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Survey on Online Signature Verification Using MATLAB and GSM

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ABSTRACT

Online signature verification using MATLAB and GSM is based on the simulations in MATLAB and mobile devices. We introduce a effective method for online signature verification. An online signature is computed in linear time. The resulting signature template is compact and requires same space. This has been verified over a set of images. The results show that the performance of the proposed technique is similar and often higher level to state-of-the-art algorithms despite its simplicity and efficiency. In order to verify the proposed method on signatures on camera devices, a data set was collected from an uncontrolled environment and over multiple periods. Experimental results on this data set confirm the effectiveness of the proposed algorithm. The results demonstrate the problem of within user variation of signatures over multiple sessions.

Keywords: Signature verification, Biometrics, Skilled forgeries, Density pixels, Deep training.

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INTRODUCTION

Handwritten signatures are socially and legally accepted in our day to day life. These are used as traits for the biometrics based on each person. Until today typically there are mainly two types of verification systems for handwritten signatures. They are online signature verification and offline signature verification. Offline method explains about the methods of template aging, feature extraction, segmentation, pre-processing, data set images and similarity measurements K.Srilatha [6]. But they are useful only in cases of small scale verifications such as schools, colleges and other places. But considering the projected view of very large scale usage of this method we can implement it in the places of banks, passport verifications and highly authorized places. That is why we are proposing a few methods in the implementation of online signature verification S. Chi et al [7]. Basically the forged signatures are classified into two types. They are either free hand or skilled. Freehand signatures are done randomly or lethargically without any interest. They are generally easily to identify with naked eye on practice. Skilled method consists of tracing. In the existing system verification process is obtained from traditional data sets K. Huanget al [8] and K.Srilatha [9]. We will be collecting all the signatures from a place such as banks and maintain a database for all the signatures. There are two types of databases. They are MCYT-100 and SUSIG datasets. In the existing system we first give a input image then it receives the image it divides the image into x and y co-ordinates and then pre-processing is done. An image can be processed adoptically or digitally using a computer. Pre-processing is basically the term for operations on images at the lowest level of abstraction. It can be based on colour or gray level techniques. After the pre-processing segmentation is done which means decomposition of the scene into different components. Then the features are extracted from the signature to perform the information packing, dimension reduction, salience extraction, and noise cleaning. In the proposed system we are implanting the ARM controller based on the simulations in MATLAB by connecting a camera to the personal computer such that we get a message through the GSM technique D. Guru et al [13] and J. Galbally et al [14] . We are using the GSM to verify the signature with the respective person by sending a message to the persons personal mobile number that is stored in the database along with his account.

ARM-acorn risc machine is being used for the proposed system by using a 32 bit microcontroller. The main idea of using a ARM controller is that we can use it in the real time. It contains 37 registers and it is 32 bit longer. Then the key part in the system is GSM technology. GSM means global system for mobile communication. It I an external device connected to a pc by a serial cable E. Maiorana et al [18]. The main advantage of using this technology is that we can locate the associated person globally anywhere in the world and we can pass on the information. It can send the message signals and can monitor the signal strength.

The transmission of data in computers is done in two ways namely serial communication and parallel communication L. Nanni et al [19]. The usage of serial communication is for the very fast communication through the controllers. For short distance transfer there is no use of modulators but for the long distance communication we must use the modems.

LITERATURE SURVEY

Abhijit Mitra, Pranab Kumar Banerjee and Cemal Ardil (2008):

We took this paper as the main base paper for our project as we gained much knowledge about the various types of skilled forgeries occurring through signatures. Forged signatures can be either freehand or skilled. Freehand forgeries are done randomly or simply. The way of doing it randomly is by writing it many times which may be valid or invalid. Skilled can be traced or simulated. The people doing this paper Abhijit Mitra et al [1] have done a efficient way of approach for identifying the skilled forgery through the method of evaluating the number of low density pixels which is a offline process. They have been maintaining a database of some signatures. While evaluating it recognizes the threshold points for low density and high density pixels. Then they found out the formulae based on both high and low density pixels. Finally they succeeded in finding the forged signatures and they also verified them.

