

Analysing Wound Area Measurement Using Android App

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Abstract - This Project proposes a portable wound area measurement method based on the Pixel calculation of digital images. Its objective is to provide a practical, fast and Non-invasive technique for medical staff to monitor the healing process of chronic wounds. Whereas existing system only identifies wound size and does not provide its healing status and its accuracy is low.

The initial segmentation in proposed system can also be modified by the user, providing higher control and accuracy. Area measurements are further normalized to remove effects of camera distance and angle. The application has been implemented for the android platform version 2.2 with a prototype model running on any smart phone. The results to evaluate the efficacy of the application have been encouraging with high accuracy level. Accompanied database stores all relevant wound information. Stored information makes possible qualitative and quantitative tracking of wound healing process, which gives the clinician necessary information to evaluate and adjust used therapy. The current methodology has been used where the system provides the usefulness of portability and the ease of use that other devices have failed to achieve.

Key Words: Wound Analysis, Image Extraction, K-Mean Clustering, Kernal Algorithm, Pixel Calculation, Histogram.

1. INTRODUCTION

The dimensions of chronic wounds alter with time due to reasons such as Epithelial Closure and Increased Swelling. Hence, time-evolution of wound area is recorded in order to assess the rate of healing and the effectiveness of treatments. Traditional wound area measurements are in the form of measuring perpendicular distances of the wound border, manual tracing and digital photography. These measurements are prone to be tedious, inconsistent and inaccurate. Furthermore, tools based on image processing techniques require stationary units.

Wounds primarily consist of a non-uniform mixture of black Necrotic Eschar, yellow Necrosis and Fibrin (slough), and red Granulation tissue which indicates the state of healing of different tissue types. These coloration differences adds to the complexity of area segmentation since the clarity of the wound border depends on the wound's inner hues and outer skin colours. Built on a mobile phone, the software is interfaced via Bluetooth with a laptop

where the segmentation is carried out based on morphological operations.

A histogram method is used to calculate the number of pixels within the wound, which is then scaled to the actual size using the initial calibration triangle. Manual refining and complete retracing are also enabled. In this report, the results based on a clinical sample of twenty wound images and five users comparing against statistics for traditional measurement methods.

1.1 Android Application

Android applications are primarily written in the Java programming language. During development the developer creates the Android specific configuration files and writes the application logic in the Java programming language. The ADT or the Android Studio tools convert these application files, transparently to the user, into an Android application. When developers trigger the deployment in their IDE, the whole Android application is compiled, packaged, deployed and started.

There are procedures you have to follow in mobile application development. The developer has to figure out first what the applications theme is. "What will this application be about?" is what the developer has to ask his or her self. Once that is complete the developer has to know what OS they will use. iPhone applications can only be used through MacOS. After picking your OS the developer then starts to think about its functionality.

After choosing what the application will do, the developer then needs to contemplate on the initial look of the application. What the application appearance is determines on whether a user will want to use it. The application cannot be bulky because the user will not know what to do with it because it has so much stuff to look at. The application cannot be too simple because it will be boring.

2. EXISTING SYSTEM

The semi-portable wound measurement system developed by Duckworth et al is one of the key comparable for our application. The user is required to draw the border contour manually on the touch screen of the phone. Almost all the process will be carried out on the phone. So it takes a lot of time to produce the output.

3. PROPOSED SYSTEM

This Project proposes a portable wound area measurement method based on the Pixel calculation of digital images. Its objective is to provide a practical, fast and Non - invasive technique for medical staff to monitor the healing process of chronic wounds. The initial segmentation can also be modified by the user, providing higher control and accuracy. Area measurements are further normalized to remove effects of camera distance and angle. The application has been implemented for the android platform version 2.2 with a prototype model running on any smart phone. Accompanied database stores all relevant wound information. Stored information makes possible qualitative and quantitative tracking of wound healing process, which gives the clinician necessary information to evaluate and adjust used therapy. The current methodology has been used where the system provides the usefulness of portability and the ease of use that other devices have failed to achieve.

