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Efficient Segmentation and Feature Extraction Method for Iris Recognition

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An Algorithm is presented using circular Hough transform in order to detect and locate the pupil and iris in an eye image. Segmentation is a key step in the flow of iris recognition process. Accuracy of segmentation determines the accuracy of further processes. Area limiting is used to locate iris once we find the pupil parameters. The CHT is combined with spiral IDO method to increase overall speed of CHT. A feature extraction method is also presented. Algorithms are tested on CASIA V.1, CASIA V.3I, MMU V.1, UBIRIS V.1 and COEP databases.

Keywords : Circular Hough Transform, Curvelet Transform, Feature Extraction, Iris Recognition, Iris Segmentation.

1. INTRODUCTION

Iris recognition is leading technology in biometrics and changing quickly with time with introduction of new techniques. Authentication of individuals is necessary in many different fronts of our lives, with most people having to authenticate their identity on a daily basis. Biometric identification proves to be a solid method to identify and authenticate people in important places like government and private buildings, transportations, airports, *etc.*. Patterns found in the iris are used for reliable iris recognition. The iris is so reliable as a form of identification because of the uniqueness of its pattern. The folding of tissue membrane gives iris its uniqueness. Identification of people is getting more and more importance in the increasing network society [1]. And hence this body part varies from person to person and is unique for every person thus making it the best option for classifying and identifying people.

In comparison to other visual recognition techniques, the iris has a great advantage in that there is huge variability of the pattern between individuals, meaning that large databases can be searched without finding any false matches. This means that irises can be used to identify individuals rather than just confirm their given identity; a property that would be useful in a situation such as border control, where it might be important not to just show that an individual is not who they say they are but also to show exactly who they are. This work is focused on segmentation of iris, *i.e.*, to find pupil centre and radius and iris centre and radius. This algorithm acts as a prototype program that functions as an iris segmentation tool in order to implement this in an accurate and useful way that is also user-friendly. Advantage of Hough transform is that it is resistant to most of the noise sources in image [2]. Wildes [3], Kong and Zang[4] and Tisse *et al.* [5] have used Hough transform for segmentation. Lots of research has been done on Iris feature extraction side [6],[7] so efficient segmentation is a key for successful Iris recognition. The proposed algorithm is tested on CASIA database [8]. Figure 1 shows structure of human eye and its parts.

2. IRIS RECOGNITION SCHEME

Figure 2 shows Flow Diagram for Iris Recognition scheme, Iris recognition system mainly consists of 5 steps,

1. Image Acquisition

Time required for segmentation for various databases using above technique is around 0.5 second. Time for feature extraction and matching is around 0.23 seconds. Thus overall time for complete iris recognition system is nearly 0.8 seconds.

4. RESULTS

4.1. Results for Different Databases

Figure 11 shows segmented iris images for $CASIA\ V.1$, $CASIA\ 3I$ and $MMU1\ Db1$ databases.

4.2. Accuracy

Table 1 gives the accuracy of the proposed algorithm when tested on various databases.

5. CONCLUSIONS

The Circular Hough Transform approach accompanied with constrained area approach gives a very robust and efficient iris segmentation method. The speed of CHT can be increased by using spiral IDO initially. A feature extraction technique is proposed based on Curvelet Transform. The proposed method proves more accurate than conventional segmentation methods in noisy images which are affected with specular reflections from eye surface, reflections from spectacles and noise created by eyelids and eyelashes.

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