

Automated leaf alignment and partial shape feature extraction for plant leaf classification

ABSTRACT

The last few decades have witnessed various approaches to automate the process of plant classification using the characteristics of the leaf. Several approaches have been proposed, and the majority focused on global shape features. However, one challenge that faces this task is the high interclass similarity amongst the leaves of different species in terms of the global shape. Furthermore, there always has been an obstacle against full automation as several approaches require user intervention to align the leaf. Therefore, a new set of Quartile Features (QF) is proposed in this paper to describe the partial shape of the leaf, in addition to an automated alignment approach to automate the system. The QF are extracted from the horizontal and vertical leaf quartiles to describe the partial shape of the leaf and the relations among its parts. The well-known Flavia dataset has been selected for the evaluation of the proposed system. The experimental results indicate the ability of the proposed alignment algorithm to align leaves with different shapes and maintain a correct classification accuracy regardless of the orientation of the input leaf samples. Furthermore, the proposed QF indicated promising results by increasing the accuracy of the classification by a range of approximately 26% to 30% when combined with Hu's Moment Invariants, using k-fold cross-validation technique.

Keyword: Plant leaf classification; Quartile features; Partial shape; Feature extraction; Leaf alignment