IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 7, July 2016

Patient of Foot Ulcer Diabetes Identification Based on Smartphone

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Abstract: Our System a novel wound image analysis System implemented solely on Gmail Smartphone. Now-a-day's many people face to Foot ulcer. The Aim is to identify foot ulcer by Smartphone. The camera on the Smartphone with the assistance of an image that captured the wound image using Smartphone, it is easy to capture wound image at that time patient are active participants in their own care. After that by using mean shift Algorithm Smartphone performs wound segmentation. Doctor can easily analyse the problem through image & Segmentation. According to patients with diabetes these technique is easy to use Smartphone device for self-management of foot ulcer. The outline of foot ulcer & accurate wound area are detected by the image segmentation. The processing algorithm of mean Shift Algorithm & K-mean Algorithm both are Accurate & well suited for the available hardware & computational resource that can be provided by the candidate through image capture & image processing.

Keywords: Android-based Smartphone, mean-shift, Image of patient with diabetes, Wound Analysis.

I. INTRODUCTION

In [1] now a day for treating diabetic foot ulcers there are several problem with current practice. In this firstly clinicians checked to for their wound on a regular basis. Patient frequent clinical evaluation which is not only inconvenient and time consuming for patients and clinicians, they represent noticeable health care cost because patients may require special transportation, e.g., ambulances. Second, a clinician wound assessment process is based on visual examination. Doctor describes the injury by its physical dimensions and the color of its tissues, providing important indications of the wound type and the stage of healing. Because the visual assessment does not produce objective measurements and quantiable parameters of the Healing status, tracking a wounds healing process across consecutive visits is a difficult task for both clinicians and patients.

The assistance of an image captured the injury through the camera on smartphone. After that, by applying the accelerated mean-shift algorithm smartphone perform wound segmentation. Specifically, Based on skin color the outline of foot is found, and the wound boundary is seen using as implementation connected region detection method. Within the wound boundary, t next assessed based on red–yellow–black color evaluation model that is healing status. In these manner Diabetic wound management requires long-term, repeated measurements to ensure therapeutic effectiveness. As the number of patients requiring wound management increases, the available doctor-patient time for simple wound tracking becomes insufficient. As such, there is a need to provide a means to accurately track diabetic wounds outside of a clinical setting. Current clinical approaches have limited accuracy for wound size measurements.

The mobile application prompts a patient to take an image of their wound, and then it sends the image to the host server.

The server outputs the calculated surface area to the application where the data points are stored. The principal Components of the solution include the Phone Application, Wound Measurement Code, and Host Server. Our principal objective is that our complete mobile application functions.

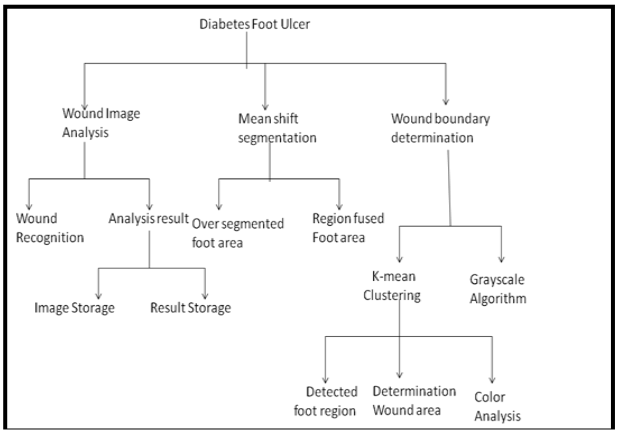

Fig 1: Hierarchy of Foot Ulcer

Since two types diabetes of foot ulcer is self-management to identify the wound image with Smartphone. The assistance of an image that captured the wound image using Smartphone, it is easy to capture wound image at that time patient are active participants in their own care. Through image & Segmentation doctor can identify injury of their patients. According to the image segmentation the

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outline of foot ulcer & accurate wound area are detect. Here we will progress the classification of foot ulcer in a hierarchy.

The diabetes foot ulcer Scheme is classified into following technique:

- Wound Image Analysis System overview.
- Mean-Shift-Based Segmentation Algorithm.
- Wound Boundary Determination and Analysis Algorithms
- K-Means Clustering Algorithm

