A Proficient Approach to Detect the Threshold Rate for Diabetic Patient using Wound Healing Status

Deepa A[1], Janani G[2], Jeevanantham P[3], Mr. C. Rukumani Khandhan[4]
[1, 2, 3, 4] Department of CSE
[1, 2, 3, 4] K.S.Rangasamy college of Technology, Thiruchengode, Namakkal (DT)

Abstract- *"A PROFICIENT APPROACH TO DETECT THE THRESHOLD RATE FOR DIABETIC PATIENT USING WOUND HEALING STATUS" is an approach based on image processing.The physical components of the system consist of an image capture box, a camera for wound image capture and a laptop for analyzing the wound image. The wound image assessment algorithms calculate the overall wound area, color segmented wound areas, and a healing score, to provide a quantitative assessment of the wound healing status both for a single wound image and comparisons of subsequent images to an initial wound image. In the existing work, the visual assessment does not produce objective measurements and quantifiable parameters of the healing status, tracking a wound's healing process across consecutive visits is a difficult task for both clinicians and patients. The wound boundary determination was done with a particular implementation of the level set algorithm. The entire process of recording and analyzing a wound image, using algorithms that are executable on a camera, and provide evidence of the efficiency and accuracy of these algorithms for analyzing diabetic foot ulcers.*

Diabetic foot ulcers represent a significant health issue. Currently, clinicians and nurses mainly base their wound assessment on visual examination of wound size and healing status, while the patients themselves seldom have an opportunity to play an active role. Hence, a more quantitative and cost-effective examination method that enables the patient and their care givers to take a more active role in daily wound care potentially can accelerate wound healing, save travel cost and reduce healthcare expenses. Considering the prevalence of smartphones with a high-resolution digital camera, assessing wounds by analyzing images of chronic foot ulcers is an attractive option. In this paper, we propose a novel wound image analysis system implemented solely on the Android smartphone. The wound image is captured by the camera on the smartphone with the assistance of an image capture box. After that, the smartphone performs wound segmentation by applying the accelerated mean shift algorithm. Specifically, the outline of the foot is determined based on skin color, and the wound boundary is found using a simple connected region detection method. Within the wound boundary, the healing status is next assessed based on red–yellow–black color evaluation model. Moreover, the healing status is quantitatively assessed, based on trend analysis of time records for a given patient. Experimental results on wound images collected in UMASS—Memorial Health Center Wound Clinic (Worcester, MA) following an Institutional Review Board approved protocol show that our system can be efficiently used to analyze the wound healing status with promising accuracy.

Keywords- Android-based smartphone, mean shift, patients with diabetes, wound analysis.

I. INTRODUCTION

An image may be defined as a two-dimensional function, f(x,y), where x and y are spatial (plane) coordinates and the amplitude of f at any pair of coordinates (x,y) is called the intensity or gray level of image at that point.

Image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.

Digital image processing is the use of computer algorithms to perform image processing on digital images. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and signal distortion during processing. Since images are defined over two dimensions (perhaps more) digital image processing may be model in the form of multidimensional systems.

1.1 FUNDAMENTAL STEPS IN DIGITAL IMAGE PROCESSING

Image Acquisition is the first step or process of the fundamental steps of digital image processing. Image

acquisition could be as simple as being given an image that is already in digital form. Generally, the image acquisition stage involves preprocessing, such as scaling etc.

Image enhancement is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. Such as, changing brightness & contrast etc.

Image restoration is an area that also deals with improving the appearance of an image. However, unlike enhancement, which is subjective, image restoration is objective, in the sense that restoration techniques tend to be based on mathematical or probabilistic models of image degradation.

Color image processing is an area that has been gaining its importance because of the significant increase in the use of digital images over the Internet.

Wavelets are the foundation for representing images in various degrees of resolution. Images subdivision successively into smaller regions for data compression and for pyramidal representation.

Compression deals with techniques for reducing the storage required to save an image or the bandwidth to transmit it. Particularly in the uses of internet it is very much necessary to compress data.

Morphological processing deals with tools for extracting image components that are useful in the representation and description of shape.

Segmentation procedures partition an image into its constituent parts or objects. In general, autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually.

Representation and description almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region or all the points in the region itself. Choosing a representation is only part of the solution for transforming raw data into a form suitable for subsequent computer processing. Description deals with extracting attributes that result in some quantitative information of interest or are basic for differentiating one class of objects from another.

Object Recognition is the process that assigns a label, such as, “vehicle” to an object based on its descriptors.

