IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

IMPLEMENTATION of IRIS SCANNING -by COLOUR DETECTION and SCALE INVARIANT FEATURE TRANSFORM(SIFT)

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Abstract

Colour detection is the process of detecting the name of any colour. Human eyes and brains work together to translate light into colour. Light receptors that are present in our eyes transmit the signal to the brain. Our brain then recognizes the colour. But one of the limitations of human brain is that it cannot recognize all the shades of colours. But, through this process we can detect even the shades of most of the colours (approximately around 1500) by placing an target object for which the colour should be detected in front of the camera. We are formulating a process/algorithm through which we can produce faster results in Iris detection by first considering the colour of the Iris and then scanning the user data with the reduced data through scale invariant feature transform (SIFT). Iris is one of the unique features which can be distinguished between two different individuals. Since the Iris feature are unique, this can be used in Biometric applications. Fingerprint biometrics are efficient, but one need to move to Iris scanning for the biometrics because this method is more hygienic and accurate.

Keywords **- Iris, Euclidean distance, colour-detection, SIFT.**

1. INTRODUCTION

A process for finding the colour of a sample is intended to develop firstly. Colour detection is the process of detecting the name of any colour. Human eyes and brains work together to translate light into colour. Light receptors that are present in our eyes transmit the signal to the brain. Our brain then recognizes the colour. But one of the limitations of human brain is that it cannot recognize all the shades of colours. Colours are made up of 3 primary colours; red, green, and blue. In computers, we define each colour value within a range of 0 to 255. So, we can define a colour in 256*256*256 = 16,581,375 ways. There are approximately 16.5 million different ways to represent a colour. Through this process we have targeted to detect most of the colours (approximately around 1500) and can display the name of the colour as the output and can be stored in data base, by giving a sample (Iris) through a camera as input. Using this technique, we are primarily focusing on detection of colour of the iris which is the main step in Iris scanning. Iris is one of the unique features that varies from person to person. It is unique to a level where the Iris features varies from one eye to the other of the same person. So, this unique identification feature can be used for biometric purposes. The problem with the conventional methods like fingerprint is that the error rate is present during biometric authentication and chance of duplication of fingerprint is there. In these cases, there will be a breach to the data integrity of the person. But we are still using the fingerprint biometric authentication because fingerprint biometrics are faster. Whereas on the other hand, even though the Iris biometrics is the more accurate and reliable than Fingerprint biometrics, searching of biometrics of a person through Iris can put high load on the processing system. So, to avoid this problem we are formulating a method to find the colour of the Iris. Before understanding this method, we need to know the biology of the Iris. The iris is a thin circular ring region, a part of the human eye positioned between the black pupil and white sclera presenting a unique and rich texture information, such as patterns, rifts, colours, rings, spots, stripes, filaments, coronal, furrows, minutiae and recess and other detailed characteristics seen under the infrared light. "Fig. 1" shows image of an Iris with all the patterns and texture. Out of all the features of an Iris mentioned above, we are concentrating on the colour pigment of the Iris. By using this process and first finding the colour and by screening the data available in the database based on identified colour, the data on which a system should verify to identify the biometrics of person an later through SIFT we can detect the actual biometrics of person by just matching with the reduced data due to which the system efficiency can improved. In this way the system capacity can be improved.

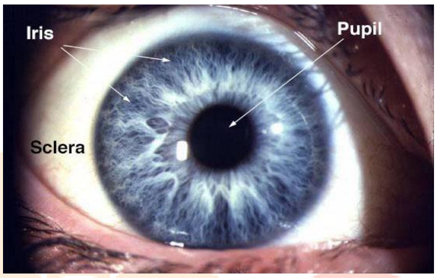

Fig.1. Eye with Iris pattern

2. IMAGE ACQUISITION

In Image processing, image acquisition is an action of retrieving the image from the user input source usually we are providing input by taking the samples from the video through a digital camera. The acquired image is stored and processed further. An image can be defined as a 2-D function f(x,y) where (x, y) is co-ordinate in two dimensional space and f is the intensity of that co-ordinate. Each co-ordinate position is called as pixel. Pixel is the smallest unit of an image. So digital images are composed of pixels, each pixel represents the colour (gray level for black and white images) at a single point in the image. Pixel is like tiny dot of particular colour. A digital image is a rectangular array of pixels also called as Bitmap. From the point of view of photography of the digital [2].

