Embedded System Implementation For Vein Detection

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***Abstract*— The appropriate location or detection of vein vessels plays important role in forensic field, medical applications and in biometrics like human identification, matching. Identification of vein vessels is necessary in medical field for needle infusion in the patients. Sometimes many of doctors or nurses found difficulty to locate vein vessels so if it goes wrong then it can cause Trauma, Hematoma, cuts on the bones, Allergic reactions, Swell in the skin. The pattern of vein can be used for human identification in biometrics and other biometrics features having particular drawback which can be overcome if we go for vein detection which having its unique features. Many researches are going on the vein recognition which includes researches on palm vein, wrist vein, dorsal vein, Finger vein, forearm vein etc. The framework for all types of mentioned vein recognition is based on authentication, more or less all having with same aspiration to detect vein in respective ROI. So to get rid of problems with needle infusion the embedded system with infrared camera can be developed which can detect veins on the body. And this system can be a handheld system which will be used to detect veins of persons practically. Camera will take a real time video with help of infrared lights and every vein on skin will give different contrast, hence it will be easier to identify.**

***Keywords*—Vein location, Infrared Source, Skin anatomy, Image Processing, Biomedical.**

I. INTRODUCTION

Vein pattern recognition has been emerging technique in the field of biometric. It can successfully use in various other applications like field of forensic, human recognition & medical applications such as bruises & burns, intravenous injection, among children, blood transfusions, geriatrics, enter medications or fluids in body. The upcoming biometric techniques include vein detection pattern, DNA and body odor recognition. Vein recognition also known as vascular biometrics and sub dermal nature of vein, vascular biometric are consider to be highly secure modality, whereas other types of biometrics had proven vulnerable to prevention of attacks, but vein patterns are virtually unspoofable.

The technique of vein detection is based on identification of the subcutaneous vein patterns in individuals. Generally it is easier to find veins in young generation persons, but in elderly persons it if difficult to find the veins only in visible light. The advantage of identifying vein is that it does not require the direct contact with the device and speed of operation is also very high. The appropriate location or identification of vein vessels is mandatory for needle infusion in the patients.

In medical field to deal with the problems of needle infusion, a single tool for identifying the veins are required which will clearly shows the veins. In proposed system for vein detection infrared lights is used because vein patterns are not easily observable in visible light. Infrared lights will emit to the body of patients. The reason why near infrared light is used because the light is absorb more strongly by human blood than the surrounding tissues. The advantageous features of near infrared imaging are it can easily penetrate up to 3mm into the tissue.

This helps in detecting required veins accurately and reducing the chances of faulty needle injecting by the doctor or nurse to the patients.

II. LITERATURE SURVEY

The appropriate location or detection of vein vessels gives large contribution in the field of forensic and in medical applications and in biometrics like human identification, matching. The accurate location of veins plays very important role in medical application for needle infusion for the purpose of drug or medications delivery in patients.

Insertion of intravenous catheters plays an important role in any surgery. IR LED ring is used for infrared radiation. Smartphone camera is used to capture the image and its preprocessing can be done by using MATLAB. Noise removal filter and adaptive histogram equalization technique is used to enhance the image. This system only implements the acquisition and segmentation of image [1]. Specialists confront the issue while distinguishing veins for intra-venous medication conveyance. Therefor framework needs to create which will distinguish non-obtrusive subcutaneous veins. This framework can be utilized for treatment of varicose veins, profound vein thrombosis and vascular sicknesses [2]. This exploration has been centered around to utilize, cost effective vein design recognition framework that utilizations near infrared radiation yet the calculations and the equipment lighting and detecting head can effectively be utilized as a part of different applications in the field of legal sciences, human acknowledgment or in medicinal applications [3]. The system relate to development of non-invasive subcutaneous vein detection. This system uses a CCD camera for capturing

image and compute software module. This system works on video but under the particular ideal light conditions and therefor it needs external adjustment or automatic software calibration. USB cable restrict transfer frame rate [4]. IR radiations for biometrics provide a promising result in the field of security and biometrics applications. The method is to detect the veins using an IR illumination then different techniques is used for enhancement of vein image for identification of person. This work consists of IR vein detection and matching of systems for identification of persons. The novel scheme approach is used which capture image by an infrared illumination. This system is used to detect veins on palm dorsal surface [5].

Vein pattern can also be used in biometrics, other biometrics features having several disadvantages which will not bother if we go for vein detection which having its unique features. The biometrics gives a normalized, efficient and discriminative representation of feature. There are multiple types of biometric recognition.

III. PROPOSED METHOD

The flow diagram of proposed method for vein detection is as shown in figure.1. In proposed framework image is captured and region of interest is selected from input image. The various techniques of image enhancement are available to improve the quality of image. Adaptive thresholding and morphological operations are used. Morphological operations reduce the unwanted noise from an image. Segmentation process is used for image extraction.

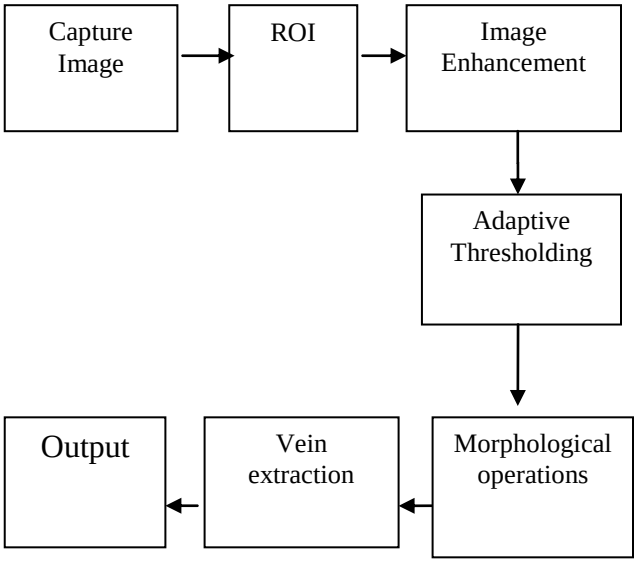


Fig 1: Block Diagram of Proposed Method

A. *Image capturing and Region of interest*

Image is captured and interested region of interest is selected from input image.

