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AN EFFECTIVE AI APPROACH FOR GENDER CLASSIFICATION WITH KUWAHARA-MEDIAN FILTERATION

Er. Nidhi Sharma
Electronics and Communication
Gviet Sector-7 Banur-140601

Er.Rashi Bansal
Electronics and Communication
Gviet Sector-7 Banur-140601

Er.Tanika Thakur
Electronics and Communication
Gviet Sector-7 Banur-140601

***Abstract*— Biometric recognition system is widely adapted by each technical domain recognize the person accordingly their behavioural properties. Different traits are used to authorize the identity of the person. Iris based recognition system is a kind of biometric recognition systems which is highly in use nowadays.**
The enhanced usage of iris for identification system leads to increment in the more improved system with reliable results and output. Thus, diversity of researches has been demeanor in this file for improving the excellence of the results. This study also introduces a novel mechanism for iris based recognition system that performs the gender classification on the basis of the extorted features of the iris. In this work, the hybrid filtration mechanism is utilized to pre-process the selected image of iris from the available dataset.
In this study, pre-processing of input image is done to remove the noisy content from it. This is achieved by applying the collaboration of median and kuwahara filters. After filtration, the feature from the processed image is extracted by using the LBP-LDA technique. After extorting the features, the ANN is implemented for pattern matching from the images.
For purpose of performance assessment, the MATLAB simulation platform is used. After implementation and analysis the proposed system is found to be much efficient and reliable than conventional work.

Keywords—Biometric recognition, Iris recognition, feature extraction, pattern matching, Filtration.

I. INTRODUCTION

Privacy and Security being the major concern now-a-days, Recognition Technique could find a variety of applications. Such applications could be: Biometric authentication, Security and many more. A biometric system is intended to follow certain biometric recognition algorithm, defined specifically for each different mechanism. Every biometric system employs several modes or processes to authorize, these are: sensing, feature extraction, and matching modules. Iris is the ring shaped region in the human eye than inscribes the pupil of eye. Iris recognition technique employs the detection and comparing of the unique patters of iris for every individual. Iris recognition is designated as the fastest and most efficient technique that holds the capability of producing intended results in least duration of time. The fine texture and traits of iris favors the identification and authentication using iris recognition technique completely attainable and less complex. In initial stage development of iris recognition technique, the process was to capture a series of images and compare it with the stored data, the most comparably matching of these images was considered authentic and thus access was granted.

II. PROBLEM FORMULATION

Many researches were carried out on the techniques related to iris recognition systems for providing authentication. Further research into the technology produced the application of same iris recognition system for predicting gender of person. The input images were given an image resolution analysis. Image resolution could be defined as the amount of accurate information in an image. Higher the resolution, greater will the amount of information. Further, the resolution could be considered in reference to the pixel count of the image. Pixels are the number of color dots in the image, hence the pixel count provides the evaluation of how refined the image is. In the image resolution analysis, it was evaluated that the image may or may not be appropriate enough to provide sufficient information about the authentication of the person. The lack of data may lead to false reports such as denied access to legal holder or the illegal access to unauthorized person. The techniques used traditionally had outcomes that suffered from reliability issues, since the image quality and orientation at the time of capturing does effect the process of iris recognition system. The techniques used traditionally had no provision of specific feature extraction, i.e. there work did not define certain features on which there authentication system was based. Moreover, they lacked intelligence systems, they classified person based on weights completely a hit and trial technique. Hence, it lacks reliability.

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III. PROPOSED WORK

As mentioned in above section, the issues related to traditional techniques inhibited the application of iris recognition system reliably. The problematic area was the absence of specific feature extraction and utilization of classifiers. The images used for the process lacked resolution. In order, to overcome these backlogs, an introduction of few newer mechanisms is made in our proposed work. The preprocessing mechanism is applied on the input images to enhance its resolution and quality. The hybrid filtration scheme i.e. the collaboration of median filter and kuwahara filter is provided to the input image. Feature extraction techniques available are LDA and PCA. LDA being of higher efficiency is utilized in work, also LDA technique is capable of performing more accurately for larger datasets. The pattern is recognized using LBP. The features and the pattern specification produced after applying these techniques is provided to the artificial intelligence system i.e. neural network for training and further comparison is done for gender classification based on the features extracted.
Methodology:

