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A High Sensitive Approach for Gender Detection Based on Human Iris

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Abstract: **- Now a day's iris patterns play a vital role in gender classification. Iris patterns are distinctive and cannot be changed until it becomes unnatural. This paper focus on gender has been detected using iris images. This work presents a new method for gender classification based on features of the iris texture selected by mutual information to improve gender classification of iris images For determining the recognition performance of the system database of digitized grayscale eye images were used. This grayscale images are segmented. Traditional iris segmentation methods always time-consuming and sensitive to noise. Here, in iris recognition, the segmentation is based on Hough transform used for automatic segmentation and able to localize the circular iris and pupil region. Edge points of iris boundaries are detected with canny edges steps and the threshold values are matched with the hamming distance. The Hamming distance was employed for classification of iris images. This work comes to the conclusion that iris segmentation is an essential part of recognition system and the prediction is based on iris texture features and stop matching when a generation of Iris close match is found.**

Keywords: **Canny, Gender detection., Hamming distance, Hough transform, Segmentation.**

I. INTRODUCTION

The human iris is distinctive and cannot be duplicated or imitated since it is impossible to extract an iris image without the knowledge of a person. Iris region is the part between the pupil and the sclera. This field is sometimes called iris texture. The human iris is not changeable and is stable. From one year of age until death, the patterns of the iris are relatively stable over a person's lifetime. The average diameter of the iris is 12mm. The pupil size can differ from 10% to 80%of the iris diameter. Fig.1 denotes the pictorial representation of iris image.

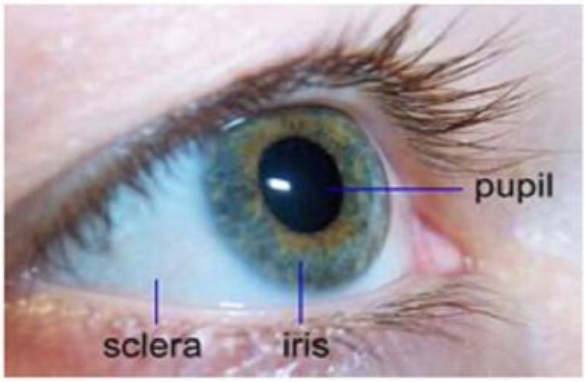

Fig.1 Eye image

The iris of the eye is well suited for authentication purposes. These days for security, it is equally important to find out the gender of an imposter. For a human being, it is forever easy to recognize gender, but it is very difficult when it comes to the computer version. The function of iris recognition system is mediated to be more accurate and reliable in the detection of gender. In this paper, our focus is gender detection from iris image. In the latest years, many researchers have made the most of facial images to classify gender whereas minority studies of this nature have utilized the properties of iris images to predict gender. Gender detection is helpful in the area of forensic sciences, security systems, and many more. For gender, studies suggest that female iris is shorter in diameter to the male iris. Such factors could contribute to significant textural differences between the male and female iris. This paper consists of several methods for gender detection using iris image. Canny edge detection method is used to preprocessing. Then circular Hough transform method is applied to detect the inner and outer boundaries of the iris [10]. Preprocessed data are further used to extract the features. Hamming distance method is used for gender detection by the extracted features.

II. LITERATURE SURVEY

Pooja Kawale et.al [1] "Matlab Based Iris Pattern Recognition System" In this paper proposed an IRIS pattern classification using hamming distance to extracting the iris portion of the eye image. The extracted iris part is normalized, and then IrisCode is generated by using 1D Gabor filters.

Rehana Parwin, Swati Verma [2] "A Survey: Iris Recognition Techniques & Predict Gender from Iris

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Images" In this paper analysis gender based on the iris texture Features. Feature vectors are classified using Hamming Distance and dissimilarity function.

Bansal A., Agarwal R.and Sharma R.K [3] "Predicting Gender Using Iris Images" In this paper gender has been identified using iris images. The segmentation step is being carried out using circular Hough transform. Then predict the gender by using Support Vector Machine (SVM).

