VARICOSE VEINS DISEASE DETECTION AND AUTOMATED TREATMENT USING BAN (BODY AREA NETWORK)

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Abstract *In existing system separate person need to check the patient and give treatment, whenever the patient need treatment they need a medical assistant help. So to avoid this need we induced a new system automated treatment using BAN (Body area network).Varicose veins are twisted, enlarged veins. Any superficial vein may become varicose, but the veins most commonly affected are those in your legs. That's because standing and walking upright increases the pressure in the veins of your lower body. For many people, varicose veins and spider veins a common, mild variation of varicose veins are simply a cosmetic concern. For other people, varicose veins can cause aching pain and discomfort. Sometime varicose veins lead to more-serious problems. Treatment may involve self-care measures or procedures by your doctor to close or remove veins. Approximately 23% of US adults have varicose veins. If spider telangiectasia and reticular veins are also considered, the prevalence increases to 80% of men and 85% of women. Generally more common in women and older adults, varicose veins affect 22 million women and 11 million men between the ages of 40 to 80 years. In this paper we proposed monitoring the varicose patients and automatically given the treatment whenever the patient need.*

INDEX TERMS *Db18b20 Temperature Sensor, Presssure Sensor, Body Area Network, Zigbee Tx & Rx, Vibration Motor.*

I. INTRODUCTION

Varicose veins are a common medical condition that affects millions of people worldwide. It is a condition that occurs when the veins in the legs become enlarged and twisted, resulting in discomfort, pain, and cosmetic concerns. Timely diagnosis and treatment of varicose veins are crucial to prevent complications and improve the quality of life for patients.

In recent years, there has been a growing interest in the development of innovative technologies to improve the detection and treatment of varicose veins. One such technology is the use of Body Area Networks (BANs) for automated detection and treatment of varicose veins. BANs are a type of wireless network that involves wearable devices and sensors that can monitor the body's functions and transmit data to a centralized system for analysis and processing.

The transfer of health monitoring data from multiple patients using wireless body-area networks requires the use of robust, and energy and bandwidth efficient multiple- access schemes. This paper considers the frequency-division multiple access for the wireless uplink to a fixed access point when using infrared signals to collect medical data from several patients

inside an emergency waiting room.

The conventional optical orthogonal scheme applies Hermitian symmetry to obtain real valued signals, which implies increased computational complexity. We consider a new approach transmitting only the real part of a complex-valued signal, where no such constraints imposed. Based on the proposed scheme, and taking into account the limited dynamic range of an infrared light-emitting diode, we study the performance of direct current biased and asymmetrically clipped schemes, and show their advantage in terms of energy efficiency and computational complexity, as compared with the conventional schemes. For instance, we show that by using asymmetric clipping, around 35 mW less transmit power is needed to achieve a bit error rate of 10-3 in the considered scenario.

The technological developments of the project is varicose veins patients monitoring and automated treatment is to give a temporary solution for varicose veins patients to made blood circulation and normalization.

II.RELATED WORK

The paper [1] “An Energy-Efficient Optical Wireless OFDMA Scheme for Medical Body-Area Networks” discusses the transfer of health monitoring data from multiple patients using wireless body-area networks requires the use of robust, and energy and bandwidth efficient multiple-access schemes. This paper considers the frequency-division multiple access for the wireless uplink to a fixed access point when using infrared signals to collect medical data from several patients inside an emergency waiting room. The conventional optical orthogonal scheme applies Hermitian symmetry to obtain real-valued signals, which implies increased computational complexity. Here they consider a new approach transmitting only the real part of a complex-valued signal, where no such constraints imposed. Based on the proposed scheme, and taking into account the limited dynamic range of an infrared light-emitting diode, they study the performance of direct current biased and asymmetrically clipped schemes, and show their advantage in terms of energy efficiency and computational complexity, as compared with the conventional schemes. For instance, they show that by using asymmetric clipping, around 35 mW less transmit power is needed to achieve a bit error rate of 10-3 in the considered scenario. They also demonstrate the robustness of the proposed scheme against multiple access interference.

