

Handwritten Arabic Characters Recognition Using a Hybrid Two-Stage Classifier

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Handwritten Arabic character recognition presents a big challenge to researchers in the field of pattern recognition. Arabic characters are characterized by their highly-cursive nature and many of them have a similar appearance. For example, the only difference between some of the alphabet characters is the existence of a number dots above or below the main character shape. This paper proposes a system for isolated off-line handwritten Arabic character recognition using the Discrete Cosine Transform (DCT) as the feature extraction method and a two-stage hybrid classifier. The two stages are a Support Vector Machine (SVM) and a Neural network (NN). The first stage is a two-class SVM classifier which classifies a character either a character with dot(s) or without dot(s). The output of this stage is used to extend the feature vector of the character by the class value to give it an extra unique feature. The extend feature vector is fed to a multi-class neural network model to classify the character. The proposed approach is tested on a database of Arabic handwritten characters called AlexU Isolated Alphabet (AIA9K) containing 8,737 character images. The experimental results of the first stage classifier showed a high recognition accuracy rate of 99.14%. The proposed two-stage hybrid classifier obtained an average recognition accuracy rate of 91.84% over all Arabic Alphabet characters.

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