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Hybrid feature based fish classification using support vector machines

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Fish recognition is one of the important tasks under object detection due to its prominence in oceanography or marine science. This paper proposes a method for multi-class classification using the hybrid feature and support vector machines (SVMs) to recognize fish species. This study proposes the various steps of fish species classification: (i) binarization using Otsu's method; (ii) noise removal using median filter; (iii) boundary detection using horizontal and vertical projection technique; and (iv) feature extraction and classification using SVMs. The Hybrid feature is a combination of geometric features and texture features using Histogram of Oriented Gradients (HOG). The geometric features that are extracted, are the aspect ratio of the fish image, density, the perimeter of the fish image and the number of curves. The data set consists of 10 different fish species, and 20 samples of each species are considered in the experiment. One-Versus-One (OVO) yields a recognition rate of 81.67%, One-Versus-All (OVA) yields a recognition rate 86.67%, and unbalanced decision tree (UDT) shows a better recognition rate of 93.33% using the hybrid features. The test results show that the accuracy of using geometric features and texture features to classify and recognize fish species images is better than that of the development system using geometric features or texture features.

Keywords: SVMs, HOG, UDT, Geometric features, Fish Species Classification