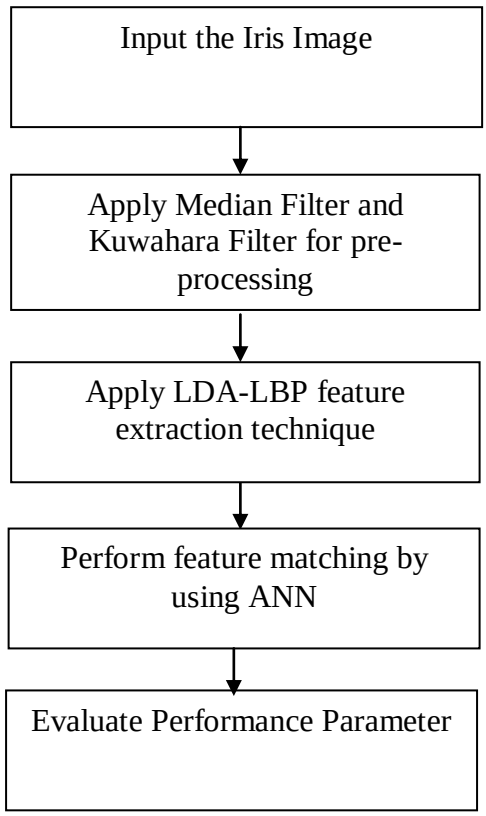

Figure `1. Framework of Proposed Work

As represented in the figure 1, the flow chart of the proposed work contain five steps. The techniques applied are framed in order as described below:

Step 1: Select the input image of iris for performing further processing on it.

Step 2: Perform image preprocessing by using the median and kuwahara filters collaboratively.

Step 3: Apply LDA and LBP feature extraction technique to extract the texture or features from region of interest from the input image.

Step 4: Apply neural network to perform feature matching.

Step 5: Evaluate the performance of the system in terms of various performance parameters. Such as Accuracy, Recall, Precision, F-Measure and Mean Square Error.

IV. RESULTS

This study developed an iris recognition system by using filtration schemes for filtering the images, LDA for feature extraction, LBP for pattern analysis and neural network for pattern matching on the basis of the extracted features.
In the proposed work, the captured image is pre-processed to obtain clarity and refinement. The input images are converted to the gray scale format. For the pre-processing of image, the gray scale image is provided to the median filter and kuwahara filter. As represented in the figure 2, the image obtained after kuwahara filter is more refined and its boundaries are sharper than the original image, i.e., the pixels obtained of the image are higher in number as compared to input image. The pre-processed image is then operated for feature extraction and pattern recognition.

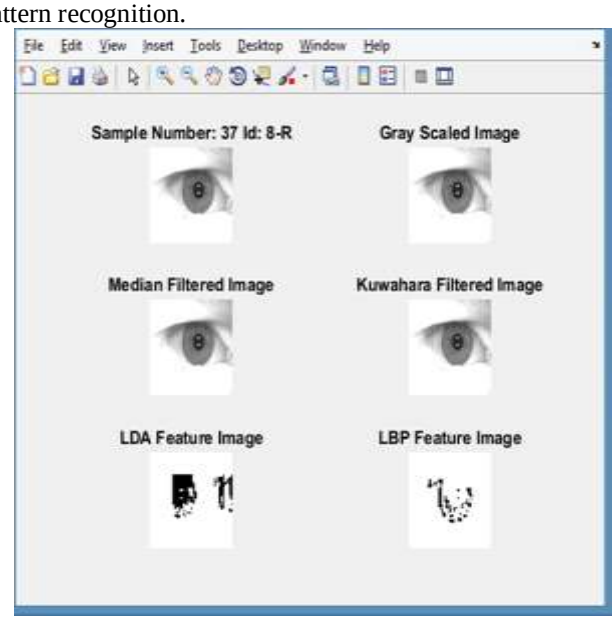

Figure 2 Analysis of image after preprocessing

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In the proposed work, LDA (*Linear Discriminant Analysis*) technique is utilized because of its better performance statistics. The LBP (local binary *pattern*) provides pattern recognition. The outcome of image after applying the above mentioned techniques is represented in the figure 2.

