Human Skin Texture Analysis using Fuzzy based Pixel Matching Algorithm

L.Sathiya.,M.Sc.,M.Phil.,Dr.V.Palanisamy.,
Professor & Head., Department of Computer Applications,
Alagappa University – Karaikudi.
Department of Computer Applications, Alagappa University – Karaikudi.
sathyass660@gmail.com

***Abstract*— The recent advancements of sensible evaluation systems, human skin-like texture is essential for physical contact with humans. In Image processing, based on some parameters the texture explore taken place. Skin plays important role in the protection of human body since it boundary by means of the Environment. It holds many functions like insulation, regulation of temperature, synthesis etc. This paper proposed a new type of human skin texture analysis with Fuzzy Based Pixel matching algorithms and a replica of human surface observation. The skin texture System is designed by rivalling the surface shape pattern. To assemble a model of skin-like surface discernment through multivariate investigation between physical parameters and sensible factor scores. It can show that, what factor is imperative for human skin-like surface. This technique implements a pixel-matching algorithm and Fuzzy Logic, Reason is to point out the skin level and skin strength according to Contrast, Correlation, Energy and Homogeneity. The experimental analysis consists of the conversion of the image into sharpened image with noise removal and then fuzzy logic is implied. From the outcomes got the effectiveness of the proposed conspire is clarified with some execution measurements.**

Keyword - Fuzzy Logic, Skin Texture analysis, Pixel Matching Algorithm.

I. INTRODUCTION

The human skin texture analysis is appearance of skin surface. The features of the skin texture such as amount of collagen, hormone changes and the skin wrinkle changes etc. Because age is also a factor for skin texture changes it is also considered as one of the important feature. Based on the location also the texture gets changed. Image processing tools are used in the arena of texture analysis, since it is considered as a scanned image [5].

In the case of image processing, the consideration here is the appearance of the texture from the camera view, recording parameters and direction of the view. The objective is to have a good image analysis, which must be applied to surfaces with irregular non periodic patterns. In the advanced picture preparing, a few techniques have been created to recognize them. The texture inequity can be obtained by choosing a set of attributes, the texture features, which account for the spatial organization of the image [3].

Fuzzy logic is one of the most important problems solving technique that comprises of the mathematical framework to solve the improbability of information. Fuzzy image handling is utilized for the portrayal of the images, their segmentation, and features as fuzzy sets [10]. Fuzzy classifier is based on the concepts of fuzzy rules, used for the classification of the skin and non skin pixels. Regarding this, many approaches of fuzzy skin detection uses various fuzzy classification methods like fuzzy logic methods, fuzzy interference system, Modified Fuzzy C Mean Algorithm, and Linear Matrix Inequality (LMI) Fuzzy Clustering [2].

The paper is summarized as follows. Section 1 provides a detailed description of fuzzy logic and skin texture. Section 2 consists of the related works done in same skin texture analysis. Section 3 consists of the proposed methodology, and Section 4 the fuzzy technique for texture analysis discussed and section 5 consists of the conclusion.

II. RELATED WORK

In 2013 [7], Rajandeep Kaur and Vijay Dhir proposed a fuzzy logic based new method for the face detection method is taken place. The algorithm implements the methodology on still colored images. It is done by combining the skin detection method with template matching method. The edge Recognition is performed with fuzzy edge location strategy, by checking the image utilizing 2 * 2 floating cover systems. The algorithm yields better results when compared with other classic detection algorithm.

In 2013 [1] Afia Nazir et.al explains about Fuzzy Based Skin Detection and Segmentation, provides the performance evaluation of two well-known fuzzy based skin detection techniques, fuzzy inference Framework and Modified Fuzzy C-Mean calculation (MFCM) on a paradigm dataset. For the inference system the authors used the Fuzzy Unordered Rule Induction Algorithm (FURIA) implementation, and Brute Force Search Algorithm implementation for the Modified Fuzzy CMeans algorithm.

In 2012 [4] I. A. G. Boaventura et.al examine about Fuzzy Classification of Human Skin Color in Color Images, in which a fuzzy approach for the characterization of skin shading tones in shading picture is exhibited. It is done in two steps. First is the selection of images with different skin tones and then it is followed by color variations. Also, their defining tones in relation to the RGB color system were used for the definition of the fuzzy sets as well as the inference rules implemented into the system.

