



Détection of Psoriasis Skin Disease using Image Processing and Hu Moment Algorithm

الكشف عن مرض الصدفية الجلدي باستخدام معالجة الصور وخوارزمية العزوم

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الملخص

مرض الجلد (الصدفية) قد تصيب من 2 إلى 3% من سكان العالم، فيما قد تحدث الالتهابات المفصليّة الصدفية مع 30% من المرضى المصابين بالصدفية، وقد يسبق التهاب المفاصل البقع الجلدية في بعض الأحوال، لاسيما أن التهاب المفاصل الصدفية هو شكل من أشكال التهاب المفاصل الروماتيزم. الهدف من النظام وهو الكشف عن مرض الجلد باستخدام معالجة صور الخطوات التي تم استخدامها في هذه العملية ثلاثة خطوات وهي. الخطوة الأولى هي المعالجة المسبقة (المستوى الرمادي، عتبة الصورة) الخطوة الثانية استخراج ملامح مرض الجلد باستخدام خوارزمية العزوم والخطوة الثالثة هي تحديد نسبة مرض الجلد لدى الإنسان. باستخدام النسبة المئوية. الكلمات المفتاحية: الصدفية، الجلدي، خوارزمية العزوم.

Abstract

Skin disease (psoriasis) may affect 2 to 3% of the world's population, while psoriasis arthritis may occur with 30% of patients with psoriasis. Arthritis may precede skin spots in some cases, especially as psoriasis arthritis is a form of rheumatic arthritis.

The goal of the system is to detection disease using algorithm Hu moments, and the steeps that were used in this process are three steps: The first step is pre-processing (gray level, image threshold), the second step is extracting the features of skin disease using the moment algorithm and the third step is determining the percentage of skin disease in humans. Using Percentage.

Keyword: Psoriasis, Cutaneous, Moments algorithm.



1.Introduction

Psoriasis is the most common form of psoriasis, causing dry and prominent skin spots covered by silver or grey crusts. Their shape may vary depending on the colour of the skin, as they vary between pink on white skin to brown or grey on brown or black skin.

Psoriasis is widespread in some areas of Libya and classifies psoriasis as an autoimmune disease; That is, they show the result of the body accidentally attacking healthy cells skin cell production accelerates, irritating the skin and increasing the number of dead skin cells The symptoms of psoriasis vary from person to person, and in general, individuals with this disease have periods where they feel better and other periods where they feel less and worse, These periods depend on the person's lifestyle.

There are many reasons that cause some problems in skin; it might contain lack of care in preserving the restless, skin, utilization of a few products which will not be altered to the skin or owing to little diseases. Frequently a variation in conditions of the climate that provides additional collision on the skin causes few problems. Thus, proper maintenance or testing precisely what type of problems occurred in the skin is very important to be sustained (S & M, 2020). Skin is more sensitive to the human body and the main cause of the prevalence of skin diseases is a changing climate causing fungi, sensitivity, bacteria and viruses ,

Sometimes skin diseases take a lot of time to detect, so there is no medical knowledge and it is difficult to diagnose the disease , It is therefore necessary to detect early so that the spread of the disease reduces and does not cause the spread of the disease between people and in some cases the disease spreads in the person with a feeling and even the dermatologist is unable to diagnose this disease and this leads to more expensive laboratory tests.

There is a shortage of dermatologists, especially in rural areas, so early identification of the type of dermatology is required. (Gautam, et al., 2023)

2. LITERATURE REVIEW

There are many research that classifies dermatology and research is :

(Gaikwad, Sonayallu, Tilekar, & Deokar, 2020).The Used in this algorithm system Convolutional Neural Network and naive Bayes classification To explain the highest taste. (AlDera & Ben Othman, 2022). this system is used to detect dermatological diseases and this system used adaptive filter to remove noise after which it was converted into grey color and then the image was converted into threshold technology and then GLCM technology was used to extract features and after SVM technology was used and was 89% accuracy. (Patil, Buchkule, More, & Abhale, 2020).This paper shows the detection of skin disease based on a machine learning model to classify images infected with ANDROID. This app has succeeded in detecting



diseases to reduce time and faster solution in the treatment of skin diseases. (Elngar , Kumar , Hayat , & Churi, 2021) .This paper contributes to the detection of dermatology in order to identify the problem of skin disease in order to reduce medical treatment with people spreading, especially in rural areas this paper uses the SVM algorithm.

