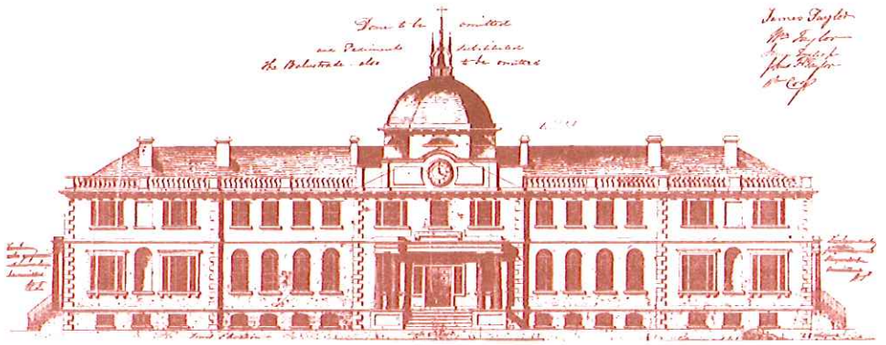
User-Side Modelling and Comparative Analysis of Airborne Lidar Errors

Abstract

Project specifications are designed and enforced to determine whether or not delivered data met required standards. However, rapid advancements in LiDAR data capture technologies have led to major challenges for end users to validate the data and processes for fitness for use. The developed UDTEB model uses two approaches to fill this gap – 1) the deterministic approach employing CMP and SBET or their equivalent files of ALS surveys to extract the root mean square errors of points with respect to a trajectory and an estimated terrain, and 2) where these files are not available, the non-deterministic approach employing published LiDAR system performance reports to simulate flight conditions and estimate errors under defined conditions.

To validate the UDTEB model, five areas of varying topography and land cover were investigated. TIN differencing and a new method for point by point comparison of checkpoints and corresponding LiDAR points using square windows around the checkpoints was employed. When the checkpoints where further categorized as "clear", "light" and "dense" obstructions, average RMSE values observed were 0.06 m, 0.05 m and 0.10 m respectively.

The UDTEB model proposes a method to equip end-users to perform error budgeting from data acquisition to the end product creation and validate the elevation accuracy of a LiDAR data at a given confidence interval. The method can be customized for a given error analysis task, allowing the user to include other error sources into the model. It can also be adopted for elevation error analysis of large datasets similar to LiDAR.



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UNIVERSITY OF NEW BRUNSWICK

SCHOOL OF GRADUATE STUDIES

ORAL EXAMINATION

Patrick Adda

IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

Ph.D. Candidate

Patrick Wetarni Adda

Graduate Academic Unit

Geodesy & Geomatics Engineering

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July 31, 2013

1:00 p.m.

ADI Studio (Room HC-25)
Head Hall

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Examining Board:

Dr. David Coleman (Geodesy & Geomatics Eng.)	Supervisor
Dr. Peter Dare (Geodesy & Geomatics Eng.)	
Dr. Raid Al-Tahir (Geodesy & Geomatics Eng.)	
Dr. Glen Jordan (Forestry & Environmental Mgt.)	Chairperson

External Examiner:
Dr. Songnian Li, P.Eng.
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The Oral Examination will be chaired by:
Dr. Demetres Tryphonopoulos, Assistant Dean of Graduate Studies

BIOGRAPHY

Universities attended (with dates and degrees obtained):

2008-2013	PhD candidate, University of New Brunswick
March 2010	Diploma in University Teaching University of New Brunswick, Fredericton,
2005-2007	MSc. Photogrammetry and Geo-Informatics (GIS).Stuttgart University of Applied Science, Germany.
1998-2002	B.Sc. Geodetic Engineering., Kwame Nkrumah University of Science and Technology, Ghana.

Publications:

Adda P and Coleman D (2012). "Scalable integration of multiple datasets towards meeting scalable user requirements" Poster prepared for the MAPPS/ASPRS 2012 Specialty Conference. Tampa, Florida USA October 29 - November 1, 2012 Tampa.

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Adda P (2012) CARIS report CARIS LIDAR INITIATIVES for LiDAR and Laser scanning analysis. Contract Technical Report Submitted to R&D Manager, CARIS, 115 Waggoner's Lane, Fredericton, New Brunswick. June 13.

Adda P., Mioc D., Anton F., McGillivray E., Morton A., Fraser D.,(2011). "3D Flood-Risk Models of Government Infrastructure". ISPRS Commission VI, WG VI/4. [Online] http://www.isprs.org/proceedings/XXXVIII/4-W13/ID_39.pdf.

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Adda, P., Coleman, D. and D. Finley [2010]. "Designing LiDAR Data Acquisition and Quality Assurance specifications for multiple organizations - Canada's first experience in New Brunswick". Proceedings of the 2010 Conference on Applied Geoinformatics for Society and Environment (AGSE 2010), pp. 43-48. ISBN 978-3-940670-19-9. [Online] http://www.applied-geoinformatics.org/downloads/AGSE_2010_ Proceedings_2010_11_01.pdf.

Several other publications & conference presentations.