Geophysical Research Abstracts
Vol. 19, EGU2017-17043, 2017
EGU General Assembly 2017

Automatic 3D relief acquisition and georeferencing of road sides by low-cost on-motion SfM

Jérémie Voumard (1), Perrick Bornemann (2), Jean-Philippe Malet (2), Marc-Henri Derron (1), and Michel Jaboyedoff (1)

(1) University of Lausanne, Institute of Earth Sciences, Lausanne, Switzerland (jeremie.voumard@unil.ch), (2) University of Strasbourg, School and Observatory on Earth Sciences, CNRS, Strasbourg, France

3D terrain relief acquisition is important for a large part of geosciences. Several methods have been developed to digitize terrains, such as total station, LiDAR, GNSS or photogrammetry. To digitize road (or rail tracks) sides on long sections, mobile spatial imaging system or UAV are commonly used. In this project, we compare a still fairly new method -the SfM on-motion technics- with some traditional technics of terrain digitizing (terrestrial laser scanning, traditional SfM, UAS imaging solutions, GNSS surveying systems and total stations). The SfM on-motion technics generates 3D spatial data by photogrammetric processing of images taken from a moving vehicle.

Our mobile system consists of six action cameras placed on a vehicle. Four fisheye cameras mounted on a mast on the vehicle roof are placed at 3.2 meters above the ground. Three of them have a GNNS chip providing geotagged images. Two pictures were acquired every second by each camera. 4K resolution fisheye videos were also used to extract 8.3M not geotagged pictures. All these pictures are then processed with the Agisoft PhotoScan Professional software.

Results from the SfM on-motion technics are compared with results from classical SfM photogrammetry on a 500 meters long alpine track. They were also compared with mobile laser scanning data on the same road section. First results seem to indicate that slope structures are well observable up to decimetric accuracy. For the georeferencing, the planimetric (XY) accuracy of few meters is much better than the altimetric (Z) accuracy. There is indeed a Z coordinate shift of few tens of meters between GoPro cameras and Garmin camera. This makes necessary to give a greater freedom to altimetric coordinates in the processing software.

Benefits of this low-cost SfM on-motion method are: 1) a simple setup to use in the field (easy to switch between vehicle types as car, train, bike, etc.), 2) a low cost and 3) an automatic georeferencing of 3D points clouds. Main disadvantages are: 1) results are less accurate than those from LiDAR system, 2) a heavy images processing and 3) a short distance of acquisition.