VLSI Implementation Of Sobel Edge Detection For Iris Segmentation

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ABSTRACT

Iris found in an eye image forms the important biometric feature in a human body. The biometric feature can be used for authentication thus forms the necessity for feature extraction. This paper proposes new methodology for iris segmentation. Hence iris is extracted from an eye image and it is subjected to image processing which includes segmentation .The segmentation is a process which usually involves resizing, color to grey conversion or to binary conversion and thinning of the image. Thinning of an iris image refers to converting a thick image signal to thick image signal. Thinning also referred to as skeletalization. once iris is extracted from an eye image basic image processing is done then segmentation. Segmentation forms the major part as eye image contains abundant information which is not required.

Keywords – Biometric, Feature, Thinning, Image-processing, Segmentation.

I. INTRODUCTION

In the field of science, image processing is any form of signal processing for which the input is an image for example photograph or video frame the output of image processing may be either an image or a set of characteristics or related parameters to the image. Almost all the image-processing techniques have the image as a two-dimensional signal and standard signal-processing techniques applied to it.

Image processing usually refers to digital image processing, but analog image and optical processing also can be done. This is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging.

The related works to image processing are computer vision computer visions and computer vision. In graphics computer, images are manually made from physical models of, environments, objects and lighting, instead of being captured (via imaging devices such as cameras)naturally , as in most animated movies. Computer vision is often considered high-level image processing for which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images and technologies, additionally images also have much wider scopes due to the ever growing importance of scientific visualization. Examples are data in genetic research, micro array , or real-time multi-asset portfolio trading in finance.

II. RELATED WORK

Template Level Concatenation of Iris and Fingerprint in Multimodal Biometric Identification Systems .This paper aims biometric identification system is to discriminate automatically between subjects in a reliable and dependable way, depending on a specific-target application. biometric identification systems which are multimodal aim to fuse two or more physical or behavioral traits to provide optimal False Acceptance Rate (FAR) and False Rejection Rate (FRR), thus improving system accuracy and dependability. They provided, an innovative multimodal biometric identification system based on iris and fingerprint traits.

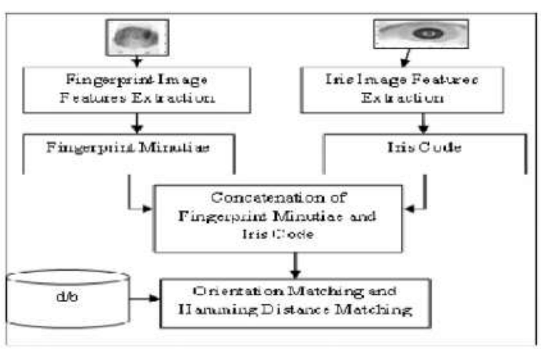

Fig.1 General Schema of the multimodal system.

In greater detail, a concatenation approach results in a homogeneous biometric vector, combining iris and fingerprint information. They did a hamming-distance-based matching algorithm deals with the iris biometric vector and minutiae points are extracted from fingerprints to be matched and their location and ridge orientations stored. They proposed multimodal system achieves interesting results with several commonly used databases. They aforementioned result may be reached by online biometric authentication systems, because of the freedom to reject the low quality acquired items. The official ready-to-use databases (FVC databases, CASIA, BATH, etc.) images have different quality, including low-, medium-, and high-quality biometric acquisitions and partial and corrupted images. For this reason, these biometric authentication systems do not achieve the ideal result. They increased the security level, parameters of the system are then fixed in order to achieve the FAR = 0% point and a corresponding FRR point. They put forth a template-level fusion algorithm working on a unified biometric descriptor. Their aforementioned result leads to a matching algorithm that is able to process fingerprint-codified templates, iris-codified templates, and iris and fingerprint-fused templates. Their frequency-based approach should consider a high number of ROIs, resulting in the whole fingerprint image coding, and consequently, in high-dimensional feature vector. At the same time, their iris preprocessing aims to detect the circular region surrounding the feature, generating an iris ROI as well. [1]

Secured Cryptographic Key Generation From Multimodal Biometrics: Feature Level Fusion of Fingerprint and Iris Human users have a tough time remembering long cryptographic keys. The researchers have been examining ways to use biometric features of the user instead of a memorable password or passphrase, in an effort to generate repeatable and strong cryptographic keys. Their objective is to incorporate the volatility of the user's biometric features into the generated key, so that the key unguessable to an attacker lacking significant knowledge of the user's biometrics. They have gone one step further trying to incorporate multiple biometric modalities into cryptographic key generation so as to provide better security. In the paper they proposed an efficient approach based on multimodal biometrics (Iris and fingerprint) for generation of secure cryptographic key. Their proposed approach is composed of three modules namely, 1) Feature extraction, 2) Multimodal biometric template generation and 3) Cryptographic key generation. The minutiae points, features, and texture properties are extracted from the fingerprint and iris images respectively. Subsequently, their extracted features are fused together at the feature level to construct the multi-biometric template. At last the multi-biometric template is used to form a 256-bit secure cryptographic key is generated. For experimentation, we have employed the fingerprint images obtained from publicly available sources and the iris images from CASIA Iris Database. Their experimental results demonstrate the effectiveness of the approach.[2]

