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Organ Abnormality Prediction Using Finger Vein Reader

S Manimala[3], B Santhamala[4], P Sri Indhuganga[5]

Department of ECE, New Prince Shri Bhavani College of Engg. & Tech., Chennai, India [3,4&5]

ABSTRACT: This project deals with su jok which means all organs can be controlled within palm of our hand and feet. Veins in fingers are related to our major organs .Every changes in organ in the organ leads to changes in shape of vein. This changes in shape of vein shape indicates the disease. Here, vein image processing approach done based on morphology principle, which is suitable for examining the veins shape. Finger vein reader is a setup used to gather vein from human finger. By gathering the vein image, the disease or change of organ can be identified whether the organ is normal or abnormal before the symptoms occurs. Hence diseases can be easily identified without any scanning process of whole body. So that, this project is very valuable to our society and medical field.

KEYWORDS: Su Jok, Finger vein reader, Morphology principle, Curvature flow method, Median filter.

I. INTRODUCTION

Veins are very important for flow of blood towards the heart to whole body. So it is necessary to check the vein condition which may reflect any disease [1]. Many of the veins may carry deoxygenated blood from body parts to the heart [2]. Phlebology is a study of treatment of vein disorders. The changes in shape of vein which reflect diseases are observed from the diagnosis of specialists [3,4]. Diagnosing of the vein is very important to known about the major organs and whole body within our hand and feet. The control of whole body within hand and feet system is called as su jok which is under the world of Acupuncture. Finger vein reader is a setup used to capture the finger image from the human being. This finger vein reader contains web camera, IR LED's and Adapter. Web camera is used to capture the finger image of human being. Vein image are separated from the finger image in pre-processing method only. IR LED's are used to get the transparent vein image. Adapter made connection from power supply to IR LED set and then image from web camera is given to the laptop for further processing steps. The vein image from the reader should be pre-processed and segmented. The processing function involves removal of noise, resizing and conversion of colour into gray image, in the captured vein image. Preprocessing function is necessary for the good clarity of image. Segmentation of vein image under the process of feature extraction. For segmenting the vein image, curvature flow method algorithm is used. This flow method is used for getting every curved image of vein in fingers. The normal and abnormal condition of organ can be identified based on classification process. In classification process, connected component analysis method is involved. The normality and abnormality can be classified based on number of veins in the finger.

II. SCOPE OF THE PROJECT

The identification of the disease are not be identified without scanning the organ. In this project the disease of organ can be identified before symptoms occurs and also without scanning the organ.

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MATHEMATICAL MORPHOLOGY PRINCIPLE

Morphology is a study of shape of vein image. This principle is a technique is used for analysis and processing of geometric structure of images based on predefined theory. It is most common for digital image processing. This principle is specific for graphs, solids and other spatial structures. The continuous-space concept in topology and geometric such as size, shape, convexity, connectivity and distance are functional in morphology algorithm and for discrete spaces. The operations in morphology consist of erosion, dilation, opening and closing. Morphology algorithms are basically developed for conversion of image into binary format and it was later extended to conversion of colour to gray scale functions and images. In binary conversion of images, each pixel is set to fixed value as either 1's or 0's. The binary image conversion has some techniques such as blob analysis, connectivity analysis and morphological image processing. The noise images are identified based on wrong binary value of pixels in captured images.

III. HARDWARE COMPONENTS

WEB CAMERA

Web camera is used for capturing an image and video with audio that streams in real time to computer. Webcam means clipped compound which is used in original sense of a video camera. Webcam used in this project is for real time purpose. It is low cost and flexible with resolution of 640*480. Here webcam is used for capturing the finger image.

IR LED

IR LED is also called as IR transmitter. IT is used to transmit infrared rays in a range of 760 nm wavelength. LED is made of gallium arsenide or aluminium gallium arsenide. IR LED along with IR receiver are used as sensor. Here 24 LED are used which is enough for capturing the finger with specified resolution.

ADAPTER

Adapter is a device used as power supply which converts attributes of one electrical device. AC adapter called as recharger which is a small power supply that changes normal household electric current into low voltage DC power supply. Here 12 V, 2 Amp adapter is used for power supply to LED's.

