

Extreme Average Warping and Discrete Wavelet Transforms for Online Signature Authentication

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Abstract— In this paper, we propose Online signature authentication system based on Discrete Wavelet Transform and Extreme average warping technique. The technique is based on a feature set comprising of several histograms that can be computed efficiently given a raw data sequence of an online signature. The digital tablet capture the dynamic information like speed, time strokes and their average. A set of shape features and dynamic features are extracted from a set of original signatures to create a reference signing model of a person. An algorithm is developed to convert sample signatures to a template by considering their characteristics and by extracting features. Decision about online handwritten signature verification depend on DWT and EAW features.

Index Terms— Online signature, mobile device authentication , Discrete Wavelet Transform, feature extraction ,verification

INTRODUCTION

There exist a number of biometrics methods at present, e.g. Signatures, fingerprints, iris, etc. Fingerprints and iris verification require the installation

of costly equipments and hence cannot be used at day to day places like banks, etc. There is considerable interest in authentication based on handwritten signature verification system as it is the cheapest way to authenticate a person. Banks and Government bodies recognize signatures as a legal means of authentication. Signature verification technology utilizes the distinctive aspects of the signature to verify the identity of individuals.. A handwritten signature is biologically linked to a specific individual. Modern forensic document examiners commonly compare a suspect signature with several examples of known valid signatures. They look for signs of forgery which include:

Signatures written at a speed which is significantly slower than the genuine signatures, frequent change of the grasp of the writing implement, rounded line endings and beginnings, poor line quality with hesitant and shake of the line, retracing and patching, and stops in places where the writing should be free Compared with other electronic identification methods such as fingerprints scanning and retinal vascular pattern

screening, it is easier for people to migrate from using the popular pen- and paper signature to one where the online handwritten signature is captured and verified electronically. Many times the signatures are not even readable by human beings. Signature verification problem therefore is concerned with determining whether a particular signature truly belongs to a person or not. There are two approaches to signature verification, online and offline differentiated by the way data is acquired. In offline case, signature is obtained on a piece of paper and later scanned. Offline signature verification deals with a 2D static image record of the signature. It is useful in automatic signature verification found on bank checks and documents authentication. Offline verification techniques are based on limited information available only from shape and structural characteristics of the signature image. A fundamental problem in the field of offline signature recognition is the lack of a significant shape representation or shape factor.

In contrast, online signature verification systems are extremely precise. It require the presence of the author during both the acquisition of the reference data and the verification process. Online handwritten signature is usually obtained on an electronic tablet and pen. Automatic online signature verification is an interesting intellectual challenge with many practical applications. This technology examines the behavioral components of the signature such as: stroke order, speed, and pressure, as opposed to comparing visual images of signature. Unlike traditional signature

comparison technologies, online signature verification measures the physical activity of signing. The target of this research is to present online handwritten signature verification system based on DWT features extraction.

SURVEY ON ONLINE SIGNATURE AUTHENTICATION.

A simple and efficient method for online signature verification. The performance of state-of-art algorithms despite its simplicity and efficiency proposed in [1]. An algorithm for online handwriting signature verification using two levels verification method by extracting wavelet features and using neural network recognition is proposed in [2]. The dynamic verification of handwritten signature of wavelet transform of by the back propagation neural network (NN) is explained in [3]. Extracting features from handwritten signatures using discrete wavelet transform technique (DWT) in that achieved higher verification rate than that of a time domain verification system is reported in [4,5]. Various dynamic properties of online signature verification system based on extracting local information time function in [6]. The Dynamic online signature verification systems using a set of 49 normalized features that tolerate inconsistencies in genuine signatures while retaining the power to discriminate against forgeries is in [7]. The signature verification systems impact of an incremental level of skill in the forgeries against is explained in [8]. Signature recognition algorithm pixel-to-pixel relationship between signature in [9]. Neural Networks (NN), Hidden Markov Model (HMM) and Support Vector Machine (SVM) signature samples required to train the classifiers is reduced proposed in

[10]. The Off-line Chinese signature verification problem proposed by Heng. The features of signature are obtained by finding the principle axis of the signature and equally dividing the signature into a number of radial regions [11]. Hidden Markov Model (HMM) based off-line verification system to distinguish between genuine and forged signatures in [12]. Extract features of DWT using Image Registration, Discrete Wavelet Transform (DWT) and Image Fusion proposed Ghandali and Moghaddam. The several registered instances of each signature are fused together to generate reference pattern of signatures in [13]. Handwritten signatures reference data acquired through a digitizing tablet is used with three different classification schemes to recognize is discussed in [14].

