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Online Signature Verification System

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Abstract—*Signature is related to biometric that identifies a person by his/her behavioural characteristics. We will propose an online system for verification purpose. Verification of signatures (dynamic) online use signatures to detect pressure sensitive tablets to extract dynamic characteristics of a signature addition to its form. The purpose of the project is to develop an authentication system based on personal signatures. Verification of signatures is subject of significant research in the field of biometrics authentication. In this project the signatures are captured using a digital pen and tablet. Audit system online signatures based on the vision which the pen tip of the signatory is properly traced in real time.The data acquisition of the system consists of main equipment such as an electronic tablet that is connected to computer through the universal serial port(USB). Online signature data is obtained while the individual is signing on the tablet using the special pen. The signature will be characterized as pen strokes having x-y co-ordinates. The data will be then stored in the database of number of signatures in txt.file form. Finally, the input signature is classified as genuine or a forgery by comparing it with the database records. In this, the method of Support Vector Machine(SVM) is focused to verify and match signatures of the user individuals[2].*

Keywords— Digitizing tablet, Pen-tip strokes, Signature database records, Support Vector Machine(SVM),Universal Serial Bus.

I. INTRODUCTION

Humans recognize each other according to the characteristics they observe around them like,we recognize others by their face and voice. Things like keys or card are more likely to get stolen and disclosed. Toget a more reliable verification, we should use something that truly characterizes the person in a unique way. Biometrics is an automatic method of identity verification that is based on the principle of measurable physiological or behavioral characteristics such as a signature(or any other characteristics as well). These features should not be duplicate, but unfortunately it is often possible to make a copy that is accepted as a template by the biometric system[5].

Each one of us have special characteristics which makes us unique and these characteristics are important in recognizing and authenticating individuals. Biometrics has been mostcommonly used nowadays in physical access controller applications.Biometric features are used to provide an enhanced level of security and identity. Signatures are the most common thing to confirm a person's identity.In this letter, the signature is verified using and is based on Support Vector Machine (SVM). Support vector machine is an innovative training machine for pattern recognition that generates its solution (decision function A) as a support vector, a subset of training data.

Apart from providing very good results for various pattern recognition, it also is a good method for signature recognition and verification.SVMTypically fixed-feature features apply to data sets containing vectors, and not to problems related to time series of variable lengths, such as sign online signature recognition [2].

SVM is mainly used in classification and representation problems.

In classification it involves estimation of the decision function, ‘f’ using a set of training data with the labels that will correctly classify unseen test examples.

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On the other hand, the use of contraction is a predictor of actual value actions performed in a similar way of model recognition [1].

1.1 IDENTIFICATION

Person is identified based on only biometric characteristics. Biometric stored in the database is compared by the computer with the signed signature on tablet to check whether it matches each other using matching algorithm.

1.2 VERIFICATION

Identity of a particular person is either confirmed and verified or rejected, when the person claims to be already enrolled in the system,through. The biometric information from this person is compared with his information already stored in the database.

II. METHOD

Here we will describe the methodology of the project such as data capture, data capture, data acquisition, size normalization, feature extraction and matching image.