III.PROPOSED METHOD

A. Pixel Matching Algorithm

Two important drawbacks in the existing system are the matching criterion and the conversion of images [8]. In this proposed work, a new Pixel Matching algorithm with novel approach is developed. It is started with a careful analysis of the properties of the continuous disproportion in the space image and derives a new pixel matching cost value.

After the procedure, utilize a symmetric matching procedure that utilizes deceivability limitations to allocate imbalance to an extensive portion of pixels with insignificant presumptions. While the matching operates on numerical attributes, throughout the process, the equality in dataset is maintained.

B.Fuzzy Based Image Analysis

Based Image Analysis is a type of many-valued logic; it manages thinking that is inexact instead of matured and corrects [6]. Fuzzy logic is a form of multi-valued reason in which the truth values of variables may be defined as any real number between zero and one. The Fuzzy control Systems are a development of fuzzy logic that allows for extremely precise control of robotic systems. The Fuzzy set is the foundation of a non-added substance instability hypothesis, and o a adaptable device for both semantic and numerical displaying and fuzzy rule based framework.

C. Performance Metrics

Contrast: It measures the local variations in the gray level co-occurrence matrix. Contrast is zero for a constant image.

Correlation: It calculates the combined possibility incidence of the specified pixel pairs. Correlation is 1 or -1 for a perfectly positively or negatively correlated image. Correlation is N for a constant image.

Energy: Provides the sum of squared elements in the matrix value. Energy is 1 for a constant image.

Homogeneity: It determines the nearest distribution of the elements in the crosswise. Homogeneity is 1.

D. Proposed Methodology

A measurable technique for analysing surface that considers the spatial relationship of pixels is the Gray level co-occurrence Matrix (GLCM). It capacities describe the surface of a picture by ascertain) how frequently combines of pixel with particular esteems and in a predefined spatial relationship happen in an image [9], creating a gray scale matrix and then extract measures from this matrix. The following operations were taken place in the texture analysis.

1. Image Acquisition
2. Filtering the image using the Sharp filtering technique
3. Pixel matching algorithm implementation to find out the similar pixels.
4. The analysis is done using the fuzzy logic and fuzzy sets.
5. Finally the image is turned back to its original format.

In the image acquisition process, the input image is provided. The given input skin texture may or may not contains the disease infects [9]. The image is now entering into the filtering step. The filtering is used to remove the impurities and noise from the given image. The sharp filtering technique is used since to completely reduce the impurities so as to get the clear image texture.

The resolution of an extracted region may still be high. In this case, application of the matching algorithms can be impractical due to the high computational complexity. Therefore, the size of extracted images must further be reduced. It can be done by scaling, which is the process of resizing a digital image through changing its pixel resolution. To reduce the image size, down sampling is performed. During this process, new pixel values are found through interpolation of old ones. This results in better matching between the images from different classes and consequently leads to the increase of the recognition error. Therefore, the choice of an appropriate image scale must be viewed as a compromise between the quality of recognition and the computation complexity.

This is then followed by the pixel matching algorithm, to find out the similarity between the skin textures. The nearest textures were clustered based on the similarity between their pixels. The similar pixels were then clustered and organized. The fuzzy logic is applied to the process. Based on the specified condition, the diseases are classified. The disease is clustered and the condition based on the ABCD (Area, Border, Color, and Diameter) rule. When the image is matched on the database based on this rule the diseases is identified.

The acquired image is in jpeg format and is read in Matlab .Now the input images are converted into gray scale image and then it is enchased by using histogram equalization algorithm. The image thus obtained underwent several processes such as cropping, down sampling etc., to remove the noise and outliers from or may the image.

Cropping is defined as a process of extracting correct image region without the outer parts of the image. Cropping helps the image to accentuate the content which is relevant for recognition. As matching algorithms proceed on the whole pixel grid and deform the entire image, undesirable image areas, has to be preliminarily eliminated.

