

IMAGE CLASSIFICATION OF PADDY FIELD INSECT PESTS USING GRADIENT-BASED FEATURES

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Sri Lanka Agriculture is one of the principal economic activities of the Jaffna district in the Northern Province of Sri Lanka. Over 60% of the work force in the district depends on agriculture for their livelihood. Paddy cultivation in the district contributes substantially to the gross national income of the country. Such Paddy crops are affected by the attack of insect pests. Therefore, paddy field insect pest identification is an important task to the sustainable agricultural development in the Jaffna district. In this report, a framework is proposed to classify images of paddy field insect pests using gradient-based features through the bag-of-words approach. Twenty classes of paddy field insect pests images were obtained using Google Images and photographs taken by the Faculty of Agriculture at the University of Jaffna, Sri Lanka. The images are then classified through the system that involves identification of regions of interest and representation of those regions as scale-invariant feature transform (SIFT) or speeded-up robust features (SURF) descriptors, construction of codebooks which provides a way to map the descriptors into a fixed-length vector in histogram space, and the multi-class classification of the feature histograms using support vector machines (SVMs). Furthermore, we have applied the histograms of oriented gradient (HOG) descriptor for the classification. As a baseline classifier the nearest neighbour approach is also used and compared with SVM-based classifiers. The testing results show that HOG descriptors significantly outperform existing local-invariant feature sets SIFT and SURF in paddy field insect pests classification. HOG descriptors when combined with SURF features yields around 90% accuracy in classification. For simplicity and speed, the linear SVM is used as a classifier throughout the study.