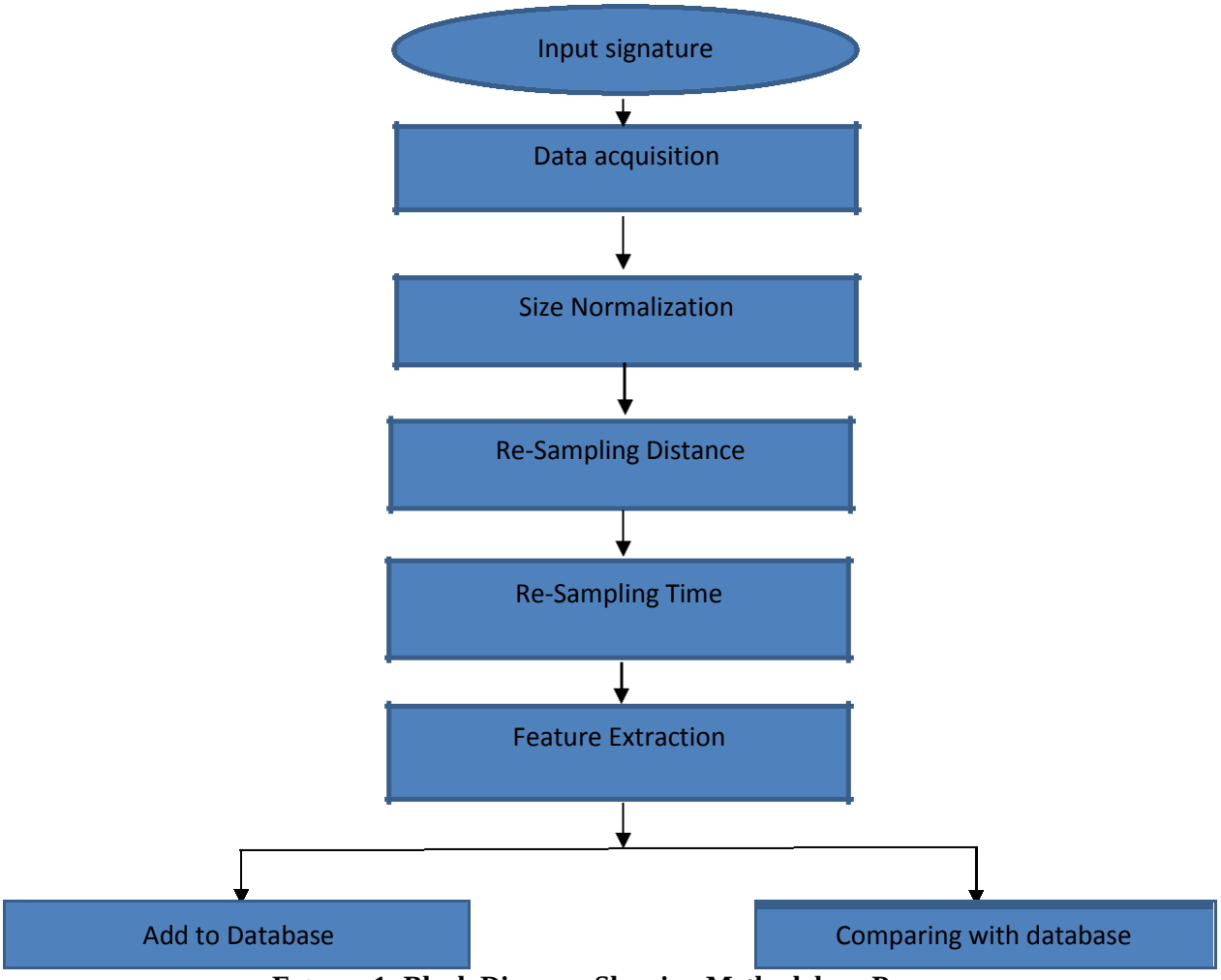

FIGURE 1: Block Diagram Showing Methodology Process.

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III. MATERIAL AND METHOD

3.1.: Hardwares to be used:

3.1.1.:Digitizing tablet:

We implemented a tablet based online signature verification system. The system consists of a low cost tablet with a special pen. The input online signature data obtained in real time are through this digitizing tablet, while the signature is being written using the special penThis includes a data collection process in which real-time entries from digitalization tablets and special processing pens are read into the process [4].Signatures taken from different users are stored in a unique database called as Signature database. The digitizing tablet is sending the real time inputs to the CPU for further processing and storage. Finally, the input signature is classified as genuine or forgery by comparing. We collected different sample of signatures from 3 users. We observed that the system was suit for signature verification.

3.1.2.:Pen For Signature points tracing purpose:

The input signature using this pen will be read in terms of x-y coordinate While the user is signing,different points will be traced along the whole signature from start to end point. Tracing the points correctly will enable us to know the points of the pen such as pen-up points and pen down points. This data will be stored in the database which is very important for matching and verifying purpose. The main pen-down point would be the first point which indicates the ending of the signature[3].

3.1.3.:Universal Serial bus(USB):

As mentioned earlier,will need a USB to connect the digitizing tablet to the computer via USB port in the computer[1].

