Geophysical Research Abstracts
Vol. 19, EGU2017-10040, 2017
EGU General Assembly 2017


# Time-lapse photogrammetry in geomorphic studies

Anette Eltner (1) and Andreas Kaiser (2)

(1) Technische Universität Dresden, Department of Geosciences, Dresden, Germany (anette.eltner@tu-dresden.de), (2) Technische Universitat Bergakademie Freiberg, Section of Soil and Water Conservation

Image based approaches to reconstruct the earth surface (Structure from Motion – SfM) are establishing as a standard technology for high resolution topographic data. This is amongst other advantages due to the comparatively ease of use and flexibility of data generation. Furthermore, the increased spatial resolution led to its implementation at a vast range of applications from sub-mm to tens-of-km scale.
Almost fully automatic calculation of referenced digital elevation models allows for a significant increase of temporal resolution, as well, potentially up to sub-second scales. Thereby, the setup of a time-lapse multi-camera system is necessary and different aspects need to be considered: The camera array has to be temporary stable or potential movements need to be compensated by temporary stable reference targets/areas. The stability of the internal camera geometry has to be considered due to a usually significantly lower amount of images of the scene, and thus redundancy for parameter estimation, compared to more common SfM applications. Depending on the speed of surface change, synchronisation has to be very accurate. Due to the usual application in the field, changing environmental conditions important for lighting and visual range are also crucial factors to keep in mind.
Besides these important considerations much potential is comprised by time-lapse photogrammetry. The integration of multi-sensor systems, e.g. using thermal cameras, enables the potential detection of other processes not visible with RGB-images solely. Furthermore, the implementation of low-cost sensors allows for a significant increase of areal coverage and their setup at locations, where a loss of the system cannot be ruled out. The usage of micro-computers offers smart camera triggering, e.g. acquiring images with increased frequency controlled by a rainfall-triggered sensor. In addition these micro-computers can enable on-site data processing, e.g. recognition of increased surface movement, and thus might be used as warning system in the case of natural hazards.
A large variety of applications are suitable with time-lapse photogrammetry, i.e. change detection of all sorts; e.g. volumetric alterations, movement tracking or roughness changes. The multi-camera systems can be used for slope investigations, soil studies, glacier observation, snow cover measurement, volcanic surveillance or plant growth monitoring. A conceptual workflow is introduced highlighting the limits and potentials of time-lapse photogrammetry.