Geophysical Research Abstracts
Vol. 19, EGU2017-15944, 2017
EGU General Assembly 2017

WASS: an open-source stereo processing pipeline for sea waves 3D reconstruction

Filippo Bergamasco (2), Alvise Benetazzo (1), Andrea Torsello (2), Francesco Barbariol (1), Sandro Carniel (1), and Mauro Sclavo (1)

(1) Institute of Marine Sciences, Italian National Research Council (ISMAR-CNR), Venice, Italy, (2) DAIS – Università Ca' Foscari, Venice, Italy

Stereo 3D reconstruction of ocean waves is gaining more and more popularity in the oceanographic community. In fact, recent advances of both computer vision algorithms and CPU processing power can now allow the study of the spatio-temporal wave fields with unprecedented accuracy, especially at small scales.

Even if simple in theory, multiple details are difficult to be mastered for a practitioner so that the implementation of a 3D reconstruction pipeline is in general considered a complex task. For instance, camera calibration, reliable stereo feature matching and mean sea-plane estimation are all factors for which a well designed implementation can make the difference to obtain valuable results. For this reason, we believe that the open availability of a well-tested software package that automates the steps from stereo images to a 3D point cloud would be a valuable addition for future researches in this area.

We present WASS, a completely Open-Source stereo processing pipeline for sea waves 3D reconstruction, available at http://www.dais.unive.it/wass/.

Our tool completely automates the recovery of dense point clouds from stereo images by providing three main functionalities. First, WASS can automatically recover the extrinsic parameters of the stereo rig (up to scale) so that no delicate calibration has to be performed on the field. Second, WASS implements a fast 3D dense stereo reconstruction procedure so that an accurate 3D point cloud can be computed from each stereo pair. We rely on the well-consolidated OpenCV library both for the image stereo rectification and disparity map recovery. Lastly, a set of 2D and 3D filtering techniques both on the disparity map and the produced point cloud are implemented to remove the vast majority of erroneous points that can naturally arise while analyzing the optically complex nature of the water surface (examples are sun-glares, large white-capped areas, fog and water areosol, etc).

Developed to be as fast as possible, WASS can process roughly four 5 MPixel stereo frames per minute (on a consumer i7 CPU) to produce a sequence of outlier-free point clouds with more than 3 million points each.

Finally, it comes with an easy to use user interface and designed to be scalable on multiple parallel CPUs.