Images are of two types,1-Black and white Images -Black and white images are made of different shades of gray. These different shades lie between 0 to 255, where 0 refers to black, 255 refers to white and intermediate values refer to different shades of black and white. Grayscale refers to the range of neutral tonal values (shades) from black to white.2-Colour Image - Colour images are made up of coloured pixels. Colour can capture a much broader range of values than grayscale. "The spectrum – the band of colours produced when sunlight passes through a prism –includes billions of colours, of which the human eye can perceive seven to ten million". The electronic capture and display of colour are complicated. RGB (Red, Green, and Blue) is the most commonly adopted colour system.

3. PIXEL EXTRACTION

Pixel values are extracted in the iris region ignoring the sclera portion of the eye. The obtained R,G,B values are converted into hex values.It takes input in the form of values for Red, Green and Blue ranging from 0 to 255 and then converts those values to a hexadecimal that can be used to specify colour.

we wanted to extract each pixel values so that we can use them for locating simple objects in an image. Every image is made up of pixels and when these values are extracted using python, three values are obtained for each pixel (R,G,B). This is called the RGB colour space having the red, green, blue colours value respectively. Each pixel value can be extracted and stored in a list. Though IDLE shell can be used for it, it can take a long time to extract the values and hence its recommended that it is done using command line interface, create an image object and open the image for reading mode or an image frame obtained from an video camera:

>>>im = Imread('myfile.png')

myfile is the name of the image to be read and give the appropriate file format. that is if it's a jpeg image then give it as myfile.jpg This list comprehension extracts each element of each set in the list pixel values and all the elements are stored. Thus, this can be compiled into a script or made into a function which can be used in any image processing projects later.

4. COLOUR DETECTION

Finding the Euclidean distance from the detected pixel to the colours present in the data sheet. The Euclidean Distance between two points in either the plane or 3-dimensional space measures the length of a segment connecting the two points. It is the most obvious way of representing distance between two points. The Euclidean distance between two points in either the plane or 3-dimensional space measures the length of a segment connecting the two points. It is the most obvious way of representing distance between two points.

The Pythagorean Theorem can be used to calculate the distance between two points, as shown in the figure below. If the points (x1, y1) and (x2,y2) are in 2-dimensional space, then the Euclidean distance between them is given in Eq.1 $\sqrt{((x2 - x1)^2 + (y2 - y1)^2)}$ (1)

Now after calculating the distance, the pixel with the shortest distance from the colours in data sheet is considered as the match colour and then displayed as output. Table 1. shows few of the 1500 different colours it can identify using this method.

Table 1. Sample Colours

Colour name	Hex code	R	G	B
Gray	#808080	93	138	168
Antique Ruby	#841b2d	132	27	45
Jet	#343434	52	52	52
Amber	#ffbf00	255	191	0

The displayed colour along with the RGB values will be displayed on the image (In an image the place where we want to identify the colour). In the entire input frame when we are selecting the region where we want to know the exact colour [1]-[4], we are selecting the region by using mouse click for example either by left button double click or by right button double click. In this case, since we need to identify the colour of the iris the process identifies the colour of the Iris can be just automated.

When the function is executed the pixels values at the target region is taken and find the distance among them and displaying the colour in small rectangular box along with RGB values [6]. This data is stored in database against the name of the person and his/her iris data. "Fig. 2, 3" shows the colour of the Iris of two different persons.