The paper [2] “Radiofrequency ablation of varicose veins in obese patients” discusses radiofrequency ablation of the superficial venous systems has become one of the mainstays of minimally invasive approaches to varicose veins and chronic venous insufficiency. These procedures have high rates of success with scarce complications. Radiofrequency obliteration of the subcutaneous veins can be a method of choice in patients with obesity.

The paper [4] “Analysis of Varicose Veins of Lower Extremities Based on Vascular Endothelial Cell Inflammation Images and Multi-Scale Deep Learning” discusses whether there are lesions in the human body through the diagnosis of medical images, and classifies and identifies the lesions. Therefore, the automatic classification and recognition of medical images has received extensive attention. Since the inflammatory phenomenon of vascular endothelial cells is closely related to the varicose veins of the lower extremities, in order to realize the automatic classification and recognition of varicose veins of the lower extremities, this paper proposes a varicose vein recognition

algorithm based on vascular endothelial cell inflammation images and multi-scale deep learning, called MSDCNN. First, we obtained images of vascular endothelial cells in patients with varicose veins of the lower extremities and normal subjects. Second, multiple convolutional layers extract multi-scale features of vascular endothelial cell images. Then, the MFM activation function is used instead of the ReLU activation function to introduce a competitive mechanism that extracts more features that are compact and reduces network layer parameters

The paper [6] "Mathematical modeling of varicose veins ultrasound heating" discusses the last decade less invasive endovenous methods of treatment of lower limb varicose veins (LLVV) have obtained widespread appreciation. Nevertheless, the problem of improving their long-term results is still actual. The aim of this study is investigation of the biothermomechanical response of the venous wall to the low-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. The dependencies of the venous wall collagen denaturation time on the temperature and pullback velocity of the ultrasound instrument were obtained. After the developed model is supplemented with temperature dependencies of the physical properties of the venous wall, these results can be used to form requirements for ultrasound treatment modes for lower limb varicose veins

The paper [8] "Comparison of Mechanical Parameters of the Great Saphenous Vein under Various Test Conditions" discusses the mechanical parameters of the human veins are often measured in different test conditions. There are no studies on the influence of different test conditions on these parameters to date. This complicates the comparison between experimental data in different studies and creates the need to establish a universal test method for mechanical parameters acquisition. The influence of the test conditions of the test results was studied by comparison between mechanical parameters of veins using uniaxial tension in air at a room temperature and in the sodium chloride solution at 37 °C. Due to the substantial nonlinearity of the stress-strain data and the lack of suitable constitutive equation the proposed parameters for comparison were maximum stress, maximum strain and Young's moduli at small and large strains.

The paper [10] "Non-Invasive Capillary Blood Pressure Measurement Enabling Early Detection and Classification of Venous Congestion" discusses Capillary blood pressure (CBP) is the primary driving force for fluid exchange across microvessels. Subclinical systemic venous congestion prior to overt peripheral edema can directly result in elevated peripheral CBP. Therefore, CBP measurements can enable timely edema control in a variety of clinical cases including venous insufficiency, heart failure and so on. However, currently CBP measurements can be only done invasively and with a complicated experimental setup. In this work, we proposed an opto-mechanical system to achieve non-invasive and automatic CBP measurements through modifying the widely implemented oscillometric technique in home-use arterial blood pressure monitors. The proposed CBP system is featured with a blue light photoplethysmography sensor embedded in

finger/toe cuffs to probe skin capillary pulsations. The experimental results demonstrated the proposed CBP system can track local CBP changes induced by different levels of venous congestion. Leveraging the decision tree technique, we demonstrate the use of a multi-site CBP measurement at fingertips and toes to classify four categories of subjects (total N = 40) including patients with peripheral arterial disease, varicose veins and heart failure. Our work demonstrates the promising non-invasive CBP measurement as well as its great potential in realizing point-of-care systems for the management of cardiovascular diseases.

