Subject: Virtual COUNT: 14-18 June 2021 Program

The schedule for the online 2021 COUNT activities is as follows (all times are EDT).

Monday 14 June 2021	12:00 – 13:50	Plenary: COUNT Research Updates
	14:00 – 16:00	Webinar 1: Navigation Components of Mobile Mapping Systems, Charles Toth, The Ohio State University
Tuesday 15 June 2021	14:00 – 16:00	Webinar 2: Advanced GNSS Receivers, Jade Morton, University of Colorado Boulder
Wednesday 16 June 2021	14:00 – 16:00	Webinar 3: Resilient, Collaborative PNT for Autonomous Systems, Robert Leishman, Air Force Institute of Technology
Thursday 17 June 2021	14:00 – 16:00	Webinar 4: Spaceborne GNSS Instruments for Remote Sensing, Andrew O'Brien, The Ohio State University
Friday 18 June 2021	14:00 – 16:00	Webinar 5: CubeSat Development, Launch and Operation from a University Perspective, Sabrina Ugazio, Ohio University

Plenary: COUNT Research Updates

12:00 – 12:10	COUNT Overview, Frank van Graas
12:10 – 12:30	Overview of PNT Research at The Ohio State University ElectroScience Laboratory, Dr. Andrew O'Brien
12:30 – 12:50	Overview of PNT Research at The Ohio State University SPIN Laboratory, Dr. Charles Toth
12:50 – 13:10	Overview of PNT Research at The Air Force Institute of Technology, Dr. Robert Leishman
13:10 – 13:30	Overview of PNT Research at the University of Colorado Boulder, Dr. Jade Morton
13:30 – 13:50	Overview of PNT Research at Ohio University Avionics Engineering Center, Dr. Frank van Graas

Navigation Components of Mobile Mapping Systems

Charles Toth, The Ohio State University, SPIN Laboratory

This webinar will provide an overview of the state-of-the-art navigation sensors and techniques suitable for various close-range navigation and georeferencing of mobile mapping systems, including driverless vehicle platforms, wearable/personal navigation, and UAS. First, the technology trends and developments are reviewed, and then a short analysis is provided on sensors and algorithms as well crowdsourcing. While there are many technologies to facilitate navigation indoors or in any GNSS-challenged environments, the mostly widely used techniques are based on imaging sensors, including active and passive sensors. The main part of the course is the discussion on current navigation solutions available on typical mobile mapping platforms with a focus on the imaging sensors and vision techniques used. The examples presented will include performance assessments and brief discussion on the operational conditions.

Advanced GNSS Receivers

Jade Morton, University of Colorado Boulder

This webinar will focus on advanced GNSS receiver signal processing techniques developed for challenging applications. In recent years, there are increasing demands for GNSS receivers to generate navigation solutions in urban and indoor environments, on LEO satellites or aircraft. Moreover, GNSS signals are highly sought-after signals-of-opportunity for remote sensing of the ionosphere, troposphere, and Earth surface. For these navigation and sensing applications, conventional GNSS receiver signal processing techniques are not adequate to produce desired solutions. In this webinar, we will first provide a brief analysis of fundamentals of GNSS receiver signal processing, followed by discussions of several types of challenging applications, including ionospheric scintillation, radio occultation, and GNSS reflectometry. Finally, we will present several advanced processing techniques, including Kalman filter-based receiver tracking, inter-frequency aiding, and vector processing for weak signal and high dynamics receiver platforms.

Resilient, Collaborative PNT for Autonomous Systems

Robert Leishman, Air Force Institute of Technology

Tremendous amounts of support and energy are currently being poured into the quest for autonomous solutions. The effort spans almost all fields, from research to consumer products, and from transportation to defense and space. Underlying many of these autonomous solutions is an assumption of reliable and robust PNT. This webinar will expound on several current and proposed autonomous solutions and then will highlight the gaps between where we currently are with reliable and robust PNT for autonomy and where some autonomy researchers may be assuming we are. The course will then detail a novel method for providing resilient, cooperative PNT, which may better enable autonomous systems.

Spaceborne GNSS Instruments for Remote Sensing

Andrew O'Brien, The Ohio State University - ElectroScience Laboratory

Over the last several years, there has been a surge of activity using GNSS signals reflected off of the surface of the Earth for remote sensing. This webinar will provide an in-depth review of current and future spaceborne GNSS reflectometry missions, instrument hardware, and science results. The GNSS receiver and GNSS satellites form a unique passive bistatic L-band radar system. Since the receive-only GNSS instrument can be made less expensive than traditional radars, large constellations of small satellites are readily possible, enabling completely new Earth observing strategies. In this short course, we will review the details of the several GNSS sensing satellite missions, including NASA's 8-satellite CYclone GNSS (CYGNSS) constellation, U.K.'s TechDemoSat-1 (TDS-1) satellite, NASA's Soil Moisture Active Passive (SMAP) satellite, and several commercial cubesat constellations. We will review the state-of-the-art in a number of applications, include the measurement of ocean surface wind speed, soil moisture, sea ice, wetland depth and extent, and centimeter altimetry from space. Finally, we will present a review of the next generation of GNSS remote sensing technologies currently under development by NASA, universities, and space companies.

CubeSat Development, Launch and Operation from a University Perspective

Sabrina Ugazio, Ohio University Avionics Engineering Center

This webinar provides an overview of the steps involved in CubeSat development, launch and operation from a university perspective. With NASA and university support, Ohio University developed Bobcat-1, a 3-Unit CubeSat (10 by 10 by 34 cm) to measure time offsets between GNSS constellations. Concept development for Bobcat-1 started in January of 2017. Bobcat-1 was launched on October 2, 2020 and deployed from the ISS on November 5, 2020 and has been operational for more than 6 months. The overall process will be summarized with examples of challenges experienced during the development of the CubeSat and Ground Station. The GNSS payload will be detailed, and examples of GNSS performance data will be provided, including GNSS spectrum snapshots and measurement performance in an almost multipath-free environment.