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Iris Recognition and Authentication using Canny Edge Detection Technique with Hybrid Technology

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Abstract- *In this paper, we describe the edge detection techniques to develop an Iris Recognition System and to authenticate our result. After verifying most of the edge detection techniques we found better result in canny edge detection technique. Therefore here we used canny edge detection technique to detect the boundaries of iris in the eyes digital image. Then, by comparing data base image with the input image, we determine whether two irises are similar or not. And our system gives result which is quite effective.*

Keywords: **Canny Edge Detection, CC2500, GUI, Image processing, Iris recognition, MATLAB.**

1. INTRODUCTION

Conventional methods of identification based on possession of ID cards or exclusive knowledge of social security number or a password are not altogether reliable. ID cards are almost lost, forged or misplaced and passwords can be forgotten. Biometric technology has now viable alternative to traditional identification system because of its tremendous accuracy and speed. Iris recognition is a process of recognizing a person by analyzing the random pattern of the iris. Iris scan biometric employs the unique characteristics and the features of the human iris in order to verify the identity of an individual. The iris is the area of the eye where it is pigmented or colored circle usually brown or blue. This technology is considered to be one of the fastest, safest and most accurate non invasive bio metric technologies.

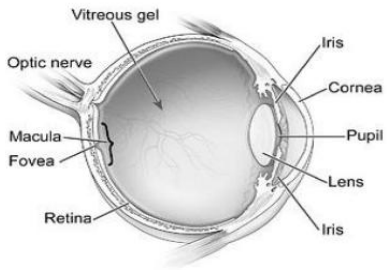


Fig-1: Internal structure of human eye

I. The iris is so reliable as a form of identification because of the uniqueness of its pattern. The image of eye comprises of iris pupil, sclera, eyelid and eyelashes. In order to develop a good iris authentication algorithm for individual identification, the presented paper recognize iris images by utilizing two edge detection approaches like Canny to reduce the noisy data and detect the edges. The detection of iris form the eye image can be performing by segmenting the annular portion between the pupil and sclera. Iris recognizing techniques identify a person by mathematically analyzing the unique pattern of the iris and making comparison with an already existing knowledgebase. The overall performance of iris recognition system is decided by the accuracy of conversion of iris features into iris code. The iris data base is used to implement and test the model for iris recognition technique. Iris recognition identifies people by utilizing the particular iris pattern properties and contrasting it with database's reference. Iris is usually well protected interior organ that utilized to denote the thin rounded diagram and the colours part which is located at the rear of the cornea and the human eye's lens. The sclera is the external part of the eye that is occupied just about 30% eye's area and pupil is located in the central part of the eye which includes 5% eye's area. The operation of the iris would be to control the light's amount getting into the pupil. The iris's average diameter is 12mm and the size of the pupil can differ between 10 to 80 percent of the diameter of the iris.

2. SYSTEM OVERVIEW

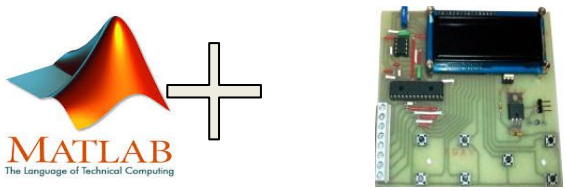


Fig- 2: fig shows combination of hybrid technology

In our project we are introducing the Hybrid technology. Hybrid technology is nothing but the combination of hardware and software which means we

are controlling our hardware using software i.e. MATLAB. In MATLAB we use advanced Image processing toolbox. In these we use a concept of the wireless communication to transmits and receive signals that is from MATLAB to receiver modal. For wireless communication we use the special component at transmitter and receiver. The image processing toolbox is a collection of the functions that extend the capability of the MATLAB numeric computing environment. The toolbox supports the wide range of image processing operations.

The major components in our project are the microcontroller, CC2500 module. The microcontroller is used to control the operations of all the components connected to it. We use here AT89S52 which has a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of system programmable Flash memory. The AT89S52 provides 8K bytes of Flash, 256 bytes of RAM, 32 I/O pins, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is constructing with static logic for operation down to zero frequency and supports two software selectable power saving modes.

