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Research Article

Design and Develop a Biometric Authentication System using Lip Image

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Abstract: Biometrics based authentication techniques have gained much importance in recent times. The reliability of any automatic biometric system strongly relies on the precision obtained in the grooves extraction process. A number of factors damage the correct location of the groove. Among them, poor image quality is the one with the most influence. The proposed alignment-based elastic matching algorithm is capable of finding the correspondences between grooves without resorting to exhaustive research. Lip features are extracted from the lip print of individuals using edge detection technique by studying the spatial orientations of the grooves present in the lip. The standard deviation and the variance are calculated between the segmented images and within the images. The main idea behind this approach is to identify human beings uniquely from their inherent physical qualities. Identifications using lip print biometric eradicate the problems associated with traditional methods of human identification.

Keywords: Hough Transform, Histogram Equalization, Image segmentation Feature extraction

1. Introduction

Identification of person plays a critical role in the society, in which questions related to the identity of an individual are asked of times every day by hundreds of thousands of organizations in commercial services, government, health care sectors, telecommunication and electronic market, etc. In recent years, more and more people are electronically connected due to the fast growth of information technology. So, achieving a highly accurate method used for automatic detection of personal identification is more difficult. To overcome this, an automatic personal identification system can work either to confirm or determine the identity of individuals for more reliability. The purpose for developing new schemes is for accessing authentic user in the condensed services like a computer, cell phone and ATM. Suppose the scheme is vulnerable then anyone can easily access the system. So, recently knowledge-based and token-based security is introduced to limit access to the system. The traditional personal identification methods are very simple and easy to integrate into other systems but it is having disadvantages like tokens may lose, stolen, forgotten or misplaced cases PIN or a simple password can easily be guessed by impostors. In the traditional method biometric is used for personal identification on the basis of the geometric and behavioral characteristic of the person. Enrollment, live presentation and matching are the three processes present in every biometric system.

Fingerprints based personal identification system developed [1] because each finger of a person is different including twins. Different type of approaches is discussed [2] to fingerprint verification for personal identification. The physical characteristic of the finger and hand-based personal identification system is proposed [3] with tolerance by measuring the parameters like length, width, thickness and surface area of the hand. By the easy integration of the other system, the shape of the hand geometric measures are taken for personal identification is explained [4]. In addition to hand geometry analysis the veins, arteries and fatty tissues in hand also measured [5] by the result conclude that addition biological measures values also differ with a different person.

Iris based personal identification is developed [6] because iris patterns are unique. Performance analysis of iris-based identification system based on exudates is developed [7]. By analyzing the blood vessels layer situated in the back of the eye is used for identifying the person is discussed [8].

Signature features like speed, velocity, and pressure are measure from signature by signature verification device in the accepted identifier is explained [9]. Persons are familiar with their voice and signature for identification and verification of person on daily basis but the accuracy of this is not to make sure is discussed [10]. Improving the expectation level of security in the public and private sector, existing biometrics technology will be enhanced [11]. The acoustic features of speech are used for recognizing the speaker between the individual

is clearly stated [12]. Pattern Matching Algorithms (PMA), Matrix Representation (MR), Hidden Markov Models (HMM), Neural Networks (NN), and Decision Trees (DT) are the different technology is used to process the stored voice to identify the individual is explained [13]. Voice can be changed due to ageing, so the person identification system needs to address the problem for improving the performance of the voice-based recognition system is discussed [14].Lip Print Recognition Method Using Bifurcations Analysis is stated [15].A leading biometric technology used for personal identification in the past five years are Facial, Fingerprint, Hand Geometry, Iris Recognition, Signature Recognition and Speaker Recognition. In addition to this recent lip imprint recognition technology also be used.

Alignment-based elastic matching algorithm is proposed for identifying the personal using biometric statics features like Standard Deviation (SD), Variance (V), Mean (M) is explained in session 2. Results of each steps in the personal identification is discussed in section 3 and finally the proposed method outcomes are concluded in section 4.

2. Methodology Used for Lip Based Biometric Authentication System

Lip print characteristics are widely used in forensics and by the law for human identification. The structural pattern on the lips are consider for examining the human lip characteristics. The goal of this work is to examine the groves in the human lips are unique to each person or individuals. Identification from biometric parameters destroys the problems associated with traditional methods of human identification. In order to differentiate the lip images of all the individuals acquired are unique with distinct groove patterns, need to be processed. There are various methods that can be adopted to process the lip images using MATLAB. The automated machine learning based lip – imprint detection methods are classified into two sub categories such as structural and statistical analysis. Structural analysis based lip print processing methods basically extracts various structural features. The steps followed to develop an identification system are shown in figure 1.