Person Identification by Iris Recognition Using 2-D Reverse Bi-orthogonal Wavelet Transform Iris Recognition System being highly accurate and reliable is superior to all the biometric systems for person identification. Their Proposed iris recognition algorithm is describes the localization of the upper and lower boundaries of iris has been obtained by applying Canny Edge Detection (CED) and Circular Hough Transform (CHT).

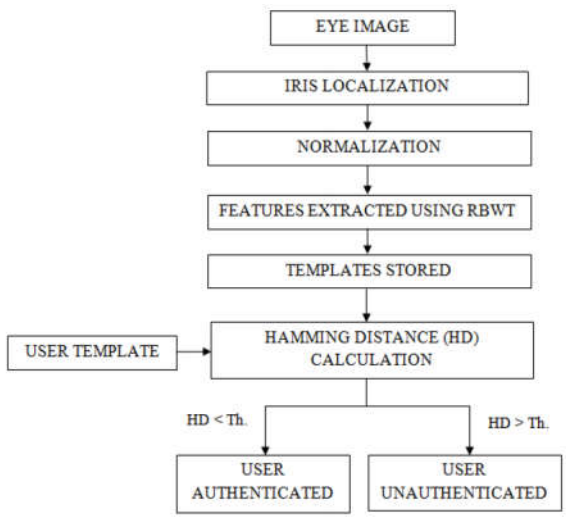

Fig. 2 Block diagram of the personal identification by iris recognition.

Their paper describes a Hough Transform and Reverse Bi-orthogonal Wavelet Transform based iris recognition system. Performance of the system has been evaluated on various levels of decomposition. For this, grayscale images of UBIRIS ver.1 database have been used. Their work implemented an iris recognition algorithm with a new approach which includes 2-D Reverse Bi-orthogonal Wavelet Transform used for extracting the iris features. Their proposed algorithm gives a high correct recognition rate with low FAR and FRR. [3].

III. SYSTEM DESIGN

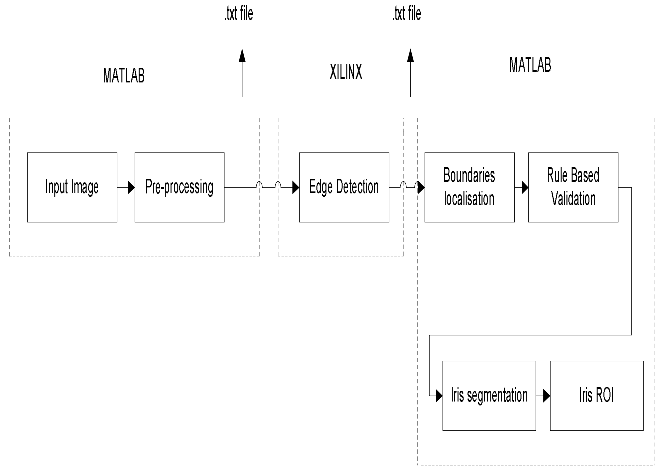

Fig. 2: Block diagram of the proposed system to get iris segmentation.

The design has three sub blocks namely 1.preprocessing block 2.Edge detection block 3.ROI block. In the preprocessing block Initially input image processing is done. Pre-processing involves image resizing, colour to gray image conversion ,histogram equalization and so on using MATLAB is done and stored in text file to convert image to text. If the image is too large then resizing is done to reduce the size of the image so that the size of the image is reduced retaining valuable information or without losing valuable information. The image is converted from colour to gray as colour image contains more information which is not needed so it is converted to a gray image to reduce the size of the image.

While in the edge detection block Using the text file edge detection is done in Xilinx. Edge detection include gray image to binary image conversion and edge detection using sobel edge detection. The eye image contains many edges like pupil and iris is detected using edge detection technique and output of this state is stored in txt file.

Later using MATLAB text back to image conversion is done. The boundaries in an iris image are extracted by means of edge-detection techniques to compute the parameters of the iris and pupil neighbours. The approach aims to detect the circumference centre and radius of the iris and pupil region, Even if the circumferences are usually not concentric using Boundaries localization block. Rule based validation is done to detect the iris and later iris segmentation is done and iris region of interest is obtained.