III. PROPOSED SYSTEM

The Architecture and the Data Flow Diagram of the proposed system is shown in **Fig. 1** and **Fig. 2** respectively. Varicose veins are a common medical condition that affects a significant number of people worldwide. While there are various treatment options available, most of them are invasive, time-consuming, and may not provide immediate relief to patients. In this proposed system, we aim to use a combination of a thermistor and a pressure sensor to detect the abnormality in varicose veins and provide temporary treatment to the patients. The system will consist of a wearable device that will be placed over the affected area. The device will contain a thermistor sensor that will measure the temperature of the skin over the varicose veins and a pressure sensor to detect the swelling. The sensors will be connected to a microcontroller unit that will process the data and analyze it for abnormality. If the temperature and pressure sensor readings indicate abnormality, the microcontroller will activate a massaging mechanism to provide temporary relief to the patient. The massaging mechanism will be in the form of a pair of socks containing a vibration motor that will be worn by the affected patient. The vibration effect will help to reduce the inflammation and pain associated with varicose veins, providing immediate relief to the patient.

In addition to the temporary treatment, the proposed system will also collect data on the patient's physiological signals, such as temperature and pressure, which will be transmitted to a centralized system for analysis and diagnosis. The data collected will help healthcare providers to monitor the patient's condition and provide personalized treatment options based on the severity of the condition.

The proposed system has several advantages over current treatment options for varicose veins. It is non-invasive, easy to use, and provides immediate relief to the patient. The system also collects real-time data that can be used for further analysis and diagnosis, enabling healthcare providers to provide more personalized and effective treatment options.

In Fig. 1, there are two modules. The first module is worn by the patient on the upper body to read the temperature and transmit the data wirelessly via ZIGBEE TX to the second module. The second module is worn by the patient in the form of socks and consists of a pressure sensor and temperature sensor. The lower body module receives the upper body temperature readings via ZIGBEE RX and compares them with the readings of the pressure and temperature sensors. If an abnormality is detected, the vibration motor is turned on to provide a massage to relieve pain.

In conclusion, the proposed system using a thermistor and a pressure sensor to detect the abnormality and provide temporary treatment to varicose patients is a promising approach. While it may not provide a permanent solution, it can offer

immediate relief to patients suffering from varicose veins. Further research is needed to explore the full potential of this system and to develop more advanced and automated treatment options.

