

A Tracking Scheme for Norway Lobster and Burrow Abundance Estimation in Underwater Video Sequences

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Abstract—Underwater imaging constitutes an alternative approach for stock assessment in some commercial fisheries. Herein, the Norway lobster, *Nephrops norvegicus*, a benthic burrowing crustacean, is used as our case study. A unified tracking scheme is presented to track our object of interest, either the lobsters themselves or their burrows, across video footage obtained from an underwater Remote Operating Vehicle (ROV) during a survey on deep-water crustacean grounds off the Portuguese South coast. The objective of the tracking module is to prevent the over-counting in consecutive frames thus ensuring a correct estimation of the actual abundance of Norway lobster and their burrows appearing in the whole video footage. The proposed tracking scheme involves two different methods for lobster(s) and burrow(s) respectively. Lobster candidates are tracked using a particle filter-based method since the lobsters are moving freely under the moving camera. Contrastingly, the burrow locations, although static, are under dynamic observation. Thus burrow candidates are tracked based on the motion model of the observer, where the affine transformation model is used as the motion model. The latter is estimated using a set of matching feature points over pairs of consecutive images by the iterative Lucas-Kanade's optical flow method. The experimental results demonstrate the efficiency of the proposed method.

Keywords—Underwater imaging; Norway lobster; Burrows; Underwater object tracking; Video processing

I. INTRODUCTION

In our previous work [1], we have presented a framework for the automatic detection of both lobsters and their burrows which constituted a first step in a unified approach to obtain an estimation of their density in commercial fishing ground. However, detection is done on a frame by frame basis, meaning that the same object is identified in successive frames. As such, for a proper quantification is our final goal. We extend our previous work [1] by applying a tracking scheme to achieve a video-based abundance estimation.

II. EXPERIMENTAL DATA AND PROPOSED TRACKING SCHEME

The experimental data used herein were obtained from an underwater video sequence obtained during a research cruise

on board the vessel from the Non-Governmental Organization OCEANA. Footages were obtained from colour camera installed in a Remote Operated Vehicle (ROV) operating on deep-water crustacean grounds off the Portuguese South coast. The flow of the tracking methodology in this paper is summarized as below.

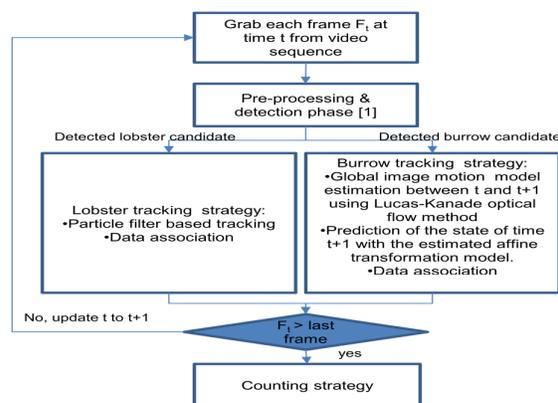


Fig 1. Experimental Results – (a) lobster tracking in 46th frame and 110th frame; (b) burrow tracking in 52th frame and 100th frame.

REFERENCES

- [1] C. S. Tan, P.Y. Lau, T. J. Low, P. Fonseca, A. Campos, "Detection of marine species on underwater video images," 2014 Proc. of International Workshop on Advanced Image Technology (IWAIT 2014), Bangkok, Thailand, pp. , 6-8 January 2014.

