

## PHOTOGRAMMETRIC NEWS

Mr. Petri Rönholm made his doctoral dissertation on November 12<sup>th</sup>, 2010 at the Aalto University School of Science and Technology, Finland. Professor, PhD **François Goulette**, Mines ParisTech and PhD **Helén Burman-Rost**, Blom Sweden AB, appeared as opponents. The title of the thesis was “Orientation and integration of images and image blocks with laser scanning data”. (Photo: Matti Kurkela)



### Abstract of the thesis

Laser scanning and photogrammetry are methods for effective and accurate measurement and classification of urban and forest areas. Because these methods complement each other, then integration or integrated use brings additional benefits to real-life applications. However, finding tie features between data sets is a challenging task since laser scanning and imagery are far from each other in nature.

The aim of this thesis was to create methods for solving relative orientations between laser scanning data and imagery that would assist in near-future applications integrating laser scanning and photogrammetry.

Moreover, a further goal was to create methods enabling the use of data acquired from very different perspectives, such as terrestrial and airborne data. To meet these aims, an interactive orientation method enabling the use of single images, stereo images or larger image blocks was developed and tested. The multi-view approach usually has a significant advantage over the use of a single image.

After accurate orientation of laser scanning data and imagery, versatile applications become available. Such applications include, e.g., automatic object recognition, accurate classification of individual trees, point cloud densification, automatic classification of land use, system calibration, and generation of photorealistic 3D models. Besides the orientation part, another aim of the research was to investigate how to fuse or use these two data types together in applications. As a result, examples that evaluated the behavior of laser point clouds in both urban and forestry areas, detection and visualization of temporal changes, enhanced data understanding, stereo visualization, multi-source and multi-angle data fusion, point cloud colorizing, and detailed examination of full waveform laser scanning data were given.

**Keywords:** Photogrammetry, laser scanning, orientation, integration