

APPLYING ARTIFICIAL NEURAL NETWORKS (ANN) TECHNIQUES TO AUTOMATED VISUAL APPLE SORTING

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Abstract

Nondestructive quality evaluation of fruits is important and very vital for the food and agricultural industry. Traditionally sorting of fruits is based on human visual inspection using size as a particular quality attribute. The Artificial Neural Networks (ANNs) are the imprecise, approximation and inexact set of computing methods that can study, examine and evaluate complex problems. These techniques deliver low cost solution as compared to hard computing and also provides a low cost solution with a tolerance of imprecision, vagueness, partial truth, uncertainty and approximation. A usual procedure is based on human visual inspection considering general fruit attributes like quality, size and color; furthermore, size information is vital in packing houses. Apple is an important fruit products in Albania. Its production calls for quality sorting for domestic and regional markets. In this paper we propose a combination of image processing and ANN techniques for developing an algorithm to sort apple fruits into size groups (Small, Medium and Large).

For this purpose, a backpropagation network model with a number of training functions were used for ANN modeling. A logsig transfer function was applied in input layer, which has 4 input parameters (Area, Perimeter, Max diameter and Min diameter), whereas a linear transfer function was used in the output layer. The hidden layer has different number of neurons and ANN models were trained by Training Batch. For evaluating and finding the most accurate ANN model the Evaluating Batch was used.

Results showed that algorithms based on 4 mentioned parameters and the ANN model, produced lower errors. Sorting records of each algorithm were compared to the relevant sorting data brought about by experts. Results show that sorting error can be 1.1%, thus apple fruits can be sorted at high speed, high accuracy and low costs by using the ANNs techniques.

The results reveal that apple fruits can be sorted at high speed, high accuracy and low costs by using the ANNs techniques.

Key words: Artificial Neural Network, Backpropagation, Training, MLP, Image processing, Machine vision, Apple sorting.