

Towards automating underwater measurement of fish length: a comparison of semi-automatic and manual stereo–video measurements

Faisal Shafait^{1*}, Euan S. Harvey², Mark R. Shortis³, Ajmal Mian⁴, Mehdi Ravanbakhsh³, James W. Seager⁵, Philip F. Culverhouse⁶, Danelle E. Cline⁷, and Duane R. Edgington⁷

¹School of Electrical Engineering and Computer Science, National University of Sciences and Technology (NUST), Islamabad H-12, Pakistan

²Department of Environment and Agriculture, Curtin University, Kent Street, Bentley, Perth, Western Australia 6102, Australia

³School of Science, RMIT University, GPO Box 2476, Melbourne, Victoria 3001, Australia

⁴School of Computer Science and Software Engineering, The University of Western Australia, 35 Stirling Hwy, Crawley, Perth, Western Australia, 6009, Australia

⁵SeaGIS P/L, PO Box 1085, Bacchus Marsh, Victoria 3340, Australia

⁶Centre for Robotics and Neural Systems, University of Plymouth, Drake Circus, Plymouth, Devon PL4 8AA, UK

⁷Monterey Bay Aquarium Research Institute, 7700 Sandholt Road, Moss Landing, CA 95039, USA

*Corresponding author: tel: þ92 (0)51 9085 2400; fax: þ92 (0)51 9085 2002; e-mail: faisal.shafait@seecs.edu.pk

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Abstract

Underwater stereo–video systems are widely used for counting and measuring fish in aquaculture, fisheries, and conservation management. Length measurements are generated from stereo–video recordings by a software operator using a mouse to locate the head and tail of a fish in synchronized pairs of images. This data can be used to compare spatial and temporal changes in the mean length and biomass or frequency distributions of populations of fishes. Since the early 1990s stereo–video has also been used for measuring the lengths of fish in aquaculture for quota and farm management. However, the costs of the equipment, software, the time, and salary costs involved in post processing imagery manually and the subsequent delays in the availability of length information inhibit the adoption of this technology.

We present a semi-automatic method for capturing stereo–video measurements to estimate the lengths of fish. We compare the time taken to make measurements of the same fish measured manually from stereo–video imagery to that measured semi-automatically. Using imagery recorded during transfers of Southern Bluefin Tuna (SBT) from tow cages to grow out cages, we demonstrate that the semi-automatic algorithm developed can obtain fork length measurements with an error of less than 1% of the true length and with at least a six

fold reduction in operator time in comparison to manual measurements. Of the 22 138 SBT recorded we were able to measure 52.6% (11 647) manually and 11.8% (2614) semi-automatically. For seven of the eight cage transfers recorded there were no statistical differences in the mean length, weight, or length frequency between manual and semi-automatic measurements. When the data were pooled across the eight cage transfers, there was no statistical difference in mean length or weight between the stereo–video-based manual and semi-automated measurements. Hence, the presented semi-automatic system can be deployed to significantly reduce the cost involved in adoption of stereo–video technology.

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