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- K.S. Manjunatha
Abstract

In this research work, the problem of online signature verification is addressed by exploiting writer dependent characteristics. This research work focuses on the utilization of writer dependent characteristics at three levels viz., feature level, decision threshold level and classifier level. The proposed models resemble the verification procedure generally adopted by a human expert while manually verifying a signature where a different set of features and different matching strategies are used for different writers.

We propose a model based on the usage of writer dependent features. Writer dependent features are selected by means of two different approaches. The two approaches differ in the way the relevancy of a feature is computed. In the first approach, the relevancy of a feature is decided based on the contribution of a feature towards preserving the cluster structure of a writer. In the second approach, the relevancy of a feature is estimated by means of different dispersion measures. Features are ranked based on their relevancy which varies from a writer to a writer and verification is carried out by considering features with top score. Even though the features selected are different for different writers, feature dimension and threshold used are same for all writers.

As consistency of signing varies from a writer to a writer, the usage of same number of features and also the same threshold for all writers is not effective. Hence, we propose a model based on writer dependent feature dimension and threshold. Further symbolic representation scheme for preserving intra-class variation has been adopted for representing the features selected for each writer.

A novel method called ‘Recursive Subset Training’ is introduced for estimating writer dependent feature dimension and threshold. This method is based on recursively splitting the entire dataset into disjoint subsets based on the error rate estimated for the entire dataset and then estimating the error rate of individual writers in each subset. With this approach, these two parameters for each writer are fixed dynamically based on the EER estimated for each writer relative to the EER of other writers.
We also propose an algorithmic model for selection of writer dependent classifier. Classifier for each writer is decided based on the minimum error rate criterion which is estimated from the training samples. Further the notion of cluster dependent classifier selection is introduced for recommending a suitable classifier for those writers with homogeneous characteristics. Clustering is done based on a unique representative created for each writer. The representative created for each writer exhibits a maximum similarity with the remaining signatures of the same writer.

All the proposed models have been experimentally demonstrated on relatively large benchmarking datasets namely MCYT (DB1) and MCYT (DB2) to demonstrate the importance of the proposed models. Further, the superiority of proposed models are well established by an extensive comparative analysis with other existing contemporary models.

All in all, in this research the applicability of various writer dependent characteristics is investigated for designing online signature verification models towards achieving lower error rate.