Asima Akber Abbasi, M.N.A. Khan and Sajid Ali Khan [4] studied multiple techniques to recognize cooperative, noisy, off an angle, blurred and occluded images. This process comes to the conclusion that iris segmentation is a crucial part of the recognition system. Hamming distance of red pixels and green pixels are previously calculated in the second step. At a final step, the weighted sum is calculated for red, green and gray channel excluding the blue channel. Identifies more reflection on pupil and iris region affects the overall accuracy of the system.

Salve, S.S., & Narote, S. P.[5] "Iris recognition using SVM and ANN" In this paper proposed an improved approach to recognize the person using iris recognition technique is based on Artificial Neural Network and Support Vector Machine (SVM). The segmentation using canny edge detector and Hough transform. The experimental tests are performed over the standard CASIAIrisV4 database.

Naveen Singh, **Dilip Gandhi2, Krishna Pal Singh**, [6] developed "Iris Recognition System Using a Canny Edge Detection and a Circular Hough Transform". In this paper, proposed the novel techniques to produce an Iris identification System, by using canny edge detection and Circular Hough transform to identify the iris boundaries in the eye's digital image.

Mrs.M.Sujatha, K.V.S.Sravanthi, B.Jahanavi Raja, L.Dhanunjay, J.Naveen Kumar [7] proposed "Recognition of Human Iris Patterns for Biometric Identification". In this paper proposes a personal recognition using iris identification system. The boundaries of the iris are detected by using Canny Edge Detector. Now, finally perform matching process on iris code using Hamming Distance for acceptance and reject process.

III. METHODOLOGY

Classification of iris involves three major steps such as following: An eye image is captured in the Acquisition step. The Segmentation step localizes the iris region from the acquired eye image. This step involves detection of the iris and pupil boundaries. The Prediction step uses the data generated at the output of the previous step and performs the gender classification task itself. Fig 2 represents the step by step process of the gender detection.

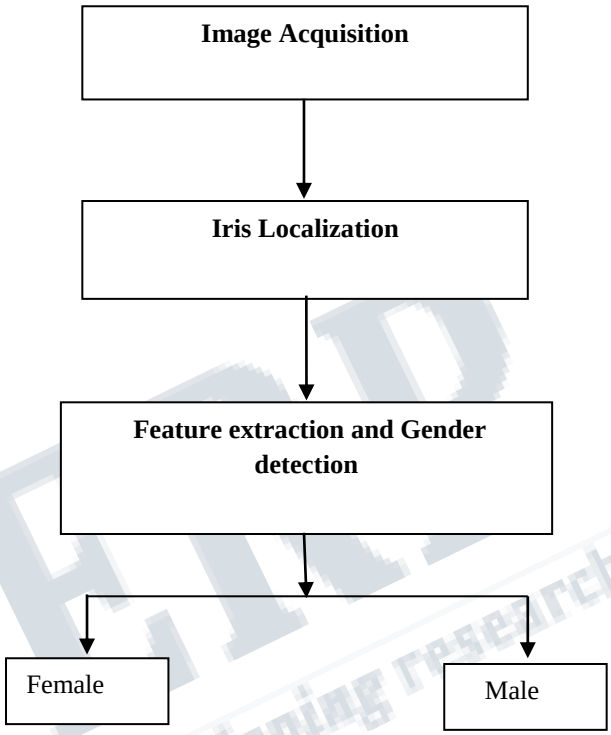

Fig.2 A Process of Gender Detection

A. LOCALIZATION

The first step in the preprocessing stage is to split iris from the eye, it is necessary to get the inner boundary and the outer boundary of iris. Applying one of the edge detection techniques can get an edge map of the iris image to enable determining all boundaries of the iris by using the canny edge detection technique. The next step after determining the edge points is to apply a circular hough transform to detect the two circles of the iris (outer) and pupil (inner) boundary [9].

