Abstract Diploma Thesis

Normalisation and Surface Classification of multitemporal Intensityrasters from ALS - Data at Hintereisferner, Tirol (Austria)

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The Diploma Thesis is embedded in the ALS-X project. The main objective of the project is the glaciological and snow hydrological analysis and evaluation of time synchronous airborne laser scanning data (ALS) and TerraSAR-X data and the possible application of these technologies for glacier monitoring. Therefore, 4 laserscanning data acquisation campaigns were carried out at two contiguous glaciers (Hintereisferner and Kesselwandferner) in the Ötztaler Alpen, Tyrol. As Glaciers are sensitive regional indicators for multiple climate change processes, scientific and public interest is increasing. Project Partners are the Institute of Geography at the University of Innsbruck (Leading Partner), the Institute of Metreology and Geophysics at the University of Innsbruck (Austria), the Institute of Geography at the University of Tübingen (Germany) and the alpS-Center for Natural Hazard and Risk Management. For further information please visit the website http://www.uibk.ac.at/geographie/projects/alsx/.

Nowadays, the use of laserscan devices, especially airborne laser scanning (ALS), has evolved into the standard technique for acquiring topographic/3D information. The main reasons why this procedure has grown so fast during the last decades is that exact digital elevation models can be generated with less effort than other 3D acquisition techniques, resulting from very precise depth information and a high point density (usually more than one point per square meter) .

Each point of the produced point cloud normally contains geometric attributes (x, y, z-value) and a value for the signal strength, often referred to as intensity. This strenght value is influenced by atmospheric factors, flight height, inclination, angle of incidence of the laser beam, strenght of the laserbeam and surface reflectance.

The main objective of the Diploma Thesis is the analysis of signal strength and the possibility to create a surface classification out of this value. Previous research studies, e.g. by Hoefle(2007), Kodde (2006), stated that laser scanning has a large potential for supporting surface classification and object detection.

Before working with the intensity values, they had to be corrected for known influences (e.g. flight height, spherical loss, topographic and atmospheric effects). Therefore a correction model developed by Hoefle, B. (2007; adapted by Wichmann, V. for LIS softwaresystems) was used. As the project has access to 13 other ALS-datasets, which were carried out in the same region since 2001, in total 10 datasets containing intensity values were corrected and transformed to rastermaps of different resolutions. The range of intensity values still is variable for a certain object from flight to flight. So a normalisation had to be develop to make the intensities comparable, which is the basic requirement for a multitemporal surface classification.

Afterwards boarders of the different surface objectclasses (ice, firn, snow, rock and perhaps some subclasses) are determined for a special flight, of which a terrestrial orthophoto is available to evaluate the classification results.

The classification then can be used for change detection studies of the different surfacetypes and can supply useful informations for further analysis such as mass balances and climate change studies.

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References:

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