Human Ear Recognition System

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Introduction

Biometric features are widely used today for identification purposes. The most interesting human anatomical parts for biometrics systems are finger prints, the irises, face and ear. These parts contain a large volume of unique features that allow identifying humans. Among them the ear has a large amount of unique features (Bhanu*et al.*, 2008). The shape and appearance of an ear are fixed while other biometric features are changed with age (Singh *et al.*, 2013). There are no developed systems for identifying a human by using the ear.

This System can be used for criminal investigation purposes. Police Departments, Custom Departments and other government agencies can use this system as a tool for person identification.

Methodology

The system will accept an image which contains the ear of a person and register the image and store its color information taken from 25 regions. When it searches information of a person by his/her ear, it will compare the values with stored database values using Euclidean distance and output the corresponding personal information.

The Human Ear Recognition System is an Image based recognition system consisting of three main modules as shown in Figure 1.

The Widget module contains Graphical User Interfaces of the system. The process component supports preprocessing of the ear image before registering the ear in the system. It performs image rotation, cropping and edge detection. Registration component supports the registration of personal information with a preprocessed image of the ear. The search component supports searching a particular person from the system by using his/her ear image.

The Service module contains functionalities to detect the edges of the ear, rescale the ear image and compare the particular ear with the ear database. The average color values of pixels within predefined 25 areas are taken in to account (Figure 2). The comparison is based on Euclidean Distance.

The Database module supports the Widget module and the Service module to access the database. The Database includes records of personal information, a photograph of particular person and an ear image of the person. These data can be accessed only through the Database module.

Result and Discussion

The system is able to recognize a person by ear, independent of the angle of the ear. However problems were occurred due to various lighting conditions, which affects the detection the edges of the ear. Therefore, there should be standards to take an ear image that will not change from time to time. So the ear image that is going to be recognized should be taken by following the same standards as registered images were taken.

The collections of ears used in this research were provided by IIT Delhi Ear Database. They were taken under identical conditions. The accuracy level of system for those images is 90%.

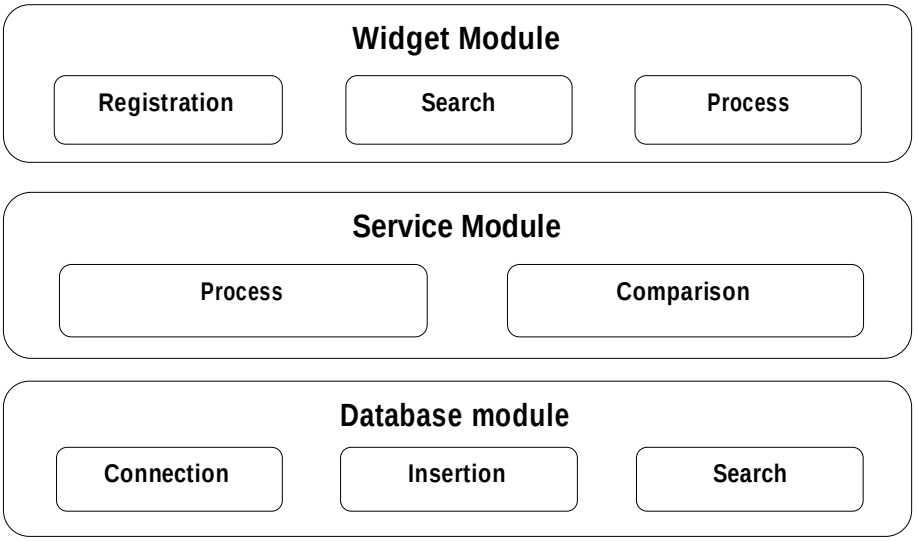

Figure 1. High level architecture of the system.

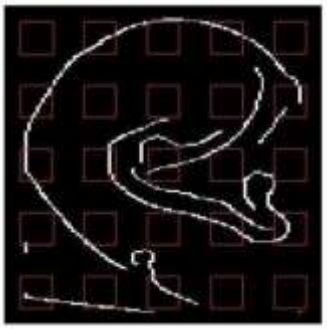

Figure 2. Feature Extraction Regions.

Conclusions

This research showed that Digital Image Processing techniques combined with Euclidean Distance is able to recognize a person by ear with an acceptable accuracy level.

References

Bhanu, B., Chen, H., 2008. Human Ear Recognition by Computer.London : Springer.

Singh, S., Singla, S.K., 2013. A review on biometrics and ear recognition techniques.International Journal of Advanced Research in Computer Science and Software Engineering,3(6), 1624-1630.