



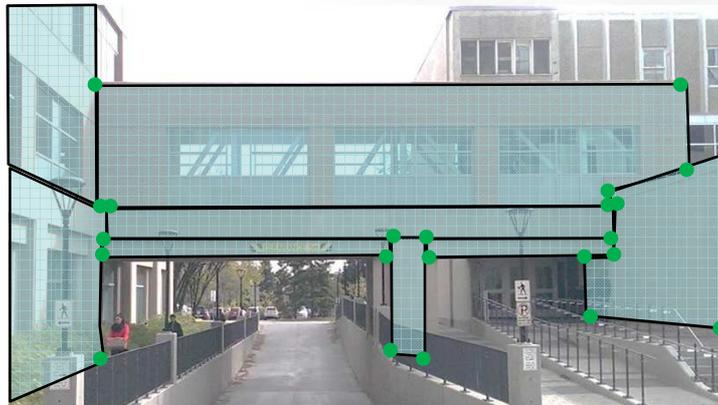
"From the wisdom of the ages
to the challenges of modern world"

Laser Scanning Validation Methods for Land Surveyors

Sam Rondeel

Michael Barry, Derek D. Lichti
University of Calgary

Background



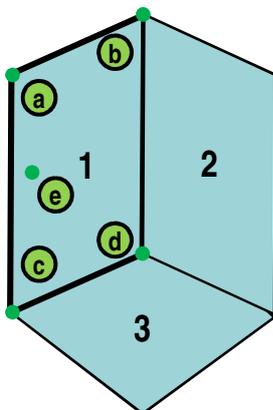
2

Overview

- ❖ **Motivation:** Can 3D property **boundaries** derived from **laser scanned** structures withstand cross-examination?
- ❖ **Gap:** Methodology needed when adequate **facilities are unavailable** for the calibration of laser scanners.
- ❖ **Findings:** **Total station** measurements can be used to drive a **validation procedure** for calibration and boundary positions.

3

Boundary Validation Procedure



Planes (1,2,3)
Extracted from
Laser Scanner Point Cloud

Points (a, b, c, d)
Validation from
Total Station Survey

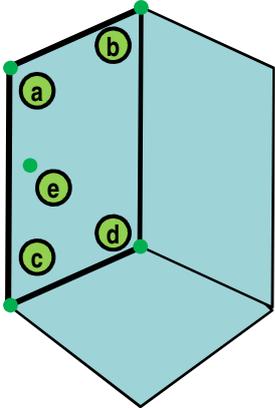
4

Experiment Area & In-Situ Self-Calibration



5

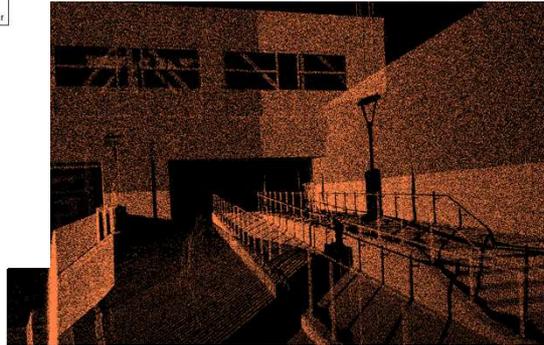
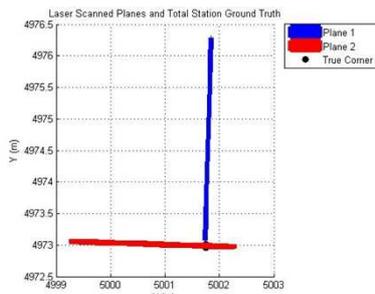
Total Station Validation Survey



Calibrated Survey Probe

6

Plane Extraction



7

Results

	Planes	Positions
Valid* / Total #	11 / 14	57 / 83
Precision (1σ)	± 5 mm	± 3 mm
Accuracy	± 11 mm	

***Valid planes have all normal distances <20 mm**
Valid positions are <20 mm from the plane

8

Conclusions

- The validation methods shown are promising for land surveyors who wish to use laser scanners for cadastral surveying.
- Total station measurements can be used to validate the laser scanner self-calibration procedure where facilities are unavailable
- An independent measurement should always be done to validate the planarity of 3D boundaries
- Total station measurements provide an option for independently checking positions of 3D boundaries

9



"From the wisdom of the ages
to the challenges of modern world"

Thank you!

**Laser Scanning Validation Methods for
Land Surveyors**

FIG WORKING WEEK
17-21 MAY SOFIA BULGARIA 2015

Boundary Validation Procedure

- ❖ **Experiment Area:** Typical urban structures.
- ❖ **Calibration:** Total station and laser scanner calibrated.
- ❖ **Boundary Extraction:** Planes that represent boundaries are extracted from the laser scanned point cloud.
- ❖ **Validation:** Total station validates both the calibration and the **boundary extraction**.

11