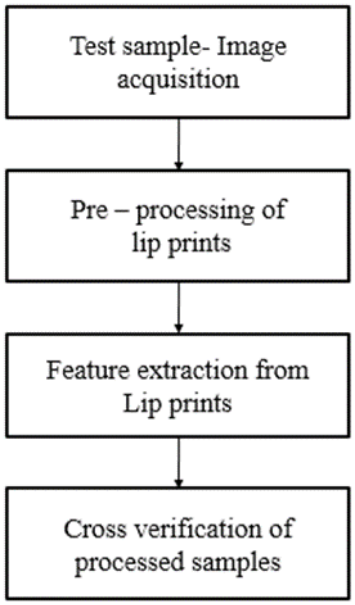


Fig.1 steps followed to develop an identification system

The first and foremost step in lip print based biometric authentication technique is to acquire the input images. The lip print color images are converted to gray scale images in order to make ease for further processing. Originally, the enhancement step is done by canny edge detection to improve the quality of the image. Borders of the edges in an images are highlighted in the image segmentation processes. But in edge detection requires extra step to fill out the shapes. So it takes more processing time and code are complex. To overcome this here two methods are adopted for image enhancement stage: the first one is Histogram Equalization (HE); the next is Hough Transform (HT).Gray scale image and its histogram equalization images are shown in figure 2.

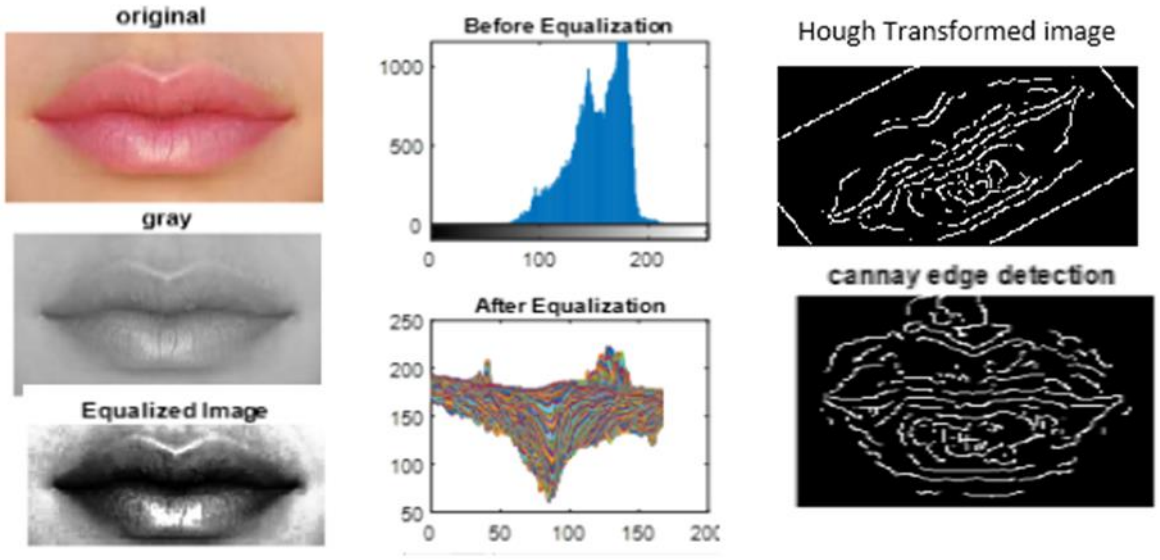
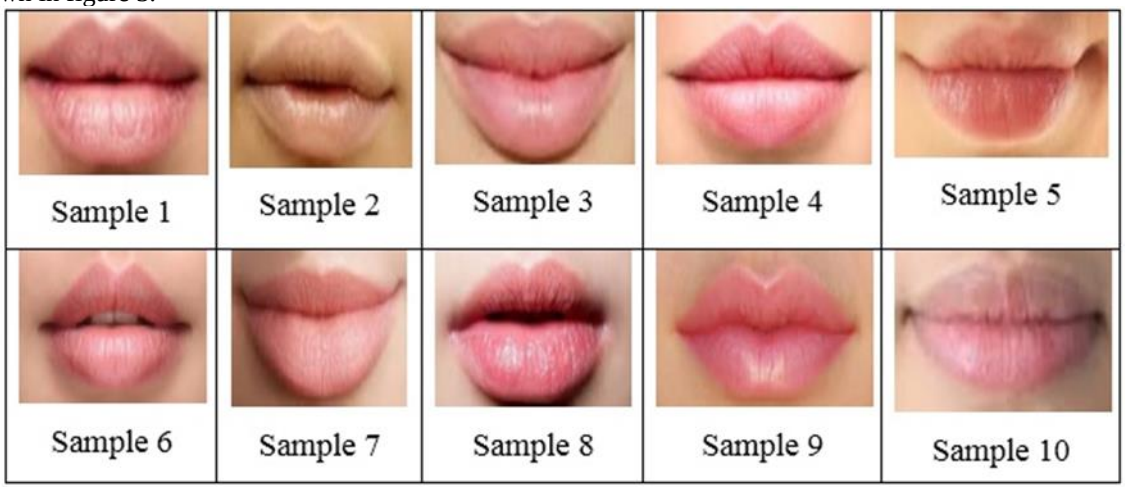


