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Received: 14 February 2011 Accepted: 7 March 2011 Published: 18 March 2011

#### 5 Abstract

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Due to the increase in the number of crimes and different ways they are perpetrated, demand 6 has increased on the means that increase the level of security accuracy in the places that need 7 special kind of protection, and places that require verifying the identity of those who demand 8 access, such as computer networks, banks and home land security departments. There are 9 many ways to identify people and grant them the required access; these methods include: 10 What people have? (like an access card or key) and What people know? (like password); 11 Moreover, there are physical biometric features such as (figure prints, retina, iris, DNA, etc) 12 and behavioral biometric features such as (signature, voice, walking, etc). Recently, experience 13 proved that using the iris is the best and more accurate than any other way and it will be the 14 target of our research. There are several ways to increase the level of security that have been 15 innovated, most important of which was using the biometrics. The most accurate biometric 16 feature is the human eye iris, due to the characteristics it enjoys, and which make it possible 17 to be used to identify people. The eye iris texture differs from one person to another; it even 18 differs between identical twins, and the right and left eyes of the same person too. The aim of 19 this research is to design an algorithm to recognize the iris for using it to identify people and 20 create an international biometric passport for that person. 21

23 Index terms— prints, retina, iris, DNA

#### <sup>24</sup> 1 Future Biometric Passports and Neural Networks

25 By Kheder Durah, Omar Al Zoubi, Bilal Alzoubi, Emad Mohammed Abstract-Due to the increase in the number 26 of crimes and different ways they are perpetrated, demand has increased on the means that increase the level of 27 security accuracy in the places that need special kind of protection, and places that require verifying the identity of those who demand access, such as computer networks, banks and home land security departments. There are 28 many ways to identify people and grant them the required access; these methods include: What people have? 29 (like an access card or key) and What people know? (like password); Moreover, there are physical biometric 30 features such as (figure prints, retina, iris, DNA, etc) and behavioral biometric features such as (signature, voice, 31 walking, etc). Recently, experience proved that using the iris is the best and more accurate than any other way 32 and it will be the target of our research. There are several ways to increase the level of security that have been 33 innovated, most important of which was using the biometrics. The most accurate biometric feature is the human 34 eye iris, due to the characteristics it enjoys, and which make it possible to be used to identify people. The eye 35 iris texture differs from one person to another; it even differs between identical twins, and the right and left eyes 36 37 of the same person too. The aim of this research is to design an algorithm to recognize the iris for using it to 38 identify people and create an international biometric passport for that person. Due to the increase in the number 39 of crimes and different ways they are perpetrated, demand has increased on the means that increase the level of 40 security accuracy in the places that need special kind of protection, and places that require verifying the identity of those who demand access, such as computer networks, banks and home land security departments. There are 41 many ways to identify people and grant them the required access; these methods include: What people have? 42 (like an access card or key) and What people know? (like password); Moreover, there are physical biometric 43 features such as (figure prints, retina, iris, DNA, etc) and behavioral biometric features such as (signature, voice, 44 walking, etc). Recently, experience proved that using the iris is the best and more accurate than any other way 45

and it will be the target of our research. There are several ways to increase the level of security that have been innovated, most important of which was using the biometrics. The most accurate biometric feature is the human eye iris, due to the characteristics it enjoys, and which make it possible to be used to identify people. The eye iris texture differs from one person to another; it even differs between identical twins, and the right and left eyes of the same person too. The aim of this research is to design an algorithm to recognize the iris for using it to identify people and create an international biometric passport for that person. everal methodologies using the iris for identifying people have been used, most important was that applied by scientist J. Daugman. Generally

speaking, all those are similar in their steps of operation; what is different in our research is the way of performing
 each, some were modified in one step while others were done in more than one step.

each, some were modified in one step while others were done in more than one step.
The process of identifying and recognizing people using the eye iris goes through the following steps:

1. Iris image acquisition 2. Processing 3. Post processing 4. Matching

### 57 2 Decision

We carried out few thousands lab tests and experiments and took several pictures of the eye iris by a special IRIS capture camera used for this purpose namely Panasonic Authenticam using Iridian technologies; We also developed a computer program using MATLAB language to code the iris and execute the matching process between one iris and another. In this research paper we developed new ways in many stages:

-We used a new method to locate inner and outer boundaries of the iris by considering that the iris is not a circle, it has an elliptical shape. We used a method to locate the iris boundaries by generating circles with different diameters and different centers, and then we measure the mean of the intensity for each circle.

#### 65 **3**

<sup>66</sup> We used a new method t select a sector of the iris by locating the cross points of the eyelashes with the iris.

#### 67 **4**

68 We used neural networks based on simplex algorithm to verify the person who stand in front of the camera.

The most accurate biometric feature is the human eye iris, due to the characteristics it enjoys, and which make it possible to be used to identify people. To have a perfect iris image, the light source must be hidden and not shiny.

Iris recognition has tremendous potential for security in any field. The iris is extremely unique and cannot be artificially impersonated by a photograph (Daugman, 2003). This enables security to be able to restrict access to specific individuals.

