A MORPHOLOGICAL AND GRADIENT BASED APPROACH TO CLASSIFY PLANT LEAVES USING SUPPORT VECTOR MACHINES

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Plants are the backbone of all life on Earth and an important resource for human well-being. Plant recognition is very essential in agriculture for the management of plant types whereas botanists can use this application for medicinal purposes. Leaves of different plants have different characteristics which can be used to classify them. This report presents a simple and computationally efficient method for plant identification using digital image processing and machine learning technologies.

Plant leaves classification is an important task to the sustainability of agricultural development and non-expert stakeholders such as land managers, foresters, agronomists, amateur gardeners, etc.

The proposed method is evaluated on Flavia dataset that consists of thirty two classes of plant leaves (around 1900 leaves), Each class has 50 to 70 sample leaves. Each image in the dataset has 400×300 resolution with white background and no leafstalk.

The proposed approach consists of three phases: pre-processing, feature extraction and classification. Pre-processing is the technique of enhancing data images prior to computational processing. The feature extraction phase derives features based on basic geometrical, digital morphological and Histogram of Oriented Gradients (HOG) of the leaf image. The basic feature measures are the leaf diameter, area, perimeter, length and width. The morphological features are calculated based on the basic geometrical features of leaves.

These features are then represented as a fixed-length feature vector which is the input to the classifier for efficient classification and the results were tested with the k-Nearest Neighbour (k-NN) and Support Vector Machine (SVM) classifiers.

The k-nearest neighbour approach is used as a baseline classifier and compared with SVM classifier. The proposed approach shows around 90% of classification rate using HOG descriptors combined with basic and morphological features using SVM classifier. Our testing results are very similar to what others have achieved on the Flavia dataset.

The proposed system is trained with few images and tested on a large number of images of the Flavia dataset which others have failed to do so. Moreover, the proposed system involves no manual process in extracting features and classifying them.

Keywords: Plant identification; basic geometrical features, morphological features, HOG, SVM.