The accuracy of cropping has direct influence on the performance of the matching algorithms discussed in this work. The block diagram for the proposed architecture is given as follows:

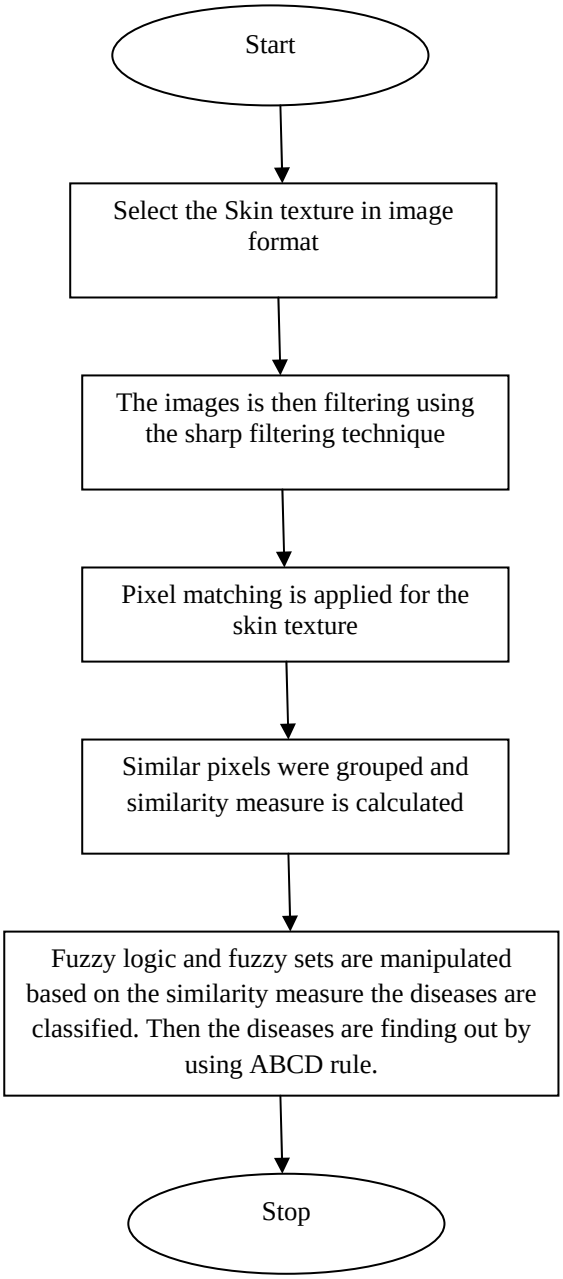

Figure 1. Architecture Design of Proposed Method

IV. EXPERIMENTAL ANALYSIS

The implementation work is completed through java. The input image is fed into the image acquisition area. Then it is filtered using the sharp filtering technique and remove the impurities and noise from the image. The noise free image is now, search for its pixel matching between the existing and the filtered image texture. The original image performance metrics were calculated fist before filtering the image. The factors considered here are the energy, correlation, contrast and homogeneity.

Then, sharp filtering of the given input image taken place. After, the image is converted to show the pixel textures in proper way without any blur effects. Now, the pixel matching similarity is calculated. Then, condition is checked for the multivariate analysis. The fuzzy logic shows the conditions and their appropriate results for the obtained results. The graph shows the detected skin problem level and their specifications.

