Geophysical Research Abstracts
Vol. 17, EGU2015-12013, 2015
EGU General Assembly 2015

A cost-effective laser scanning method for mapping stream channel geometry and roughness

Norris Lam (1), Marcus Nathanson (2), Niclas Lundgren (3), Robin Rehnström (4), and Steve Lyon (5)

(1) Stockholm University, Physical Geography, Stockholm, Sweden (norris.lam@natgeo.su.se), (2) Stockholm University, Physical Geography, Stockholm, Sweden , (3) Umeå University, Department of Applied Physics and Electronics, (4) Umeå University, Department of Applied Physics and Electronics, (5) Stockholm University, Physical Geography, Stockholm, Sweden (steve.lyon@natgeo.su.se)

In this pilot project, we combine an Arduino Uno and SICK LMS111 outdoor laser ranging camera to acquire high resolution topographic area scans for a stream channel. The microprocessor and imaging system was installed in a custom gondola and suspended from a wire cable system. To demonstrate the systems capabilities for capturing stream channel topography, a small stream (< 2m wide) in the Krycklan Catchment Study was temporarily diverted and scanned. Area scans along the stream channel resulted in a point spacing of 4mm and a point cloud density of 5600 points/m2 for the 5m by 2m area. A grain size distribution of the streambed material was extracted from the point cloud using a moving window, local maxima search algorithm. The median, 84th and 90th percentiles (common metrics to describe channel roughness) of this distribution were found to be within the range of measured values while the largest modelled element was approximately 35% smaller than its measured counterpart. The laser scanning system captured grain sizes between 30mm and 255mm (coarse gravel/pebbles and boulders based on the Wentworth (1922) scale). This demonstrates that our system was capable of resolving both large-scale geometry (e.g. bed slope and stream channel width) and small-scale channel roughness elements (e.g. coarse gravel/pebbles and boulders) for the study area. We further show that the point cloud resolution is suitable for estimating ecohydraulic parameters such as Manning's n and hydraulic radius. Although more work is needed to fine-tune our system's design, these preliminary results are encouraging, specifically for those with a limited operational budget.