

Human Iris Processing Using Matlab

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Abstract: *Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article 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. Image segmentation is a process of partitioning an image into sets of segments to change the representation of an image into something that is more meaningful and easier to analyze.*

Key words: Image processing, Iris, Matlab

1. Introduction

With the rapid advancement of computer technology, the use of computer-based technologies is increasing in different fields of life. Image Acquisition is an important problem in different fields of image processing and computer vision. Image reproduction is the largest application of electronic image acquisition systems [3]. Traditional microscopic image acquisition system needs to be equipped with special image acquisition card as a source of system input; as a result, it makes the process of focusing is very tedious. This result in low response which influences the efficiency and cannot meet

the real-time requirements of image acquisition . Video Images can be acquired and directly loaded into MATLAB and Simulink from PC-compatible imaging hardware. One can detect hardware automatically, configure hardware properties, preview an acquisition, and acquire images and video. MATLAB supports multiple hardware vendors, having a range of imaging devices, from inexpensive Web cameras or industrial frame grabbers to high-end scientific cameras that meet low-light, high-speed, and other challenging requirements .Digital cameras generally have a direct interface with computer (USB port), but analogue cameras require suitable grabbing card or TV tuner card for interfacing with PC[1].



Figure 1.1: Interfacing of Scientific Camera to Laptop [24]

This figure shows that an external camera can be interfaced to laptop and by acquiring the real time video in MATLAB the properties or parameters of that image or video can be changed.

MATLAB provides a very easy platform for image acquisition and processing. Even serial and parallel ports can be directly accessed using MATLAB. The Matlab language is well known for its versatility and efficiency. Matlab's major problem is pricing. Matlab can be used only if we have skills to locate a link, which offers us a cracked version of Matlab or we have enough money to spend on it. Matlab has a very simple interface; once Matlab is started one would never like to switch over to any other platform. A lot of documentation is available for using Matlab. Matlab is almost similar to the code written in C++ or C. Best source of learning Matlab is using its Help. There is a huge library available in C/C++ for processing images. By using JVM (Java virtual machine), applications developed on java can be easily ported on any machine.

The Human Iris



The iris is a thin round diaphragm lies between the cornea and the lens of the human eye. Iris is perforated close to its centre by a circular aperture known as the pupil. The function of the iris is to control the amount of light entering through the pupil, and this is done by the sphincter and the dilator muscles, which adjust the size of the pupil. The average diameter of the iris is 12 mm, and the pupil size can vary from 10% to 80% of the iris diameter [27].

The lowest layer of iris is the epithelium layer, which contains dense pigmentation cells. Above the epithelium layer is the stromal layer, and contains blood vessels, pigment cells and the two iris muscles. The colour of the iris is determined by the density of stromal pigmentation. The externally visible surface of the multi-layered iris contains two zones, which often differ in colour. An outer ciliary zone and an inner pupillary zone, and these two zones are divided by the collarette – which appears as a zigzag pattern .

2. Objectives

- To acquire real time video and images in MATLAB for online processing.
- To detect human eye using simple interface arrangement with web camera.
- To develop algorithm in MATLAB to detect edges and correlate it with stored images.
- Filter the image to reduce noise.

3. Methods

3.1 Block Diagram

The block diagram used for acquiring and analyzing real time eye images in MATLAB is shown in Figure 3.2.

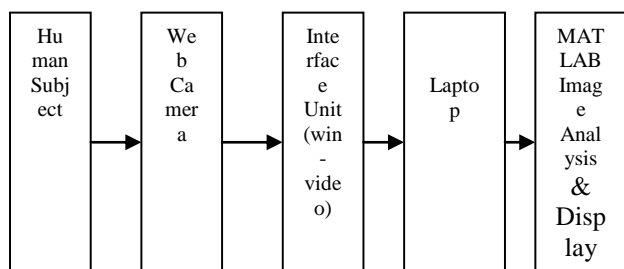


Figure 1.2: Elements of Image Processing

System consists of

Image acquisition setup: It consists of a video camera, web camera, or an analogue camera with suitable interface for connecting it to processor. Processor: It consists of either a personal computer or a dedicated image processing unit. MATLAB Code and MATLAB display

3.2 Steps for Image Acquisition

Step 1: Install Image Acquisition Device

Step 2: Retrieve Hardware Information regarding the image acquisition device

Step 3: Create a Video Input Object

Step 4: Preview the Video Stream

Step 5: Configure Object Properties



Figure 1.4 Acquired Image in Gray Scale

An Iris data base is finally generated and canny edge detection is performed. The various edge detected results for stored and real time acquired eye images is shown in next section.

