# Ear and Face Recognition System for Multilevel Authentication

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***Abstract*** **-** *Multilevel authentication using Ear image is future technology in image processing. Many unique features of human are explored, but not many are used. This paper focuses on one such area that is authentication technique using Ear model and also provides the Face image recognition. The primary motivation of this system is to use the system for the high secure authentication using three dimensional Ear and Face Recognition. This paper tries to solve the problem of biometric authentication using Ear recognition along with Face and OTP (One Time Password). The algorithms that are used for this system are Haar-Cascade for Face and Ear detection, LBP (Local Binary Pattern) for Face Recognition and ORB (Oriented Fast and Rotated Brief) for Ear recognition. In this system, the user will be authenticated, using a username, password and Ear image as well as Face image which are captured from the HD (High Definition) camera, and the authentication technique will be done by matching real time Ear image and Face image with the stored Ear image and Face image while sign-up. This paper presents the technology that provides the multilevel security using Ear and Faces recognition. At the level of the result, it shows how it is impactable than other security systems.*

**Keywords** - *Face recognition, Ear Recognition, Authentication technique.*

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## I. INTRODUCTION

Biometric authentication using ear image is a new research area. There are many unique features of human are explored, but not many are used. This project focuses on one such area that is Authentication using ear image and also provide the Face image recognition.

While signing up, the user will provide a user name, password, email id. Also, the user will register his ear and face image using High Definition camera. In this application, the user will be authenticated, using a user name, password and ear image as well as face image which is captured by the camera. In the 1st step of login user will be authenticated based on username and password. The user will capture his ear Image it will be converted to 3D and this image will be saved in drive also user will capture his face images and saved into drive. In the 2nd step of a user will provide his ear image as well as face using High Definition camera, and authentication will be done by matching real time ear image and face image with the stored ear image and face image while sign-up.

Motivation part is Large pose variations, poor resolution and occluded or missing facial data are commonly encountered in settings where controlled conditions cannot (or could not) be assured for the data acquisition procedure. This is typically the case in forensics applications, which also often experience difficulties in utilizing the available (video) evidence due to the poor performance of the existing recognition technology on data captured in uncontrolled conditions. So that a shape-model based technique for locating ears in a side face range image.

It needs to be noted that we only focus on investigating the ear classification methods. For 3D ear ROI (region of interest) extraction, we used the method proposed in it. In this paper, we assume that 3D ear ROIs have already been available.

## II. RELATED WORK

Sayan May and et al. The presented a fully automated system for 3D ear segmentation and time-efficient recognition. Utilizing the tree-structured graph model and active contour segmentation we proposed the first fully automated 3D ear-region segmentation algorithm from the range scan of the face profile. The segmented 3D ear region is used for hierarchical categorization of the gallery based on the shape information and surface depth information, respectively. The rank one recognition results, and the computation times in Tables IV-VIII show the robustness and efficiency of our approach. We applied our algorithm to the largest available 3D ear database (UND database collection J2). The accuracy of the proposed segmentation approach outperforms the state-of-the-art 3D ear segmentation techniques. Compared with the results reported in the literature, the rank-one recognition accuracy obtained by the proposed approach is the highest on the UND database collection J2 and is faster than other automatic 3D ear recognition systems in the literature [1].

Kiran B. Raja and et al. Secure applications such as financial transactions need strong authentication processes. To overcome the necessity of cumbersome passwords, one can use biometric characteristics. In this work, we have proposed a new smartphone based recognition system

employing multi-modal biometric characteristics. The proposed system uses face, periocular and iris characteristics. An important contribution of this work is in implementing the open source iris segmentation algorithm - OSIRIS v4.1 to Android platform [2].

Bourouba Houcine, and et al. An automated human identification system using ear imaging based on bag-of-features model call "HSM-BoF" is proposed. The main contribution of the proposed method is extracting the discriminating ear histogram representation of the ear images using BoF and Kernel Discriminant Analysis. The experimental results show that the ear recognition algorithm proposed in this paper is effective and superior to the other similar methods in the recognition rate. Our future work will be focused on two aspects :(1) in the ear encoding stage, we need to improve the accuracy by using other encoding methods and (2) in the ear identification authentication stage, we need using other classifier and other larger dataset to testify the matching accuracy and the real-time performance of the proposed method [3].

