

Novel Retina Recognition System Using GUI

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Abstract:

A retina recognition system is presented in this paper using AWN and KNNRF classifiers that are simulated with GUI environment in MATLAB 2015 b. The result using guiare displayed for more efficient and accurate viewwith STARE(Structured Analysis of the Retina) database images. The paper also summarizes fundamental procedures in the processing of input retinal image. AWN(Adaptive Weighted Neighbor) classifier is used to detect blood vessels from retinal fundus image takes into consideration, the spatial distribution features of each pixel to form a feature vector. Along with the above-mentioned process, a new technique for Retinal Recognition System based on GUI is proposed by comparing the angles between the bifurcation point of the blood vessels using a hybrid KNNRF Classifier for Retina Recognition system. The algorithm's operation has shown that it can successfully perform image recognition and thus be controlled via its push button on the GUI screen.

Keywords: Retina, AWN, KNNRF Classifier, GUI

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I. INTRODUCTION

Image processing deals with image or video frame processing. It enhances essential image characteristics while attenuating information that are irrelevant to a particular application. Image processing contains either adjusting the nature of an image to optimize its human observation pictorial information or making it appropriate for machine interpretation [1,2].Graphical User Interface (GUI) is a visual console for the system and presents the user with a perfect view of the procedures they can execute. MATLAB programs are generallyapplicablefor image processingand color detection that involves of a user - friendly graphical interface that is useful to those who are not well known toMATLAB programs that run behind every image processor.

With the rapid growth of computer technology science, it was essential to display or store a high

amount of hospital medical details in a digital image fashion that obviously causes damage and deflection of medical images [3]. MATLAB is a commercial mathematics software introduced by the company Math works and is now extensively included in engineering computation, control system layout, image processing, signal retrieval and processingfinancial designing and analysis[4].Currently, the design of the GUI is based on MATLAB and has been used to solve numerous computational mathematics problems domestically and internationally[5,6], such as online development and evaluation of the ECG signal[7], sports data supervising and video interface design[8], synchronized acquisition of force calculations and Doppler ultrasound musculature images [9]and curriculum programming, etc. MATLAB GUI's optimally integrated environment for developing an X-ray image user interface that is advantageous for

medical workers. The medical field requires the use of many forms of imaging structures to gather data from patients and then conduct a precise diagnosis. Medical imaging systems vary in many ways, but they all necessitate the same tools to process and analyze the collected data. The aim of this project is to evolve a MATLAB-based GUI that reads, exhibits and structures a scalar digital volume data as per the needs of the user and international standards [10].

- (1) Import and export of common file formats (MATLAB, binary, .gif) and international standard format (DICOM [11];
- (2) Bi - dimensional and tri - dimensional data simulation in accordance with international standards [12], including the option of selecting among conventions on radiological or neurological medical watching widely introduced by medical practitioners.
- (3) Statistical analysis focused on slice or volume.
- (4) Image analysis: rigid transformations, data masking and filtering, together with recording and fusion of images.

AWN takes into consideration, the spatial distribution features of each pixel to form a feature vector. A vector of features is generated for each pixel of every image of retina from the dataset that contains eight values of features those are the green channel image intensity of pixels, the local maximum of the magnitude gradient, the local maximum of the highest eigenvalue, energy, inertia, contrast, correlation, moment of difference and homogeneity. Using these features, a vector of features is formed. AWN classifies the input retinal image based on the features extracted and matches the features with the trained features.

II. Software Description and Analysis

Image processing operations are approximately categorized into 3 main categories, Initialization of image, Image pre-processing, extraction feature and thinning process. This instruction shows the dialog window for the GUIDE Quick Start. Then select a

push button to open an existing GUI, the main page of which is shown in Fig. 1.

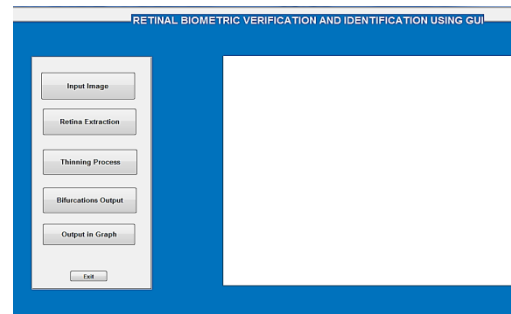


Fig. 1 Main page of GUI

Fig.1 shows that the GUI is configured to perform a number of functions that serve the software's goals. Six push buttons on the left side refer to perform the various operations such as Extraction of features, thinning process and detection of bifurcation points. To import an image from a file or initialize the input image, the input image button is applied.