Fig.2 Grouping of all processed image for analyzing the statistical measure

Errors are detected by measuring the values of variance and standard deviation (SD) from the segmented image. Variance is the measure, how far a set of data are isolated out from their mean or average value. It is denoted as 'σ2'. The degree of distribution is computed by estimating the deviation of data points is denoted by the symbol, 'σ' and it named as SD. Ten sample lip images are tested for evaluating the system performance is shown in figure 3.



The standard deviation and the variance of the segmented images are calculated between and within the images. The calculated standard deviation and variance is tabulated in table 1 and table 2.

Table 1: Standard Deviation for ten different sample images

Image	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
S1	0	.0295	.0047	.0184	.0230	.0124	.0263	.0230	.0233	.0184
S2	-.0029	0	-.0248	-.0111	-.0066	-.0171	-.0032	-.0065	-.0062	-.0067
S3	-.0047	.0248	0	.0137	.0182	.0077	.0216	.0183	.0186	.0137
S4	-.0184	.0111	-.0137	0	.0046	-.0060	.0079	.0046	.0049	.0201
S5	-.0230	.0066	-.0182	-.0046	0	-.0105	.0034	.0206	.0703	-.0045
S6	-.0124	.0171	-.0077	.0060	.0105	0	.0139	.0105	.0109	.0060
S7	-.0263	.0032	-.0216	-.0079	-.0034	-.0139	0	-.0033	-.0030	-.0079
S8	-.0230	.0065	-.0183	-.0046	0.0206	-.0105	.0033	0	.0646	-.0046
S9	-.0233	.0062	-.0186	-.0049	-.0703	-.0109	.0030	-.0646	0	-.0049
S10	-.0184	.0067	-.0137	.0045	.0045	-.0060	.0079	.0046	.0049	0

Table 2: Variance of ten different sample images

Image	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10

S1	0	.1596	.0150	.0619	.0964	.0282	.1268	.0967	.0997	.0621
S2	.1596	0	.1126	.0227	.0291	.0535	.0069	.0288	.0258	.0225
S3	.0150	.1126	0	.0341	.0608	.0400	.0853	.0610	.0634	.0343
S4	.0619	.0227	.0341	0	.0140	.0238	.0423	.0142	.0348	.0004
S5	.0964	.0291	.0608	.0140	0	.0119	.0076	.0004	.0013	.0138
S6	.0282	.0535	.0400	.0238	.0119	0	.0353	.0203	.0217	.0241
S7	.1268	.0069	.0853	.0423	.0076	.0353	0	.0074	.0220	.0420
S8	.0967	.0288	.0610	.0142	.0004	.0203	.0074	0	.0011	.0140
S9	.0997	.0258	.0634	.0348	.0013	.0217	.0220	.00011	0	.0162
S10	.0621	.0225	.0343	.0004	.0138	.0241	.0420	.0140	.0162	0

Variance and SD values are zero when the lip image is match with the existing data base images. Based on these statistical values of the segmented image the personal are identified.

4. Conclusion

The reliability of any automatic biometric system strongly relies on the precision obtained in the grooves extraction process. A number of factors damage the correct location of the groove. Among them, poor image quality is the one with the most influence. The proposed alignment-based elastic matching algorithm is capable of finding the correspondences between grooves without resorting to exhaustive research. Using Matlab software, images are processed and analyzed with the statistical parameter like standard deviation (SD) and variance (V). There is a scope for further improvement in terms of efficiency and accuracy which can be achieved by improving the hardware to capture the image or by improving the image enhancement techniques. So that the input image to the thinning stage could be made better, this could improve the future stages and the final outcome. In this work, all the lip print images are proved unique. The main advantage of lip print-based biometric authentication is its uniqueness and it can be used as a universal biometric where all individuals can use.

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