Figure 2. Original Image

Figure 3. Filtered Image

Figure 4. Converted Image to Pixel matching

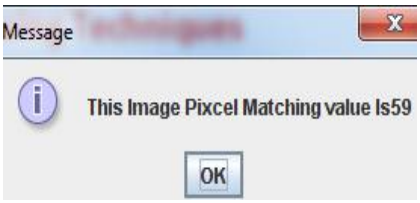

Figure 5. Pixel matching value is calculated

Figure 6. Fuzzy Logic calculated and disease detected

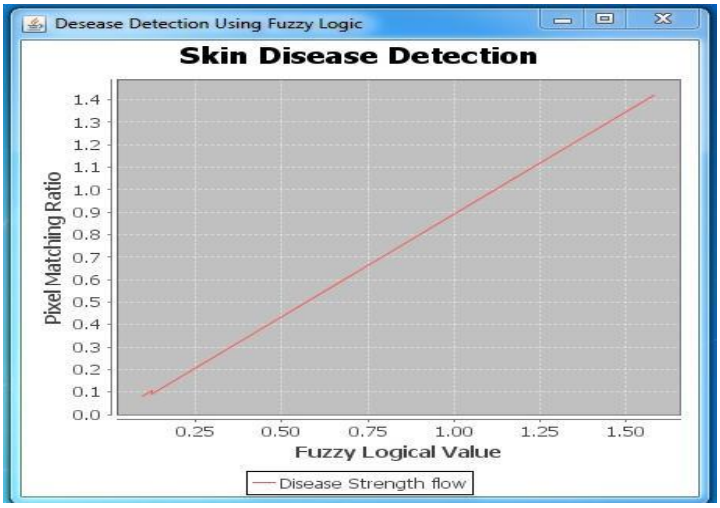

Figure 7. Fuzzy logic and pixel matching ratio graph

The following table shows the performance metrics calculated for some input images. The correlation, energy, contrasts and homogeneity of the image is calculated.

TABLE 1. Performance Analysis

ID	File Name	Contrast	Correlation	Energy	Homogeneity
1	dd.jpg	1.58	1.23	0.095	0.123
2	dd3.jpg	1.65	0.143	0.132	0.143
3	dd9.jpg	1.84	0.159	0.154	0.159
4	dd2.jpg	1.63	0.115	0.101	0.115
5	dd1.jpg	1.9	0.133	0.122	0.133
6	dd7.jpg	1.78	0.182	0.191	0.182

V. CONCLUSION

In this proposed work, the skin texture is computed using the fuzzy metrics and based on that the results were evolved. The gray scale functions differentiate the texture of an image by manipulation how repeatedly pairs of pixel with particular values and in a specified spatial relationship occur in an image and then extracting statistical measures from this matrix. Further, the image performance metrics are also computed in order to correlate the skin symptoms to the skin texture images. From the performance metrics analysed, the energy and the homogeneity of the obtained image are clear. The contrast of the image does not vary in a larger scale so that the image distortion is low. From the experimental results shows above, we improve that the fuzzy cluster method can provide an effective mechanism in identifying skin diseases. The future work will be based on developing algorithms to identify various other skin diseases, to improve the overall efficiency and to further reduce the computational time.

REFERENCES

[1] Afia Nazir, Laiq Hassan, Alamzeb M. Zai, and, Rehanullah Khan, “Fuzzy Based Skin Detection and Segmentation “, in International
[2] Journal of Computer Science Issues, Vol. 10, Issue 3, No 1, May 2013 , pp:219 -222.
[3] Ben Hmida, M. Nat, Ben Jemaa,“fuzzy classification, image segmentation and shape analysis for human face detection”,Electronics, Circuits and Systems, 2006. ICECS '06. 13th IEEE International Conference .
[4] D. Brown, I. Craw, and J. Lewthwaite, “A SOM Based Approach to Skin Detection with Application in Real Time Systems,” in British Machine Vision Conference, Manchester, United Kingdom, Sep. 2001.
[5] I. A. G. Boaventura, V. M. Volpe, I. N. da Silva, A. Gonzaga, “Fuzzy Classification of Human Skin Color in Color Images”, in iris.sel.eesc, 1154.
[6] Damanpreet Kaur, Prabhneet Sandhu, “Human Skin Texture Analysis using Image Processing Techniques”, in International Journal of Science and Research (IJSR), India, pp:17 – 20.
[7] Fernando Roberti de Siqueira, William Robson Schwartz and Helio Pedrini, “Adaptive Detection of Human Skin in Color Images”, pp:1-5.
[8] Rajandeep Kaur, Vijay Dhir, “Fuzzy Logic Based Novel Method of Face Detection”, in International Journal of Latest Research in Science and Technology, Volume 2, Issue 1 :Page No.558-566 , January-February (2013).
[9] A. Sparavigna ,and R. Marazzato, “An image processing analysis of skin textures”, pp:1-9.
[10] M.H. Yang and N. Ahuja, “Gaussian mixture model for human skin color and its applications in image and video databases,” in SPIE: Storage and Retrieval for Image and Video Databases, San Jose, CA, USA, Jan. 1999.
[11] Ebtihal AlMansour et al., Fuzzy Contour based Automatic Segmentation of Skin Lesions in Dermoscopic Images, IJCSNS International Journal of Computer Science and Network Security, VOL.17 No.1, January 2017, page. No. 177-186.