According to wound Assessments System Several functional module in which wound image capture. wound image storage in database, wound image pre-processing, wound boundary detection ,wound analysis by color segmentation by using different type of algorithm such as mean-shift algorithm-mean algorithm ,convert all color image to grayscale ,wound trend analysis based on the time sequence of infected area for given patient. These entire technique steps are analyse by computational Smartphone. In these technique due to its awesome CPU + GPU high resolution camera use to chosen. The infected area image is captured through the Smartphone. The JPEG file path of this image is added into wound image database. Compressed image file cannot be processed directly with our main image processing algorithm. According standard RGB colour model 24bit bitmap file based on it to need for decompressed. This technique of image processing step, the original image (pixel dimensions of 3264 X2248) that divided by '4' both vertical & horizontal direction to pixel dimension .i.e816 X612 which has proven to provide a good between the wound resolution & pre-processing efficiency.
In these technique android Smartphone use high efficiency platform, According to foot outline detection result that can be determined by wound boundary .we carry out if the foot detection result is regarded as binary image at that time infected area detect by 'White' & rest part marked as 'black' these easy to identify the wound boundary within the foot region .when the foot boundary not closed at that time problem become more complicated. According to performing color segmentation evaluate the healing state of wound. After the size & dimensions of both the wound &original best record which is the earliest record for these patient describe by the color segmentation feature vector

II. RELATED WORK

In [1] Sarah Ostadabbam.et.al, proposed, the criticality of sensor architectural trade off in developing the in-shoe plantar pressure monitoring systems. That evaluate the trade off by using our custom-made platform for data collection during normal walking. Trade off also showed that smaller sensors underestimate the total force and may not be placed well to receive the peak pressure. The larger sensors, on the other hand, are more likely to contain the peak pressure, but the reading may be a significantly under-estimation of the peak pressure.

In [4] A.Suresh.et.al, proposed, the Chan-Vese active contour based method for medical purpose to easily identifying of ulcer affected area in a foot of a diabetic patient. Chan-Vese active contour method was used for segmentation. It took into account as of visualization of the diabetic ulcers in the foot and used segmentation and represented with effective ulcer area with color and also in grey color images.
In [5] Simerjit Singh.et.al, proposed, Diabetic foot ulcer is characterized by a classical triad of neuropathy, ischemia, and infection. Each of these has a multifactorial aetiopathogenesis. These factors are compounded by mechanical stress created by foot deformities. The most commonly used classification systems are the Wagner-Ulcer Classification system and the University of Texas Wound Classification. These classifications help to predict the outcome of this condition. Prevention of this condition is paramount to prevent long term morbidity and sometimes mortality.

III. SYSTEM ARCHITECTURE

Now- a -days, we carry out the foot outline detection result on which wound boundary depends. the foot area marked as "white" and rest part marked as "black," it is easy to determine when the foot detection result is regarded as a binary image at that time with the wound boundary within the foot region boundary by detecting the largest connected black" component within the "white" part. When the foot region boundary is located, then the foot boundary is not closed, at that time the problem becomes more complicated, i.e., we might need to first form a closed boundary. When the wound area calculated at that time infected wound are identify. According to mean shift algorithm wound image area are easily classified such as color space, spatial space or combination of two spaces it belongs to the density estimation based nonparametric clustering method in mean shift based segmentation. In clustering method in which feature space can be considered as accurate density function and that probability density function of the determined parameter.

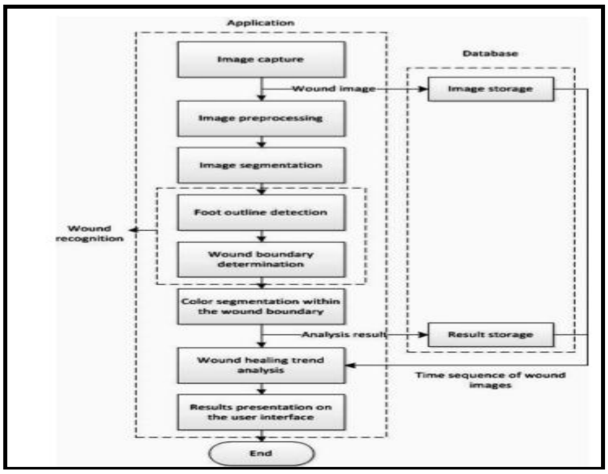

Fig 2: System Architecture

A. Methodology:

Setup phase:

A. **Patient Registration**: In these process Patient name in username field then click on new Patient registration button for creation of new user. Then verification is done and Wound image stored in database. Then Image selection process is done.