Knowledge Base may be as simple as detailing regions of an image where the information of interest is known to be located, thus limiting the search that has to be conducted in seeking that information. The knowledge base also can be quite complex, such as an interrelated list of all major possible defects in a materials inspection problem or an image database containing high-resolution satellite images of a region in connection with change-detection applications.

COMPONENTS OF IMAGE PROCESSING SYSTEM

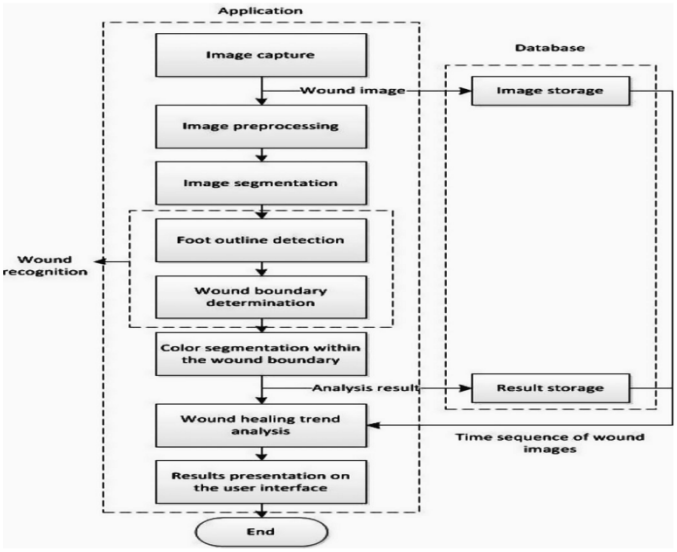
1. In sensing, two elements are required to acquire digital images. The first is physical device that is sensitive to the energy radiated by the object we wish to image. The second called a digitizer, is a device for converting the output of the physical sensing device into digital form.
2. Specialized image processing hardware usually consists for the digitizer plus hardware that performs other primitive operations such as arithmetic and logical operations (ALU). Eg. Noise reduction. This type of hardware sometimes is called a front end subsystem.
3. The computer is an image processing system is a general purpose to supercomputer Software which include image processing specialized modules that perform a specific tasks
4. Mass storage capability is a must in image processing applications.
5. Image displays in use today are mainly color tv monitors.
6. hardcopy devices for recording images include laser printers, film cameras, inkjet units, Networking for communication

II. PROPOSED SYSTEM

Diabetic foot ulcers represent a significant health issue. Currently, clinicians and nurses mainly base their wound assessment on visual examination of wound size and healing status, while the patients themselves seldom have an opportunity to play an active role. Hence, amore quantitative and cost-effective examination method that enables the patients and their caregivers to take a more active role in daily wound care potentially can accelerate wound healing, save travel cost and reduce healthcare expenses. Considering the prevalence of smartphones with a high-resolution digital camera, assessing wounds by analyzing images of chronic foot ulcers is an attractive option. In this paper, a novel wound image analysis system implemented solely on the Android smartphone. The wound image is captured by the camera on the smartphone with the assistance of an image capture box.

After that, the smartphone performs wound segmentation by applying the accelerated mean-shift algorithm. Specifically, the outline of the foot is determined based on skin color, and the wound boundary is found using a simple connected region detection method. Within the wound boundary, the healing status is next assessed based on red–yellow–black color evaluation model. Moreover, the healing status is quantitatively assessed, based on trend analysis of time records for a given patient. Experimental results on wound images collected in UMASS—Memorial Health Center Wound Clinic (Worcester,MA)following an Institutional Review Board approved protocol show that our system can be efficiently used to analyze the wound healing status with promising accuracy.

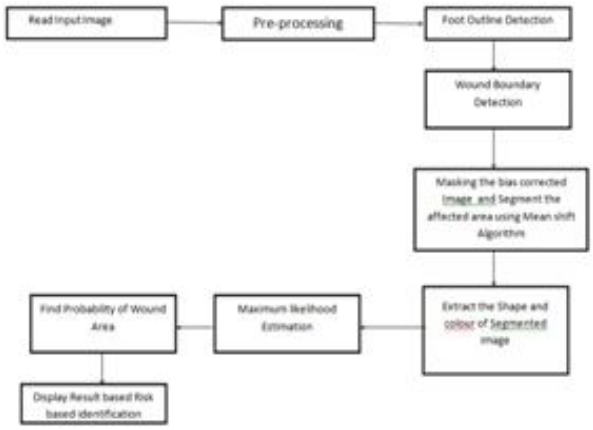
In this paper, the level set algorithms with the efficient mean-shift segmentation algorithm is used. While it addresses the previous problems, it also creates additional challenges, such as over-segmentation, which we solved using the region adjacency graph (RAG)-based region merge algorithm. In this paper, we present the entire process of recording and analyzing a wound image, using algorithms that are executable on a smart phone, and provide evidence of the efficiency and accuracy of these algorithms for analyzing diabetic foot ulcers.



