

A System for Underwater Stereo Video Image Processing and Its Application in Fisheries

R. Li¹, T. Curran², R. Smith², H. Li¹

¹Department of Geomatics Engineering, The University of Calgary, Calgary, AB T2N 1N4

²Institute of Ocean Sciences, Sidney, B.C. V8L 4B2

Abstract

Underwater video images are mostly used for visualizing objects in the underwater environment. Quantitative analysis, such as measuring objects and reconstruction of 3D object shapes, still needs to be researched. In this paper, a system for underwater stereo video image preprocessing is presented, which includes modules of Graphical User Interface (GUI), preprocessing, camera calibration, photogrammetric processing and graphic display. Some geometrical, optical and electrical properties of CCD-camera and images in the underwater environment are investigated, for instance, lens distortion, noise elimination/reduction, ray bending etc. Based on these, a photogrammetric model can be established for determining object space coordinates from measured image coordinates. This allows to calculate positions and shapes in the 3D object space as long as the objects to be measured can be seen in stereo images. The GUI makes the modules involved transparent to users and provides a convenient, efficient and user-friendly environment for object-oriented measuring procedures. Results of a water tank test for the camera calibration and fisheries applications are presented. Other potential applications of the system could be precise seafloor mapping, underwater target tracing, object monitoring and others.