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Disease Identification in Plants Using K-means Clustering and Classification with ANN

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ABSTRACT:

The aim of this study is to design, implement and evaluate an image-processing-based software solution for automatic detection and classification of plant leaf diseases. Studies show that relying on pure naked-eye observation of experts to detect and classify such diseases can be prohibitively expensive, especially in developing countries. Providing fast, automatic, cheap and accurate image-processing-based solutions for that task can be of great realistic significance. The methodology of the proposed solution is image-processing-based and is composed of four main phases; in the first phase we create a color transformation structure for the RGB leaf image and then, we apply device-independent color space transformation for the color transformation structure. Next, in the second phase, the images at hand are segmented using the K-means clustering technique. Finally, in the third phase the extracted features are passed through a pre-trained neural network. Present experimental results indicate that the proposed approach can significantly support an accurate and automatic detection and recognition of leaf diseases. The developed Neural Network classifier that is based on statistical classification perform well in all sampled types of leaf diseases and can successfully detect and classify the examined diseases with a precision of around 93%. In conclusion, the proposed detection models based neural networks are very effective in recognizing leaf diseases, whilst K-means clustering technique provides efficient results in segmentation RGB images.

KEY WORDS: Leaf image segmentation, K-means, Feature extraction, plant disease identification, ANN classification.

INTRODUCTION:

Plant diseases have turned into a nightmare as it can cause significant reduction in both quality and quantity of agricultural products, thus negatively influence the countries that primarily depend on agriculture in its economy. Consequently detection of plant diseases is an essential research topics as it may prove useful in monitoring large field of crops and thus automatically detect the symptom of diseases as soon as they appear on plant leaf. Monitoring crops for to detecting diseases plays a key role in successful cultivation. The naked eye observation of experts is the main approach adapted in practice. However, this requires continues monitoring of experts which might be prohibitively expensive in large forms. Further, in some developing countries, formers may have to go long distance to contact experts, this makes consulting experts to very expensive and time consuming. Therefore, looking for a fast, automatic, less expensive and accurate method to detect plant leaf disease cases is of great realistic significance.

Study shows that image processing can successfully be used as a disease detection mechanism. Since, the late 1970's, computer based image processing technology applied in the agricultural engineering research become a engineering research became a common In this study we propose and experimentally validate the significance of using clustering techniques and neural networks in automatic detection of leaf diseases. The proposed approach is image-processing-based and is composed of four main phases; in the first phase we create a color transformation structure for the RGB leaf image and then, we apply dev ice-independent color space transformation for the color transformation structure. Next, in the second phase, the images at hand are segmented using the K-Means clustering technique In the third phase, we calculate the texture features for the segmented infected objects. Finally, in the fourth phase the extracted features are passed through a pre-trained neural network. As a testbed we use a set of leaf images taken from Al-Ghor area in Jordan. We test our program on five diseases which effect on the plants; they are: Early scorch, Cottony mold, Ashen mold, late scorch and tiny whiteness. Using the proposed framework, we could successfully detect and classify the examined diseases with a precision of around 93% in average. The minimum precision value was 80%.

Present experimental results indicate that the proposed approach can significantly support accurate and automatic detection of leaf diseases.

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