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Skin Disease Detection through Contour Detection Techniques

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A B S T R A C T

Millions of individuals worldwide suffer from skin sores. They are simple to identify because of their often-odd texture and colour, but are challenging to diagnose because several forms of lesions have symptoms that are identical. The purpose of this study is to compile and evaluate computer vision applications in skin lesion research in an effort to promote the creation of automated systems for the detection of skin diseases. Several skin image datasets have been created and made available online to help dermatologists with clinical diagnosis. Such initiatives have encouraged researchers and medical professionals to create automated methods for diagnosing skin conditions using picture segmentation and classification techniques. The main processes in skin lesion diagnosis are outlined in this essay. In this work we have used Mean and Median image smoothing techniques to detect the affected area of skin by any disease like fungal infection, virus, bacteria, allergy or skin cancer. The ongoing evolution of trustworthy and efficient computer-aided skin disease diagnosis systems is benefited by such technological study.

Keywords: Contour Detection, Disease Detection, Median Filter, Mean Filter

1. Introduction

Overall, the majority of regular people are unaware of the type and stage of a skin illness. Some skin conditions don't manifest signs for several months, which makes them worsen and progress further. The general public's ignorance of medicine is to blame for this. Occasionally, an allergist (a doctor who specialises in skin conditions) may also have trouble diagnosing the skin condition and may need pricey laboratory testing to determine the exact type and stage of the skin condition. Skin disorders can now be identified much more rapidly and accurately because to improvements in laser and photonics-based medical technologies. However, the price of such a diagnostic is still very high. As a result, we suggest using image processing to diagnose skin problems. This technique uses image analysis to determine the effected area of skin by taking a digital photograph of the probable skin area. We have identified the edges of affected area of skin through image contour detection techniques and mean and median filtering.

2. Related Work

Over the past ten years, AI has advanced quickly in the field of picture recognition by combining techniques like machine learning (ML) and deep learning (DL). Traditional ML and DL techniques can be used to create segmentation and classification systems. When opposed to DL approaches, which take as inputs extracted and chosen features, traditional ML algorithms have simpler structures (yao & Huang, 2022). In picture identification and processing applications, the DL approach may automatically find underlying patterns and pinpoint the most salient and evocative characteristics. This development has greatly encouraged medical professionals to investigate the possibilities for using AI techniques for disease diagnosis, notably for the diagnosis of skin diseases.

The use of big data for assisting image processing applications is crucial for ensuring dependable performance and generalizability. Setting up trustworthy databases is crucial for accelerating the development of image processing applications for diagnosing skin diseases. The International Skin Imaging Collaboration (ISIC) Dataset was developed by researchers from several organisations, and obstacles were held from 2016 to 2020 (Rotemberg, 2021). Finding the deadly skin cancer melanoma is the most typical research assignment.

In order to identify skin lesions from photos, traditional image segmentation techniques include pixel, region, and edge-based approaches. Binary or Otsu thresholding are two pixel-based methods of segmentation that can divide each pixel into two categories, i.e., healthy skin and skin lesions. The low contrast and seamless transitions between lesions and healthy skin, particularly in dermoscopic pictures, can cause these approaches to provide discontinuous results, nevertheless. By merging or extending regions, region-based segmentation can recognise and combine nearby pixels to create skin lesion regions. Growing starts from a point and scans neighbouring pixels to improve region coverage while merging merges adjacent pixels with similar intensities together (Nock, 2004 & Hojjatoleslami, 1998). The range of hues and textures present in each skin lesion makes it challenging to apply these techniques. Intensity differences between adjacent pixels are used by edge-based segmentation techniques, like the watershed algorithm (Levner, 2007), to define the perimeter of a skin lesion. These techniques can be affected by noise from things like hair, skin texture, and air bubbles, which can cause convergence, particularly around noisy points, and lead to inaccurate segmentation findings. In general, when segmenting images with noise, low contrast, and varying colour and texture, standard segmentation methods frequently struggle to produce correct results.

3. Methodology

3.1 Noise Removal

A median filter is used to lessen the amount of noise in an image. Each pixel of the original image is processed through a collection of filters to replace them with the output of the desired operation. The current pixel is replaced with the median of the entire window by the median filter of size 3 X 3 pixels, which has the current pixel at its centre.

The median filter's primary principle is to iteratively replace each element in the signal with the median of its nearby entries. The "window" is the neighbourhood pattern, which moves entry by entry over the entire signal. The simplest window for one-dimensional signals is the first few preceding and following entries, whereas the window for two-dimensional (or higher-dimensional) data must contain all entries within a certain radius or elliptical region.

