Off-Line Persian Signature Verification: An Empirical Evaluation

Kamlesh Kumari, Sanjeev Rana

Abstract: Signature verification is a frequent task in forensic document investigation. In this paper, an empirical study of off-line Persian signature verification system has been proposed. Persian signatures are different from other signature types because citizens generally do not use text in it and they draw a outline as their signature. Initially scanned signature images undergoes suitable preprocessing steps. After preprocessing, features based on Euler number, average object area, mean and area are extracted. Finally offline signatures are verified using SVM, KNN and Boosted Tree. Publically available database UTSIG is used. Paper also compares the result for different signers and different samples size

Index Terms: Support Vector Machine (SVM), UTSig (University of Tehran Persian Signature)

I. INTRODUCTION

The most widely acknowledged means of official recognition for legal documents is handwritten signatures. When there are a huge number of official papers, the physical verification of papers based on signatures is time consuming. By automating the signature authentication process, burden can be reduced. The purpose of an automatic offline handwritten signature authentication scheme will be to authenticate the uniqueness of an individual based on scanned signature. Signature verification system can be online or offline. In online signature verification scheme we use pressure responsive tablet to capture signature and for offline signature verification scheme we use image of signature. Signatures in different culture have different shapes. In this paper, off-line Persian signature authentication classification has been proposed. Persian signatures are different from other signature types because citizens generally do not use text in it and they draw a outline as their signature. Fig.1 shows genuine and forged sample of scanned Persian signature from UTSIG [1]. The paper is organized as follows: Section I covers the Introduction part. Section II depicts Related Work. Section III portrays the Methodology adopted. Section IV portrays Experimentation. Comparison with other database is rendered in section V and Section VI depicts the Conclusion.

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Fig.1 Persian signature

II. RELATED WORK

In offline handwritten signature authentication scheme, to decide the method for characteristic mining of signature image different studies are explained in [2][3]. Sparse coding and consequent Dictionary leaning is are well known methods for tackling computer vision problems. The prospects of Sparse Representation on creating discriminative feature for efficient and accurate signature verification on four database i.e. UTSIG ,GPDS ,CEDAR and MCYT-75 is demonstrated in [4].Signer-dependent method is used to build up the symbolic demonstration for each individual. Median and standard deviation are use for generating symbolic features in [5].Simulated annealing optimization method with SVM for offline signature verification was used on two dataset i.e. CEDAR and GPDS in [6].Signature's image is generally represented with fixed-size features vectors capturing properties of the signature's script.Two structural methods i.e. graph edit distance and ink ball models for offline signature verification are used in [7].

Offline signature verification of Persian signature using wavelet transform was proposed in [8]. The number of samples signature for training was 12 and 8 for UTSig and PHBC respectively. Equal error rate was 14.34 and 7.50 i.e. low as compared to other research work.

The combinations of four features (Euler number, average object area, mean and area) are used for CEDAR dataset. Accuracy of the system for user dependent model is high as compared to user independent model [9]. Adversarial examples that are misclassified and fool a machine learning classifier are described in [10].

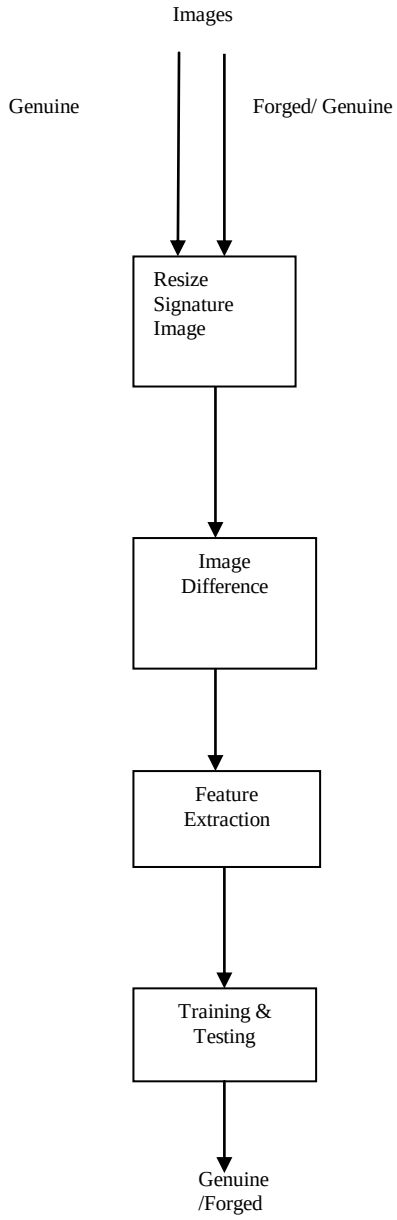

Fig. 2 Block diagram of Offline Signature Verification

The precision of Automatic Signature authentication depends on the feature of signature image, image type and classifier used in [11].

III. METHODOLOGY

Fig. 2 presents the offline signature verification's diagram. The Design accepts pair of scanned Persian signatures i.e. questioned and actual signature. The final result of the system determines whether scanned Persian signature is genuine or forged.

IV. EXPERIMENTATION

Fig. 3 and Fig. 4 shows that accuracy of Persian signature verification using SVM is high w.r.t .sample size and number of signer as compared to two other classifiers i.e. KNN and Boosted Tree.

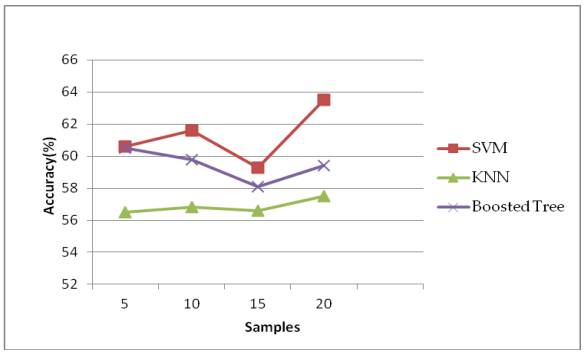

Fig.3 Accuracy of Persian Signature Verification

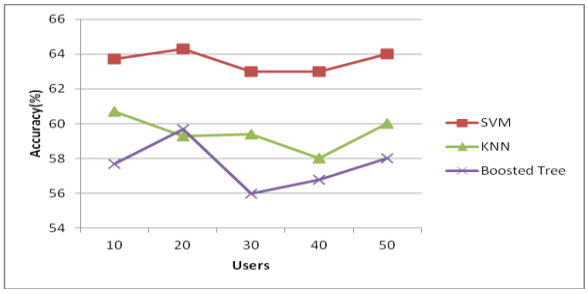

Fig. 4 Accuracy of Persian Signature Verification

V. COMPARISON WITH OTHER DATABASE

Accuracy of Persian signature verification is low i.e. 64 % as shown in fig. 3 and fig. 4 as compared to other language (i.e. English, Hindi and Bengali) signature verification as shown in table I.

Table I Comparison with other database

Database	Accuracy	Ref:
CEDAR	87.4	**[9]**
BHsig260(Hindi)	80	[12]
BHsig260(Bengali)	72	

VI. CONCLUSION

In this paper, an empirical study of Persian off-line signature verification using image based features i.e. combinations of four features has been presented. As far as accuracy of Persian off-line signature verification is concerned, it is low as compared to other language database as shown in table 2. Persian signatures are different from other signature i.e. do not use text. As far as storage requirement is concerned, storage complexity is low since numbers of features used are four only. In future, we plan to extend our work on Persian signature verification using different features and classifier to improve the result.

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