(Gautam, et al., Early Skin Disease Identification Using Deep Neural Network, 2023)

This system consists of two phases, the first to detect the disease using techniques, k-assembly means, and the success rate was 95.99% and the second using synthetic neural networks. The success rate was 94.016 per cent.

(BORDOLOI, KALIYAPERUMAL, RITONGA, JAWARNEH, KASSANUK, & HOQUECOTA, 2023)

The is use in this system a 98.8% resolution SVM algorithm. Also use KNN algorithm with resolution of 91%.

3. Problem Statement

There are many cases of skin disease that are difficult to diagnose according to lack of experience despite each doctor giving different information from the second doctor.

4.Objective

The Goal from this system classifies skin disease (psoriasis) and summarizes the main precipitation on the following points :

- 1- Study of skin disease (psoriasis) in the infected human body
- 2- Identification of the infected part of the patient
- 3- Determination of the patient's percentage using the Hu moment algorithm

5. Importance Of Research

The current system using the torque algorithm classifies skin disease (psoriasis) with precision between 79%, 85% and results are better than previous works and accuracy has been achieved up to 89.75

6.Methodology

6.1Generalized View

The proposed framework consists of following main steps which are

- 1) Give image of input skin diseases .
- 2)Convert it to grey scale image and thresholding .
- 4) Extracting features by using moments
- 5) matching ratio based on features

The following figure shows the phases of the system

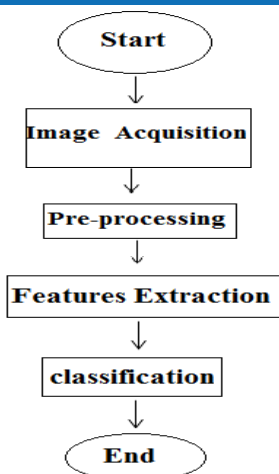


Fig 1 "steps of the proposed system"

6.2 Image Acquisition

The image is obtained using the camera or scan image.

6.2.1 Samples of study

Study samples collected from Tripoli Medical Center "Dermatology Department" Health School

from September 2022 to March 2023 Fifty samples The following images show a portion of the samples collected during this period



Fig 2 Images from skin psoriasis

6.3 Image Pre-processing

In this phase two steps are formatted as shown :

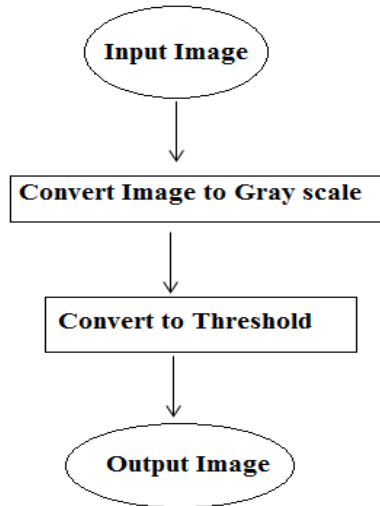


Fig 3 step pre-processing

6.3.1 Gray scale images

At this step, the colored image of the affected skin was inserted by the scanner

It will turn into a gray-level image. Each image of an infected skin will be converted into a colored entrance Gray scale image using severity relationship as shown in eq 1.

$$I = (R + G + B) / 3 \quad (1)$$

$$B(i, j) = \begin{cases} 255 & \text{if } I(i, j) > T \\ 0 & \text{if } I(i, j) < T \end{cases}$$

$I(i, j)$ is the gray level of the pixel and T is a specific threshold value. Obtaining T automatically

1. Select a value of Threshold
2. Segment the image using the obtained T . this will create to groups of pixels. G_1 with all pixels with values $\leq T$, and G_2 with all pixel with values $> T$.

6.3.2 Threshold Filter

This filter is used to convert image to black (0) and white (255). (Gonzalez & woods, 1992)

The goal is to remove unnecessary information by using specific threshold as

3. Compute the average U_1 and U_2 for the two regions G_1 and G_2
4. Compute the new threshold $T = 0.5 (U_1 + U_2)$
5. repeat steps 2 to 4 until the change in T is smaller than predefined value

6.4 Feature Extraction Using Hu moments

The mean goal of this process is to come out for features that distinguish Skin Disease Detection image so after trying using different parameters and functions.

For a 2-D continuous function $f(x, y)$, the moment of order $(p+q)$ is defined as described in eq.(3):

$$m_{pq} = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x^p y^q f(x, y) dx dy \quad (3)$$

A uniqueness theorem states that if $f(x, y)$ is piecewise continuous and has nonzero values only in a finite part of x, y plane, moments of all orders exist and the moment sequence

m_{pq} is uniquely determined by $f(x, y)$.