Step 6: Acquire Image Data

Step 7: Clean Up

4. Result: Image Acquisition is an important problem in different fields of image processing and computer vision. Image reproduction is the largest application of electronic image acquisition systems [3]. Traditional microscopic image acquisition system needs to be equipped with special image acquisition card as a source of system input as a result, it makes the process of focusing is very tedious. This result in low response which influences the efficiency and cannot meet the real-time requirements of image acquisition. The snapshots of the video clipping acquired is shown in Figure 1.3

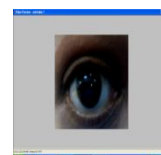


Figure: 1.3 Preview of Acquired Video

After acquiring the real time video and image it is converted into gray scale. Snap shot of the gray scale converted image is in Figure 1.4

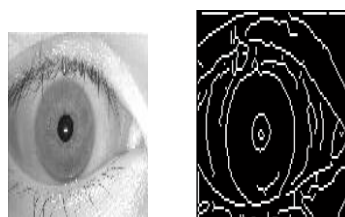


Figure 1.5 Eye1 and its edges

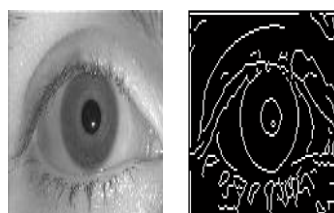


Figure 1.6 Eye2 and its edges

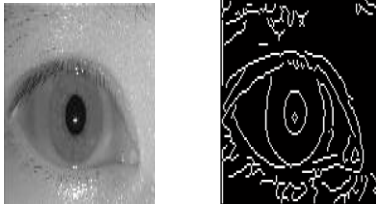


Figure 1.7 Eye3 and its edges

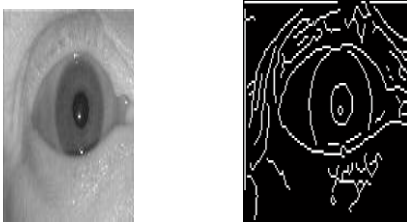


Figure 1.8 Eye4 and its edges

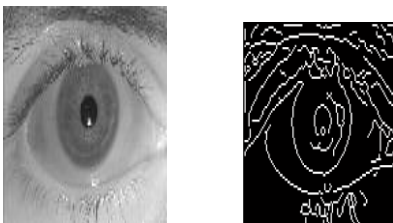


Figure 1.9 Eye5 and its edges

Next figures show the results for real time iris .Figure 1.10 shows the result when edges are found without converting the image into gray scale.

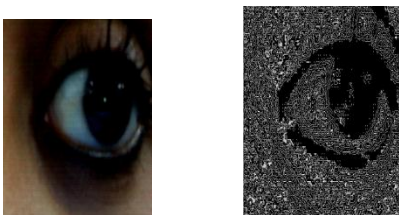


Figure 1.10 Real Time Eye1 and its edges

| | | |
|------|----|----|
| Eye5 | 47 | 13 |
|------|----|----|

5. Conclusion

. The system developed shall provide an easy and effective real time environment that allows acquisition and processing of video input in MATLAB. This can be used to acquire real time video for processing Biometric data. Image reproduction is the largest application of electronic image acquisition systems

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| Subject | Iris Diameter (in pixel) | PupilDiameter (in pixel) |
|---------|--------------------------|--------------------------|
| Eye 1 | 53 | 14 |
| Eye2 | 45 | 16 |
| Eye3 | 44 | 17 |
| Eye4 | 45 | 15 |

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