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Biometric Recognition System using Ear and Face

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ABSTRACT

We use various applications in day to day life. But we can never know if any of those applications is stealing data from our desktop. So it is important to know about such activity and take action on this. This causes harm to desktop as well as user. This may turn out to be data loss or private data theft. Biometric authentication using Ear and Face image is new research area. Many unique features of human are explored but not many are used. This project focuses on one such area, that is authentication using ear and face image. While sign up, user will provide user name, password, email id. Also user will register his ear and face image using High Definition camera. In this application, user will be authenticated, using user name, password and ear image captured from camera. In 1st step of log in user will be authenticated based on user name and password. User will capture his ear image and this image will be saved in drive. In 2nd step of user will provide his ear image using High Definition camera, and authentication will be done by matching real time ear image with ear image stored while sign-up, same steps will be performed for face recognition.

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I. INTRODUCTION

The need for secure and automatic authentication is ever growing. Most of the used biometric systems for authentication are fingerprint and face. But Ear biometric is a novel technique that can be used for authentication. Since ear shape does not change with facial expressions and most of the times its shape does not change with age[1].

Many people have proposed systems that have ear biometric. Some have concluded that since we match the real time image of ear with the image stored in database, the system may take a lot of time to compare and make conclusion and thus may become inefficient. This is because the database may have superfluous amounts of stored images, and sequentially comparing the real time image with all of them will be an inefficient process, and the performance of the system will deteriorate. Same is applicable for face recognition.

To overcome this, some systems use hierarchical categorization of images stored in database. This would overcome the problem of performance deterioration caused by comparing the image in hand with all other images in database for recognition i.e doing sequential search.. In this paper, two systems(ear and face recognition) are discussed and their flaws are tried to overcome. Firstly, ear recognition system was proposed by Sayan Maity, *Member, IEEE*, and Mohamed Abdel-Mottaleb, *Fellow,* IEEE [1]. And the secondly face recognition system was proposed by Vitomir ˇ Struc, Janez Kriˇzaj, Simon Dobriˇsek, Faculty of Electrical Engineering, University of Ljubljana, Trˇzaˇska cesta 25, SI-1000 Ljubljana, Slovenia[2]. P S Hanwate and U L Kulkarni proposed a system that uses SIFT algorithm and Edge detection for Content Based Image Retrieval [7]. Swati Shirke and Suvarna Pansambal proposed a system for IRIS recognition using Gabor filter[8]. In that paper advantages of using Gabor over FFBPANN. Also comparison of databases NIR and UNIRISv2 is done. Also a system's password authentication system can be enhanced

using images, this was proposed by Amol Bhand, Vaibhav Desale, Swati Shirke, Suvarna Pansambal[9].

II. OBJECTIVES

The main goal behind designing a multi-modal biometric system is to create a reliable security system for authentication of people. This way if one of the ear or face of a person undergoes transformation, still the person can authenticate himself/herself using other.

III. RELATED STUDY

As mentioned earlier the two different system discussed are based on ear recognition and face recognition. To understand both the system there is a need to have some knowledge about each of them. Some information about them is given below.

1. Knowledge about Ear recognition:

The earlier research on ear biometrics used only 2D ear images. But recently, researchers are using 3D or using both 3D and 2D images simultaneously[1]. In [3], Chen and Bhanu proposed a two-step iterative closest point (ICP) based approach to match 3D ear images.

2. Knowledge about Face recognition:

Face recognition is not a novel field, it has already been commercialized and many systems have been using it for years now. This is also a very good way of authenticating, but since face of a person changes with time and age, this can become a little inefficient in long run. To overcome this, the system must take new reference images from people after a certain period of time.[10]