Conversely m_{pq}

$$u_{pq} = \int \int (x - \bar{x})^p (y - \bar{y})^q \cdot f(x, y) \cdot dx dy \quad (4)$$

Where

$$\bar{x} = \frac{m_{10}}{m_{00}} \text{ and } \bar{y} = \frac{m_{01}}{m_{00}} \text{ for digital image}$$

$$u_{pq} = \sum_x \sum_y (x - \bar{x})^p (y - \bar{y})^q \cdot f(x, y) \quad (5)$$

The normalized central moments, are defined as:

$$\eta_{pq} = \frac{\mu_{pq}}{\mu_{00}^\gamma} \text{ where } \gamma = \frac{p+q}{2} + 1 \text{ for } p+q = 2, 3, \dots$$

A seven invariant moments can be derived from the second and third moments:

$$q_1 = n_{20} + n_{02} \quad (6)$$

$$q_2 = (n_{20} + n_{02})^2 + 4n_{11}^2 \quad (7)$$

$$q_3 = (n_{30} + 3n_{12})^2 + (3n_{21} + n_{03})^2 \quad (8)$$

$$q_4 = (n_{30} + 3n_{12})^2 + (n_{21} + n_{03})^2$$

$$q_5 = (n_{30} + 3n_{12})(n_{30} + n_{12}) [(n_{30} + n_{12})^2 - 3(n_{21} + n_{03})^2] + (3n_{21} - n_{03})(n_{21} + n_{03}) [3(n_{30} + n_{12})^2 - (n_{21} + n_{03})^2] \quad (9)$$

$$q_6 = (n_{20} - n_{02}) [(n_{30} + n_{12})^2 - (n_{21} + n_{03})^2]$$

$$+ 4n_{11} (n_{30} + n_{12}) (n_{21} + n_{03}) \quad (10)$$

$$q_7 = (3n_{21} - n_{03})(n_{30} + n_{12}) [(n_{30} + n_{12})^2 - 3(n_{21} + n_{03})^2] + (3n_{12} - n_{30})(n_{21} - n_{03}) [3(n_{30} + n_{12})^2 - (n_{21} + n_{03})^2] \quad (11)$$

6.5 Classification Using Matching Ratio

The following chart shows the steps Classification.

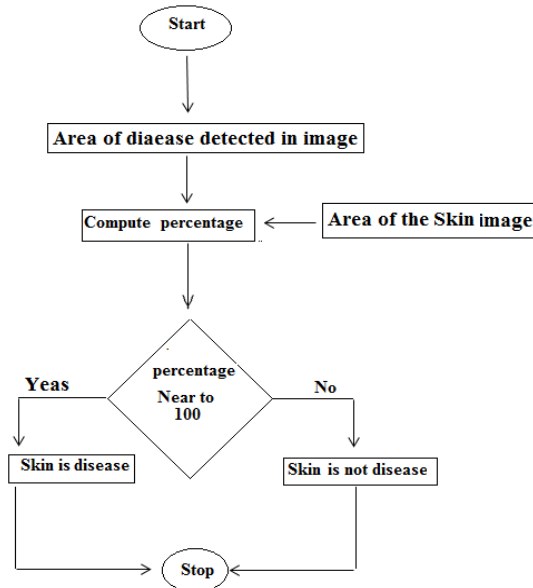


Fig 3 The step Classification

The total area of the skin and the affected area can be found the total area infected in percentage.

$$\text{percentage} = \frac{\text{area of disease detected in image}}{\text{area of the Skin image}} \times 100$$

7.Result

Main interface of the system as illustrated in 4 format

Fig4 The Skin Authentication

Note: T= Threshold Filter

Feature Extraction Using Hu moments

The "load" Image Skin is shown in Figure.(5).

Fig 5 Load the image for the purpose of the application

The next part explains Thresholding and grey scale operation is shown in fig.(6).

