

AUTOMATED RIPENESS ASSESSMENT SYSTEM OF TOMATOES USING PCA AND SVM TECHNIQUES

ABSTRACT

One of the prime factors in ensuring a consistent marketing of crops is product quality and the process of determining ripeness stages is a very important issue in the industry of (fruits and vegetables) production for getting high quality, since ripeness is the main quality indicator from customers perspective. so to ensure optimum yield of high quality products, an objective and accurate ripeness assessment of agricultural crops is important. This research presents a content-based image classification approach to automate the ripeness assessment process of tomato via examining and classifying the different ripeness stages. The proposed system consists of three phases, namely pre-processing, feature extraction and classification phase. The classification process depends totally on color features (colored histogram and color moments), since the surface color of tomato is the most important characteristic to observe ripeness. This system uses Principal Components Analysis (PCA) and Support Vector Machine (SVM) algorithms for feature extraction and classification, respectively. The dataset used for experiments was constructed based on real sample images for tomato at different stages, which were collected from different farms in Minya city, Upper Egypt. Dataset of total 250 images was used for both training and testing datasets with 10-fold cross-validation. Training dataset is divided into 5 classes representing the different stages of tomato ripeness. Experimental results showed that the proposed classification approach has obtained ripeness classification accuracy of 91.20%, using one-against-one (OAO) multi-class SVM algorithm with linear kernel function and accuracy of 85.60% using one-against-all (OAA) multi-class SVM algorithm with linear kernel function.

Keywords: image classification; features extraction; ripeness assessment; principal component analysis (PCA); support vector machine (SVM)