An iris is an internal organ making it immune to environmental effects. Since an iris does not change over the course of a lifetime, once an iris is encoded it does not need to be updated. The only drawback to iris recognition as a security installment is its price, which will only decrease as it becomes more widely used.

A recent application of iris recognition has been in the transportation industry, most notably airline travel. The

<sup>79</sup> security advantages given by iris recognition software have a strong potential to fix problems in transportation

80 ??Breault, 2005). Its most widely publicized use is in airport security. IBM and the Schiphol Group engaged in a

joint venture to create a product that uses iris recognition to allow passengers to bypass airport security ??IBM 2002). This product is already being used in Amsterdam. A similar product has been installed in London's

Heathrow, New York's JFK, and Washington's Dulles airports ??Airport, 2002). These machines expedite the
 process of passengers going through airport security, allowing the airports to run more efficiently.

<sup>85</sup> Iris recognition is also used for immigration clearance, airline crew security clearance, airport employee access <sup>86</sup> to restricted areas, and as means of screening arriving passengers for a list of expelled persons from a nation <sup>87</sup> ??Daugman, 2005). This technology is in place in the United States, Great Britain, Germany, Canada, Japan,

88 Italy, and the United Arab Emirates.

The system has the following stages [8] a) Image acquisition

We use a special camera to capture a clear picture of the eye, in order to have a clear shot of the inner eye boundaries with the pupil and the outer boundaries with eye Sclera.

## <sup>92</sup> 5 b) Preprocessing

93 In this stage several activities takes place to process the image. We shall try to summarize them as follows:

a) Convert the color RGB image to Gray scale. b) Normalize of the image's histogram in order to distribute the density on the entire range [0-256]. c) Images dimensions are unified. d) Determine the inner and outer boundaries of the eye iris. In this step, the determination of the inner boundaries of the Iris is identified; with the assumption that the pupil position from the outer boundaries compared to the inner boundaries of the Iris with a rate of 1.5 from the eye center as shown in the following figure:

We may also add a constant value related to the race of the human (white, black, and yellow) as we have noticed from the many thousands of experiments conducted to this respect. e) Iris center is then determined assuming that it is equal to the center of the pupil, although in many cases we found that both centers may have a difference between 5-6 pixels, but such small difference will affect our results. f) Then we convert Image's

103 Cartesian coordinates to Polar coordinates using the following method:

With the assumption that the center of pupil is identical of the Iris center, we draw x, y access at the center of the image.

#### 106 6

We assumed that the cross section of these lines with the outer boundaries forms the frame edges where the picture is placed within. In this stage we encode the iris in order to save it at the end of the entry as a template. This process can be performed by the application of Gabor filter [8] or Wavelet Transformation [2], [3].

# <sup>110</sup> 7 Application of Gabor Filter:

? We apply Gabor filer on the iris part and we get at the end we get two values that determines the image's elements. One of these values is real and the other is imaginary. ? Then we extract the phase for each value and prepare them for encoding. ? At this stage we encode the phases assuming -1? for values greater than 1 and -0?

 $_{114}$   $\,$  for values less than in order to get final values representing the phase.

# 115 8 Application of Wavelet Transformation

116 The aim of using this method is to have few images for the eye in different resolutions. Wavelet is cable of dealing

with the smallest details in the image which is an advantage compared with other transformation methods. \* When application of Wavelet, the image passes through two types of filters, high and low frequency as shown in

Figure We then pass these approximate coefficients in to high and low frequencies filters in order to get new set

of coefficients namely A1 and D1; and so on we repeat the process several times. In ideal situations when dealing

with images the process is repeated /3/ times and when dealing with uni-directional frequencies, the process is

122 repeated /7/ times. We can also apply the same analysis on the detailed coefficients until we get a magnified

123 signal analysis.

### 124 **9** \*

125 The next important step is to choose the best filter as there are many of them:

-Haar -Daubechies -Biorthogonal -Coiflets -Symlets -Morlet -Mexican Hat -Meyer In this research paper, we shall use -Haar? for simplicity; and as we apply this filter we get various different images of the same iris in different resolutions; we then combine the D and V coefficients for the last level of the analysis in one matrix. After that we add the H coefficient to the matrix to get a final one which will be encoded as a template for the original iris used for future comparisons.

## <sup>131</sup> 10 d) Matching Stage

- This process is carried out using the stored template and the captured iris using the hamming distance given in the following formula:?? = 1 ? ?? ??? ?? ?? =1
- 134 Whereas, -N? is the number of elements in the matrix.
- -X,Y? are the elements in the both matrixes being compared.

The matching is considered to be identical if HD = 0 and if HD = 1 then there is no match. By matching we mean deciding the identity of the person subject to the test.

## <sup>138</sup> 11 e) The Decision Stage

139 In this stage we determine the Threshold of the matching value which will highly affect the nature of the decision

the system will carry out. This stage is also critical as it also determine the fault rates of the system namely the False Accept (FAR) and False Reject Rates (FRR).

In the system that was designed by -J. Daugman, 2003? the Threshold was 0.32, meaning if HD < 0.32 then we have a match, and if HD > 0.32 then we don't have a match.

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Figure 1: 6 Future



Figure 2: -



Figure 3: Figure ( 1 )



Figure 4:



Figure 5: Figure ( 5 )





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