The preprocessed images are represented in form of histograms. These color histograms are the pixel statistic feature vectors utilized for evaluation of the image resolution.

The figure 3 represents the pixel count of the image after operating it with hybrid filtration scheme. The x-axis of the graph depicts the filters used and y-axis provides the histogram variations with respect to pixel count and it ranges from 0 to 4500. As analyzed from the graph, the pixel count of the image increased after applying kuwahara filter on the image. Hence, the image after preprocessing is reliably appropriate with enhanced quality to extract features and perform iris recognition. **Various samples of images is analyzed for the iris recognition mechanism in order to evaluate accuracy, precision, recall, Mean Squared Error and F-Measure.**

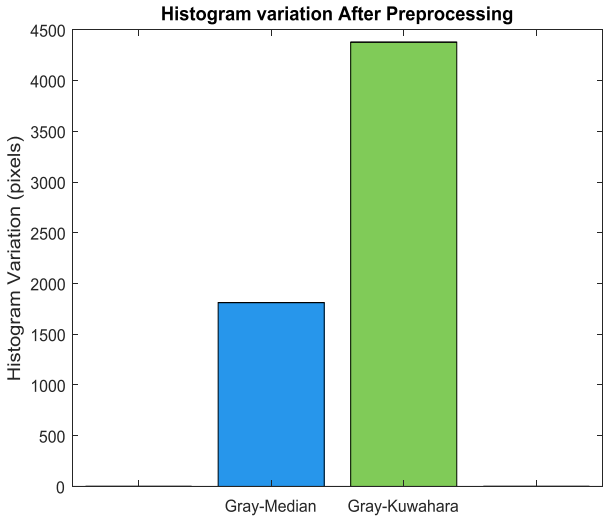

Figure 3 Histogram variation after preprocessing

The comparison of the proposed technique is done to the traditional techniques. This evaluation provided the statistic on the basis of which the effectiveness of proposed system could be measured. The project have the provision of three comparisons among five technologies. The technologies involved are: mRMR, CMIM, WmRMR, WCMIM and the proposed system.

The first comparison is done on overall population as depicted in the figure 4. The five technologies mentioned above are placed on the x-axis of the graph. The y-axis contain accuracy marked on a scale of 0-100 percent. As analyzed from the graph, the overall efficiency of the proposed technique is highest when compared to other methods. It leads WCMIM by 6% approximately and the value increases as we move down the x-axis.

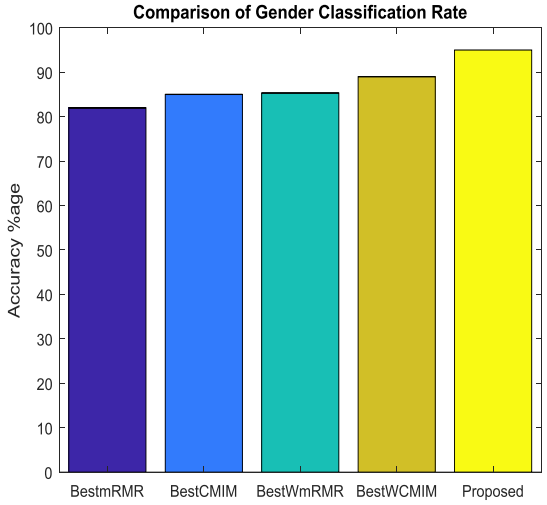

Figure 4 Comparison of Gender Classification Rate

Similarly, the second comparison is for the Male population. The figure 5 depicts the comparison of gender classification rate for male, where x-axis contain the technologies in order and y-axis contain percentage values from 0-100 scale. As illustrated from the graph, the accuracy percentage for the proposed system stands highest among all the technologies. The value of accuracy is about 95% for the proposed technique which is approximately 6% higher than the WCMIM technique, the value gradually decreasing down the x-axis.