Canny Edge Detection

Canny edge detection is one of the basic algorithms used in shape recognition. The algorithm uses a multi-stage process to detect a wide range of edges in images. Steps for Canny Edge Detector algorithm are as follows:

1. Image smoothing: This is done to reduce the noise in the image.
2. Calculating edge strength and edge direction.
3. Directional non-maximum suppression to obtain thin edges across the image.
4. Invoking threshold with hysteretic to obtain only the valid edges in an image.

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Fig 3 represents the step by step process of canny edge detection

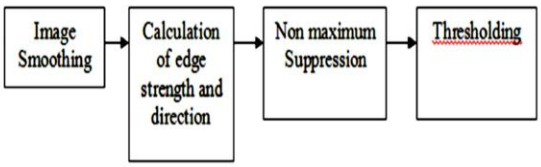

Fig. 3 Process of canny edge detection

Fig 4 shows the result of the canny edge detection which states the segmented iris image.

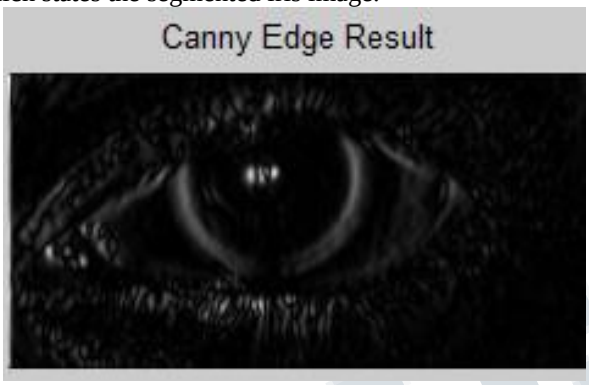

Fig. 4 Canny edge detection

Circular Hough transform

The Hough transform is a standard computer vision algorithm that can be used to find out the parameters of simple geometric objects, such as lines and circles, present in an image. The circular Hough transform can be used identify the iris boundaries in the eyes of the pupil and iris regions. An automatic segmentation based on the circular Hough transform [9]. Iris segmentation is carried out in following steps:

- Detection of an inner boundary,
- Outer boundary ,and
- Isolation of Iris Pattern from the iris image.

The main reason for the iris segmentation is twofold: (i) To extract only information i.e., the Iris Patterns that distinguish individuals.

(ii) To reduce the size of pattern vector from iris image to the Iris Patterns.

B. FEATURE EXTRACTION AND GENDER DETECTION

In this process, the feature extractions are obtained by using the mean and standard deviations values. The featured values are obtained from the segmented image. The Gender Detection process is done using the Hamming distance.

Hamming Distance

In this process, hamming distance is used for matching metric system employed by Daugman, and Hamming distance computation. This process deals with the images that are taken only in bits that are generated from the actual iris section. For Gender detection, the Hamming distance was chosen as a metric which is based on matching values, since bit-wise comparisons are very necessary. The process of Hamming distance employed for gender detection also consist of noise masking, so that only considerable bits are used in calculating the Hamming distance between two iris templates [8]. Now when taking the Hamming distance, only those bits in the iris pattern that corresponds to '0' bits in noise masks of both iris patterns will be used in the calculation. The Hamming distance will be calculated using only the bits generated from the accurate iris region. The Gender detection is obtained by the value of hamming distance. The hamming distance is determined by the feature value such as mean and standard deviation. The Hamming distance is based on the difference between the trained image value and inputted image value. The Hamming distance can be computed by means of the basic logical operator XOR as shown in fig 5 (Exclusive-OR) and thus can be finished very quickly.