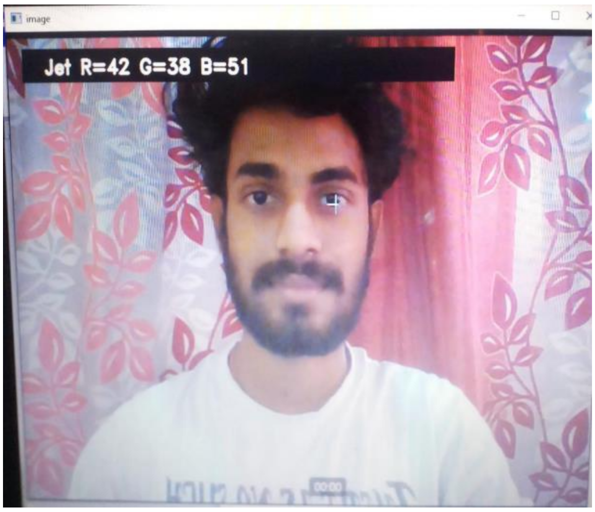

Fig.2. Iris colour detected of a peron1

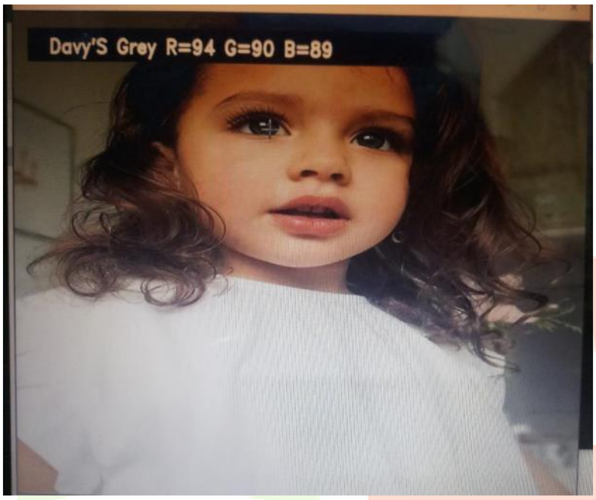

Fig.3. Iris colour detected of a peron2

5. DATA REDUCTION and DATA MATCHING THROUGH SIFT.

Let us consider the there is a huge amount of biometric data based on iris data (including colour of the iris) of people in an organization. Table 2. gives the sample table of the iris colour data of people in an organization.

Table.2. Sample data of people in an organization with their iris colour data present against their name

S no.	Name of the person	Iris colour
1.	John	red
2.	Rahul	gray
3.	Raju	hazel
4.	Rahim	red

Let us consider john is the person on which we need to find the biometrics. firstly, after detecting the colour from the data base, we pick the data off all the members with the matched colour. Table 3. shows the reduced data on which we need to scan to find the biometric of john (i.e., all the columns with red iris colour gets selected).

Table.3. Reduced data table based on the identified colour

S no.	Name of the person	Iris colour
1.	John	red
4.	Rahim	red

Later, using input iris data of the person to be matched is matched with the data present in the reduced data through sift. The scale-invariant feature transform (SIFT) is a feature detection algorithm in computer vision to detect and describe local features in images [5],[7]. An object is recognized in a new image by individually comparing each feature from the new image to this database and finding candidate matching features based on Euclidean distance of their feature vectors. From the full set of matches, subsets of key points that agree on the object and its location, scale, and orientation in the new image are identified to filter out good matches.

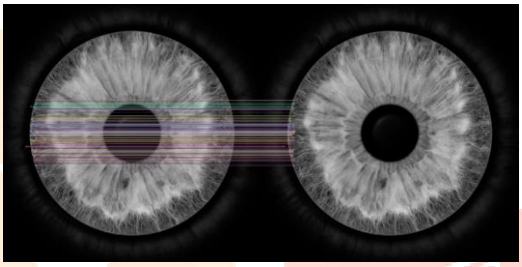

Fig.4. Iris feature matching done through SIFT algorithm.

6. RESULT

Therefore, through SIFT algorithm we have identified the identical match and found the particular person's biometrics. "Fig. 4" shows the feature matching of Iris using SIFT algorithm. Also, because we have developed a process to identify the exact name of the colour in the first place, the data to be matched is reduced to maximum extent, thereby improving the system efficiency and therefore the load on the server gets reduced resulting in faster response.

In the above sample process, we have seen that the results are obtained 50% faster since the iris of john is tested only with the two persons instead of four. The system improved efficiency can be seen more evident if we consider large data like data of people in an entire state or the data of an entire country.

7. CONCLUSION

The work carried out in this paper is to improve system efficiency during Iris detection by preliminary screening of data on basis of colour. From the result obtained we could see that the process we have developed can identify the colour of the Iris. On the basis of these results, it is clear that we can improve the efficiency of the biometric systems as a particular person's biometric information is searched against only a limited set of data where the result colour matches with the colour of the Iris in the database, thereby improving the system efficiency. The motivation behind the formulating of this process is to develop more efficient biometrics system.

ACKNOWLEDGEMENT

We would like to thank G.Gayatri, B Tech., M tech(Ph.D),Assistant professor, ANITS, Department of ECE for her extended support throughout our work.

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