Accurate classification of cherry fruit using deep CNN based on hybrid pooling approach

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Abstract

The most important quality parameter of a product is its nutritional value, but marketability of agricultural products depends primarily on the overall appearance and shape of the products. This study was carried out with the aim of developing cherry fruit packing methods and thus reducing waste and increasing its exportability and marketability. Therefore, the purpose of research was to use the improved Convolutional Neural Network (CNN) algorithm to detect the appearance of cherries and provide an efficient system for their grading. In order to identify and classify images cherry on two classes (regular and irregular shaped) was prepared. After preprocessing the images, the proposed method utilized its ability to improve generalization in the CNN through a combination of max pooling and average pooling techniques, to grade cherries. In order to compare the proposed method (CNN) with HOG and LBP methods, the properties of the images extracted by KNN, ANN, Fuzzy and Ensemble Decision Trees (EDT) algorithms were categorized. The proposed method based on hybrid pooling is also compared with CNN with baseline pooling method such as average pooling. Comparisons based on the results of simulation demonstrate the superiority of the proposed improved CNN over other methods presenting an accuracy of 99.4 %. Therefore, the CNN and image processing methods are effective in managing the marketability and exportability of the cherry fruit and can replace the traditional methods applied for grading cherries.