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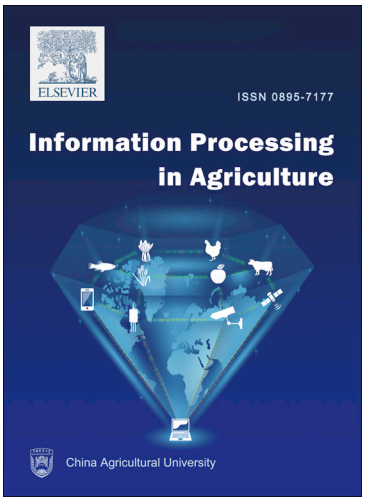

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A new approach for visual identification of orange varieties using neural networks and metaheuristic algorithms

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Abstract: Accurate classification of fruit varieties in processing factories and during post-harvesting applications is a challenge that has been widely studied. This paper presents a novel approach to automatic fruit identification applied to three common varieties of oranges (*Citrus sinensis* L.), namely Bam, Payvandi and Thomson. A total of 300 color images were used for the experiments, 100 samples for each orange variety, which are publicly available. After segmentation, 263 parameters, including texture, color and shape features, were extracted from each sample using image processing. Among them, the 6 most effective features were automatically selected by using a hybrid approach consisting of an artificial neural network and particle swarm optimization algorithm (ANN-PSO). Then, three different classifiers were applied and compared: hybrid artificial neural network - artificial bee colony (ANN-ABC); hybrid artificial neural network - harmony search (ANN-HS); and *k*-nearest neighbors (kNN). The experimental results show that the hybrid approaches outperform the results of kNN. The average correct classification rate of ANN-HS was 94.28%, while ANN-ABS achieved 96.70% accuracy with the available data, contrasting with the 70.9% baseline

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