Taking the mean of all the values in the kernel is the most basic sort of filter. Here, we choose a simple average since we believe that each kernel value has an equal chance of being close to the genuine value. This average is rounded to the nearest whole number because, obviously, the output pixel still needs to have an integer value. An image is blurred using the mean filter to reduce noise. The mean of the pixel values within a n x n kernel must be found. The mean is then used in place of the centre element's pixel intensity. This smoothes the image's borders and reduces some of the noise in the image.

3.2 Contour Detection

The detection of contours is a challenge in the field of computer vision because they are known to be a representative property of imaging objects. It is essential necessary to use contour detection algorithms to carry out practical tasks like item recognition and scene comprehension. A contour can be characterised as an outline that represents or confines the form or shape of an object, as stated in (Ming, 2016). Contour detection makes an effort to derive curves that correspond to the forms of objects from photographs. In actuality, there is no formal scientific definition for the notion of contour; rather, it is based on common experiences among people. Edge and boundary, which correlate to the discontinuities in the photometrical, geometrical, and material characteristics of objects in photographs, are two more notions that are strongly associated with contour. It is thought that making a distinct separation between the three ideas makes it easier to choose features when constructing specific unique detectors. In an image, a boundary is referred to as a contour that denotes a shift in pixel ownership from one item or surface to another. Contours are frequently seen as the limits of fascinating places by some academics. But the production of closed contours and the division of the image into distinct sections are not guarantees made by contour detectors.

Variations in the intensity function are used to represent edges in an image, and low-level image characteristics like brightness or color can be used to identify them. Edge detection is therefore a low-level approach that might be used to achieve the objective of boundary or contour detection. Active contour, often known as snake or deformable model in literature, is a variational approach to contour localisation. The main goal is to minimise a predetermined energy function to transform a hand-drawn curve into a certain line or contour.

3.3 Image Overlay

A computer projection technology called image overlay superimposes computer pictures over the direct view of the outside world that the user has. All of the components of the display system as well as the viewer's head movements are tracked in space. The photos are changed using these coordinates so that they resemble a natural part of the surrounding environment. The visuals can give the impression to the viewer that they are within actual things by making use of semitransparent display technology. Image Overlay is a type of "augmented reality" since it combines digital data with actual images. A typical augmented reality system uses a video camera to capture real-world images, which are then improved with precisely matched computer images and shown on a computer screen.

4. Results and Detections

In order to detect an affected piece of skin from an Image, we have first remove the noise of image. Next we find the boundary of the affected area. Next, we apply image overlay method to get a projected view of the disease affected area. The display/mirror combination creates a flat, two-dimensional virtual image that is identical to the display's surface. The use of a stereoscopic approach to create three-dimensional images is an improvement to the system. This is accomplished by showing the left and right eyes slightly distinct images, simulating what the eyes would experience if they were actually viewing a 3D scene due to their slightly different spatial placements. We get following results on an Image dataset. In the system suggested, a standard database is used for both system development and testing. A framework Fig. 1 depicts the proposed system. This framework does image processing in order to denoise and enhance the image in preparation for statistical analysis. After filtering feature extraction, the texture factor, contour detection, and overlay parameters are calculated to determine the piece of skin which is affected by some disease in the image. Fig. 1 and Fig. 2 illustrates the detection of disease while Fig. 3 depicts that area is not affected by a disease. Rather it is a normal skin.

