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Human Ear Detection and Recognitionusing MATLAB

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Abstract — The structure of ears is not completely random. They have standard part as other biometric traits like the face; Ear Recognition is widely used in government, medical, telecommunication, healthcare, traffic, university, etc. Last few years the researchers are follows the ear recognition techniques. In this paper we discussed about the ability to capture ear images from a distance and in a covert manner make the technology an appealing choice for surveillance and security applications as well as other application do- mains. This paper presents an overview of the field of automatic ear recognition and focuses specifically on the most recent, descriptor- based methods proposed in this area. In our future we develop new techniques for better development of society. Human identification, verification, validation & authors views related to the ear recognition, techniques, algorithms, and models. This paper recognizes that the ear recognition is most beneficial for the researchers who will work on biometrics techniques. A number of unique researches have already worked on this area. Ear recognition is unique identification technique other than the face recognition; fingerprint recognition so on. For the purpose of result and analysis, experimental the MATLAB tool is very useful for result oriented work.

Keywords — **Ear recognition, MATLAB**

INTRODUCTION

Now a day's our whole surrounding is electronically connected to form one big global community through internet and other digital means, it has become important to carry out reliable person recognition often remotely and through automatic means. The most important is that who is who, person who he or she claims to be because of all financial transaction and of security issues too. Also to verify that people are allowed to pass some points or use some resources [1]. for all these cases people use automatedidentity authentication systems.

For physiological or behavioral characteristic Biometrics is automated methods of recognizing a person [3]. There are different methods for verifying identity of individuals' cards, badges, and keys are used as identity which very common method and also other like Password, Personal Identification Number (PIN); and biometrics like fingerprint recognition, face recognition, ear recognition [2].The past history of research has suggested the use of ears as a biometric for human identification. Researchers found that the shape and appearance of the outer ear for humans is unique, and relatively unchanged throughout the lifetime of an individual. And we know no one has proved that each person's ears are unique. Background of the ear is very predictable it is always located on the side of the head. Ears have very important roll forensic science.

Identification or authentication technologies of ear biometric operate using the following four stages:-

A) *Capture:* A sample image is captured with the help of the camera during Enrolment and

also in identification or verification process, it is taken by any digital camera and easy to use.

B) *Extraction:* by this unique data is extracted from the sample by using different techniques and by u Different platforms like matlab and Lab VIEW a templateis created.

C) Comparison: the template and sample is then compared.

D) Match and non match: the recognition of ear is very complex technique and is based on software, the system shows that the features extracted from the new samples are a match or a non match.

All steps of ear recognition are shown below:-

Step 1:- Capturing of side face by digital camera or othersensor.

Step 2:- Extraction of ear and processing to get templateby using Lab VIEW.

*Step 3:-*Decision is make by Comparing template image with sample.

*Step 4:-*Now matching take place image, which decidematch or non match.

II. EARLY RESEARCH REVIWE

As early as the 1880s by Alphonse Published by the IEEE Computer Society French police officer Bertillon, who pioneered the use of physical measurements to identify criminals? He used qualitative and quantitative descriptions of various body parts, including the ear, in what he called anthropometry [Identification anthropométrique: instructions signalétiques, 1885].

In 1906, the R.Imhofer, a doctor in Prague, set of
500 ears and he could clearly distinguish betweenthem yon only four features.

After 50 years, a team of researchers visually assessed 206 sets of ear photographs of newborn babies and concluded that for establishment of new born identity the morphological constancy of the ear could be used[“C. Fields et al., “The Ear of the Newborn as an Identification Constant, “Obstetrics and Gynecology, July 1960, pp. 98-102”]. In the period of1948 and 1962, Alfred Iannarelli collected ear photographs of thousands of individuals and extracted 12 different geometric measurements of the ear based on the curse of helix Each photograph of the ear is

Aligned such that the lower tip of vertical guide on the development easel touches the upper flesh line of the cache area, while the upper tip touches the outline of the ant tragus. Then the curse of helix is used as a centre point. From the center point Vertical, horizontal, diagonal, and anti- diagonal lines are drawn to intersect the internal and external curves on the surface of the pinna .The 12

Measurements are derived from these intersections and used to represent the ear. The automation technique for ear recognition in 1997 is reported by Mark Burge and Wilhelm Burger. [“Ear Biometrics for Computer Vision,” Proc.21st Workshop Austrian Assoc. for Pattern Recognition, 1997, pp. 275- 282]. Mark Burge and Wilhelm used a mathematical graph model to represent and match the curves and edges in a 2D ear image.

Two years later, Belen Moreno, Angle SA nchez, and José Velez described a fully automated ear recognition system based on various features like ear shape and wrinkles [“On the Use of Outer Ear Images for Personal Identification in Security Applications,”].

After that, researchers have pro-posed different feature of extraction and matching schemes, based on computer vision and image processing algorithms, for ear recognition. The simple appearance-based methods for example

principal component analysis and independent component analysis. Effective in exploiting the 3D structure of the ear with promising results obtained in both instances is proven by work of Yan & Bower (2005; 2007). such as, Yan & Bowyer (2007) by capturing and segmenting the 3D ear images and using Iterative Closest Point (ICP) registration, they realized a "97.5% recognition rate on a database of 404 individuals" (p. 291). The 3D ear detection and recognition system in 2007 is recommended Chen & Bhanu. by utilizing an ICP for recognition, and a local surface descriptor, and detailed"96.77 percent rank-1 recognition rate (150 out of 155) on the UCR data set ES and 96.36 percent rank1recognition rate (291 out of 302) on the UND data set Collection F" (p. 731)It is still not clear ,whether 3D techniques for ear biometrics will replace the currently more popular 2D methods as using 2D images is consistent with surveillance or other geometric image scenarios. I

III. METHODOLOGY AND RESULT

A)
nput image:-An ear image is selected from the database is to be pre-processed.