PROPOSED SYSTEM

In proposed work Online signature using different parameters based on DWT (Discrete Wavelet Transform) and EAW (Extreme Average Warping). Signature verification using Discrete wavelet transform Technique to calculate speed, time and stroke points. and The system will calculate the speed of pen while drawing the signature which is useful during verification of online signature and system make use of time parameter that is the total time required to draw the signature and the system calculate the number of stroke points that have been made while drawing the signature. The extreme average warping system makes use of strong parameter which is the average of speed time and stroke. this makes online signature verification more strong. The system makes use of pen parameters like pen up and pen

down to make the signature verification more strong. Extracting x and y positions of signature points are represented as 1D time domain signal. Using Discrete wavelet transform to extract features from these signals. Using Sub-band decomposition to extract intrapersonal features from the DWT features to enhance signature individuality. In the testing phase, signals which were captured from a signature of unknown person are subjected to feature extraction. Allowing the unknown signature resulting outputs are to be identified if it is a genuine handwritten signature or not. Two algorithms are summarized of critical importance to handwritten identification system. In signature verification system feature extraction process represent. Ideally interpersonal variations should be much more than the intrapersonal variations. Minimize intrapersonal variation and maximize interpersonal variations. Therefore it is very important to identify and extract those features. There is a lot of flexibility in the choice of features for verification of a signature. Global features, such as the dimensions, and the pixel distribution. are usually not adequate to differentiate forgeries. On the other hand, significant local features are extremely hard to locate. The signature strokes of Great research efforts were made in order to concentrate on the local feature extraction process..

The feature extraction process in this research starts with pen position data. Considering two factor pen positions in x direction and pen position in y direction. Derived pen position data by Pen movement angles are as a third factor. For same individual number

of points in a captured handwritten signature varies with respect to its writing size and speed. To overcome different signature size, data points that represents x and y position are normalized.

RESULT

The result shows that verification performance of the system .Existing papers have given us the idea about the DTW(dynamic time warping) ,EPW(extreme point warping), and online system using speed and time features which was not sufficient for security of online signature.

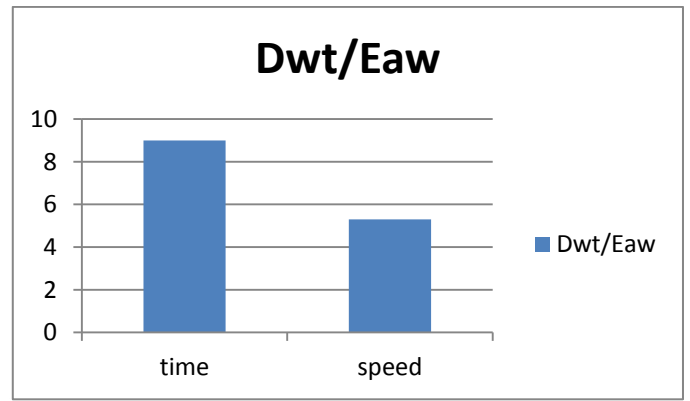
The use of Discrete wavelet transform and Extreme average warping technique calculating the average of strong parameters (speed,time,stroke) to improve the security of online signature and result show that success rate of the recognizer is 100% when tested with signatures it has been trained to recognize. In table A and B shows that the time and speed of signature. table A shows that the better performance than table B.

signal	Epw/Dtw
time	12
speed	4.8

Table A

signal	Dwt/Eaw
time	9
speed	5.3

Table B



Propose Dwt/Eaw

The result shows that the Discrete wavelet transform and Extreme average warping is better verification system. In table A shows that the value of parameter take more time to signature verification than table B.and table B is better performance than table A. Thus implementation of this system with combination of Discrete wavelet transform and Extreme average warping concept has made this possible to improve the online signature.

Conclusion

In this paper, we proposed online signature verification system based on discrete wavelet transform and extreme average warping technique. Some parameters of handwritten signature data were decomposed into sub-band signals by DWT. High frequency (details) sub band signals and Low frequency approximations) sub band signals were extracted for these parameters. The results show that success rate of the recognizer is 100% when tested with signatures it has been trained to recognize. When using all the extracted DWT and EAW approximation features, the success rate

of the recognizer is up to 90% when tested with untrained genuine signatures.

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