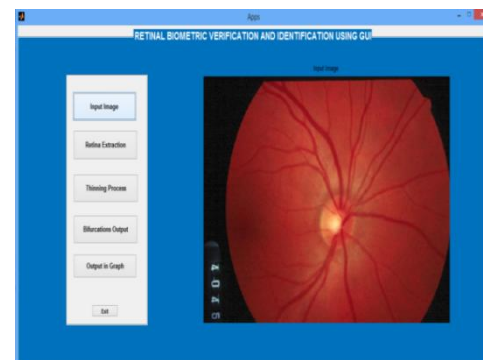


Fig. 2 Loading input image in GUI

The input image on the GUI screen is placed above the operator list as illustrated in Fig.2. Notice the 'Feature Extraction' push-button. An input image may be extracted to detect and extract its contours using operation of feature extraction. Also extract the small elements from the retina image.

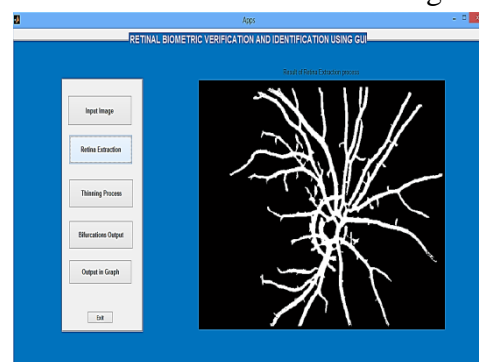


Fig.3 Feature extracted image in GUI

The import of an image and the operator [13-16] selection from the displayed points will make images to appear on both sides of the list. Input and output images can be saved in the file the user needs to select. Additional functions, including other mask operators, may be applied to the similar or other image. A still image can be activated and stored in a file, ready for import, and the online camera can be pushed, the push button on the right-hand side of the GUI display. The picture feature extracted is shown in Fig.3. Thinning operation can then be implemented to an input image to detect and extract its edges. As shown in Fig.3, the small elements are even extracted from the image of retina. The extracted image then takes the process of thinning where the vessels are thinning as presented in Fig.4.

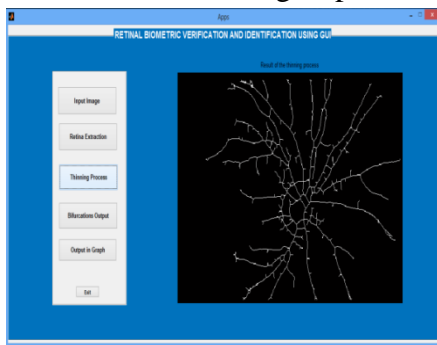


Fig. 4 After Thinning image in GUI

After completion of the thinning process, angles of the retina blood vessels will be calculated. The above described procedure is applied on Fig. 4 which results in Fig. 5.

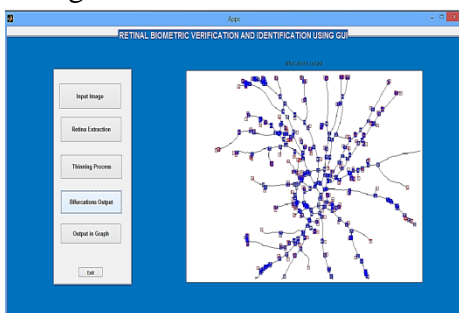


Fig. 5 Bifurcation output of retina blood vessels in GUI.

III. Outputs of Database of Stare

Fig.6. (a) represents input Image of retina used from database of STARE and Fig. 6.(b) represents Feature Extracted of image from STARE using GUI.

