Artificial Neural Network based Signature Recognition and Verification System

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Introduction

The signature is an important biometric attribute of a person which can be used to authenticate the personal identity because of its uniqueness for each person. Now a day the personal signature has a significant value in day to day works. Because of its uniqueness there is a certain pattern which can be identified by extracting certain unique features.

Though in present days signatures are using as the valid authentication mechanism, some peoples are trying to imitate another person's signature to achieve some narrow goals. It is also common sight in Sri Lanka place like banks, government organizations, universities etc. Therefore, it is essential to introduce a high accuracy validation mechanism for personal authentication. The proposed system uses an efficient image processing and feature extraction methods as well as well-trained neural network system.

Methodology

Implementation of the system mainly based on two phases, Training phase and recognition phase. Several technologies, Programming languages and Libraries are used to design and implement the system.

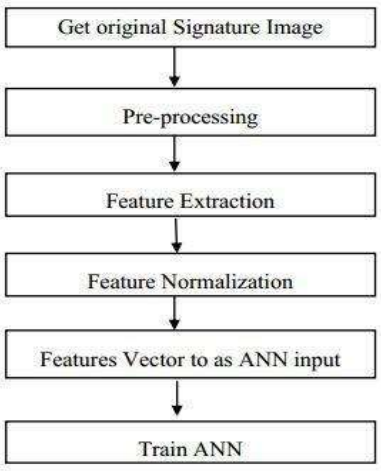

Figure 1. Training Phase

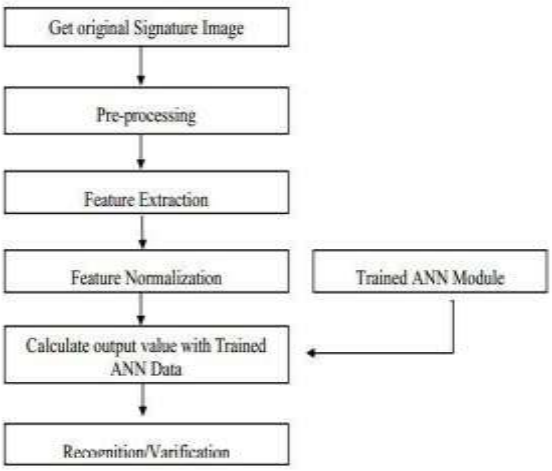

Figure 2. Recognition Phase

In the training phase there are several steps to be completed by the system before the training get started. In pre-processing activities, system is mainly focusing on background elimination, cropping (crop signature image according to the signature bounds), thresholding, thinning, and image width transformation (Abikoye et al., 2011).

Feature extraction is one of the important parts of the system because powerful features directly affect to the accuracy of the final output. In here firstly, system will collect some global features such as pixel density, width to height ratio, maximum horizontal count and maximum vertical count. Then system will extract some unique points based on vertical splitting and horizontal splitting (Ashwini*et al.,* 2012). Those feature points are related with the image geometric centre

point. After the feature extraction process is completed and then system normalizes all the features and added them to the input vector. Main purpose of the normalization is to convert values into an acceptable range for the neural network (range between 0 and 1). Then, the normalize data are used to train the Neural Network.

In the Recognition phase, all the steps up to feature normalization are accomplished and those features are compared with trained Neural Network. Finally, the system will generate a unique value and which reveals the acceptance and rejection of the relevant signature.

Result and Discussion

For the testing system used 300 signature database which is including 20 people's signatures. System successfully recognizes some person's signature within in 80% - 85%. As well as it verify relevant signature correctly (whether correct or false). System generates matching percentage for relevant signature when recognition takes place. System recognizes signatures which were used in training phase with high percentage (about 90%). For the other signatures system will recognize with 80% - 90% percentage range. From that system has able to detect signature forgeries with acceptable rate.

At the beginning system was trained with less extracted features (used only 15 geometric centre points). In that situation system's recognition percentage was between 75% - 80%. So Efficiency and the accuracy of the system output mainly depend on correctness of the extracted features and the number of features extracted from an image. Powerful features mean high correctness of the output. Also number of signatures of a single person used to train the neural network is also affect to the final outcome.

Conclusions

This system recognizes and verifies the signatures with high degree of accuracy with a law False Acceptance Rate (FAR). The system identifies the signatures, regardless of trained or not, correctly because of the Neural Network.

References

AshwiniPansare, Shalini Bhatia Off-line Signature Verification Using Neural Network International Journal of Scientific & Engineering Research, February-2012.

Abikoye, O.C., Mabayoje, M.A., Ajibade, R., 2011. Offline signature recognition & verification using Neural Network. International Journal of Computer Applications.