Excellence, given in recognition of his consistently excellent teaching of undergraduate courses.
- Dr. Steve Liang won the SSE Geomatics Engineering Early Research Excellence Award, presented every two years and recognizes his research success in 2011-2012.

Other News

As part of the Department's activities to introduce geomatics engineering to First Year Engineering Students, Steve Coast, the Principal Architect for Microsoft's Bing Mobile, was invited to provide a talk on November 21, 2012. The objective of this event was to discuss how Microsoft uses geomatics and why a career in geomatics could be the right fit. The talk covered the innovative approach of OpenStreetMap to provide a free, editable map of the world. OpenStreetMap currently has close to a million contributors collecting data for the maps with GPS devices, aerial photography, and other free sources. The differences between OpenStreetMap and other earth browsing systems were also highlighted. The talk was sponsored by Tecterra and more than 80 First Year Engineering students attended. The event also showcased Tecterra's robots equipped with digital cameras, laser scanners, and navigation systems as well as demos highlighting applied research in our department. The audience had good discussions with Steve.

Steve Coast started his career by interning at Wolfram Research before going on to study computer science at the University College London (UCL). He then went on to found OpenStreetMap. In 2006, Steve went on to create a technology consultancy company that became what is known today as CloudMade, a company which produces APIs, rendered maps, and geographic-related services using Creative Commons-licensed OpenStreetMap data. In 2010, Steve moved on to become the Principal Architect of Microsoft's Bing Mobile.

Steve Coast
Principal Architect, Microsoft Bing Mobile

Alumni Voice

At the start of my undergraduate studies in 2007, most geomatics technologies were unaffordable to the average person. By the time I graduated in 2012, various geomatics technologies had improved in terms of both cost and capability. In university, we were taught how geomatics applies to surveying, navigation, and GIS; however more applications are arriving as the technologies become more accessible.

During my undergrad studies, geomatics technologies started appearing in cars, homes, and the pockets of the average person. Most people who own a cellphone now have access to a GPS receiever and inertial system. A 3D range scanner for motion detection began to appear in homes upon Microsoft's release of the Xbox Kinect. Applications of geomatics technologies have even appeared in the film industry; in the movie Tron: Legacy, a form of photogrammetry was used to capture Jeff Bridges' acting and reconstruct a younger version of himself. Even an affordable LiDAR system is currently in development to nagivate autonomous cars.

My career has just begun, but as technological advances are made in the field of geomatics, more and more applications of such technologies are coming to light. I believe that in the future, geomatics will be involved in nearly every industry available. Personally, I look forward to the future geomatics applications that let me work with models (and not the 3D or mathematical kind)!

Alfred D'Mello, BSc 2012

Sensor Web for the Internet of Things

by Steve Liang

Though it receives a lot of press today, the "Internet of Things" (IoT) is not a new idea: From a UN report in 2005: "We are heading into a new era of ubiquity, where … humans may become the minority as generators and receivers of traffic…" and from an ITU report in 2005: "Connections will multiply and create an entirely new dynamic network of networks – an Internet of Things."

What makes a "dynamic network of networks" possible? Standards. All of the things that we seek to connect together in the IoT must "speak" a common language of open service interfaces and data encodings. They must, of course, connect to the Internet, but they must also, for example, communicate, in an ad hoc fashion without direct human intervention: presence, device identity and device-specific information of many kinds, state (e.g. "on" or "off"), location, time, etc. If they send or receive data (e.g. a video image or temperature) as well as instructions, the data must be encoded in a well-known and open encoding.

The Open Geospatial Consortium (OGC) Sensor Web Enablement (SWE): http://www.opengeospatial.org/domain/swe standards are international Web service standards that focus on the content of sensor information and on making the sensor observations useful to end user applications. SWE standards allow users to assess the fitness for use of observations and to allow accurate processing on the sensed information to create derived information suitable to the users' needs.

In much the same way that HTML and HTTP standards enable the exchange of certain basic types of information on the Web, the OGC SWE standards enable the publishing and discovery of sensors and sensor observations; the exchange and processing of sensor observations; and the tasking of sensors and sensor systems.

The IoT, however, has many requirements not fully addressed by SWE: compact encodings and protocols for battery-powered wireless sensors, location/navigation in small areas, navigation-to-thing, context-specific "around me" use cases, visualization in 3D city models and indoor models, space-time Web navigation, big data, massive transaction rates, semantic translation, privacy and access controls, proliferation of related standards, etc. Meeting these requirements takes on incredible importance with the dramatic rise in the use of sensor-rich mobile phones, cloud-based apps for monitoring and control, and the rapid emergence of IoT domains such as the Smart Grid and smart cars.

In today's world, most sensors have proprietary software interfaces defined by their manufacturers and used selectively by developers of isolated integrated systems. New APIs are requested and developed on an as needed basis, considering resource limitations and risk. This situation requires significant investment in sensor integration by application developers, and also investment by providers of sensors, gateways and portals or services where observations are used. Device and operating system vendors may control device and application "ecosystems" large enough to attract app developers and users, but developers and users are nevertheless frustrated by non-interoperability among the ecosystems. Standard interfaces for sensors in the Web of Things (WoT) and Internet of Things (IoT) (two terms that are frequently used interchangeably) will permit the proliferation of new high value services with

