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Design of the data sensor pre-processing stage for a long term multi-tracking application

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Design of the data sensor pre-processing stage for a long term multi-tracking application

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Abstract: This paper presents a design strategy for an underwater computer vision data system and its pre-processing stage with the purpose of long-term fish behavior monitoring in a controlled environment. The biological experiment requires the continuous tracking of a group of fishes (of 10 to 20 specimens) in a prepared installation located in the Science Marine Laboratory in Mallorca. The experiment is thought to obtain empirical data to estimate biological energy models from specimen's activity. In consequence it is required to identify and track each individual in the images, which supposes an important image processing effort. Our approach takes advantage from the prepared environment, as a part of the design strategy, by controlling light conditions and other environmental parameters in order to minimize undesired effects as reflections, shadows or waves in the water surface and, at the same time, taking into account the minimization of the pre-processing stage. The surface for surveillance (2,5m x 5m) in which specimens can move is enormous in comparison to the sizes of the individuals and it is mandatory to deal with high resolution images. The resolution of images is determined by the necessity to identify individuals. As each experiment lasts above twelve days, the cost of storing and processing such among of information becomes into a big data problem. However, as only the coordinates at sampling time of each specimen must be obtained to feed the models, the relevant data can be obtained in a real time processing stage. In this work we show how the combination of an appropriate experiment design with a suitable data sensor pre-processing makes the problem manageable.

Keywords: Pre-processing; underwater computer vision; lighting; experimental setting

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