Analysis of Varicose Veins in Lower Limbs through Multiscalar CNN

Assistant Professor1, B.E Student2, 3, 4, 5
Department of Electronics and Communication
SRM TRP Engineering College, Tamil Nadu, India

Abstract:
The main aim of this paper is to detect and prevent of varicose veins in earlier stage. Varicose veins are swollen, twisted veins that lie just under the skin and usually occur in the legs. Varicose veins are a common condition caused by weak or damaged vein walls and valves. Varicose veins may form whenever blood pressure increases inside your veins. It is the most common inflammatory arthropathy disease worldwide. In this proposed system, Flex sensor is used to measure the angle of deflection or bending of human patient’s leg. By this deflection angle, varicose veins disease level is detected. In order to realize the automatic classification and recognition of varicose veins of lower extremities using image processing. This paper proposes a varicose vein recognition algorithm based on CNN (convolutional neural network). Through this algorithm, the input image is compared with patient MRI image to realize the level of disease. Arduino controller is used to interface both the output. Once the veins are detected, the compression socks contains sensor with gripper is used and inclination of legs is always monitored. Thus the system provides the best detection and treating methods.

I. INTRODUCTION

Varicose veins are the most common chronic inflammatory arthropathy worldwide. It afflicts approximately 1 to 2% of the Indian population, with 4 to 6% of people over the age of 50. The current number has exceeded 25 million. In china the prevalence of varicose veins has exceeded 8%. It causes pain, swelling, stiffness, and loss of function in the joints. In addition to affecting aesthetics, varicose veins can also cause, for example venous edema, skin ulcers and thrombophlebitis and increase the risk of deep vein thrombosis which can cause disability and lower labour force. The disease usually affects the aged people. With the continuous development of science and technology, digital medicine and digital images are developing in society. In such a way, the innovative model proposed here detect the problem at its lower extremity using image processing techniques. The major problem faced by the doctors today is difficulty in accessing veins for intra-venous drug delivery. With improper detection of veins, several problems like bruises, rashes, blood clot etc occur. Therefore a non-invasive vein detection system has been developed successfully based on MRI imaging by CNN algorithm and flex sensor is used to measure angular movement of human leg. Arduino controller is used to interface with pc and hardware experiment results shows level of veins disease and provide best detection method.

II. EXISTINGSYSTEM

The technologies developed in recent years, such as image processing and virtual reality technology, are slowly being applied in the medical field. Digital medicine as a medicine interdisciplinary research combined with digital art has also achieved rapid development in recent years. The network algorithm designed by Lau et al. [1] can achieve a good recognition effect in 1000 images of skin damage. Mohammed etal [2] used 3D convolution in order to classify the patients of Alzheimer’s disease. Kawahara et al[3] applied a CNN structure to the brain connectivity map obtained from MRI diffusion tensor imaging DTI. O Shumkav et al [4] new methods have been developed to overcome traditional surgical intervention by using endovenous laser ablation. Yuan [5] used a multi-stream CNN to classify skin lesions, each working at a different image. A.S borde et al [6] The aim of this study is investigation of the biothermo mechanical response of the venous wall to the frequency ultrasound exposure, which is an advanced method in the treatment of LLVV. The model designed to analyze frequency range of the ultrasound instrument and the different values of its pullback velocity. According to the simulation results, the frequency range, in which necrotic changes of the venous wall can be caused was determined. Wanghyun et al [7] describes A.T method. The new method for remedy of varicose vein in the leg that incidents electromagnetic wave from outside of the body by using antenna and removes the blood vessels by heating. Dermatological disease recognition through lesion images, a machine intervention in contrast to conventional medical personnel-based detection. Multiple AI algorithms like convolutional neural network (CNN) and SVM used to form better structure[8]. Traditional treatment of this disease is surgery. It gives more pain and it can lead to other injury. Laser treatment, radio frequency closure, and sclerotherapy seem to work as well as surgery. The treatments work about 80 to 93 out of 100 people. The treatments may not work for about 7 to 20 out of 100 peoples. Sclerotherapy method is injecting the medicine inside the vein and makes them to shrink. There is a case where stroke occurred due to excess dose of sclerosant. There is another technique used to cure is Endovascular laser therapy. It can change the colour after the treatment patients have to wear the pressure stock ins.

III. PROPOSEDSYSTEM

Varicose veins are classified by grades ranging from I to IV and it can cause pain, itching, cramps and even ulcers if they are...
treated in time. In this paper, each part of the segmentation of the thermal image is developed for the detection of suspicious of varicose veins, which consist of the acquisition of the image, image processing, segmentation of the areas with higher temperature and finally the segmented image overlaid on the real image. Finally segmentation results determine the level of affected veins.

IV. WORKING

Image processing:
The MRI image is used to making a segmentation of grayscale histogram in the MATLAB program, then bodies of histogram will be identify and then convert the image to the HSV scale, to know the intensity of the image and finally show it Separately in the picture.

