NOTICE OF THESIS PROPOSAL PRESENTATION

Geodesy and Geomatics Engineering

Doctor of Philosophy

Emerson Pereira Cavalheri

Friday, September 29, 2017 @ 1:00 pm
Head Hall – room GD-108

Supervisor:	Marcelo Santos, Geodesy and Geomatics Engineering
Supervisory Committee:	Monica Wachowicz, Geodesy and Geomatics Engineering
	Eric Hildebrand, Civil Engineering
Chair:	Peter Dare, Geodesy and Geomatics Engineering

Improving Lane Keeping Assist Systems (LKAS) using Real-time Kinematic Precise Point Positioning and Maps

ABSTRACT

Most LKAS (Lane Keeping Assist Systems) have been developed using imagery technology to assist drivers and support autonomous vehicle to safely navigate in the correct lanes. However, image processing techniques require light to correctly identify the lane marks, potentially leading to failures in dark or bright environments. Therefore, new sensor integration and different approaches must be developed to explore and provide a safer and reliable autonomous navigation in any environment. It is conceivable that accurate Global Navigation Satellite Systems (GNSS) positioning and highly accurate digital maps could be the key for the development of advanced LKAS. Studies used GNSS and map information to provide map-matching algorithms and only slight improvements in solution availability and integrity was shown. None of the studies focused on LKAS developments. Although GNSS positioning techniques, such as the Precise Point Positioning (PPP), provide consistent global positions anytime in any weather condition, the long solution convergence times, 20 to 30 minutes, limits real-time kinematic PPP (RTK-PPP) applications. Furthermore, obstructions of satellite signals, normally in environments with restricted sky visibility, leads the positioning filter to reconverge. A common approach to bridge short periods of signal obstructions is to integrate GNSS with an inertial navigation system (INS). Due to INS inherent errors, this combination become inadequate for long periods of GNSS blindness. Therefore, we propose a GNSS/INS positioning filter with map constraints to develop a new LKAS. An adaptable filter integration of GNSS/INS with map constraints will be capable of bridging the short and long periods of GNSS outages. Moreover, by extrapolating future positions in the map and sending it to the vehicle controller will keep the vehicle on its lane of navigation in any road environment. The importance of this new and alternative LKAS is to offer a continuous and accurate real-time positioning, with relatively cheap and simple sensor structure, that will potentially allow, or support, existing LKAS developments to provide a safer and reliable autonomous vehicle navigation.

Faculty Members and Graduate Students are invited to attend the presentation