Nat. Hazards Earth Syst. Sci. Discuss.,
doi:10.5194/nhess-2017-93-AC2, 2017

Natural Hazards and Earth System Sciences
Open Access
Discussions

Interactive comment on "Direct local building inundation depth determination in 3D point clouds generated from user-generated flood images" *by* Luisa Griesbaum et al.

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Received and published: 16 May 2017

Dear Dr. Schumann

Thank you for your valuable comments. We very much appreciate your feedback.

The results of our methods are evaluated for their accuracy with respect to both the derived TLS measurements for the flood elevation and manual in-field measurements of building inundation depth. The accuracy is calculated as the difference to the reference measurement and is always stated together with the corresponding measurement's uncertainty. Accordingly, as we mention in the abstract, the accuracy obtained for the derived flood elevation is 0.05 m $\pm$ 0.13 m, while the accuracy of the derived

inundation depth is 0.13 m $\pm$ 0.10 m.

The proposed workflow is meant to support flood management by providing data on flood parameters, such as flood elevation and building inundation depth, in cases where traditional data sources may not provide sufficient information. Such information is needed for disaster managers to assess and minimize the impact of disastrous events, for example to facilitate damage assessment or risk analysis. Our method can be applied immediately after a flood event occurs, as soon as a flood image and several non-flood images become accessible. In the case of disaster response, non-flood images will ideally be readily available, whether due to preventive measurement taking or from other data sources. Otherwise, one must wait until the water has subsided in order to capture the required non-flood images. Because no specific qualifications are necessary for image acquisition, anyone can contribute to this form of flood documentation. As a benefit of close-range sensing, the photographer can capture both flood and non-flood images at a safe distance from the inundated object.

The calculation time of our method depends on the amount of images to process and the available computational resources. Once the photogrammetric point cloud has been calculated, in our case with an ordinary machine (3.60 GHz CPU, 8 cores, 32 GB RAM), the calculations take about five minutes for one building. The good news is that our approach can be scaled easily by improving computing power on a single machine (e.g. number of cores) or by using distributed parallel computing (e.g. through cluster computing or cloud services) because single buildings can be processed independently of one another. It is important to bear in mind that this is our personal experience: Computing performance has not been assessed under controlled conditions. We do however assume that near real-time applications could be feasible if base datasets already exist.

So far, the code has not been made publically available because – after scientific validation and publication in NHESS – we aim to improve the code from a technical standpoint (e.g. improve performance and modularity). However, the implementation of the method in the form of a (web) service or mobile app is being considered and, thus, of interest to further investigations. Non-technical users, especially, stand to benefit from such a service, since it could easily provide flood measurements based on just the required flood and non-flood images. For anyone interested, we are happy to collaborate and look forward to seeing this technology used in a multitude of applications in the future.

Kind regards,

Luisa Griesbaum, Sabrina Marx, Bernhard Höfle

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2017-93, 2017.