1. **Image Capture through Smartphone**: The mobile application prompts a patient to take an image of their wound, and then it sends the image to the host server. The server outputs the calculated surface area to the application where the data points are Stored. The principal components of the solution include the Phone Application, Wound Measurement Code, and Host Server.
2. **Image pre-processing**: This technique of image processing step, the original image (pixel dimensions of 3264 X2248) that divided by '4' both vertical & horizontal direction to pixel dimension .i.e816 X612 which has proven to provide a good between the wound resolution & pre-processing efficiency.
3. **Image segmentation**: In case of image segmentation use K-mean algorithm in which the wound boundary within the foot region is easily identify .infected area detect by 'White' & rest part marked as 'black'.
4. **Foot outline detection**: User According to foot outline detection result that can be determined by wound boundary .we carry out if the foot detection result is regarded as binary image at that time infected area detect by 'White' & rest part marked as 'black' these easy to locate the wound boundary within the foot region .when the foot boundary not closed at that time problem become more complicated.
5. **Color segmentation**: According to performing color segmentation evaluate the healing state of wound. After the color segmentation feature vector describe the size & dimensions of both the wound &original best record which is the earliest record for these patient.
6. **Wound healing trend**: The wound feature vectors between the current wound record and the one that is just one standard time interval earlier are current trend is obtained.
7. **Result analysis**: Image will be store in database and system will be analyses the infected area in percentage.

IV. ALGORITHMS

1. K-Mean Algorithm: The K-means algorithm is an iterative technique that is used to partition an image into K clusters. The basic algorithm is:

1. The randomly or based on some heuristic K Cluster centre are pick.
2. The cluster that minimizes the distance between the pixel and the cluster centre to assign each pixel in the image.
3. Averaging all of the pixels in the cluster that re-compute the cluster centres.
4. Repeat steps 2 and 3 until convergence is attained (e.g. no pixels change clusters) In this case, distance is the squared or absolute difference between a pixel and a cluster centre. The difference is typically based on pixel color, intensity, texture, and location, or a weighted combination of these factors. K can be selected manually, 0randomly, or by a heuristic. This algorithm is guaranteed to converge, but it may not return the optimal solution. The quality of the solution depends on the initial set of clusters and the value of K.
5. **2. Support Vector Machine:-** SVM is a machine learning algorithm for binary classification. Let (x1, y1)….(xn ,yn) be the set of n training examples, where each instance xi is a vector in RN and yi(-1,+1) is the class label. In their basic form, a SVM learns a linear hyper plane that separates the set of positive example from the set of negative examples with maximal margin (the margin is defined as the distance of the hyper plane to the nearest of the positive and negative examples). The linear separator is defined by two elements: a weight vector w (with one component for each feature), and a bias b which stands for the distance of the hyper plane to the origin. The classification rule of a SVM is:

$$\mathrm{Sgn}(f(x, w, b)) \quad (1)$$
$$F(x, w, b) = (w.x) + b \quad (2)$$

Being x the example to be classified. In the linearly separable case, learning the maximal margin hyper plane (w, b) can be stated as a convex quadratic optimization problem with a unique solution: minimize ||w||, subject to the constraints (one for each training example):

$$y_i((w.x_i) + b) >= 1 \quad (3)$$

Vectors with non-null weights are called support vectors.

V. Experimental Results

Figures shows the results of pre-processing from an image. Figs. 2, 3, 4 (a) shows the original image. (b) Pre-processing I) Gary scale image II) RGB Extract. C) Image segmentation feature extraction Threshold value generate.

(a)

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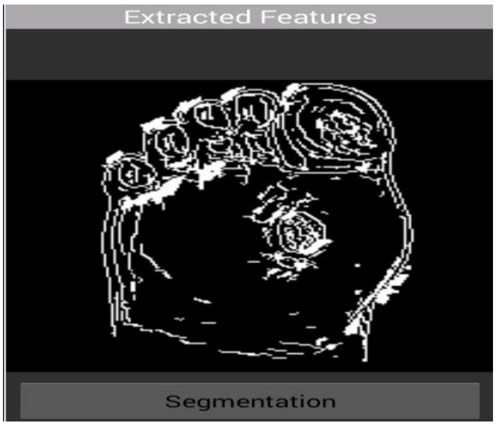
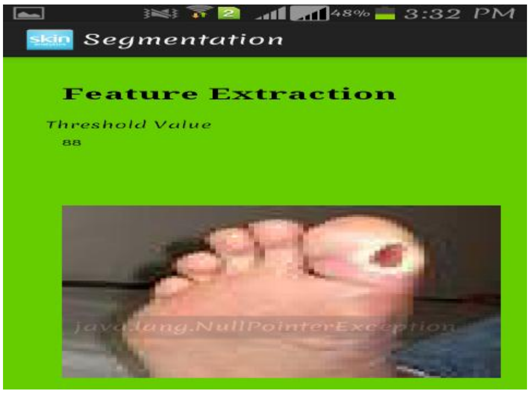


(b)

(c)

(d)

(e)



(f)

Fig. 3. Wound recognition (a) shows the original image (a). (b) Pre-processing I) Gary scale image (b) II) RGB Extract.(d) (e) (f) C) Image segmentation feature extraction Threshold value generate.