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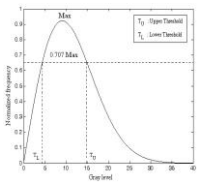
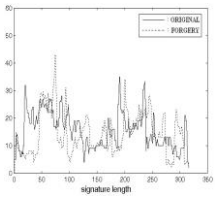
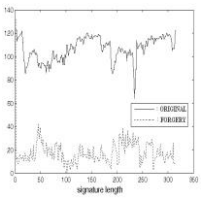






forgery signature upper threshold and lower threshold

Comparison of binarized images of a true and a forgery signature

Comparison of low density pixels of the same true and forgery samples

Fig.1

Weiping Hou, Xlufian ye, Kejun Wang (2004):

The study for the offline signature verification is being done vigorously for the past decades. They found out various methods for the prevention of forgeries Weiping Hou et al [2]. Finally they made around 5 types to hunt the forged signatures. They are based upon template matching, statically based, structural based, spectrum based and neural based approach. Each method of approach has its own importance. Based on stroke widths, pixel widths and error rates template matching is done. Statically based depends on the concept of set of extracted features and underline statically mode of generation of the panels. The third one is based on relations between the low level features to high level structures. Wavelet approach is done in spectrum based and noise detection, minor variations are some small factors used here. Neural networks are assigned for each person in neural based approach. In this paper, the research was done in the structural part based on the combination of both image pixel features and pseudo-dynamic structural features. It has been used in banking wing.

Donato Impedovo and Giuseppe Pirlo (2008):

This paper provides the state of art in automatic signature verification. This paper Donato Impedovo et al [3] is the home for most valuable results that has been obtained so far and puts light on the most profitable directions of research done so far. This paper has focused on the concepts of biometry, signature verification and system security. They bought the concept of electronic pens for detecting velocity,

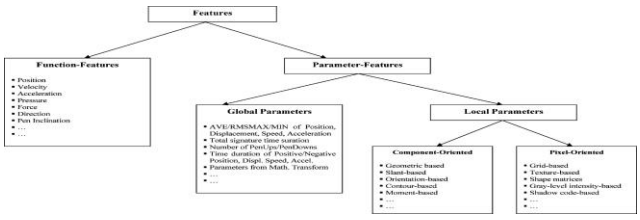
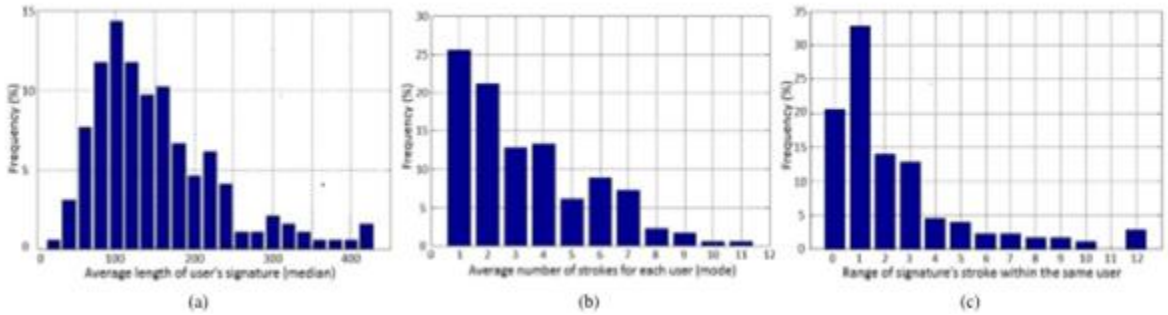


Fig.2

Acceleration, pressure, pen inclination and writing forces. Then the features will be extracted based on the methods and they will be verified using the basic verification techniques that have been being used.

R. N. Nagel and A. Rosenfeld, "Computer detection of freehand forgeries," IEEE Trans. Computers, vol. 26, pp. 895-905, 1977.

In this paper they discussed R. N. Nagel et al [4] it as notwithstanding efforts toward the dematerialization of documents, the need for fast and accurate paper-based document authentication is still growing in our society. Offline signature verification applications mainly concern the authentication of bank checks, contracts, ID personal cards, administrative forms, formal agreements, acknowledgement of services received. This type of verification is related to paper-based document authentication. Thus, offline signature verification systems can be more limited with respect to online systems. That is the reason why we are implementing the need of online signature verification as we can approach a problem in many different types.