When the application is started you have to acquire a picture on the start menu you can choose to take the picture with the on- board camera or to pick it from your sdcard through android gallery program. The start page is available from any page after pressing the home button. Further even when you are not running mobile wound analyzer, you can invoke it from any application that allow you to download or view a jpg file. MOVA register itself as system default image viewer and it will be displayed in the list of available applications dialogue chooser anytime import an image for the first time you will be prompted to accept or modify the name of the image file through the "image name "dialogue box

3.1 Explanation

1) Pre-processing: According to the need of the next level the pre processing step convert the image. It performs filtering of noise and other artifacts in the image and sharpening the edges in the image. RGB to grey conversion and Reshaping also takes place here. It includes shock filter for noise removal.

2) Sobel Edge Detection: The edge detection techniques are well developed techniques of image processing on their own. The edge based segmentation methods are based on the rapid change of intensity value in an image because a single intensity value does not provide good information about edges. Edge detection techniques locate the edges where either the first derivative of intensity is greater than a particular threshold or the second derivative has zero crossings. Result of these methods is basically a binary image.

3) Kernal Algorithm: Technically, many of the approaches in the department fall into the category of kernel algorithms. They are based on the notion of positive-definite kernels. These kernels can be shown to play three roles in learning.

First, the kernel can be thought of as a (nonlinear) similarity measure that is used to compare the data (e.g., visual images). Second, the kernel can be shown to correspond to an inner product in an associated linear space with the mathematical structure of a reproducing kernel Hilbert space (RKHS). In this way, the kernel induces a linear representation of the data. Third, it can be shown that a large class of kernel algorithms leads to solutions that can be expanded in terms of kernel functions centered on the training data. In this sense, the kernel also determines the function class used for learning, i.e., the hypotheses that are used in examining the dataset for regularities. All three issues lie at the heart of empirical inference, rendering kernel methods an elegant mathematical framework for studying learning and designing learning algorithms.

Image processing with kernel:

Having a render-to-texture frame buffer lets us color a pixel based on its neighbours. We don't know the colors of the neighbouring pixels yet in single-pass rendering. When coloring a pixel based on its neighbours we usually talk about a sliding window, or kernel - usually a 3x3 or 5x5 grid; a convolution matrix that says which neighbouring pixels should influence our "origin" pixel. A weight is given to each pixel covered by the kernel. This is the basis for many filtering algorithms. We multiply each pixel value by the weight in the kernel. All the results are summed together. This usually gives a much higher color intensity value, so we typically normalize it, or divide it by the sum of the weights.

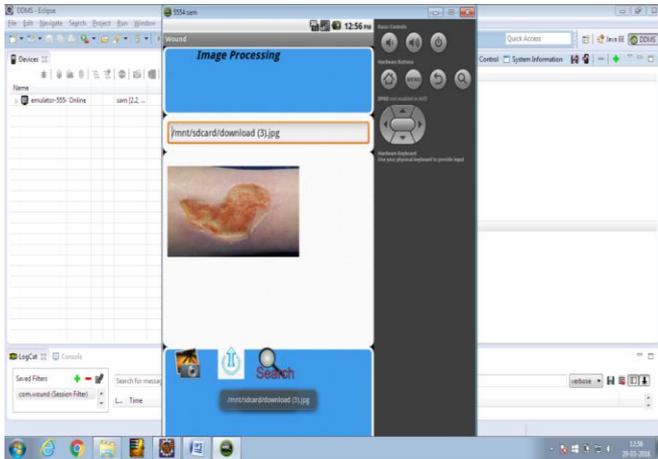
4) Fuzzy Cluster Means Technique

In hard clustering, data is divided into distinct clusters, where each data element belongs to exactly one cluster. In fuzzy clustering(also referred to as soft clustering), data elements can belong to more than one cluster, and associated with each element is a set of membership levels. These indicate the strength of the association between that data element and a particular cluster. Fuzzy clustering is a process of assigning these membership levels, and then using them to assign data elements to one or more clusters.

