Geosci. Instrum. Method. Data Syst. Discuss., 3, C74–C76, 2013
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Geoscientific Instrumentation Methods and Data Systems Discussions

Interactive comment on "LAPM: a tool for underwater Large-Area Photo-Mosaicking" *by* Y. Marcon et al.

Anonymous Referee #2

Received and published: 4 June 2013

General comments:

The manuscript by Marcon et al. deals with a new software tool which introduces state-of-art methodologies from computer science in a "turn-key" software package for scientists in other disciplines. This topic is very relevant for a wider audience and as such is definitely worth publication. As my appointment as a reviewer came at a later stage, I have also had the opportunity to read the authors' response to another referee's comments. I concur that the manuscript would benefit from reorganisation and making it more concise. Also, I think it would be useful to mention in the text that there is a user manual that potential end-users could download for perusal.

Nevertheless, besides the technical corrections, which are currently being worked, I

have a few general observations and questions that I consider worth addressing at least in the sections "Performance and limitation" (Q2 and Q5) and/or "Conclusions" (Q3, Q4 and Q5).

Question #1: There is little about the actual use of the produced mosaicks. Besides being able to create mosaicks, what are the qualities that marine scientists desire in the final images? Is geometric accuracy the most important factor? Or does the further (automatic?) analysis prefer smooth changes in intensities etc.? This should be discussed already in the introduction and maybe elaborated later.

Question #2: How do you quantify errors in mosaicking? In my opinion, this question is very relevant to visualisations of data. As the development proceeds you need error analysis to guide the selection of algorithms (to be added). Can you use test image sets already benchmarked in computer science? Have you extracted overlapping tiles from a high-resolution underwater image and then compared the constructed mosaick with the original? How does the blurring and other degradiations affect the final mosaick? How much overlap is needed? Could this be something that is provided as a convenient demonstration case that the user manual uses as an example?

Question #3: Reflecting the needs of marine scientists, have you considered "user-guided adaptive" processing where one could trade speed for accuracy in areas where accuracy is not needed? Or is the workflow such that realtime guidance is not practical? You already mention that low-resolution mosaicks are often used and a multi-scale approach might be very useful. One mouse-click on the area of interest would increase the mosaick resolution locally. (This could also be used for the browsing of very large mosaicks via net, c.f. existing web applications)

Question #4: What is your view on and/or have you considered fusing multiple image sources? Is it possible to combine images from cameras and sonars? Again, would marine scientists need this for their research?

Question #5: How do you handle multidimensional pixel data in images? This is related

to Question #4. The off-the shelf SIFT in VLFeat requires greyscale images as input. I would assume that using the full information available in each image pixel would result in more reliable identification of matching points. Of course, registering mosaicks from spectral cameras with mosaicks from sonars is outside the scope of this manuscript. However, as the fusion of images from multiple cameras, especially with differing fields-of-views, is an active research topic in computer science, I encourage the authors to take a look at what other state-of-art algorithms could be brought to marine scientists.

The authors may also want to take a look at the paper by Koen et al., where numerous SIFT variants using the full colour information are evaluated. Koen et al. also provide software for computing color-SIFT on their website (http://koen.me/research/colordescriptors/)

Koen et al., "Evaluating color descriptors for object and scene recognition", IEEE Transactions on PAMI, 2010. (doi: 10.1109/TPAMI.2009.154)

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss., 3, 127, 2013.