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Detection of Varicose Veins by Non-Invasive Method using Lab VIEW

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Abstract

In this paper we have given solution for varicose veins by adding various sensors in the knee band like force sensor, accelerometer sensor and peltier crystal to measure oxygen saturation level, leg movement,vibration and the force applied.In our project all the data's are collected and displayed in the front panel of LabVIEW. The data's received from hardware are transmitted using USB to UART drivers.We interpret this data from sensors and reduce the varicose veins.Therefore this project benefits people suffering from varicose veins and deep vein thrombosis (DVT).

Keywords: Varicose Veins, Non-invasive, LabVIEW, Peltier Crystal, PIC Microcontroller.

1. Introduction

People frequently suffer from varicose veins, particularly in India. WHO estimates that almost 10% of the world's population has varicose veins, with the prevalence being higher in women. The WHO also notes that the risk of developing varicose veins rises with age, reaching 35% for those who lead an active lifestyle and 50–60% for those who lead an inactive one. In people under the age of 40, varicose veins affect about half of the population. Adults typically have between 10% and 20% major varicose veins and 0.5% superficial varicose veins. Over 1500

persons were investigated for the Edinburgh Venous Study (EVS), which revealed that 39.7% of men and 32.2% of women had dilated, tortuous trunks of the long or short saphenous. To address a variety of lower limb issues, a multipurpose device must be released on the market.

Larger, swollen veins called varicose veins develop on the legs and feet. It occurs when the blood flow is repeatedly disrupted. Typically, they take place on our legs swiftly beneath our skin. Generally speaking, they will cause particular manifestations, but in very few instances, you might experience a pain nearby. In simple circumstances, thrombophlebitis notwithstanding, draining may even occur. They are known as varicocele when they occur close to the scrotum, whereas haemorrhoids occur when they do so close to the anus. Particularly, there is no justification for it. People who used to stand a lot at work, such as teachers, nurses, and police officers, are more likely to develop varicose veins. It may occur due to inactivity and/or stoutness, as well as other factors. It can also be passed down the ages. They may also occur more frequently while a woman is pregnant. Surgery, ligation and stripping, sclera therapy, radio frequency ablation, endogenous laser treatment, and transilluminated phlebotomy are among options for treating varicose veins.

2. Existing Idea

The disease can be detected using several techniques, including infrared image processing, scanning, and physical inspection, are used to identify the varicose vein. To determine whether the veins are healthy or whether they have any blood clots in the lower region, you must have an ultrasound test. The technician applies a transducer to the skin across the area of the body being studied in this non-invasive test. The transducer's function is to transmit the images to the monitor for review.

Surgery: The procedure is focused on cutting and removing smaller vein branches. However, the patient experiences excruciating agony and requires a lengthy recovery.

Sclerotherapy: This treatment involves injecting drugs into the veins to cause them to constrict. Allergies, inflammation, skin ulcers, burning, and stinging at injection sites are the side effects.

Endovascular Laser Therapy: In this procedure, the varicose veins are removed using a laser. Procedures typically last 30 to 35 minutes, and recovery happens quickly and easily. The colour of endovascular laser therapy changes. Following that, the patients must wear pressure stockings.

3. Block Diagram

The suggested system's block diagram shows a resistance-based analogue sensor, two motion sensors, and a sensor for blood oxygen monitoring. Force sensors, accelerometers, and a SPO2 sensor are employed as analogue sensors. The force sensor is used to gauge the user's exerted force. For various leg postures, the force values continue to change. when the person uses all of their force. The knee's bending is measured using the accelerometer. This is derived from the axis values that vary depending on the individual. The first signs of varicose are seen in the area of the calf just below the knee, thus three sensors are put in a strip there The peltier module and vibration motor are turned on by the driving circuit. This non-intrusive method is created using a driver circuit for a four channel relay.Four micromotors are used in our case for demonstrative purposes, and they are strapped together. One slide switch is utilised to turn the gadget ON and OFF out of two switches. The other is the Push button, which raises the

