LSGI Distinguished Lecture Series "Optimal Laser Scanner Viewpoint Placement and Multi-Camera System Calibration"

Overview

It was our pleasure to invite Prof. Derek Lichti, Department of Geomatics Engineering, The University of Calgary, Canada, to deliver a seminar of the LSGI Distinguished Lecture Series on 9 May 2019.

Biography

Dr Derek Lichti is Professor with the Department of Geomatics Engineering at the University of Calgary, Canada. He earned his bachelor's degree from Ryerson University in 1993 and MSc and PhD from the University of Calgary in 1996 and 1999, respectively. From 1999 to 2007, he was a faculty member in the Department of Spatial Sciences at Curtin University in Perth, Australia. He has been at Calgary since 2008 and was Head of Department from 2013 to 2018. Since 2013, he has been the Editor-in-Chief of the ISPRS Journal of Photogrammetry and Remote Sensing and he served two terms (2004-8 and 2008-12) as the Chair of the ISPRS Working Group on terrestrial laser scanning.

Optimal Laser Scanner Viewpoint Placement and Multi-Camera System Calibration

This presentation will highlight recent work in terrestrial laser scanner network design and the geometric calibration of multi-camera systems used for mobile mapping. Terrestrial laser scanners (TLSs) are precision measurement devices that can be used for a variety of applications requiring three-dimensional data. The can capture very dense spatial data of large, complex environments in a matter of minutes. The raw point cloud data can be further processed to produce detailed 3D models of cultural heritage sites, industrial installations and construction sites. The first part of this presentation will focus on first order network design, which is the problem of determining the number and location of TLS instrument locations or viewpoints needed for complete site recording. Although this problem has been well treated in the context of geodetic and photogrammetric networks, it has not been sufficiently addressed for TLS networks that might comprise hundreds or even thousands of viewpoints. A hierarchical approach to TLS viewpoint planning based on a new weighted greedy algorithm will be described and demonstrated. The second part addresses the geometric calibration of the Ladybug5 camera system, which comprises six wide-angle camera to provide a panoramic imagery and is frequently integrated into mobile mapping systems for point cloud colourizing and remote inspection.

Geometric calibration of the system is needed to maximize positioning accuracy for such applications, particularly given that panoramas generated for certain environments from Ladybug imagery can exhibit seam-line discontinuities. A rigorous modelling and self-calibration approach that allows estimation of the interior and relative orientation parameters while accounting for chromatic aberrations will be presented.