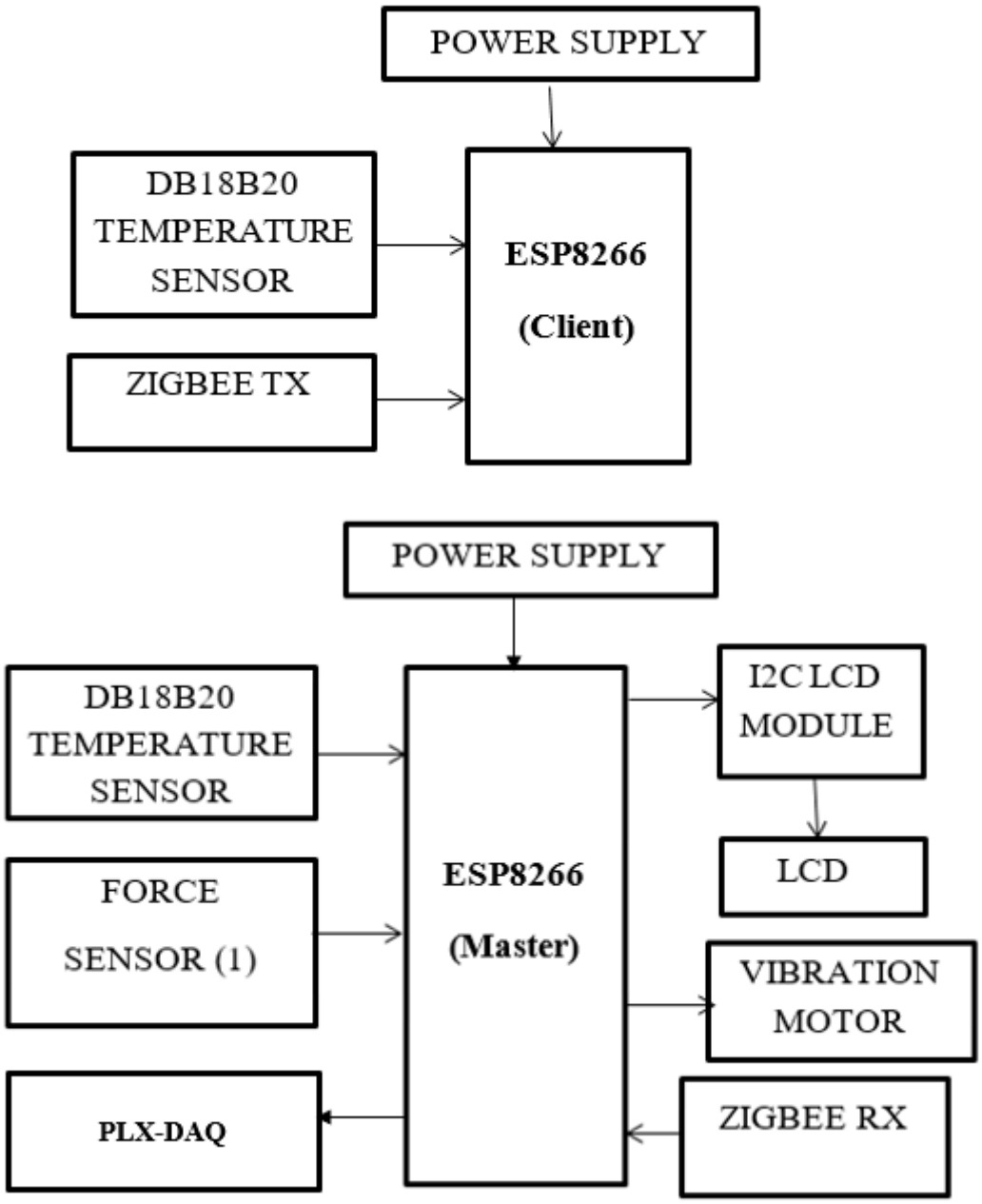

Fig.1: Architecture Diagram for Varicose Veins Disease Detection using BAN

Treatment	Time Taken
Sclerotherapy	30-60 min
Endovenous laser therapy	30-60 min
Radiofrequency ablation	30-60 min
Endoscopic vein surgery	1-2 hours
Vein stripping and ligation	2-3 hours
Ambulatory phlebectomy	1-2 hours