Lida Li and et al. In this contributions are mainly from two aspects. At first, we are the first to adapt the LCKSVD model to the application of 3D ear recognition. Secondly, we proposed an approach based on local histograms of surface types for feature extraction, which is quite effective and robust to small alignment errors. Experiments conducted on benchmark dataset demonstrate that LCKSVD LHST could achieve much higher recognition rate than the other competitors evaluated [4].

Vitomir Struc and et al.That have presented a MODEST framework for face recognition that relies on probabilistic modeling of diverse feature sets to facilitate face recognition from real-world-data. We have shown that the proposed framework ensures a recognition performance that is competitive with the existing state-of-the-art. The system as part of our future work, we plan to include an additional processing path to our framework that provides information on soft biometric cues and quality measures to the recognition system and improve the face registration step, which seems to be crucial for the recognition performance [5].

Kyong Chang and et al. Our previous experiments with ear and face recognition using the standard principal component analysis approach show lower recognition and performance using ear images. We report results of similar experiments on larger data sets that are more thoroughly controlled for relative quality of face and ear images. We find that recognition performance is not significantly different between the face and the ear [6].

Akkas Ali and et al. A complete and fully automatic approach for human ear recognition system from 3D images is developed. These are done by matching three dimensional key points and it combining local and holistic features. The efforts are detailed in this research to exploit the sparse representation of local ear shape descriptors have illustrated superior performance for the automated ear recognition problem [7].

Asmaa Sabet Anwar and et al. It proposed a new algorithm for ear recognition based on geometrical features extraction. Seven values are extracted as feature vector which is mean of ear image, the centroid of *x* coordinate, centroid of *y* coordinate, four different distances from the matrix which contain Euclidean distance between every pixel in the image. We tried to increase the distance values were taken to increase the feature vector which will be more representative. We do not effect on the run time because the feature vector is still small but representative. K-nearest neighbor used for classification because this classifier gives higher accuracy. The experimental results showed that the proposed approach gave better results and obtained over all accuracy almost 98% [8].

Durgesh Singh and et al. It has given a brief overview of the ear biometric recognition system, and different approaches for ear recognition were discussed. So newcomers can easily understand the ear biometrics recognition system process. We have considered detection stage and recognition stage of the two main stages in an ear recognition system. We have also separately discussed the 2D and 3D ear image detection and recognition technique in a literature review. The ear biometrics can be used for passive identification. Till now the ear detection and recognition systems are limited to controlled indoor conditions. Must be the ear biometrics need to be tested outdoors [9].

## III. IMPLEMENTATION DETAILS

### *A. Proposed algorithm steps*

The steps are followed:

***Step 1 Login Process:***
At first when the user has to log-in the system, and for that, he has to sign to sign up the system. While signing user has to provide the whole information about himself such as name, account details, face image, ear image and so on. When the user is entering his details, he has to mention his username and password, and with the help of username and password, the user is going to login the system.

***Step 2 OTP Generation:***
After the login process, the recognition of face is done. For this process, the system uses the stored face image and current image of a user and compares them so that matching of the image is processed with standard face recognition algorithm LBP (Local Binary Pattern). If the match is found the OTP (One Time Password) is generated. This also the part of the login process.

***Step 3 Ear Recognition:***
In this step, the recognition of ear is done. The ear recognition is done with the standard algorithm ORB (Oriented Fast and Rotated Brief) between current ear image and stored image.

***Step 4 Results to Application***
At last the all matches when found then system application is get open with it is linked. All the operations of that linked system can be done with high-level security.

### B. System Overview

The system focuses Authentication using ear image and face recognition. The user will register his ear and face image using High Definition camera. In this application, the user will be authenticated, using a user name, password and ear image as well as face image which are captured from the camera. Fig 1 shows the architecture diagram. The user will capture his ear Image it will be converted to 3D and this image will be saved in drive also user will capture his face images and saved into drive. In the 2nd step of the user will provide credential and match with the database.

