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Development of automated hybrid intelligent system for herbs plant classification and early herbs plant disease detection

Abstract

Plants such as herbs are widely used in the medical and cosmetic industry. Recognizing a species and detecting an early disease of a plant are quite challenging and difficult to implement as an automated device. The manual identification process is a lengthy process and requires a prior understanding about the plant itself, such as shape, odour, and texture. Thus, this research aimed to realize the computerized method to recognize the species and detect early disease of the herbs by referring to these characteristics. This research has been developed a system for recognizing the species and detecting the early disease of the herbs using computer vision and electronic nose, which focus on odour, shape, colour and texture extraction of herb leaves, together with a hybrid intelligent system that are involved fuzzy inference system, naïve Bayes (NB), probabilistic neural network (PNN) and support vector machine (SVM) classifier. These techniques were used to perform a convenient and effective herb species recognition and early disease detection on ten different herb species samples. The species recognition accuracy rate among ten different species using computer vision and electronic nose is archived 97% and 96%, respectively, in SVM, 98% and 98%, respectively, in PNN and both 94% in NB. In the early disease detection, the detection rate among ten different herb's species using computer vision and electronic nose are 98% and 97%, respectively, in SVM, both 98% in PNN, 95% and 94%, respectively, in NB. Integrated three machine learning approaches have successfully achieved almost 99% for recognition and detection rate.

Keywords

Computer vision; Early herb disease detection; Electronic nose; Herb species recognition; Hybrid intelligent system