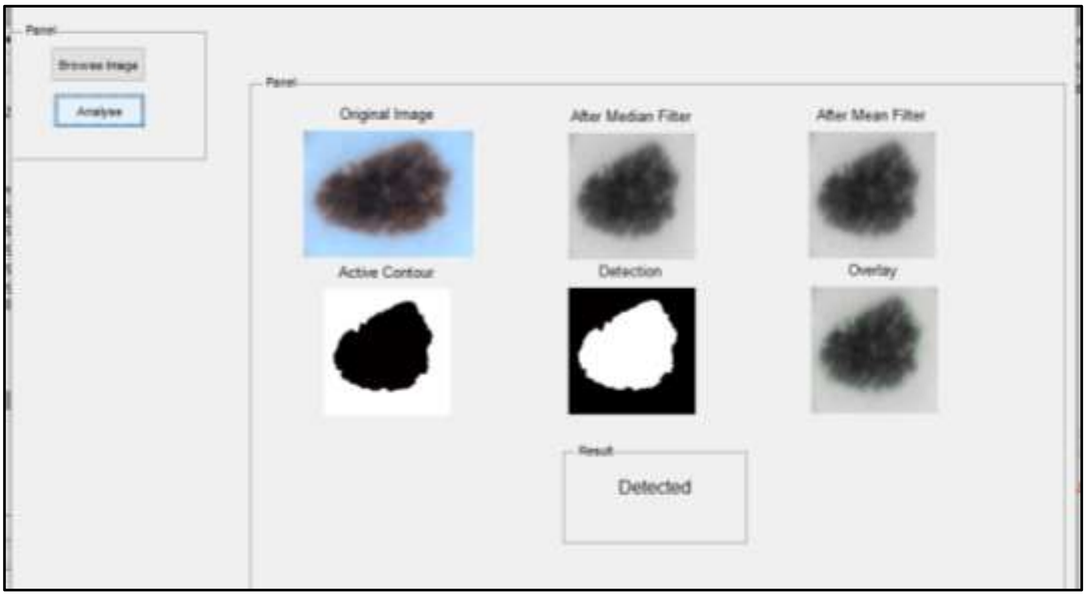

Fig. 1: Detection of affected area

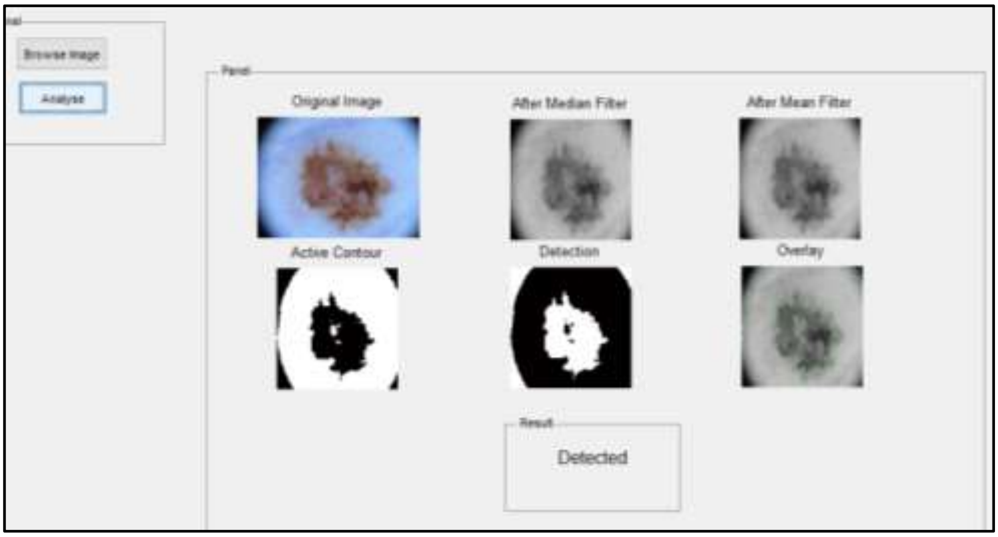

Fig. 2: Detection of affected area by another disease

5. Conclusion

A crucial first step in lowering mortality rates, disease spread, and skin disease progression is the early detection of skin diseases. Skin disease diagnosis requires lengthy and costly clinical tests. In the early stages of developing a computerised dermatology screening system, image processing technologies are helpful.

We describe an image analysis method for the treatment and identification of skin diseases in this research. We can diagnose and categorise a variety of skin illnesses using statistical analysis and correlation algorithms. To determine the likelihood of an illness, various statistical characteristics have been explored, including filtering, contour detection, and image overlay. Statistical parameters can be increased if necessary in accordance with further requirements. This system's results are intended to diagnose various skin illnesses. The illusion that the user is actually viewing stuff "inside" the patient is produced through Image Overlay and is quite convincing. According to anecdotal evidence, users claim that the system becomes "transparent" and they rapidly forget that it is there (and are shocked when they unintentionally smash a tool into the mirror - in the initial version, we had to cover the tool tips with foam). This demonstrates that Image Overlay has the desired impact, but it also highlights a significant risk: the user will likely incline to accept what he sees, even if it is false. Since there may be no other indicators of its accuracy, this might be particularly problematic when utilising Image Overlay to observe anatomical structures that aren't otherwise visible, which is one of its key strengths.

Fig. 2: No sign of Skin Disease

References

Sun, J., Yao, K., Huang, K., Huang, D. (2022). Machine learning applications in scaffold based bioprinting. Mater. Today Proc., 70, 17–23.

Rotemberg, V. Kurtansky, N., Betz-Stablein, B., Caffery, L., Chousakos, E., Codella, N., Combalia, M., Dusza, S., Guitera, P., Gutman, D. et al. (2021). A patient-centric dataset of images and metadata for identifying melanomas using clinical context. Sci. Data, 8, 34.

Nock, R., Nielsen, F. (2004). Statistical region merging. IEEE Trans. Pattern Anal. Mach. Intell. , 26, 1452–1458.

Hojjatoleslami, S., Kittler, J. (1998). Region growing: A new approach. IEEE Trans. Image Process. 7, 1079–1084.

Levner, I., Zhang, H. (2007). Classification-driven watershed segmentation. IEEE Trans. Image Process. 16, 1437–1445.

Ming, Y. S., . Li, H. D, He., X. M. (2016) .Contour completion without region segmentation. IEEE Transactions on Image Processing, vol. 25, no. 9, pp. 3597–3611.