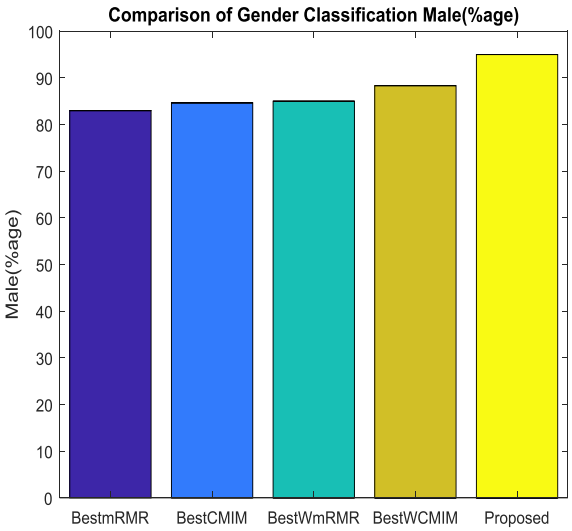

Figure 5 Comparison of Gender Classification Male

In figure 6, the comparison of gender classification rate for the female population is represented on the basis of accuracy of the system. The x-axis contain the technologies under consideration in order from oldest to recent. The y-axis provides the scale marked from 0-100 percent representing the value of accuracy for recognition of female iris in each

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technology. As it is clear from the graph the highest accuracy is provided by the proposed system as in above two comparisons. Therefore, the proposed system stands more effective as compared to older techniques.

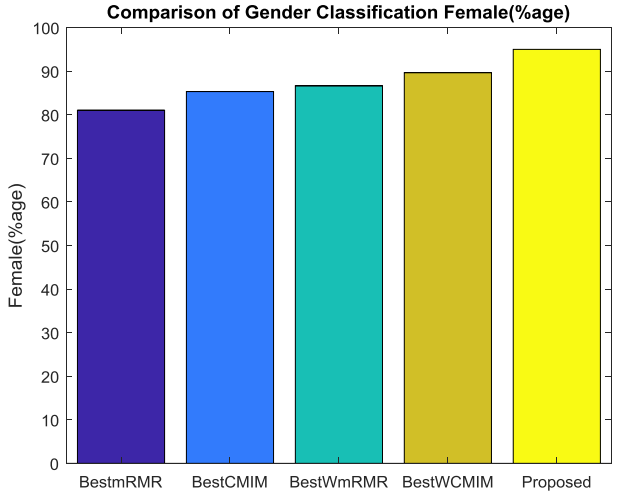

Figure 6 Comparison of Gender Classification Female

The statistical representation of the comparisons could be represented in the tabular form as depicted in table `1. On the basis of the observations it can be said that the proposed system has the highest accuracy rate in comparison to other techniques. It generates the 95% approx. accurate results, whereas the WCMIM has lower accuracy percentage i.e. 89% approx. It means that by utilizing median filter and kuwahara filters for pre-processing of the image and LDA and LBP for feature extraction and pattern recognition respectively, the results obtained are better and finally the utilization of ANN technique for feature matching also favors the effectiveness of the system.

Table `1 Comparison of accuracy for various technologies

Technology	Accuracy (%)	Male	Female (%)
mRMR	82.0000	83.0000	81.0000
CMIM	85.0000	84.6600	85.3300
WmRMR	85.3300	85.0000	86.6600
WCMIM	89.0000	88.3300	89.6600
Proposed	95.0000	95.0000	95.0000

V. CONCLUSION

Security has been become the main issue in today's world. Various security and authentication methods or techniques are applied to secure the iris template. The proposed study implements the specific feature extraction and pattern recognition techniques on the preprocessed image so that security and reliability of the system could be raised. The primary goal of our work is to enhance accuracy and efficiency of the iris recognition system. The results of the work prove that the proposed system is highly effective in providing authenticity along with successful identification of the gender of the person. The gender classification of the data could decrease the computational time required to search the databases and enhance the system speed. To evaluate the accuracy of the system comparison is conducted in three sets. Various parameters such as precision, MSE, recall etc. are evaluated to analyze the efficiency of proposed mechanism. The results prove that the accuracy of the proposed system is approximately 95% which is higher as compared to the traditional techniques used.

The future implementations in proposed work could include feature selection and deep learning mechanism. The feature selection mechanism could minimize the complexity and provide better applicability into the system. Further reduction in computational time could be obtained. The deep learning concept could enhance the feature compatibility of the system such that the feature count to be extracted from each sample could be decreased without deteriorating the overall efficiency and accuracy of the system.

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