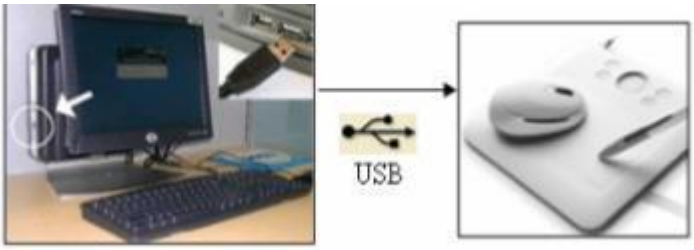

FIGURE 2: USB connection of the Tablet with computer.

3.2.:Software to be used.:

Matlab 2018b:

This software will be used for Feature Extraction Process. Determining a subset of the initial features such as similarities,corner points,size,shape,etc is called Feature selection or extraction. The Selected Features are expected to contain the useful information from the input signature data, so that the desired task can be performed by using this reduced representation instead of the complete initial data[1].Support Vector Machine(SVM) is a supervised algorithm prevailing in MATLAB used for biometric classification.It acts as a classifier to recognize signature which is a biometric attribute that validates person's identity[2].

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IV. EXPERIMENT ANALYSIS AND RESULTS

An experiment is carried out to determine whether the software used is accurate or not,so as to prove that the objectives of this project have been achieved. This experiment involves two sections, which are software validation to prove its effectiveness in different and an analysis from a population of 3 registered users(our project group).

4.1:Software Validation:

Software validation will be carried out to show the effectiveness of this software in verifying signatures. It is very important to consider other main aspects before a signature is verified as genuine signature. Thus,a validation is to be made to test the results obtained through this software[5].

FIGURE 3:Signature Sample verified as "Genuine" **FIGURE 4:Signature Sample verified as "Forgery"**

Basically, the verification process performed is based on three aspects: the orientation of the signature at coordinates x and y, the change in pressure applied when signing the signature, and the time used to sign the signature[6].Above is Figure 3 displays signatures that match the criteria required for a signature to be verified as a genuine signature.

For the orientation year, it is taken as X-coordinate and Y-coordinate as reference. Generally, a user's signature has the same orientation whenever he or she signs it. If the user largely signs in an incorrect orientation, such as the changes in X coordinate and Y coordinate, the signature is verified as a counterfeit signature. This is shown in FIG. 4 given above. It shows that the signaturesorientation is varied, making it the root cause of that signature being verified as forgery[7].

Now for the pressure aspect, a signature will be verified as forgery if the pressure applied from the pen towards the digitizing tablet is very much different from the genuine signatures that have been trained for purpose. If the user stops while signing again and again and applies altogether weird or different pressure then surely it will be verify it as forgery. The higher values will show high pressure and vice versa.

4.2. 'FAR' and 'FRR' analysis:

Apart from that,there also are two quantities used to characterize the performance of the signature verification algorithm. False Rejection Fate (FRR) is defined as the percentage of genuine signatures that are incorrectly rejected as forgery. False Acceptance Rate (FAR) is defined as the percentage of forgery or counterfeit signatures incorrectly verified by the software as genuine signature [8].

FRR = (Total number of genuine signatures tested / Total number of genuine signatures rejected) * 100

FAR = (Total number of counterfeit signatures accepted / Total number of counterfeit signatures rejected) * 100

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If the results show great accuracy, then the proposed system will be accurate enough for the signature verification in real time. The FRR and FAR have to be as low as possible for achieve the accuracy of signature verification at 100%. The low rate of FRR and FAR showed that this program software has the ability to verify signatures in the acceptable accuracy range [9].

V. CONCLUSION

The project is basically about developing an online signature verification system that uses Support Vector Machine to verify whether the written signature is genuine or forgery.
In verifying signatures, the signatures are processed through the given software and this software will have the capability to decide whether it will accept the signature or not.Thus, the ability of this software is to check the signatures of individuals (users or individuals) already signed in the software in the database and stored there. Verifying signatures has to be accurate and reliable so that we can maintain the high quality of the software. Therefore, the error rate used to measure the accuracy and reliability of this software has to be as low as possible. Thus, the FAR and FRR has to be low making the system highly accurate and if possible error must be 0%, which will show that it has a perfect accuracy[10]. Through its many applications to this program in our daily life, especially with regard to financial transactions, verifying online signatures has a potentially significant place in biometric technology
The application of automatic online signature verification will become increasingly accepted in the real world and will make lives easier[12].

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