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# A Survey on Wound Assessment System Patients of Foot Ulcer Diabetes Identification Based on Smartphone

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**ABSTRACT:** Our System a novel wound image analysis System implemented solely on the android 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

There are several problems with current practices for treating diabetic foot ulcers. First, patients must go to their wound clinic on a regular basis to have their wounds checked by their clinicians. This need for frequent clinical evaluation is not only inconvenient and time consuming for patients and clinicians, but also represents significantly health care cost because patients may require special transportation, e.g., ambulances. Second, a clinicians wound assessment process is based on visual examination. He/she describes the wound 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 quantifiable parameters of the healing status, tracking a wounds healing process across consecutive visits is a difficult task for both clinicians and patients.

The wound image is captured by the camera on the Smartphone with the assistance of an image. 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 as implementation connected region detection method. Within the wound boundary, the healing status is next assessed based on red-yellow-black color evaluation model. 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 with 90% accuracy regardless of the user's skin type, regardless the angle that the image is taken, whether or not flash is used, or the distance from the wound.

### II. RELATED WORK

In [1] Sarah Ostadabbam.et.al, proposed, the criticality of sensor architectural tradeoff in developing the in-shoe plantar pressure monitoring systems. That evaluate the tradeoff by using our custom-made platform for data



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collection during normal walking. tradeoff 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. PROPOSED ALGORITHM

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 preprocessing, 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 carried out by computational Smartphone.

In these technique due to its excellent 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 & preprocessing 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 locate 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 color segmentation feature vector describe the size & dimensions of both the wound &original best record which is the earliest record for these patient.

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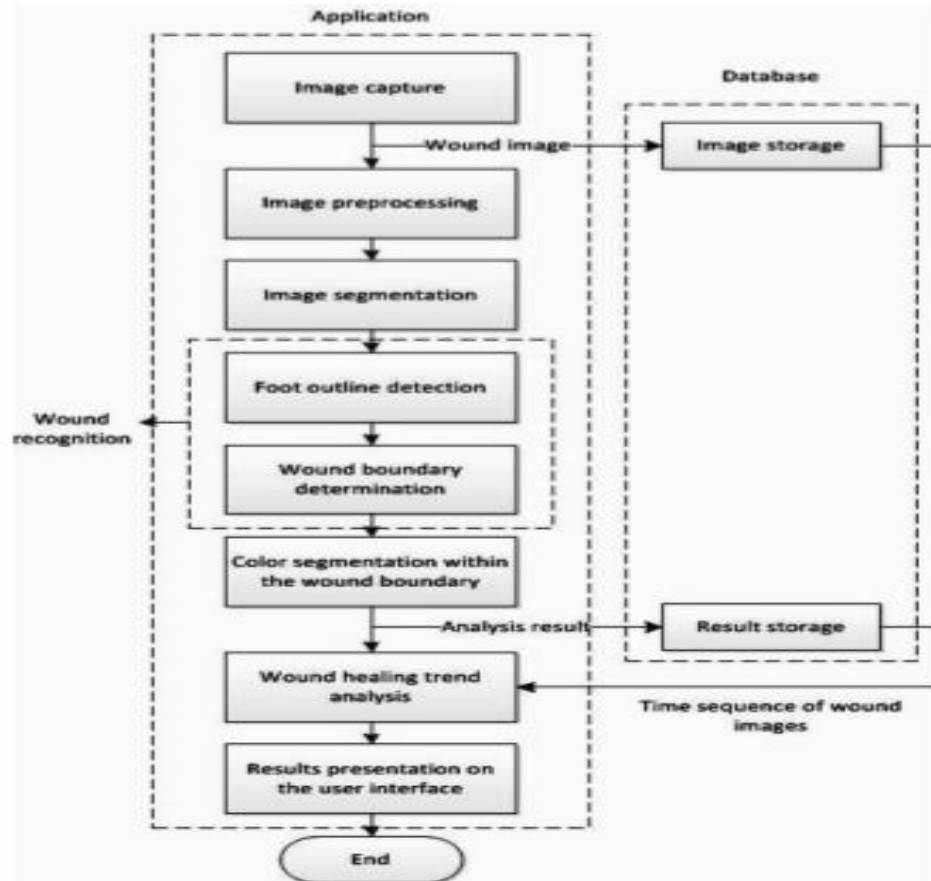


Figure 1: System Architecture

Now- a -days, we carry out a Wound boundary determination based on the foot outline detection result. the foot area marked as “white” and rest part marked as “black,” it is easy to locate when the foot detection result is regarded as a binary image 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 probability density function of probability density function of the represented parameter.

## IV.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

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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.e.816 X612 which has proven to provide a good between the wound resolution & preprocessing efficiency.
3. **Image segmentation:** In case of image segmentation use K-mean algorithm in which infected area detect by 'White' & rest part marked as 'black' these easy to locate the wound boundary within the foot region.
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 analyzes the infected area in percentage.

In these technique, we replaced the level set algorithms with the efficient mean-shift segmentation algorithm. 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.

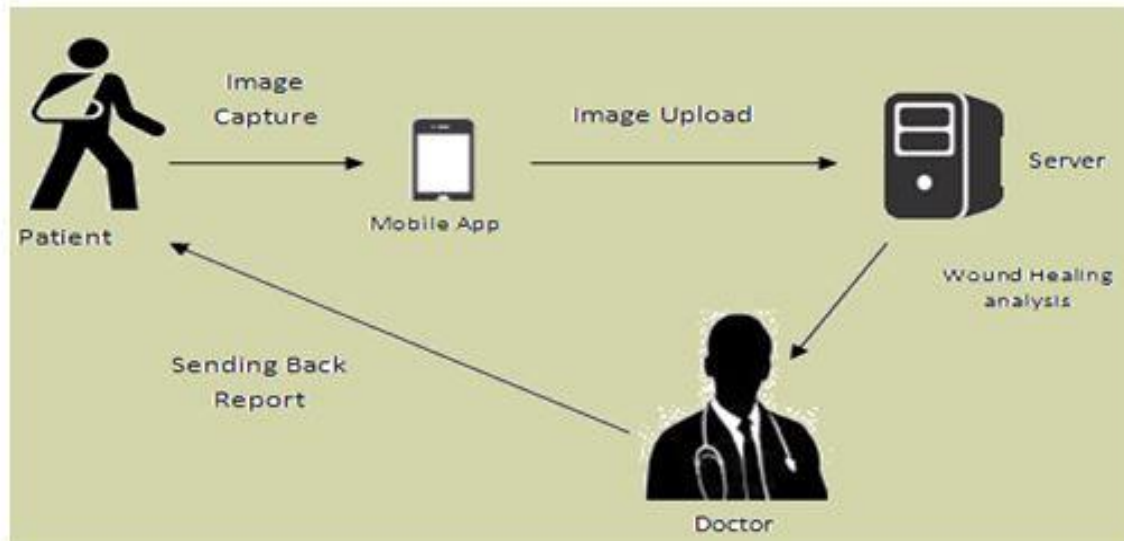


Figure 2: Wound image detect through the Smartphone.

In our system, 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. Patient's travel exposure is considerably reduced. The patients stress Also it will reduce. The problem through images and its segmentation Doctor can easily analyze. The patient on time proper report can be given by doctor. It's avoided high cost, complexity, and lack of tissue classification. Foot ulcer for patients with diabetes that easy to use device for self-management. Patients are active participants in their own care. The outline of foot ulcer and accurate wound area are detecting the Image segmentation determined. 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. Design a highly efficient and accurate algorithm for real-time wound analysed.



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## V. CONCLUSION AND FUTURE WORK

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 analyze 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.

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