Code 1	11	00	10	01
Code 2	10	01	00	10
XOR ⊕	01	01	10	11
HD	5/8 = 0.625			

Fig.5 XOR and Hamming distance calculation using iris codes

IV. EXPERIMENTAL RESULT

In this work, the iris images which are chosen as input are segmented using canny and circular hough transform. The features like mean standard deviation are extracted from the segmented iris image. The detection of gender is based on the feature extraction values using the hamming distance. The gender detection is categorized by using the mean, standard deviation and the values obtained from the hamming distances are tabulated in table I. In this process 50 iris images are taken and that 25 images are categorized as female remaining images categorized as male.

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Table I. Sample data for classification

Images	Mean	Standard deviation	Hamming distance	Result
F1	54.4739	46.6077	42.4200	Female
F2	55.8373	53.5482	32.5800	Female
F3	111.1075	54.4414	50.0900	Female
F4	93.4525	52.1438	53.4400	Female
F5	72.8170	49.4354	51.6500	Female
F6	104.7533	41.3489	50.2000	Female
F7	81.6536	60.0037	47.7300	Female
F8	58.7324	46.6065	42.6500	Female
F9	94.3146	47.7453	44.3300	Female
F10	65.0922	51.4669	42.8300	Female
M1	81.1005	46.1009	38.8200	Male
M2	59.4671	47.5843	37.6100	Male
M3	89.8846	63.3517	53.8500	Male
M4	84.0838	63.6386	50.3600	Male
M5	85.4923	61.7962	48.1900	Male
M6	67.4990	54.2737	46.4800	Male
M7	154.1075	43.4762	45.8600	Male
M8	107.1298	52.6591	54.9700	Male
M9	100.9133	55.5587	51.9800	Male
M10	133.6992	57.9863	50.8900	Male

The significance of this methodology is in identifying accurately the iris of the corresponding gender based on the comparison of iris features. The performance of a gender classification categorization system is usually measured in terms of accuracy or error rate. The accuracy is defined as per the expected result and the actual result based on the classification. The accuracy of the gender detection shown in
table II.

Table II. The Accuracy of Gender Detection

Pattern Type	No of Images	Expected Result	Actual Result
Female	25	25	22
Male	25	25	25
Total	50	50	47
Percentage		47/50 * 100 = 94%	

In this process, iris patterns are divided into two main groups. They are female and male. Fig 6,7 shows the experimental result of the gender detection.

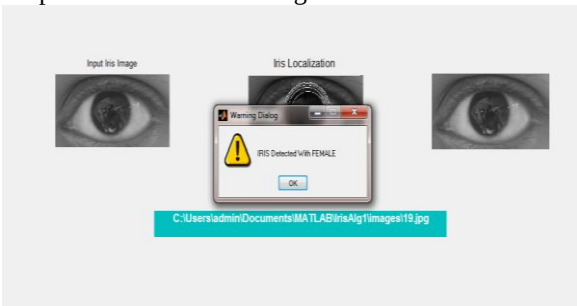

Fig 6. Female iris image

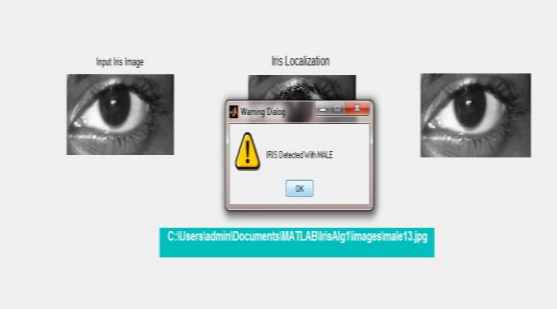

Fig 7. Male iris image

V. CONCLUSION

In this paper, the eye images used for processing are obtained from the camera. Performance of the work can be enhanced if the system uses only the quality images. This proposed methodology uses canny edge detection with Circular Hough transform to segment iris images for locating the iris. Then the featured values such as mean and standard deviation are extracted from the segmented image. Finally, the gender was detected based on the featured values using Hamming distance. The gender is detected with an accuracy rate 94.00%. In the near future neural network based classification developed using SVM.

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