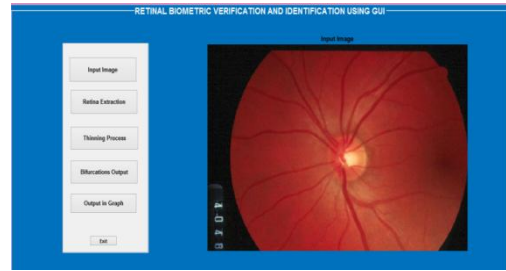


Fig. 6(a) Loading input image from STARE in GUI

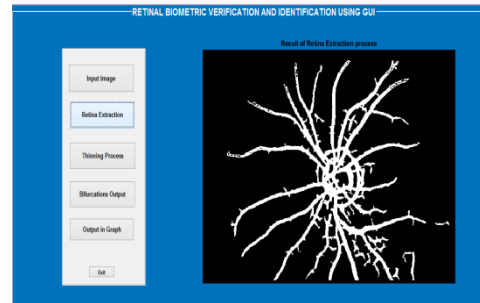


Fig. 6(b) Feature extracted image from STARE in GUI

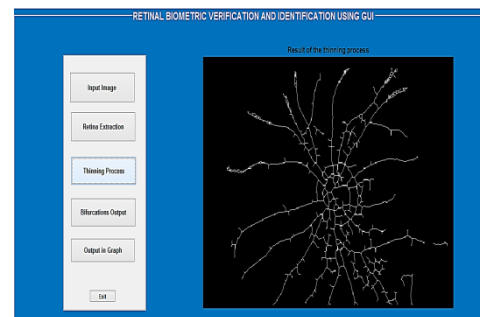


Fig.6(c) After Thinning image from STARE in GUI

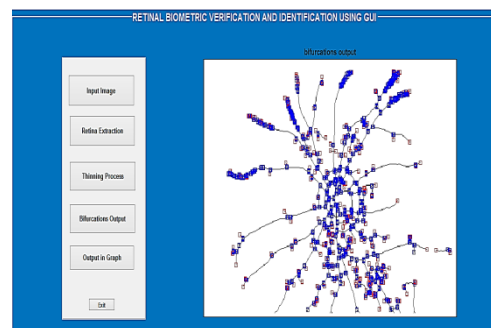


Fig. 6(d) Bifurcation output of retina blood vessels from STARE in GUI.

Fig.6. (c) shows thinning process of extracted image using GUI, Fig. 6.(d) Shows the bifurcation points and breaking points of Image using GUI.

In analyzing both images, pixel by pixel, the KNNRF, which needs the same size input images (pixels), with a view to finding out whether or not

the images match. In matching, the Hybrid KNNRF classifier is used between the data base vector and the input image feature vector. KNN is supervised learning and geometric method that consists of calculating the Euclidean Distance (ED) between the stored features of the retina training set and all the obtained features of the testing set. The parameter K must be determined by the user, KNN, where $N = \{1,3,5,7, 9, \dots\}$. KNN algorithm is implemented by selecting $K=3$. Random Forest algorithm with various number of trees are used to classify the extracted features. Once specifically trained, by placing it down each of the trees in the forest, Random Forest classifies a new feature from an input feature vector. By consistently voting for a certain class, every tree provides a classification selection. Therefore, the forest prefers the most votes classification (over all forest trees).

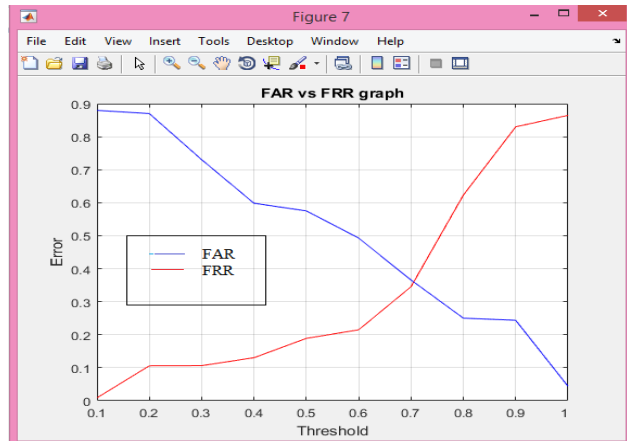
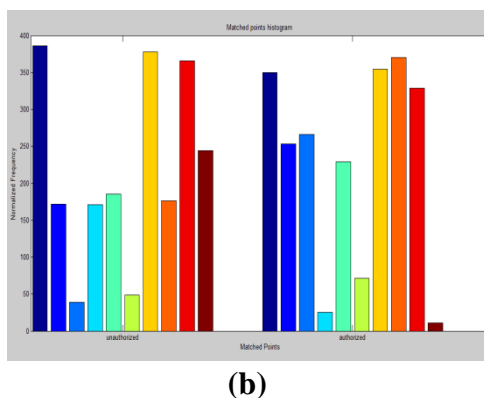
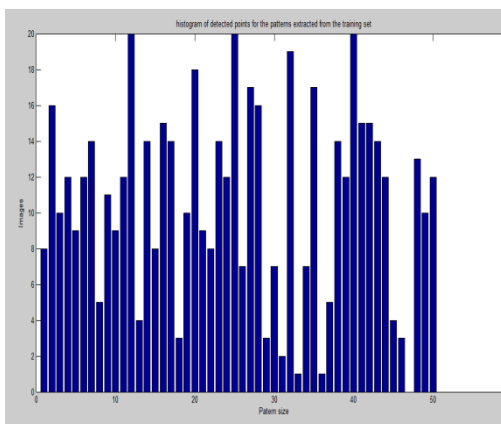


Fig.7 Performance measure (a) Normalized frequency vs matched points, (b) Pattern extracted image from training test, (c) FAR vs FRR

Fig. 7 (a) presents the performance of Histogram detected points for the pattern from training set. The KNNRF matching algorithm displays a message in command window about Matched or non-matched condition. Fig.7(b) shows the Matched Points histograms and (c) shows FAR vs FRR. If the value of threshold is lowered, the images are deemed not to match. Implementation of the entire system could be divided into several steps. Possible image processing functions have been realized and tested in an image editor based on the MATLAB GUI.

IV. Conclusion

A retina recognition system is presented in this chapter using AWN and KNNRF classifiers that are simulated with GUI environment in MATLAB 2015 b. The result using GUI are displayed for more efficient and accurate view with STARE database images.

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