VEIN DESCRIPTION

Su Jok is a system which is control of whole body within hand and feet. In proposed system, we are relating only the finger with major organs. Every major organs should be connected to every fingers. Thumb finger related to backbone. Fore finger related to three normal conditions such as fever, cold and allergic. Middle finger related to lungs and intestine. Ring finger related to the main organ of body, heart. Little finger related to kidney. Every changes in our organ leads to changes in particular finger vein. So that it is easy to identify that vein changes only without any advanced process such as scanning, ECG and ECT scan.

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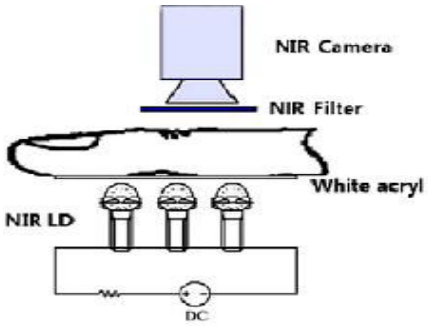
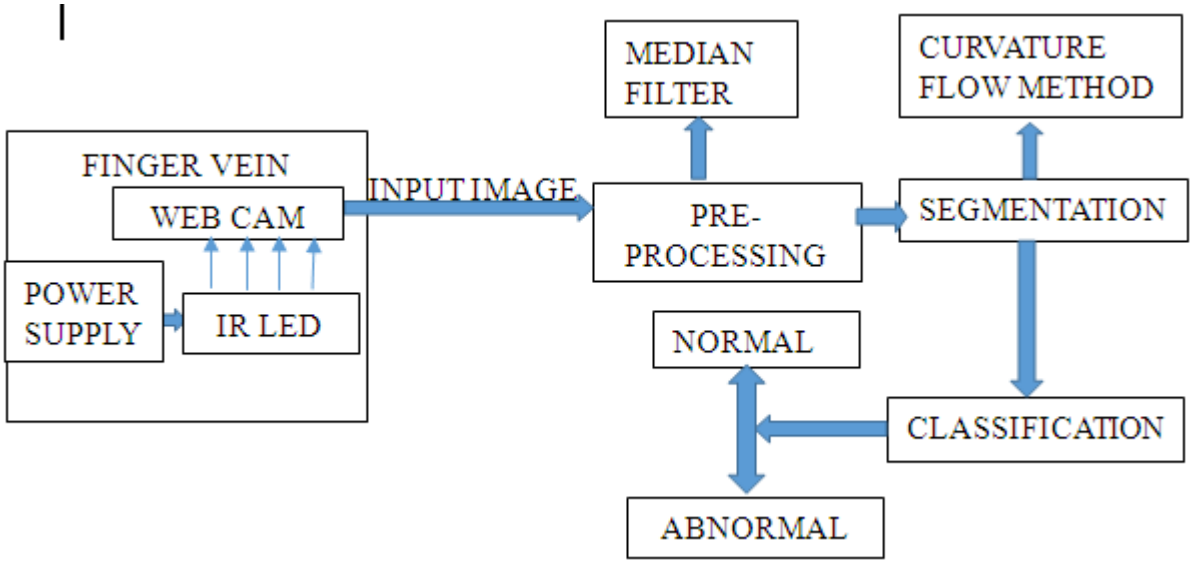
FINGER VEIN READER



Finger vein reader consists of IR LED, Webcam and adapter. Adapter provides power supply to the IR LED. IR LED is place below the finger and Webcam is placed above it. IR LED provides light source to the finger which reflects the inner part of finger which is enough to capture vein image with high resolution. Webcam captures the finger image and gives this image to laptop as input. Then further process of like preprocessing and segmenting are done using software such as MATLAB.



INPUT IMAGE

The finger vein reader is used to get the finger image which is an input for image processing. Then input image is preprocessed using MATLAB coding.

IMAGE PREPROCESSING

In image preprocessing, the functions involved such as filtering, resizing the picture, conversion of colour to gray. For filtering process, **median filter** is used. This filter is used for removal of noise in the captured input image from finger vein reader. The identification of noise in the image based on wrong binary value.