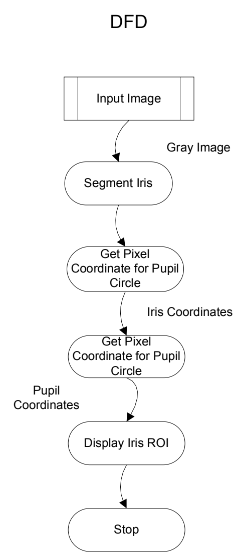

Fig 3: Flow chart of dataflow in iris segmentation using MATLAB .

This is how the data will flow. Initially take an eye image. Further process involves in converting the color image to gray image to remove unwanted information because color image will have abundant information. Then comes segment iris which involves in defining the range of iris and pupil. Then the process is followed by getting the pixel coordinates of pupil and iris then rule based validation used and iris ROI is determined.

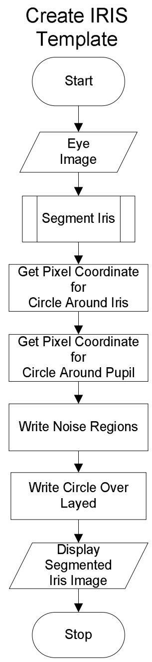

Fig 4: Flow chart for iris template creation.

Iris template is created by selecting the input eye image and then processing it. The eye image will be segmented and after segmenting pixel coordinates around both iris and pupil are located and noise regions are written and circle is overlaid. Finally the segmented image will be displayed.

IV. SIMULATION RESULTS

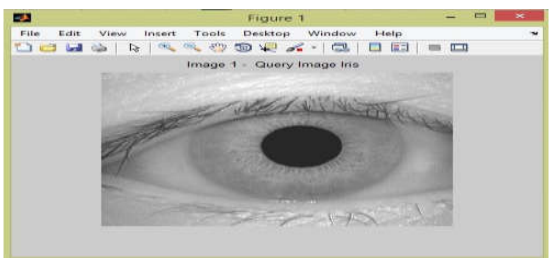

Fig 5: Snapshot of input eye image.

As the aim of the design is to extract the iris that is why input image to the processing must be an eye image. Hence the fig 5 shows that input image taken for processing is eye image. once image is selected it will undergo resizing colour conversion etc.

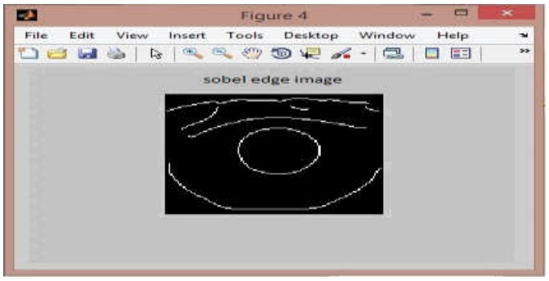

Fig 6: Snapshot of sobel edge image.

The sobel edge image shows there will be edges in an eye image and once these edges are determined the next step is to utilize the edges to find circles inside the eye image so that the iris and pupils are detected.

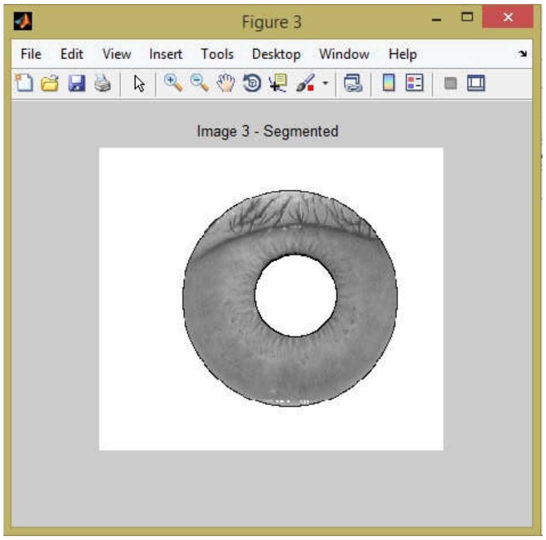

Fig 7: snapshot of the segmented iris obtained using MATLAB.

The fig shows the final output obtained through MATLAB. Only the iris part is extracted to form the eye image after series of image processing steps.

V. CONCLUSION & FUTURE WORK

The aim of this paper is to implement an efficient system that removes unwanted image contents in an iris image using sobel edge detection. The literature survey prior to system design clearly shows that many methods have been put forth to reduce the processing steps and the process can still be improved by means of thinning algorithm for an iris image to monitor the required information contents. The brief literature survey is done. A new methodology for iris segmentation is proposed. Iris segmentation is carried out using both MATLAB and Verilog and simulation results are obtained. The future work includes developing an efficient system for encryption and for authentication systems.

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