B) *Preprocessing:* - It involves converting the image to grey scale, performing histogram equalization, and Gaussian filtering. In order to remove noise and smooth the image Preprocessing is essential and very important factor.

C) *Region of interest detection*: - Region of interest detection use for identifying the boundary of the ear in the image and extracting it. For this,I used a Haar Feature-based Cascade Classifier.

D) *Feature Extraction*:-Feature extraction deals with isolating distinct features of the ear in the image.

E) *Identification*: - It is the final act of classifying an ear image as belonging to a certain individual. Identification involves using the set of features that were extracted and comparing them to the database to determine which image matches the closest to it.

In order to achieve this, I implemented the SVM classifier, and the K-nearest neighbor algorithm.

The authenticated result follows the following steps and results are shown in Table.

. 1. The proposed technique breaks the derived edges of the profile face into a set of convex edges to reduce the participation of noisy edges in the cluster of true ear edges.

I 2. Identification of true ear among the probable ear candidates with the help of an ear template results into much better and robust ear localization and reduces false positives. The technique in performs ear localization merely based on the size of the connected components which often leads to wrong ear localization as there may exist a cluster of the largest size of non-ear edges.

3. The performance obtained in the proposed technique is found to be robust and stable on a larger dataset.

Data set	Existing Method (%)	Proposed Method (%
Data Set 1	801	95.88	99.20
Data Set 2	802	94.73	98.51
Data Set 3	1070	91.11	95.65

Table 1: Comparison between existing method and proposed method.

In this experiment we used sample of IIT database, 3 ear images. Used 2 images for training and 1 image for test. Classification step done using more than classifier but one nearest neighbor with sum of absolute difference distance which give the highest accuracy, Images classified true=49 and Images classified false=1 Then Accuracy= 98% when used sum of absolute distance in K nearest neighbor classifier.

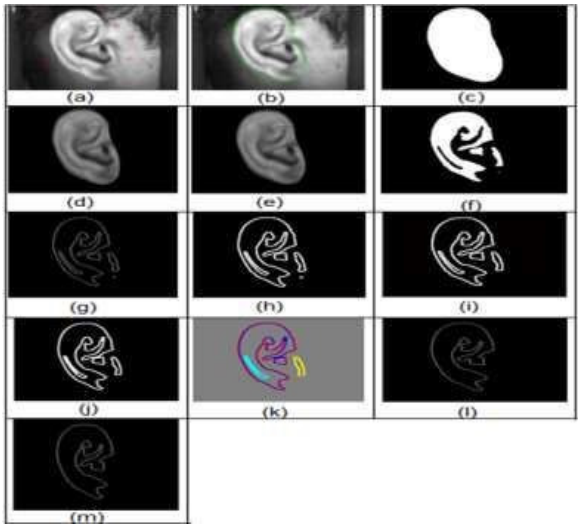
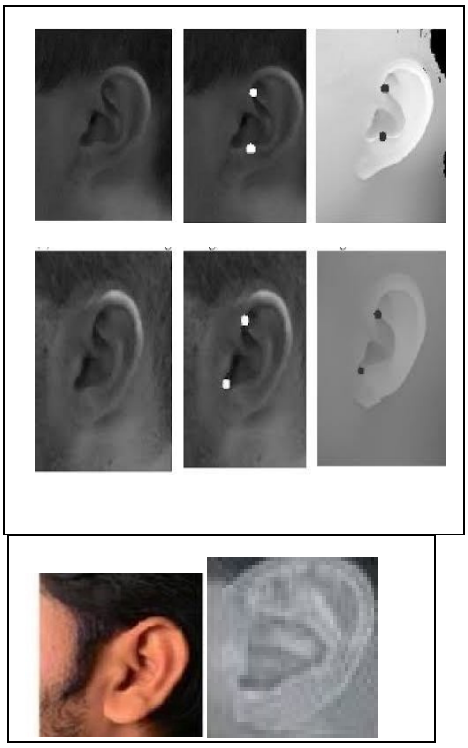


Figure 1. The result of pre-processing, ear detection and extract feature.

(a) Initialization point of snake model.

(b) Output of snake model.(c)Mask of region of interest.(d) Isolated ear image. (e)Apply median filter. (f) Converting to binary image with threshold 0.4.(g) Canny edge detection.(h) Ear after dilatation. (i)Remove object ≤50 pixel. (j)Close contour.(k)Detect largest object. (l)Separate largest object. (m) Centroid point in red.



Examples of some ear sample from database

Image from Database

extracted image

IV. CONCLUSION

Research in the field of biometric recognition in recent years a great effort has been focused on ear detectionusing biometric technique. In this paper, we have surveyed history of biometric techniques of ear detection. Biometric technique play a very important role in personal identification, the importance of biometrics in everyday life has been discussed and different biometrics technologies are introduced. it has been shown that ear biometrics can be used for identification and for the further development it is a good biometric and is comparable to that of face

We use the MATLAB tool for the analysis and check the E .

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