Geophysical Research Abstracts
Vol. 15, EGU2013-11884, 2013
EGU General Assembly 2013

LiDAR point cloud comparison: evaluation of denoising techniques using 3D moving windows

Antonio Abellán (1), Dario Carrea (1), Michel Jaboyedoff (1), and Manuel Jesus Royan (2)

(1) Centre de Recherches en Environnement Terrestre (CRET), Faculté des Géosciences et de l'Environnement, Université de Lausanne Quartier UNIL-Mouline, Bâtiment Géopolis, Bureau 3129 1015 Lausanne, Switzerland, (2) RISKNAT Group, Departament de Geodinàmica i Geofísica, Facultat de Geologia, Universitat de Barcelona, C/Martí I Franquès s/n., 08028 Barcelona, Spain

Laser scanner techniques (also referred to as LiDAR) have recently allowed the acquisition of high accuracy and high resolution 3D geometry of the terrain. A large set of geomorphological applications currently deal with precise recognition of changes on different environments as riverside erosion, rock cliff deformation, landslide evolution, etc., being the development of new change detection techniques a current challenge. When dealing with small changes on terrain surface quantification, e.g. slow erosion rates and small scale slope deformation, real change could be masked due to instrumental noise (mm to cm order of magnitude), being of capital importance the application of filtering techniques in order to remove Gaussian noise associated to LiDAR data acquisition.

We present an evaluation on the application of different linear and nonlinear adaptive spatial filtering techniques (e.g. min, max, mean, median, Wiener..) to a multi-temporal point cloud comparison. Both synthetic datasets and real case study of rock cliff deformation were used. In order to benefit from data redundancy, we considerably reduced results uncertainty by using 3D moving windows along the space and time. Different windows size were tested, both using uniform and non-uniform boxes. The implementation of our findings on new generation ground-based permanent LiDAR devices will lead to a better process understanding of small or relatively slow changes that may act as key actors of future slope evolution, as the early detection of millimetric cliff deformation before million cubic failures.