B. *Image enhancement*

To improve the quality of image this image enhancement technique is used. Image inversion is used to get a negative of original image if they are processed with morphological operations.

C. *Adaptive thresholding*

To apply single threshold on complete image intensity distribution and background pixels should be sufficiently distinct. Adaptive threshold convert gray scale image into a binary image.

D. *Morphological operation*

Ridge and Dilate morphological operations can be used to detect veins properly. After morphological operations interested region will be selected. Output of this will be a detected vein image which can be used for application.

IV. RESULTS

For vein detection by using MATLAB the important part to detect veins in interested region is image enhancement. Image enhancement is a process to remove the unwanted distortion and determine the hidden information that is present in images. The performance of the image enhancement techniques to detect vein are given.

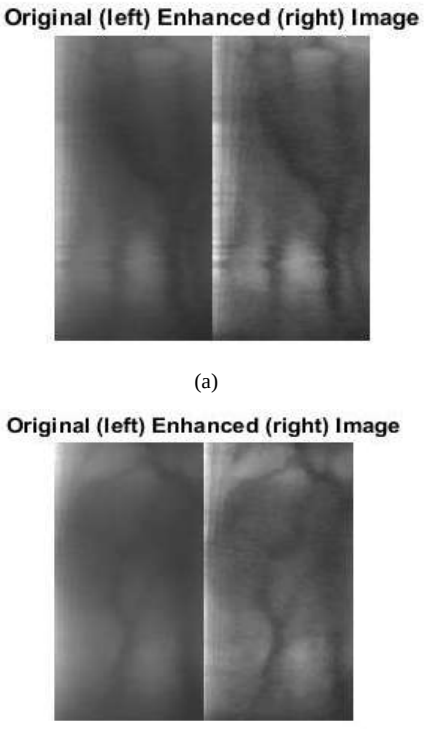
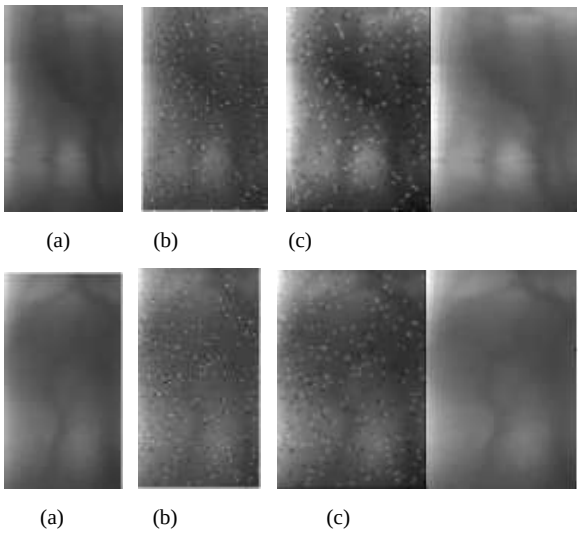


Fig 2: Contrast enhance by Adaptive histogram equalization for two images

Median Filter



(a) (b) (c)

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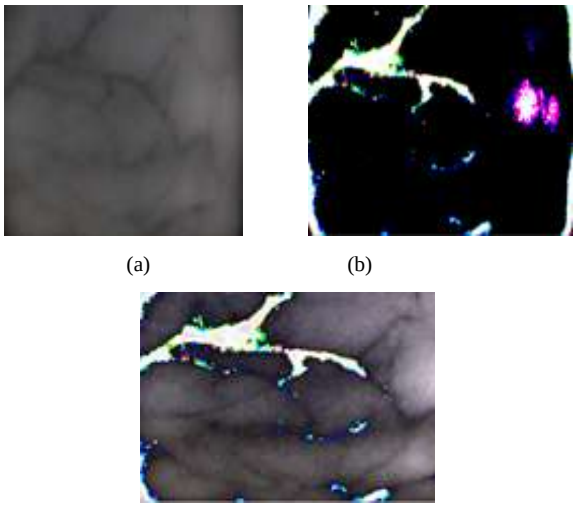
Fig 3: Noise removal by filtering (a) original image (b) noisy image (c) filter image left side result of averaging filter and right side of medianfilter2

The above results are of vein detection system which is developed by using MATLAB, but practically that is not suitable for vein detection purpose. So embedded system is developed which will be handy and cost efficient. This system will take real time input and gives vein detected output of region of interest. The results of partially detection of vein for standard images are shown below.

The image is first converted into a gray scale image which is a part of image enhancement which is shown in image "Fig 2(a)". To highlight the portion of the veins dilate and ridge morphological operations is used. In dilate morphological operations boundaries in image are found and pixels are added to the boundaries.



(a) (b)

(c)

Fig 4: (a) Input image (b)and(c) Inversion of image and morphological operations.

To find out the veins in an image morphological ridge operation is used. Result of morphological operations is shown in" Fig. 2(b)". As shown in "Fig.2(c)" threshold is applied to an image and unwanted portion are get remove from the image.

V. CONCLUSION

The traditional vein detection method gives results but those can't be used for the actual application for vein detection. The embedded system can be used for the development of application of vein detection.

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