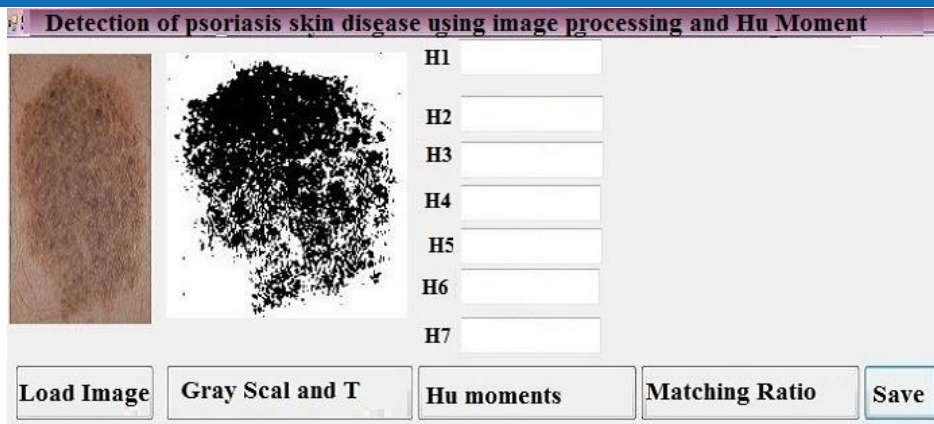


Fig.(6) Convert to grey level and thresholding operation.

The following figure shows the phase moment Operation (feature extraction) is shown in fig.(7).

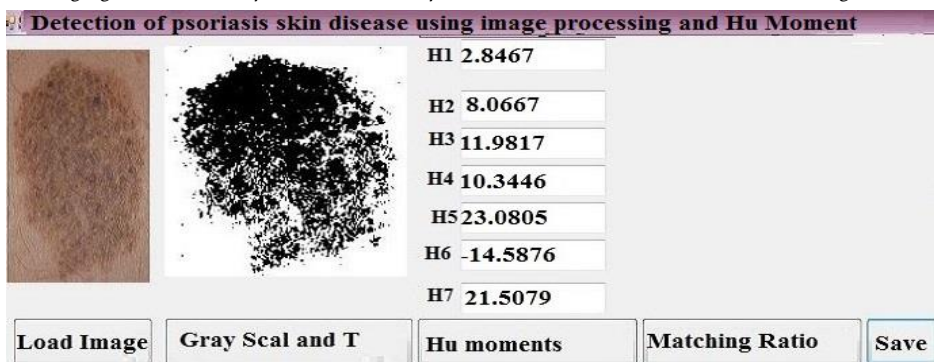


Fig.(7) The Moment Operation (feature extraction)

The following figure shows the phase matching ratio may be shown as fig.(8):

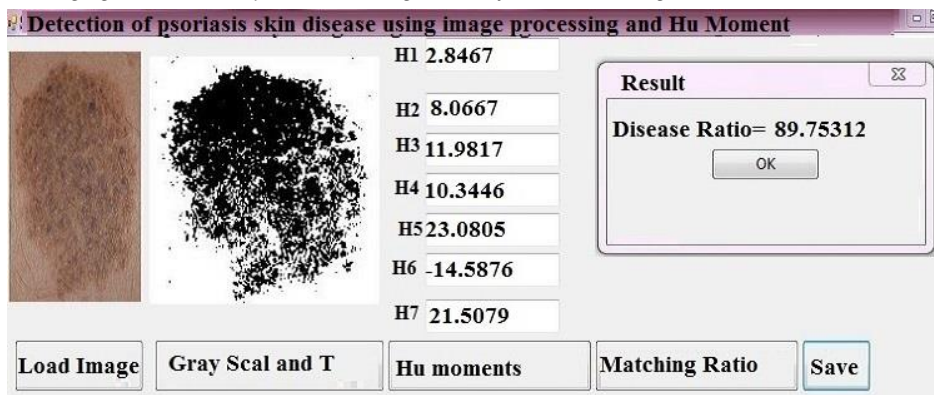




fig.(8): The percentage of correspondence between the disease area detected in the image and the area of the skin image

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8. Software, Hardware :

8.1 Hardware Requirement:

1.Hard disk: 500GB

2.Ram: 4 GB

8.2 Software Requirements:

1. Windows 7

2.visual Basic . net 215

Conclusion

In this system, the Hu moments algorithm was used for the purpose of discovering the percentage of skin diseases (psoriasis) because it is more prevalent, in order to help doctors to explain to them the percentage of the disease that the person suffers from, and if the percentage is more, the treatment of the infected person will be changed. the result reported better classification accuracies for the psoriasis disease and percentage accuracy is 89.75%.

FUTURE WORK

The use many from Feature Extraction in order to compare between Hu moments using percentage of correspondence to determine the accuracy.

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