The CC2500 is a low-cost 2.4 GHz transceiver designed for very low-power wireless applications. The circuit is ranging from the 2400-2483.5 MHz ISM and SRD frequency band. The RF transceiver is integrated with a highly configurable baseband device. The modem supports various modulation formats and has a configurable data rate up to 500 k Baud. CC2500 provides extensive hardware support for packet handling, data buffering, burst transmissions, and remove channel determination, link quality indication, and wake-on-radio. The main operating functions and the 64-byte transmit/receive of CC2500 can be controlled via an SPI interface. In a tentive system, the CC2500 will be used together with a microcontroller and a less additional passive component.

3. EDGE DETECTION TECHNIQUE

Edge Detection is a mostly used tool in image processing, basically for feature detection and extraction, which aim to verify points in a digital image where brightness of image changes sharply and find incorrectness.

The purpose of edge detection is significantly reducing the amount of data in an image and preserves the structural properties for further image processing. In a grey level image the edge is a local feature that, with in a neighbourhood separates area in each of which the gray level is more or less uniform with in different aspects on the two sides of the edge. Edge detection is divided into three main stages: image pre-processing, feature extraction of iris image and template matching. Edge detection is a well developed field on its own within image processing. Edge detection is basically image segmentation technique, divides spatial region, on which the image is defined, into meaningful parts or regions. Edge detection allows user to observe those features of an image where there is a more or less abrupt change in gray level or texture indicating the end of one region in the image and the beginning of another.

Edge detection technique plays an important role in digital image processing and in different aspects of human life. Many edge detection techniques have been developed for extracting edges from digital images. Gradient based classical operators like Prewitt, Sobel. In comparison to some other edge detection methods, Canny is much less noise. The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edge in an image. Canny also produced a computational theory of edge detection explaining why the technique works. The Canny edge detection method is better than prewitt and sobel edge detection in order to detect the two slow changes of gray level. Canny's method is chosen because it creates single pixel thick, continuous edges.

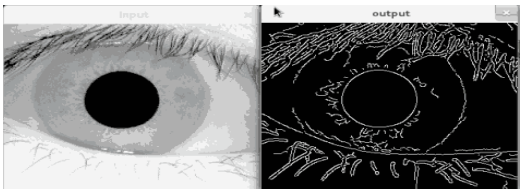


Fig-3: Edge Detection Technique Output

4. BLOCK DIAGRAM

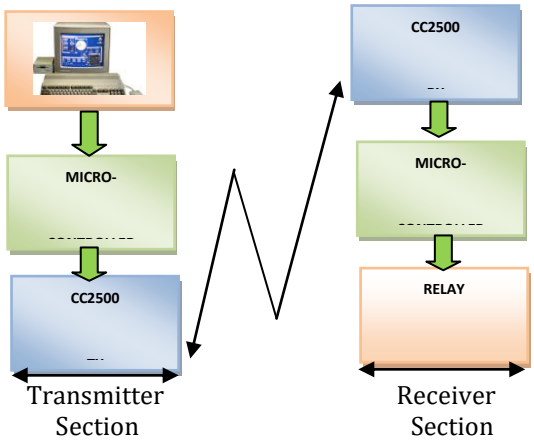


Fig-4: Basic Structure of IRIS Recognition System

Above fig-4 shows the basic structure of iris recognition system. It has transmitter and receiver section, in transmitter section we have MATLAB, microcontroller & CC2500 module. In MATLAB we make Graphical User Interface (GUI). In these GUI we took two axes block named as a data base block & browser block. In data base axes block we already stored some images of iris and the input images taken from browser axes. If both the image is matched then it sends a data to the microcontroller through the serial communication. Then with the help of CC2500 module it sends a data wirelessly at the receiver.