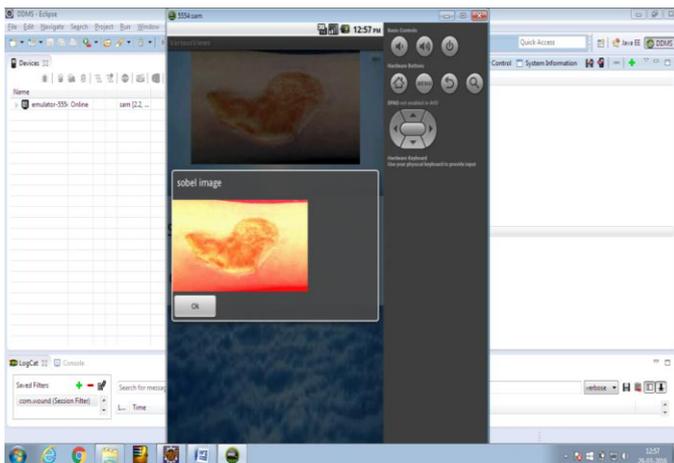
5) Result

This project was done with the objective of bringing portability, objectivity and easy management in wound measurement and related data. In overall, an average accuracy of up to 90% can be provided through the current application, given that camera distance, angle and lighting conditions are in favour of the measurements.

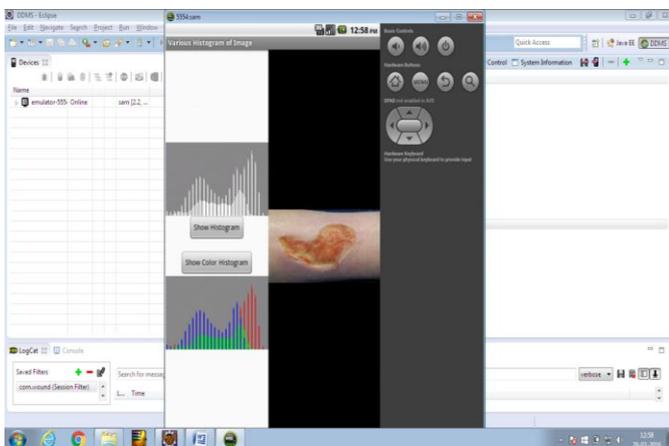
3.3 Output Images



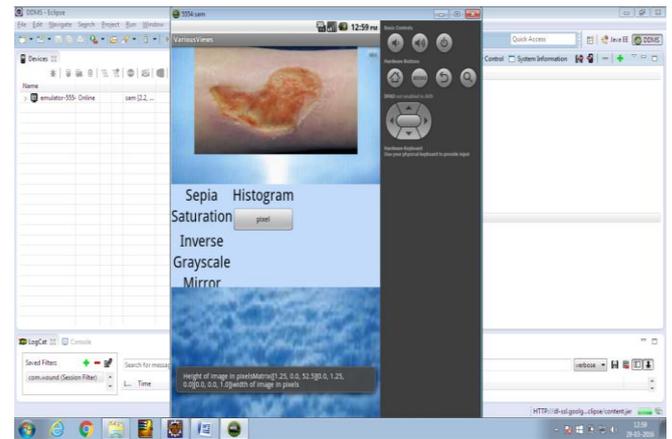
The screen above shows the different types of image processing techniques that can be processed by this application after uploading the wound image.



The screen above shows the conversion of the original wound image into the sobel image in the android application.



The screen above shows the color histogram for the processed wound image. Thus the color histogram is easy for understanding the status of wound.



The screen above shows the result in pixel value for the processed wound image.

4. CONCLUSION

This project was done with the objective of bringing portability, objectivity and easy management in wound measurement and related data. In overall, an average accuracy of up to 90% can be provided through the current application, given that camera distance, angle and lighting conditions are in favour of the measurements. Although better accuracy can be achieved by further considerations and processing techniques, this would be at a trade off with processing power and time. Hence, the current methodology has been used where the system provides the usefulness of portability and the ease of use that other devices have failed to achieve

5. FUTURE WORK

In this project, for the first time the process is made to work relatively fast with a good accuracy rate. In the future, it could well be implemented not only for wounds but also for bone fractures and all. Because the technique works on the basis of pixel calculation it could also be implemented along with an equipment in the hospital for their convenience and could also contribute to skin stitching in the hospital. This can also be developed for retinal diseases with a proper knowledge about the diseases that occur in the retina.

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