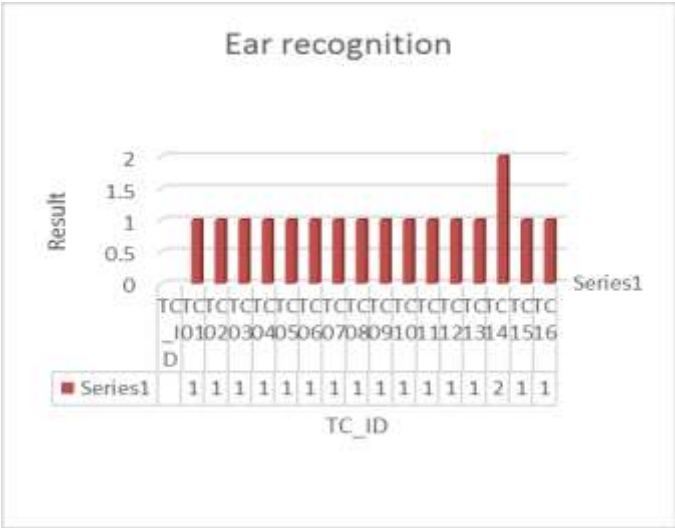
IV. SYSTEM IMPLEMENTATIONS

From the study we found that under some situations both the systems are not up to the mark. In 3D ear image based recognition system, the computations required to measure depth featured of ear are complex and may take a lot of time if executed on low power systems. Also a major drawback is if the person's ear shape undergoes change.

In enrollment, the images of the registered users are processed into templates of caricatures by the specific algorithms of the recognition system, and these templates are stored. The templates can be regarded as the transformed user images encoded by the corresponding processing techniques. The processing techniques and the templates are adjusted concurrently. In verification or identification, the face recognition system receives a new image, defines and stores the new image by the same algorithm, and compares to the templates. The decision process may incorporate all kinds of classifiers. The classifier can be a learning algorithm and its structure needs to be trained such as the neural network or Bayesian network, the enrollment database may be split into two parts, one for constructing the templates, and one for learning the classifier structure. Without considering the wireless network, the diagram of the core biometric recognition system is shown in Figure. This is a hybrid system in which both ear recognition and face recognition are used.

Algorithms used:- All algorithms need good quality images to function well. However, some are more susceptible to certain types of disturbances. Decomposition algorithms treat the recognition problem as a general pattern recognition problem, but chose the basis vectors for the decomposition based on a developmental database of faces. This approach is often sensitive to variations in rotation and position of the face in the image. Performance also degrades rapidly with pose changes, non-uniform illumination, and background clutter. In contrast, these systems are quite robust in dealing with very small images. This approach is most appropriate for applications where the image conditions are relatively controlled. In contrast, EBGM-based algorithms are much more robust against variations in lighting, eyeglasses, facial expression hairstyle, and individual's pose up to 25 degrees. However, they are obviously still heavily dependent on the extracted facial features in the first instance and may be dependent upon consistent estimation of landmark points. It is
Important that an appropriate implementation algorithm be used. As developers start to combine algorithms these considerations may become less important.
The same algorithm can function in very different ways depending on the developmental data set that was used to develop the system. Generally, one can say that the range and diversity of the developmental set will set the boundaries for the diversity of probe images that the algorithm will be able to deal with. However, it is also true that the closer the match between the conditions of the probe image and the gallery image the higher the likelihood that the system will perform well.

V. GRAPH RESULTS



VI. EXPERIMENTATION AND RESULTS

The images of the people's ear and face are taken, after that the unnecessary details are removed, such as the hair around the ear etc. After that the ear image is converted to greyscale. After this the required details for the authentications are taken like username password etc. After this login can be done, again image of ear is taken and converted to greyscale so that it can be compared to the greyscale image that is stored in the database. This way login can be done. Results are not tangible in this specific application. But the success or failure of the biometric recognition system can be understood.

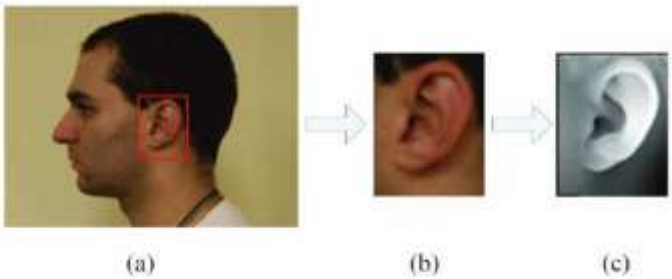


Fig 5.1. Ear Image Convertion

VII. CONCLUSION

From the implementation of the biometric recognition system using ear and face we conclude that both the systems gave desired outcomes to some extent. An optimum recognition system can be created by using the suggested hybrid system.

VIII. FUTURE SCOPE

From the development point of view, improvements to the existing system can be made by adding features like, the logs of system can be sent to the system administrator. Also if a system fails to identify a certain person for more than certain number of time, an immediate message is sent to the administrator warning him of a potential security breach.

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