

## ***Interactive comment on “The SF3M approach to 3-D photo-reconstruction for non-expert users: application to a gully network” by C. Castillo et al.***

**O. Gronz (Referee)**

gronz@uni-trier.de

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### **1 General comments**

The usage of structure from motion to generate 3D models is becoming more and more common in different geoscientific applications. On the one hand, plenty of contributions were made in conferences like the 2015 General Assembly of the EGU – on the other hand, only few geoscientific publications do exist yet. Furthermore, the workflow to generate models seems to be more or less identical in different working groups, incorporating either the usage of quite expensive software or the usage of several freely available software tools, the usage of which needs experts. Thus, there is (a) a strong

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need for freely available software covering the typical workflow and (b) a general need of structure from motion-related application publications.

The submitted paper covers both aspects: it presents the software SF3M to cover the typical workflow and also describes a sample application. Thus, it addresses several relevant questions and describes a new tool (and some new ideas).

From my point of view, there are only some minor issues to be addressed to publish this article, which are described in the following. Besides these suggestions related to the review, I would like to give some general comments in the end, perhaps to be considered in version 2.0 of SF3M.

### **2 Specific comments**

- I do not fully understand the automatic discarding and the discarding of blurry images. According to Figure 4, the order is: 3. Reduce number of images, 4. Identify (and discard?) blurry pictures, 6. Undistort pictures. According to Table 2: If 6550 images are taken and 3275 of them are automatically discarded (3275 remain), afterwards 180 blurry images are discarded (3095 remain?), why are 3275 images distorted? If I got it right, this number is wrong.
- I miss additional information concerning the blur metric: Only a footnote in table 1 specifies the metric. The paper defining the metric should be cited (P. Marziliano, F. Dufaux, S. Winkler and T. Ebrahimi, "Perceptual blur and ringing metrics: application to JPEG2000", Signal Processing: Image Communication, vol. 19, no. 2, pp. 163-172, February 2004) and I would like to know, why especially this metric has been chosen. There are plenty of others . . . e. g. compared in Ferzli & Karam: A No-Reference Objective Image Sharpness Metric Based on the Notion of Just Noticeable Blur (JNB). IEEE Transactions on image processing. Vol. 18, No. 4, 2009.

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- Processing times in Table 2 and section 3.2: It is not possible to rate the times without any information concerning the used computer. Especially the search for similar features in pairs is highly parallelizable. Thus, at least the number of cores should be given.
- VisualSfM is mainly controlled by an ini-file. Does SF3M change specific settings in this file, e. g. while using Calibration Toolbox? If SF3M changes the file: Are the remaining settings taken from a SF3M source or is only the relevant setting changed in the file?

### 3 Technical corrections

- P. 278, l. 2-3, sentence: "This list includes generally much fewer image pairs that all the possible combinations among the pictures." that = than?
- Figure 4: Two numerations are included in the screenshot: panels (with numbers followed by points) and the relevant graphical control elements (without points). The reader might be confused, as the numbers in the workflow diagram refer to graphical control elements, though points are used in the diagram.

### 4 Comments concerning the software

This section is intended as remarks for V2.0 of SF3M. From my point of view, they do not (necessarily) need to be considered in the present article.

- Assuming my interpretation in the first point of the specific comments is correct: At first, every n-th image is discarded to reach the percentage given by user in

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panel 2. Image pre-processing. Afterwards, the blurry images are discarded. Does this order make sense? Would it not be more reasonable to rate the blurriness at first, discard blurry images and respect the discarded blurry images in the automatic image reducing? Otherwise we might e. g. automatically discard images 2 and 4 due to automatic image reduction, afterwards image 3 because it is blurry. As a consequence, several subsequent images are missing, which might result in an increased dome effect at this place. If we know that we discard image 3 due to blurriness, it might make sense to keep images 2 and 4!

- I would introduce some intelligence in the automatic discarding. The current algorithm assumes truly constant speed of the human taking the images, resulting in a constant overlap of subsequent images. This assumption is at least doubtful and especially not valid for a completely different situation: Let's assume, an UAV is taking the images, traveling at different speeds in different directions due to wind. Thus, it would be more reasonable to rate the overlap (e. b. by simply estimating the spatial autocorrelation (of clipped images)). Then automatically discard e. g. image 2 only if a certain overlap between the images 1 and 3 still is maintained.
- SF3M uses several freely available third party software like VisualSfM or Cloud-compare. The latter one is being published under GNU General Public License. In the article, only the description "freely available" (p. 374, l. 15) has been used. Is there any additional comment concerning usage? I did not find any information on the download website, or in the software itself.
- Closely connected to the previous comment: Even slightly deviating workflows will demand modifications in the software. Is there a chance to get the MATLAB files to adapt the user interface to specific workflows?
- A comment from the software engineer's point of view: I do not understand, why sometimes checkboxes are used in the GUI (e. g. in panel 2. Image pre-

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processing), sometimes radio buttons (panel 3., 4. & 5.), although they do not all seem to be arranged in button groups for exclusive selection. It is possible to select several buttons in panel 3. Why?

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