

Title Evaluation of different pattern recognition techniques for apple sorting
Author İ. Kavdır and D.E. Guyer
Citation Biosystems Engineering, Volume 99, Issue 2, February 2008, Pages 211-219
Keywords apple; sorting

Abstract

Golden Delicious apples were classified using parametric and non-parametric classifiers into three quality classes. The features used in classification of apples were hue angle (for colour), shape defect, circumference, firmness, weight, blush percentage (red natural spots on the surface of the apple), russet (natural netlike formation on the surface of an apple), bruise content and number of natural defects. Different feature sets including four, five and nine features were also tested to find out the best classifier and feature set combination for an optimal classification success. The effects of using different feature sets and classifiers on classification performance were investigated. The feature set including five features produced slightly better classification results in general compared to feature sets including four and nine features. When the classifiers were compared, it was determined that the multi-layer perceptron neural network produced the highest classification results (up to 90%) while 1-nearest-neighbour and 2-nearest-neighbour classifiers followed this classifier with an 81.11% classification success. The 3-nearest-neighbour and decision tree classifiers resulted in similar classification success (75.56%). The parametric plug-in decision rule classification resulted in the lowest classification success. Principal component analysis and linear discriminant analysis techniques were applied on the training data with nine, five and four features to visualise the degree of separation of the three quality classes of apples. As a result of this application, some improvements were observed in separation of the three quality classes from using four input features to nine features especially using principal components although some overlaps still existed among the classes.