In resizing process, the original image from the finger vein reader is resized into half image as writing MATLAB code in 0.5 form. This size conversion is useful for gathering the area of finger from whole image as such in webcam. In conversion of coloured image into gray for gathering the only the black and white colour which is enough for processing. The overall performance of preprocessing is for good clarity of original image into specified and needed image format.

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IMAGE FEATURE EXTRACTION

In image feature extraction, captured original image was segmented and classified based on shape of vein image.

SEGMENTATION

In segmentation process, the input image from the finger vein reader was segmented as small pixels with specified size. Curvature flow method algorithm is used for segmentation process. The use of curvature flow method is for clear appearance of curves in the input finger vein image. The feature of Flow Curvature Method for ability to compute the analytical equation of the slow invariant manifold of singularly-perturbed system.

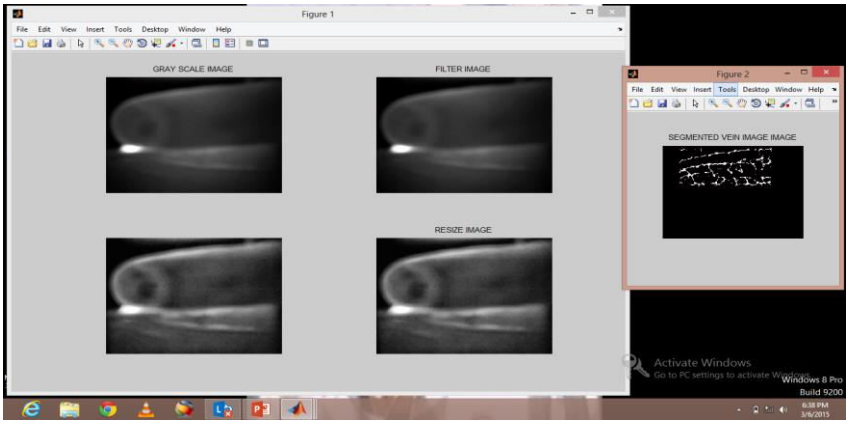
CLASSIFICATION

Connected component algorithm is used for classification of whether organ is either normal or abnormal. Here the classification of normal and abnormal are separated with the help of threshold value of veins in specified region. Normal person have more than the abnormal person have. Thus, conclude the classification that more valued vein in a region is normal and less valued range of vein in a region is abnormal.

The threshold value range for thumb finger are between 600 to 1200, for index finger the range be from 400 to 1000, for middle finger ranges are from 900 to 1200, for ring finger the ranges are from 700 to 1000 and for small finger the ranges are from 400 to 1000. If the ranges are below or above the threshold value, then the condition of organ will be abnormal.

The resultant output as normality or abnormality of organ is displayed in a separate widow as NORMAL = heart or ABNRMAL = heart. This identification of heart, intestine, etc., are based on the finger placed for capturing the vein in the finger vein reader. The MATLAB coding is written for each finger to place in reader for separate identification of organs to particular finger. Each finger have separate button forms, if thumb has to place, then press button for thumb finger and place the thumb for classification.

IV. EXPERIMENTAL RESULT



Initially run the coding as in software, the window asks for input image as “capture vein” then, press that button. Again it asks for finger has to place in finger vein reader. Then, press the button for which finger has to place for abnormality prediction. Now, the input image is captured and display in that window. After this, the gathered input image has to be processed under the functions of pre-processing and segmentation. The final process is classification. The segmented and resized images are displayed in separate windows. The classification of input image as normal and

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abnormal are displayed in different window as NORMAL = heart (denoted organ is based on which finger is placed while capturing the input image in finger vein reader). This project is very useful in medical field and for society. Thus, identification of organ abnormality can also be identified before symptoms occurs for specified disease.

V. CONCLUSION

The major advantage of this project is identification of organ disease before symptoms occurs. Every change in the organ has reflect the changes in the particular vein related to that organ. So that, vein image itself enough to find the state of organ related to that vein. There is no need of scanning the whole body when the disease was not identified.

In this proposed system, time has been consumed much more than in scanning process period. The result of captured vein is provided within few seconds.

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