Characteristics of online signatures in the dataset (a) The distribution of signature lengths (b) The distribution of signature strokes (c) The distribution of the difference in the number of signature strokes within the same user

Fig.3

M. Ammar, "Progress in Verification of Skillfully Simulated Handwritten Signatures," Int. J. Pattern Recognition, Artificial Intelligence, vol.5, pp.337-351, 1991.

They started the paper stating that in the age of the e-society, automatic signature verification can no longer be considered exclusively restricted to academics and research laboratories since the possibility of applying automatic signature verification in arrange of applications is becoming a reality. Definitely, further research is necessary to fully investigate and interpret the potential of handwritten signatures, which remain very distinct signs, unequivocally demonstrating the inspiration and complexity of human beings. So keeping in mind the whole concepts of the present day society we should still try to improve more and more techniques in the online signature verification **M. Ammar et al [5]**.

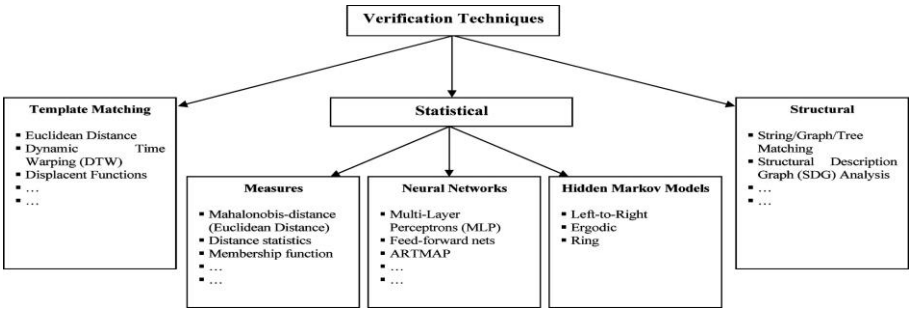


Fig.4. Verification Techniques

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Table.1 Comparison of Different Experiment Dataset with Histogram

Iteration No.	Histogram	Experiment 1		Experiment 2					
				$F=1$		$F=0.5$		$F=1.5$	
		EER-SF	EER-RF	EER-SF	EER-RF	EER-SF	EER-RF	EER-SF	EER-RF
0	Baseline (All histograms)	2.73	0.44	2.73	0.44	4.80	1.26	2.89	0.41
1	X^2	2.67	0.48	37.13	28.20	33.35	41.97	37.93	27.55
2	Y^1	2.75	0.47	24.83	24.40	38.99	36.21	25.54	21.47
3	Y^2	2.80	0.45	36.55	31.66	33.87	35.01	36.15	30.86
4	R^2	2.89	0.48	16.57	13.26	17.95	11.97	18.35	13.66
5	Φ^2	2.93	0.49	26.45	16.00	23.95	16.06	30.20	19.21
6	$P^1_{(1,2)}$	2.93	0.51	12.51	10.18	14.00	10.54	12.11	8.47
7	Φ^1	3.02	0.53	17.85	9.89	18.75	10.88	17.13	9.60
8	X^1	3.12	0.55	27.53	21.27	39.33	29.06	26.00	18.87
9	R^1	3.18	0.62	17.35	12.49	15.20	11.47	18.60	12.21
10	$< Y^1, Y^2 >$	3.45	0.64	27.15	20.55	36.47	33.12	24.93	17.33
11	$< X^1, X^2 >$	3.76	0.61	25.53	17.46	32.07	24.92	25.41	14.34
12	$P^2_{(1,2)}$	4.07	0.62	29.35	25.90	31.75	26.35	29.79	20.81
13	$< \Phi^1, R^2 >_{(1,2)}$	4.75	0.79	11.05	4.41	19.55	17.93	11.27	3.54
14	$< \Phi^2, R^2 >_{(1,2)}$	6.00	1.08	14.92	7.13	28.55	15.66	14.73	6.41
15	$< \Phi^1, \Phi^1_{d(1,2)} >$	8.55	2.26	12.66	3.51	11.73	7.09	13.62	5.21
-	$\{ < \Phi^1, R^1 >_{(1,2)}$(left)$\}$	-	-	8.55	2.26	19.55	17.93	7.85	1.47

Experiment 1 : An experiment where attributes of each histogram are iteratively removing from the feature set
Experiment 2 : An experiment where attributes of each individual histogram are used as a feature set and # histogram bins = $F\times$ the ones in Table I

REFERENCES

[1] Abhijit Mitra, Pranab Kumar Banerjee and Cemal Ardil " Automatic Authentication of Handwritten Documents via Low Density Pixel Measurements". International Journal of Computer, Electrical, Automation, Control and Information Engineering Vol:2, No:7, 2008.

