Optimizing high-density aquaculture rotifer Detection using deep learning algorithm

ABSTRACT

The dynamics of marine aquaculture depend heavily on zooplankton, which is the basis of the marine food chain. Zooplankton like Rotifer brachionus plicatillis, which are rich in nutrients, small size and rapid reproductive rate are necessary for fish in the larval stage. Rotifer must therefore be supplied to larvae culture in the correct quantity, which can be determined by counting it. In addition, it is necessary to estimate the rotifer population to ensure that, aside from care, it can support the demands of all larvae batches. Currently, the traditional method of counting small-sized rotifers still involves counting it manually. One easy potential way to count rotifer is by using binary image segmentation provided that the sample is clear from debris. In this paper, we present the method and performance to detect rotifer Brachionus plicatilis in 1ml sample automatically using deep learning algorithm YOLOv3. Detected rotifer will be counted for estimating the amount of rotifer for feeding or the density population in a rotifer culture. The method of this project consists of following steps. First, dataset acquisition from digital microscope and manual labelling annotation divided by 60, 20 and 20 percent for training, validation and testing consecutively. Second, is to develop the deep learning algorithm based on YOLOv3. Third step is to training and evaluate the model using loss function. Finally, the model is tested with average precision of 85.1 percent with average of 1.4645s inference detection speed