Fig.2: Time taken in the existing system

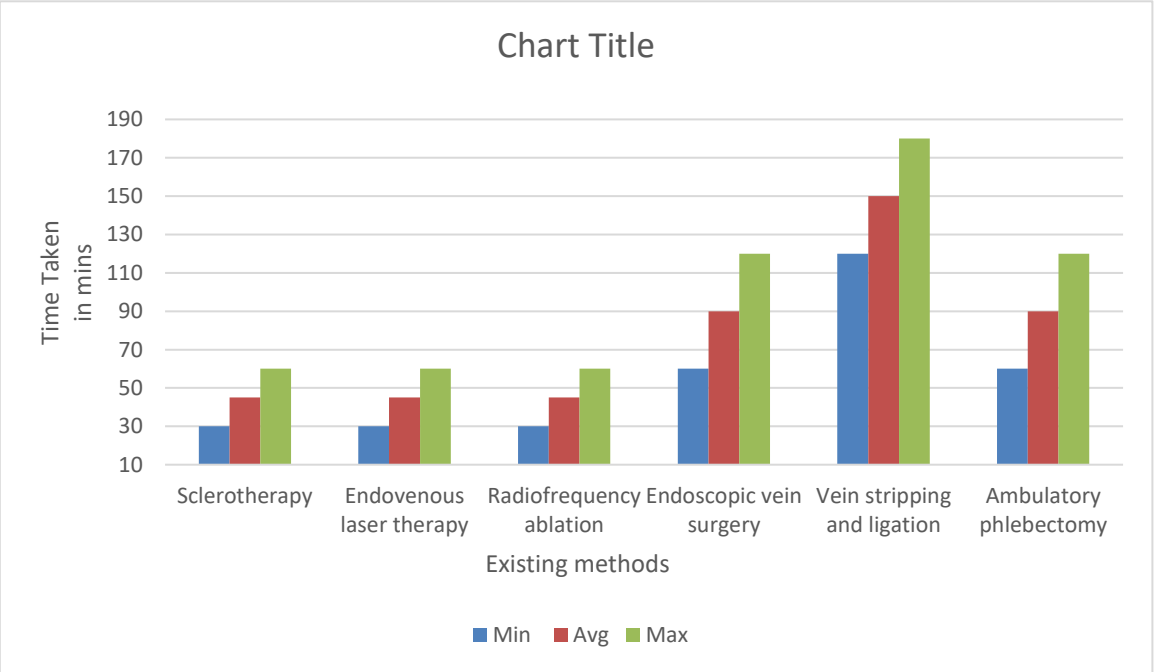

Fig.3: Histogram diagram representing the time taken for Exixting methods

Above histogram shows the time taken for various treatment options for varicose veins. The majority of treatments fall within the range of 30-60 minutes, including sclerotherapy, endovenous laser therapy, and radiofrequency ablation. Compression stockings do not have a specific time taken as they are a non-invasive treatment that can be worn throughout the day. Surgical procedures such as vein stripping and ligation, ambulatory phlebectomy, and endoscopic vein surgery take longer, with a range of 1-3 hours. **Fig 3** highlights the differences in time taken for existing methods compared to the proposed system which is immediate and does require the supervision or help of a physician. .

IV. OUTCOMES

The proposed system for varicose veins disease detection and automated treatment using BAN (Body Area Network) offers a promising approach to providing immediate relief to patients suffering from varicose veins. The system utilizes a thermistor and pressure sensor to detect abnormalities in the affected area and provide temporary relief through a massaging mechanism in the form of vibration. Additionally, the system collects real-time data on the patient's physiological signals, such as temperature and pressure, which can be transmitted for analysis and diagnosis, enabling healthcare providers to provide personalized treatment options.

Fig.4:Information Display

In he above Fig.3, the display continuously shows the stats from the modules.The proposed system has several advantages over current treatment options for varicose veins. It is non-invasive, easy to use, and provides immediate relief to the patient. The system also collects real-time data that can be used for further analysis and diagnosis, enabling healthcare providers to provide more personalized and effective treatment options. However, further research is needed to explore the full potential of this system and to develop more advanced and automated treatment options.

Overall, the proposed system using BAN technology has the potential to revolutionize the way varicose veins are treated. It offers a more patient-centric approach, allowing for personalized treatment options and immediate relief, while also collecting valuable data that can improve diagnosis and treatment outcomes. With further research and development, the proposed system could become an essential tool in the treatment of varicose veins.

Fig.5: Disease Detection

V. CONCLUSION AND FUTURE ENHANCEMENT

In conclusion, the use of Body Area Networks (BAN) in the detection and treatment of varicose veins is a promising approach. The proposed system that uses a thermistor sensor and a pressure sensor to detect abnormalities and provide temporary relief to patients suffering from varicose veins is a non-invasive, easy-to-use, and effective approach. The system collects real-time data that can be used for further analysis and diagnosis, enabling healthcare providers to provide personalized and effective treatment options. However, further research is needed to explore the full potential of this system and to develop more advanced and automated treatment options.

In the future, the proposed system can be enhanced by incorporating additional sensors and features to provide more personalized treatment options. For example, the system can be equipped with a heart rate monitor to detect changes in heart rate, which can be used to monitor the

patient's stress levels and provide stress-relieving treatments. The system can also be integrated with a mobile app that enables patients to monitor their symptoms and receive personalized treatment recommendations. Furthermore, the system can be enhanced by using machine learning algorithms to analyze the collected data and provide more accurate diagnosis and treatment recommendations. With further advancements in technology, BAN-based systems have the potential to revolutionize the detection and treatment of varicose veins and other medical conditions.

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