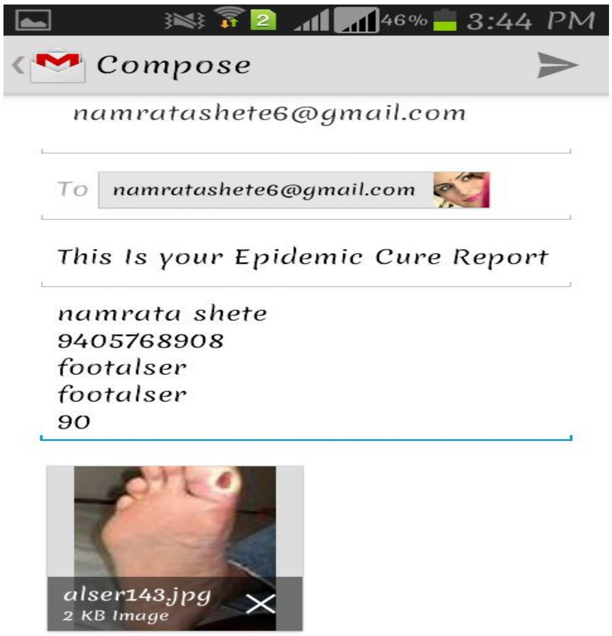


Fig 4. Final wound recognition report send to patient email Id

VI. CONCLUSION

The goal of proposed system is to provide good wound image analysis through the Smartphone. The wound image analysis algorithm is implemented on Android Smartphone using both CPU &GPU. We use the mean shift based boundary determination algorithm to analysis of accurate wound boundary detection result. This technique Patients are active participants in their own care. For each individual patient manually find an optimal parameter setting based on single sample image taken from the patient before the practical application. The wound analysis systems whereby clinicians can remotely access the wound image and result .All result are store in database. Patient's travel exposure is considerably reduced. Also it will reduce the patients stress. Doctor can easily analyse the problem through images and its segmentation. The proper report can be given to the patient on time. It's avoided high cost, complexity, and lack of tissue classification. It is easy to use device for self-management of Foot ulcer for patients with diabetes. The image segmentation can be determining the outline of foot ulcer and accurate wound area are detect. The processing algorithms are both accurate and well suited for the available hardware and computational resources that time Patient for image capture and image processing provided. For real-time wound analysis that Design a highly efficient and accurate algorithm. That is able to operate within the computational constraints of the Smartphone.

REFERENCES

[1] Lei Wang, Student Member, Peder C. Pedersen*, Senior Member, Diane M. Strong, Bengisu Tulu, Member, Emmanuel Agu, and Ronald Ignotz "Smartphone-Based Wound Assessment System for Patients With Diabetes" IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING, VOL. 62, NO. 2, FEBRUARY 2015.

[2] Adnan Saeed, Mehrdad Nourani Department of Electrical and Computer Engineering University of Texas at Dallas, Richardson, TX 75080 {sarahostad, axs055200,nourani}@utdallas.edu"Sensor Architectural Tradeoff for Diabetic Foot Ulcer MonitoringSarah Ostadabbas, Matthew Pompeo, M.D. Presbyterian Wound Care Clinic Dallas, TX 75231 healerone@aol.com" 34th Annual International Conference of the IEEE EMBS San Diego, California USA, 28 August - 1 September, 2012.

[3] K. M. Buckley, L. K. Adelson, and J. G. Agazio, "Reducing the risks of wound consultation0: Adding digital images to verbal reports," Wound Ostomy Continence Nurs., vol. 36, no. 2, pp. 163–170, Mar. 2009.

[4] V. Falanga, "The chronic wound: Impaired healing and solutions in the context of wound bed preparation," Blood Cells Mol. Dis., vol. 32, no. 1, pp. 88–94, Jan. 2004

[5] N. Singh, D. Armstrong, and B. Lipsky, "Preventing foot ulcers in patients with diabetes," JAMA: the journal of the American Medical Association, vol. 293, no. 2, pp. 217–228, 2005.

[6] N. Singh, D. Armstrong, and B. Lipsky, "Preventing foot ulcers in patients with diabetes," JAMA: the journal of the American Medical Association, vol. 293, no. 2, pp. 217–228, 2005.

[7] L. Wang, P. C. Pedersen, D. Strong, B. Tulu, and E. Agu, "Smartphone based wound assessment system for diabetic patients," presented at the 13th Diabetes Technology Meeting, San Francisco, CA, USA, Oct. 2013.

BIOGRAPHIES

Sadhana Jadhav received her B.E. degree in Computer Science from Pune University in 2013. She is currently pursuing Master of Computer Engineering from Savitribai Phule Pune University, India. Her research interest includes medical image processing, wound recognition and machine learning.

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