Image Acquisition
Image acquisition process is to acquire a digital image of the object. The general aim of Image Acquisition is to transform an optical image (Real World Data) into an array of numerical data which could be later manipulated on a computer. The MRI image of patient leg is taken as the input. MRI image of affected veins is captured by X-ray. The image that is acquired is incomplete. It is used for the further process.

Conversion from RGB to Gray scale Image
This operation converts the colour image into gray scale image. There are three colours present red, green and blue. The green channel gives better view of vein image. Since the green channel increases the brightness in veins and lower in the background. This is an 8-bit image.

Histogram Equalization
The image of gray scale is blurred using Gaussian blur. This is used to reduce the noise present in the image. Histogram equalization is performed on the output of Gaussian blurred image. The output of this image is not distributed equally along the pixel intensities. Hence histogram equalization is used to distribute equally along the range of intensities. Histogram equalization on the image is performed by calculating each value in the histogram with total number of pixels in the image. It is used to enhance the contrast of the image. It distributes all the pixels equally from 0 to 255. Hence veins appear darker than the background.

\[ p_i = \text{number of pixels with intensity } I \] total number of pixels.

Image enhancement
The goal in image enhancement to enhance the veins clearly for display. The first step is to remove the noise in equalized image using the technique of median filter. A window is moved along the image and pixel value is replaced by the median of the neighborhood values.

\[ y(m, n) = \text{median } x_{i,j},[i,j] \] p

Where ,p? represents a neighborhood pixel, centered around \([m,n]\) location in the image. Dilation is performed on the image. It helps to remove noise and enhance the image. The veins can be seen clearly. In this process the image is convolved with In the process of adaptive thresholding, the image is divided into sub-images. The sub-images must contain both the vein and background image. The output of the thresholding gives a binary image. It segments an image by settling all pixel. Values above threshold value to a foreground image and all the structuring element and it is seen that the dark region is enclosed by bright region. Hence the width of veins size is reduced to enhance the image.

Adaptive Thresholding
Thresholding is used to segment the veins from the background image. A threshold value for the pixel is set, which separate the background value from foreground value.

Remaining pixels to background value.
It finds threshold value for each pixel in an image based on neighbourhood pixel value of the histogram. If noise obtained in the image, morphological close operation is performed to remove noise. This helps to remove the background noise present in the image and segment the veins. It removes the dark regions in the background. It moves small objects present in the background.

Skeletonization
It is a process to eliminate soft tissues and leave only bones. Here we detect the medial axis of vein. After detecting the medial axis of vein, region growing is applied to remove the background noise. It mainly deals with pixel-based segmentation. The seed point and threshold is selected. The region to be segmented must be within threshold. Hence the veins are segmented from the background and it is over layed on the original image.

\[ \text{Figure.1. Process of Segmentation} \]
IV. HARDWARE WORKING MODEL

Flex sensor measures the angle of swelling of affected region. Flex sensor bends to 180 degree. It will attach to the lower limbs of the patient. Servomotor gripper is used to grip affected region. Depending upon the bending angle of sensor, the gripper will automatically adjust. Arduino controller is used to interface with pc.

V. RESULT

Using the MATLAB program, we convert it to gray scale. Each segment obtained from the histogram is to identify the peaks that can be considered as identifiable objects in the image. The software makes a averaged sum by taking the values of each pixel of the image of each dimension and multiplying with a normed value. Each segment obtained from the histogram is to identify the peaks that can be considered as identifiable objects in the image. The detected output image is considered as an input. Another input for the hardware module is taken from the flex sensor. It detects the symptom of the varicose problem in the muscular region. Considering this 2 as the input, the arduino module is programmed. The compression mechanism works when the

ADVANTAGE

This Compression method provides pain relief. It is easy to operate and can be used for childrens to aged people. It provides less side effects and reduces less joint effects.

APPLICATION

The compression gripper provides pressure to lower legs. It helps to maintain blood flow and reduce discomfort and
swelling. People can wear this compression socks for to do better in sports field and also for prevent from serious medical conditions. Peoples suffering from pheripheral disease also use compression socks for removing blood clot.

VI. CONCLUSION

Image processing and analyzing images in the medical field is very important, this research diagnose the diseases at an earlier stage. This paper uses convolutional neural network for image extraction for varicose veins of lower extremities to improve the accuracy of classification and recognition. For partitioning operation of Image, image segmentation method is used. It also the most significant task in image processing, and for better analysis and diagnosis, the original image will be partitioned into different sizes and pieces. Each segment obtained from the histogram is to identify the peaks that can be considered as identifiable objects in the image. The software makes a averaged sum by taking the values of each pixel of the image of each dimension and multiplying with a normed value. Another input for hardware module I taken from flex sensor. Flex sensor detects the swell of muscular region, depend upon the swelling level the servomotor gripper grips the leg. This could be effective treatment and easy to use. It is applicable to all aged persons.

VII. REFERENCES