[2] Weiping Hou, Xlufian ye, Kejun Wang ,"A survey of off-line signature verification", international conference on intelligent mechatronics and automation Chengdu, China , august 2004.

[3] Donato Impedovo and Giuseppe Pirlo "Automatic Signature Verification: The State of the Art".IEEE transactions on systems, man, and cybernetics—part c: applications and reviews, vol. 38, no. 5, september 2008.

[4] R. N. Nagel and A. Rosenfeld, "Computer detection of freehand forgeries," IEEE Trans. Computers, vol. 26, pp. 895-905, 1977.

[5] M. Ammar, "Progress in Verification of Skillfully Simulated Handwritten Signatures," International Journal of Pattern Recognition, Artificial Intelligence, vol.5, pp.337-351, 1991.

[6] K.Srilatha,"An effective approach of image retrieval using scalable image encryption" Journal of Theoretical and Applied Information Technology. Vol.72/Issue 02 / 2015 /pp 265-272.

[7] S. Chi, J. Lee, J. Soh, D. Kim, W. Oh, and C. Kim, "Visualization of dynamic characteristics in two-dimensional time series patterns: An application to online signature verification," in Proc. WISA 2003 vol. 2908.

[8] K. Huang and H. Yan, "Offline signature verification based on geometric feature extraction and neural network classification," Pattern Recogitation, vol. 30, no. 1, pp. 9–17, Jan. 1997.

[9] K.Srilatha "Multifocus image fusion using improved dual tree complex wavelet transform and discrete optimization method" Journal of Engineering and Applied Sciences. Vol.9 (10-12): 414-421, 2014.

[10] A. Kholmatov and B. Yanikoglu, "SUSIG: An on-line signature database, associated protocols and benchmark results," Pattern Anal. Appl., vol. 12, no. 3, pp. 227–236, 2008.

[11] J. Ortega-Garcia et al., "MCYT baseline corpus: A bimodal biometric database," IEE Proc. Vis. Image Signal Process., vol. 150, no. 6, pp. 395–401, Dec. 2003.

[12] L. Nanni, "An advanced multi-matcher method for on-line signature verification featuring global features and tokenised random numbers," Neurocomputing, vol. 69, nos. 16–18, pp. 2402–2406, 2006.

[13] D. Guru and H. Prakash, "Online signature verification and recognition: An approach based on symbolic representation," IEEE Trans. Pattern Anal. Mach. Intell., vol. 31, no. 6, pp. 1059–1073, Jun. 2009.

[14] J. Galbally, M. Martinez-Diaz, and J. Fierrez, “Aging in biometrics: An experimental analysis on on-line signature,” PLOS ONE, vol. 8, no. 7, p. e69897, 2013.
[15] M. Faundez-Zanuy, “On-line signature recognition based on VQ-DTW,” Pattern Recognit., vol. 40, no. 3, pp. 981–992, 2007.
[16] J. Fierrez, J. Ortega-Garcia, D. Ramos, and J. Gonzalez-Rodriguez, “HMM-based on-line signature verification: Feature extraction and signature modeling,” Pattern Recognit. Lett., vol. 28, pp. 2325–2334, Dec. 2007.
[17] E. Maiorana, P. Campisi, J. Fierrez, J. Ortega-Garcia, and A. Neri, “Cancelable templates for sequence-based biometrics with application to on-line signature recognition,” IEEE Trans. Syst., Man, Cybern. A, Syst., Humans, vol. 40, no. 3, pp. 525–538, May 2010.
[18] , P. Campisi, and A. Neri, “Template protection for dynamic time warping based biometric signature authentication,” in Proc. 16th Int. Conf. Digital Signal Process., Jul. 2009, pp. 1–6.
[19] L. Nanni, E. Maiorana, A. Lumini, and P. Campisi, “Combining local, regional and global matchers for a template protected on-line signature verification system,” Expert Syst. Appl., vol. 37, pp. 3676–3684, May 2010.