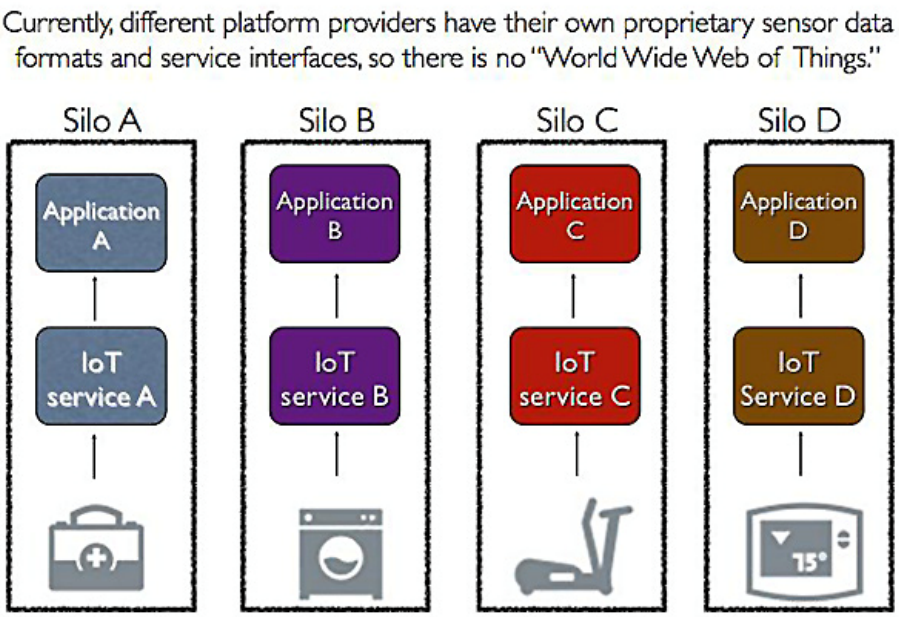

Figure 1: *Currently, different platform providers have their own proprietary sensor data formats and service interfaces, so there is no World Wide Web of Things."*

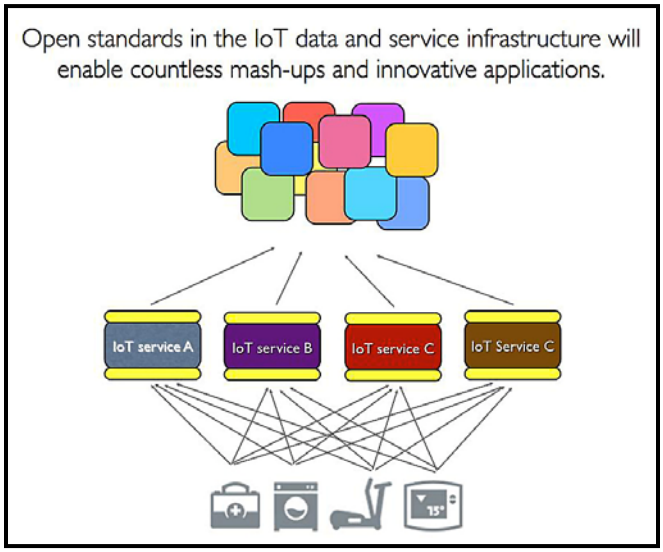

Figure 2: *Open standards in the IoT data and service infrastructure will enable countless mash-ups and innovative applications.*

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A Passion for Excellence

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

Sites to Visit:

- *http://www.opengeospatial.org/*
- *http://www.tecterra.com*

Coming Events

- 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
- Winter Term Lectures end
  Tuesday, April 16, 2013

lower overhead of development and wider market reach. It will also lower the cost and increase the market size for sensor and gateway providers, resulting in more competition, lower sensor cost and more sensor variety.

As a result of several workshops organized by the OGC, the charter for an OGC Sensor Web for IoT Standards Working Group (SWG) was approved by the OGC membership, and the first meeting was held in Seoul in October 2012. The goal of the Sensor *Web for IoT* SWG is to develop one or more standards based on existing Web protocols while also leveraging the existing and proven OGC Sensor Web Enablement (SWE) family of standards.

The initial scope of work of the SWIOT SWG is to make observations captured by IoT devices easily available to applications and users through data aggregation portals.

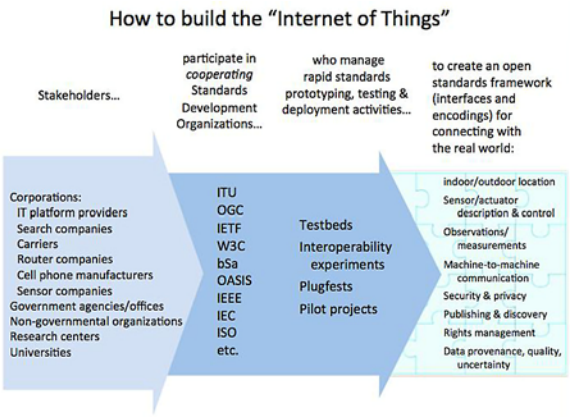

Figure 3: *Roadmap for building the IoT standards framework.*

Many standards organizations must work together to enable a standards-based IoT, but memoranda of understanding between these organizations is not sufficient. The real work of standards coordination is done by the people who participate in the standards development organizations' working groups.

Figure 4: *Representatives from private sector and public sector stakeholder organizations attend standards working groups to settle on industry standards that enable world-wide interoperability.*

Companies, organizations and government departments who want improved IoT interoperability need to step up and support cross-group participation by technical experts who will do the necessary bits and bytes work of standards organization collaboration. We invite such participation in the Sensor Web for IoT SWG.

Department Activities

The Department bids farewell to Monica Barbaro on November 30, 2012 after 13 years of excellent service.

The Department Christmas Party held on December 12, 2012.
Ivan Detchev announces winners of the Cooking Contest.