III. SYSTEM MODULES

- PRE PROCESSOR
- SEGMENTATION
- FEATURES EXTRACTION
- ANALYZE THE WOUND HEALING STATUS

BLOCK DIAGRAM:

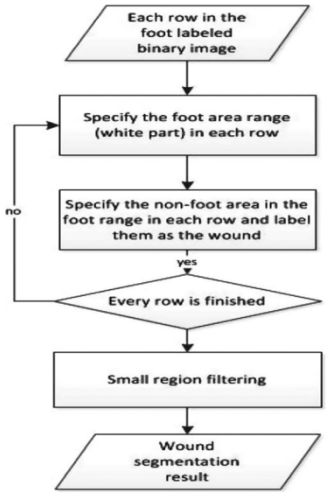


Read the input image. Remove noise while preprocessing. Determination of wound boundary using Mean shift Algorithm. Dots are noise or information that are removed. Retrieve the corrected information using Mask Bias. Use Maximum likelihood formula to extract the shape and colour. Probability of risk identification can be calculated.

Wound Boundary Determination Flowchart:

Image is segmented using mean shift algorithm. Specific threshold value is allocated to connect the boundary of wound area. Filter the noise. Determine the hollow region. Small wound boundary is determined

Mean Shift Algorithm Flowchart



In Mean Shift Algorithm, Foot is represent as binary digit. Specify foot area as White image and binary digit as 1. Specify non foot area binary digit as other than 1. Repeat until boundary is completed. Thus wound area is determined.

EXPECTED OUTCOMES

- Input image is segmented
- Analysis the features
- Report is produced based on unit
- Unit < 0.3 = LOW risk
- Unit < 0.6 = MEDIUM Risk
- Unit < 1 = HIGH Risk

IV. PROPOSED RESULT

The system provides a promising real-time method for wound assessment based on image analysis. Clinical comparisons indicate that the optimized mean-shift-based algorithm is well suited for wound area determination.

Clinical evaluation of our healing score algorithm shows its potential to provide clinicians with a quantitative method for evaluating wound healing status.

The entire process of recording and analyzing a wound image, using algorithms that are executable on a camera, and provide evidence of the efficiency and accuracy of these algorithms for analyzing diabetic foot ulcers.

V. CONCLUSION

The primary application of the wound analysis system is home-based self-management by patients or their caregivers, with the expectation that regular use of the system will reduce both the frequency and the number of wound clinic visits. One concern is that some elderly patients may not be comfortable with operating a smartphone, but this concern could be addressed by further simplifying the image capture process to a simple voice command.

REFERENCES

[1] Andrej Brechow, Torsten Slesaczeck, Dirk Münch, Thomas Nanning, Hartmut Paetzold, Uta Schwanebeck, Stefan Bornstein and Matthias Weck (2013) " Improving major amputation rates in the multicomplex diabetic foot patient: focus on the severity of peripheral arterial disease" Ther Adv Endocrinol Metab (2013) 4(3) 83–94 DOI: 10.1177/ 2042018813489719

[2] Y. Boykov, S. Corp, O. Veksler, and R. Zabih, "Fast approximate energy minimization via graph cuts," IEEE Trans. Pattern Anal. Mach. Intell., vol. 23, no. 11, pp. 1222–1239, Nov. 2001.

[3] S. A. Bus, C. E. V. B. Hazengerg, M. Klein, and J. G. Van Baal, "Assessment of foot disease in the home environment of diabetic patients using a new photographic foot imaging device," J. Med. Eng. Technol., vol. 34.

[4] Y. Z. Cheng, "Mean shift, mode seeking, and clustering," IEEE Trans.Pattern Anal. Mach. Intell., vol. 17, no. 8, pp. 790–799, Aug. 1995.

[5] C. M. Christoudias, B. Georgescu, and P. Meer, "Synergism in low level vision," in Proc. IEEE 16th Int. Conf. Pattern Recog., vol. 4, 2002, pp. 150–155.

[6] M. Dhanalakshmi, P. Premchand, and A. Govardhan(2013) "An Approach for Tongue Diagnosing with Sequential Image Processing Method" IJCTE 2012 Vol.4(3): 322-328 ISSN: 1793-8201