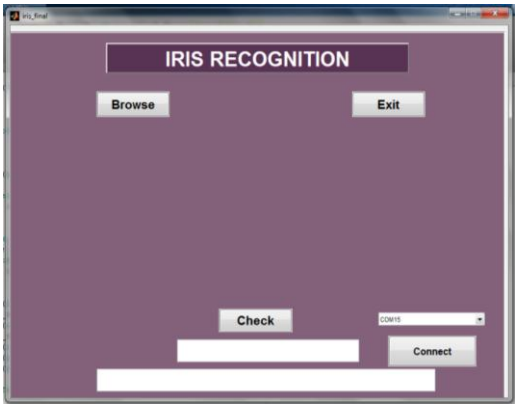
This CC2500 module act as a transmitter and receiver. In receiver section, with the help of CC2500 module the microcontroller received the data from the transmitter section. Then processes the data and sends it to the relay.

5. GUI

Our GUI (Graphical User Interface) contains two axes box, push buttons, edit button and static button. For the good understanding of the functioning or working of these GUI system. We have shows step by step process of the system and its working.

a) An input image is being selected to recognise.

To select an input image just click on 'Browse' button. Then a file explorer input will open. After that select an input iris image to recognize from the iris image data base. In second box we have already store some iris images.

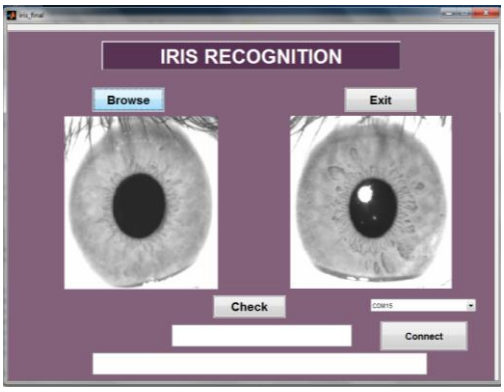


b) Input image will be show in first image window of the GUI.

When you select the input iris image in input box, after that the input image is compared one by one with all the data base images.

For comparision we use edge detection technique. Edge detection is a technique for finding boundary of an image within the object. Edge detection technique has number of algorithm but we use canny edge detection technique.

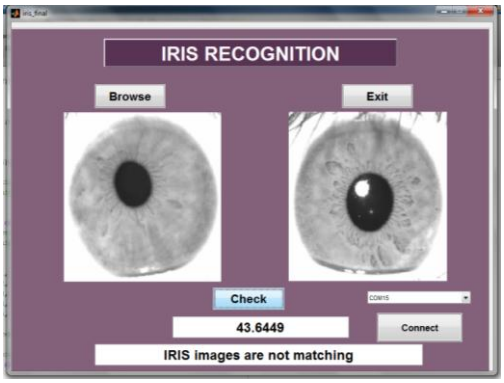
By using canny edge detection technique we extract black and white points form image and compare the black and white point with the total black and white points of the input image.



c) Mismatch GUI output

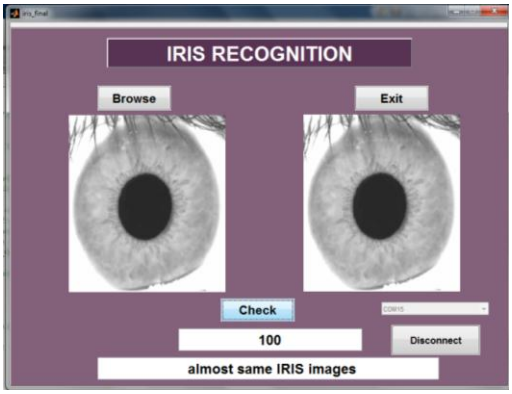
In program coding, we set threshold value if the match percentages is less than threshold value then the result will be appered as "IRIS images are not matching". Match factor can be calculated as

Match factor = (matched_data/total_data)*100



d)Matched GUI output

If the matched percentage is greater than threshold value the result will be appeared as "almost same iris image". Here matched factor can be calculated as Match factor =(matched_data/total_data)*100



6. CONCLUSION

We have successfully developed a new Iris Recognition system capable of comparing two digital eye-images. This identification system is quite simple requiring few components and is effective enough to be integrated within security systems that require an identity check. This approach is based on Canny edge detection, it guarantees the effective pupil detection to get accurate iris identification. Hence, the suggested technique proves to be an efficient solution for detect features.

7. REFERENCE

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