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Overview of image based ear biometric with Smartphone app

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Abstract - In this paper the author represent the computer vision application which can be used in underdeveloped country. In underdeveloped country this app can be used to keep medical record. Author represent smart phone app for image based ear biometric. This app is not only used in medical application but it has found several different application. The research started in 1890 by criminologist. First Ear biometric is used to detect criminal. Author represent the overview of image based ear biometric smart phone app.It also describes about methods used for image processing. Author also describes why we should go for ear biometric as nowadays there are so many options available to use as biometric.

***Key Words*: ear biometric ,smartphone app, android phone, image processing, matlab**

1.INTRODUCTION

Biometric system is technological system, which can identify the person's identity by their unique organism. In our body there are some organs they are unique which can be use for biometric system, for eg. fingerprint, face, eye etc. Here we are using ear for biometric system. Governments, businesses and organizations can use biometric systems to get more information about individuals or about a populace as a whole. Many biometric systems are developed for security applications. This system we can use in airport scanning, we can use it as biometric password. Biometric system can be used mainly for criminal investigation and for many applications. We are already using so many application for security purpose, for e.g. keep password, but nowadays it is very easy to hacked the passwords.

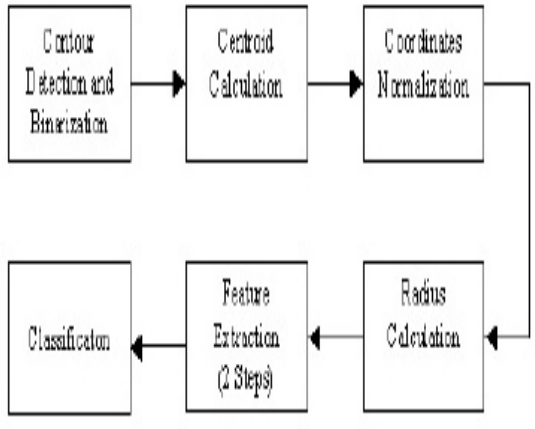
The forensic science says that there is linear change in our ear after 4 months of birth .And from the age of 8th year to 70th year the ear structure remain constant.

1.1 Advantages of Ear Biometric System

- Less changes in structure of ear compare to face.
- High stability.
- Uniqueness of outer ear shape that do not change because of emotion etc.
- Limited surface of the ear allows faster processing compared with face
- Lack of expressive variation (as in face) reduces the intra-class variations
- Easy to capture ear even at a distance and the process is non-invasive .

1.2 Technique used for the system

In each and every biometric system we have to follow image processing, important stages for ear reorganization are image detection, normalization and enhancement, feature extraction and the last is matching which includes recognition and verification. First step is to extract the ear image from the facial profile image. Feature extraction is an important stage since recognition and verification is based on feature extraction. Once the ear image is segmented it can be normalized and enhanced for other feature extraction. There are different ear detection method, this review paper represent the ear detection by using 3D image. Because of this the process became very safe as we don't need to touched the system for authentication. Different types of features have been extracted from ear images like: intensity and shape features, Fourier descriptors, wavelet-based (i.e. Gabor) features or SIFT points. Fourier descriptor are the way to encode shape of two-dimensional object by taking the Fourier transform of the object, where every point of the boundary can be mapped. SIFT stands for scale invariant feature transform, it is an computer vision algorithm which detect and describe features of image.



Above block diagram describes the process for ear detection.

2. Literature review

The potential of human ear was first identified by French criminologist Alphonse Bertilon in1890.After that in 1949 American Police officer Alfred Innareli collected more than 10000 ear images and determine 12 characteristic to identify the person's identity.Innareli developed anthropometric method to ear identification.

Table -1: Sample Table format

Sr. no	Paper Name	Published year	Technique used	Image used	Result	Remark
1	Image-based Ear Biometric Smartphone App for Patient Identification in Field Settings	2015	Local binary pattern ,Generic fourier Descriptor, Scale invariant feature transform	2D	3	1.In the databse there are 3 images of each individual 2.All the images are gather together by using smartphone app 3.prototype app was able to retrieve the correctly matching record ranked within the top 5, 79% of the time. This can be increase by working on it.
2	A Review on Ear based Biometric Identification System	2016	two- step Iterative Closest Point (ICP). For matching error criterion, root mean square (RMS) parameter is used.	3D	2	1.First result is for false acceptance 2.Second result is for false rejection.
3	Biometric Identification using 2- and 3-Dimensional Images of Human Ears by Anika Pflug	2015	Cascade Pose regression	2D,3D	1	It uses both 2D and 3D images

4	Human Ear Recognition Using Geometrical Features Extraction	2015	Geometrical features extraction using 7 points	2D	1	For edge detection median filter is used to transferred image into binary using Global threshold After that canny edge detector is used for edge detection It gives 98% accuracy.
5	Ear Detection under Uncontrolled Conditions with Multiple Scale Faster Region-Based Convolutional Neural Networks	2017	Snake-based Background Removal (SBR) and Snake-based Ear Localization (SEL)	2D	1	Performance is improved by combining both the morphological characteristic and location context of ear.
6	Biometric Ear Recognition System	2017	a combination of Iterative Closest Point (ICP) and Stochastic Clustering Matching (SCM)	3D	1	It gives 98.25% accuracy

Table1: Summary of automatic ear detection methods for 2D and 3D images.
Above table shows the study of atomic ear detection methods from year 2015 to 2017.

Bhanu and chen found 3D ear recognition method using a local surface shape descriptor. Local surface patches are defined by the feature point and its neighbors, and the patch descriptor consists of its centroid, 2D histogram and surface type. There are four major steps in the method: feature point extraction, local surface description, o-line model building and recognition.

Mark Burge and Wilhelm Burger found the automatic ear recognition process in 1997, they used a mathematical graph model to represent and match the curves and edges in a 2D ear image. Some years later, Belén Moreno, Ángel Sanchez, and José Vélez described a fully automated ear recognition system based on various features such as ear shape and wrinkles. Since then, researchers have developed many feature extraction techniques, verifivation and matching techniques, based on computer vision and image processing algorithms, for ear recognition. In this paper we will be using the technique which will extract the features from 2D image and data will get stored in database. Accordingly we are going to prepare an app in adroid.We are using 2D images as it will provide us fast and cheap solution.2D ear representation has been done by Chang et al..2003, Abdel-Mottaleb and Zhou, 2005, Cummings et al.,2010, Kisku et al., 2009 LBPs Wang et al.,2008, Boodoo-Jahangeer and Baichoo, 2013.

3. CONCLUSIONS

Ear based authentication is an advanced technology which was identified in 1849.Nowadays there are different methods to identify the ear from facial image. Some people are using 3D image ,some are using 2D image.Author represent some innovation by making an app because of this it becomes easy to store data and match data. Once we get the ear image ,it will get matched with the image which are there in database. Database will show top 5 images which almost get matched .Author have tried to represent very safe, secure ,fast and cheap system.

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