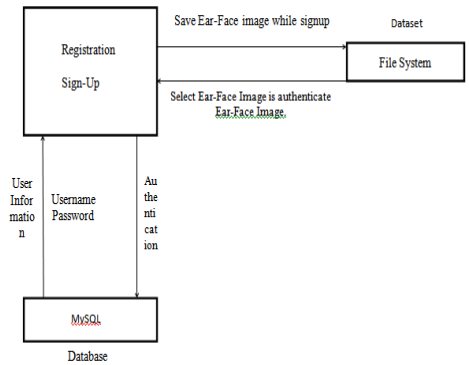


Fig. 1: System Architecture

The proposed method design using following modules:

***1. Login module***

To enter into the application with high security, the first module is login module. To log-in, the system at first user has to sign up and fill all information so that the user will get username and password generation to log-in.

***2. OTP Generation:***

After the login process, the recognition of face is done. For this process, the system uses the stored face image and current image of the user and compares them so that matching of an image is processed with standard face recognition algorithm LBP (Local Binary Pattern). If the match is found the OTP (One Time Password) is generated. This also the part of the login process and face recognition is done.

***3. Ear Recognition:***

In this step, the recognition of ear is done. The ear recognition is done with the standard algorithm ORB (Oriented Fast and Rotated Brief) between current ear image and stored image. The ear recognition can be done with the help of current and stored image.

**4. Display Results:**

The results displayed on with application operation so that all the operations were securely opened or not and operations done successfully or not.

## IV. RESULTS AND DISCUSSIONS

Comparison of the existing system with proposed system is shown in above table. Values of Parameters depend on various factors such as light intensity, a distance between camera and face/ear, speed of human to handle system.

**Table No. 1 comparison of existing and proposed system**

| Sr. No | Appearance | | |
|---|---|---|---|
| | PARAMETERS | EXISTING | PROPOSED |
| 1 | Throughput | One authentication per minute | Two authentications per minute |
| 2 | Processing time | 60 seconds | 30 seconds |
| 3 | efficiency | 40 % | 60% |
| 4 | Security level | High | High |

The graphical format of this table is also shown below.

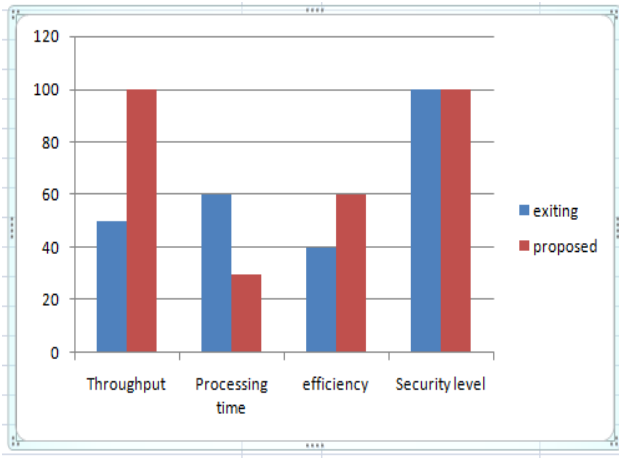


Fig 2: graph of comparison of existing and proposed system

The results displayed on with application operation so that all the operations were securely opened or not and operations done successfully or not.
The result is shown below in which image of the face is scanned and used for recognization purpose.

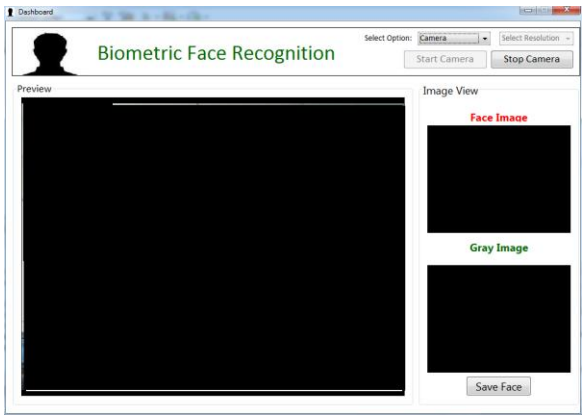


Fig 3: Displays result as application of face recognition

## V. CONCLUSION

The most of the system are not feasible to maintain the security but in this system, we are going to provide security features like this system is going to authenticate the person who is new and already have a login username and the password with is stored and processed 3D image of Ear and Face. This System provides more Authentication facility with the high secure authorization of the application.

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