University of Calgary
Schulich School of Engineering

Two MSc positions in "Vision-based unmanned systems in geomatics" available in the Department of Geomatics Engineering at University of Calgary

We are seeking highly motivated master's students to work on the following projects in the Department of Geomatics Engineering, University of Calgary, under the supervision of Dr. Mozhdeh Shahbazi.

Project 1: This project will be funded through Mitacs Accelerate and will be in collaboration with a collegial center for technology transfer originally located in Quebec (with a branch in Calgary that eliminates the need for the intern to move to Quebec).

The purpose of this project is developing a multi-sensor system based on an unmanned aerial vehicle for characterizing soil micro-topography (MT) in agricultural fields. The system will benefit from both passive imaging and active ranging technologies, respectively, based on an optical digital camera and a LiDAR sensor.

Main Research Activities: 1) New techniques will be developed for assuring data quality through i) optimizing the procedure of laboratory calibrations of the sensors and the system; ii) accurate integration of LiDAR point clouds and photogrammetric point clouds; and iii) ground filtering, digital terrain modeling, and extracting soil MT variables. 2) The impact of these procedures on the accuracy, completeness, and repeatability of MT-variable extraction will be thoroughly assessed through several data-collection and field experiments.

Project 2: This project is part of a larger project which is aimed at developing a cutting-edge visual navigation/mapping system based on unmanned aerial vehicles (UAVs). Paid industrial internship opportunity will be available for this project.

The purpose of this project is developing an integrated system consisting of a UAV with multi-modal sensor setup (INS, GPS, five panoramic cameras). The system is intended to navigate reliably in complex outdoor scenes, e.g. at the proximity of critical infrastructure.

Main Research Activities: 1) The choices of features and descriptors, and techniques of tracking and non-linear filtering will be investigated for visual feature-based SLAM using probabilistic methods. 2) The five-source camera pose solutions from the previous process will be integrated into the global pose estimation mechanism with the other measurements received from the INS and GPS.

Specific Requirements: The education background and/or technical experiences of the applicant should soundly demonstrate the applicant's ability to gain expertise and knowledge required for fulfilling the tasks mentioned above. Excellent programming skills in C/C++ and/or Python are required. The applicant is expected to develop excellent communication competencies in the course of their project to publish journal articles and present their work at international conferences.

First-contact process: If you are interested in any of the projects, you need to first send your updated curriculum vitae, unofficial transcripts, contact information for two references, as well as a statement of interest to Dr. Mozhdeh Shahbazi (mozhdeh.shahbazi@ucalgary.ca). Please specify the project in which you are interested.