Abstract

ABSTRACT

Image classification is an area in image processing where the primary goal is to separate a set of images according to their visual content into one of a number of predefined categories. It is a vital stage in Tamil Character Recognition System and in the present scenario any of the many single classification system is being used.

In order to improve the accuracy of the character classification, the present research work proposes the use of multiple classifier or fusion of classifiers. Fusion-based classification is a technique that has been proven to be efficient than single classification algorithms. Fusion of classifiers has several advantages over single classifiers. It improves the accuracy of classification and reduces the failure to recognize rates.

The main aim of this research work is to classify Tamil character images using fusion or multiple classification algorithms. Image classification is defined as a process which groups similar images together during training and maps an incoming image whose features matches close to a classified group during testing stage.

In the present research, a classifier combination, that uses three classifiers, namely, Neural Network (NN), Support Vector Machines (SVM) and K Nearest Neighbor (KNN) is proposed. Using these three classifiers, three two-classifier combination (NN + SVM, NN + KNN, SVM + KNN) and one three-classifier combination are proposed (KNN + SVM + NN).

Six image features, namely, mean, standard deviation, median, area, minimum and maximum intensity of the image were calculated for each image. The calculated features were stored as feature vector matrix and was used as input

the classifiers. The outputs from each classifier were combined using a majority voting scheme to achieve a final decision.

Three performance metrics were used during experimentation. They are error rate, accuracy and speed of classification. N-fold cross-validation method is used, where N is varied from 1 to 5 in steps of 1. When $N > 1$, the average value is calculation and is taken as the final performance result.

Experiments with various parameters prove that the aggregation of classifiers to classify images improve the classification results in terms of accuracy, error rate and speed of classification.

From the results, it is evident that the performance of classifier that combines KNN with SVM and KNN with NN is better when compared to other single classifiers and three classifier combinations. While comparing KNN combined with SVM and NN, the KNN + SVM combination produced better results than KNN + NN.

While considering the number of runs used, it is evident that the number of runs and error rate are indirectly proportional to each other. Thus, after comparing the result of the fusion classification models with their single classifiers, it is clear that the KNN + SVM classifier shows significant improvement both in terms of error and accuracy.