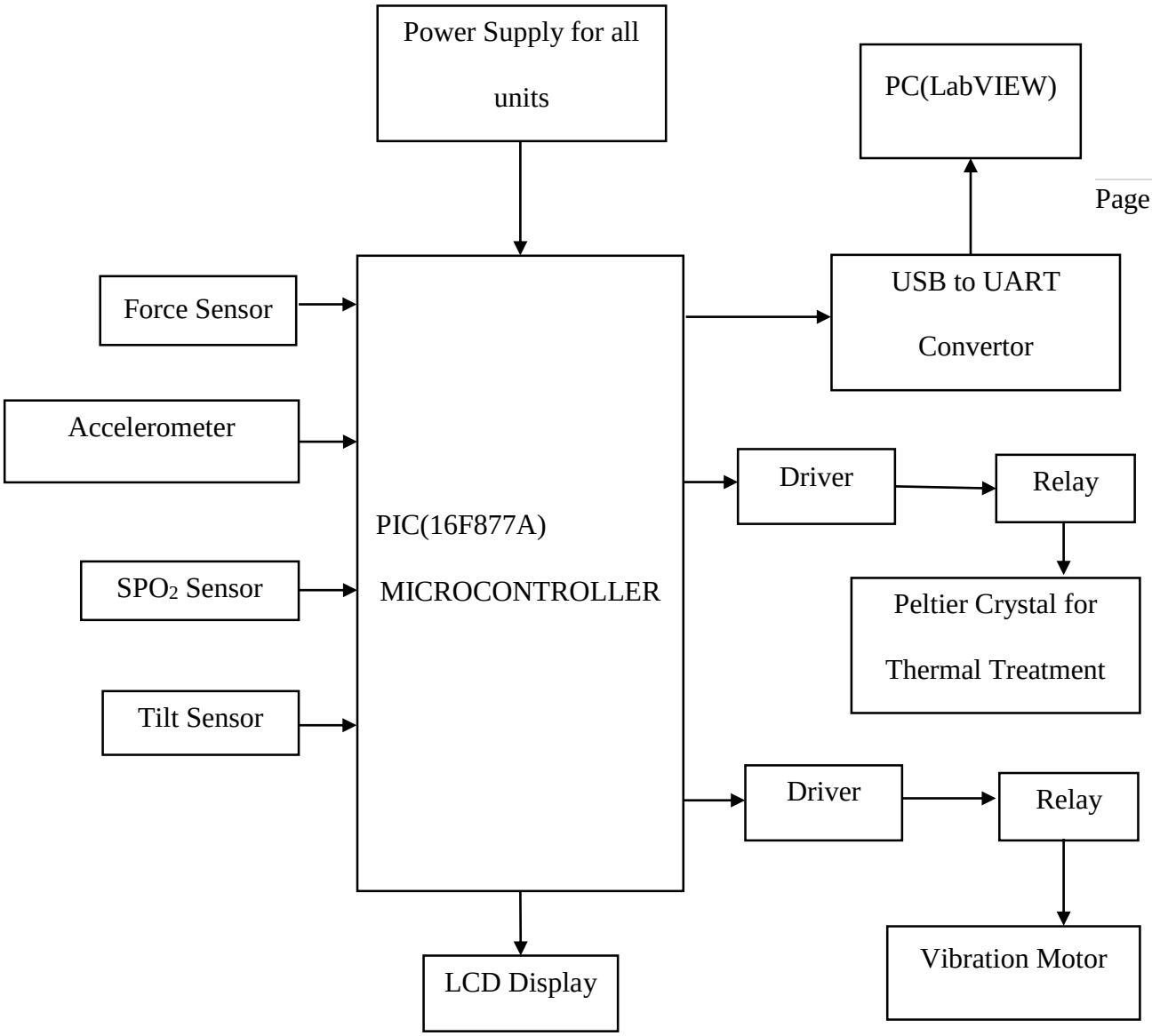

Figure 1: Schematic diagram of vericose vein detection using labview

temperature by 2 degrees Celsius when pressed for more than two seconds. This is done to highlight the case's flaws.

4.Hardware Description

4.1. PIC16F877A Microcontroller

A peripheral interface controller (PIC) is a type of microcontroller component that is used in the development of electronics, computers, robotics and similar devices. The PIC was produced

by Microchip Technology and is based on Harvard Computing architecture, where code and data are placed in separate registers to increase input/output (I/O) throughput. PIC16F877a is a 40-pin PIC Microcontroller, designed using RISC architecture, manufactured by Microchip and is used in Embedded Projects. It has three Timers in it, two of which are 8-bit Timers while 1 is of 16 Bit.

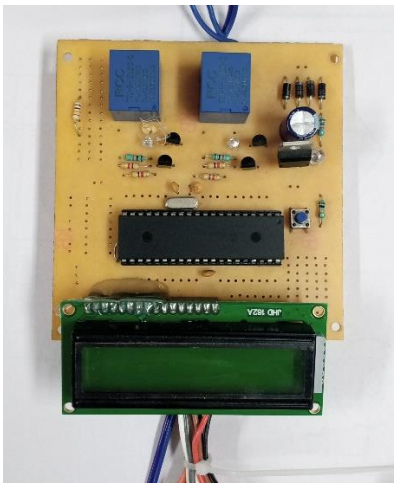

Figure.2. PIC microcontroller

4.2. ULN 2003 Driver Relay

In this proposed system, we need to use relays to control AC loads or high voltage loads using microcontroller. Relays are used to provide isolation between microcontroller's circuits and high voltage operating loads. Microcontrollers are only used to provide on/off signals to relays. Microcontrollers don't have enough current sourcing ability to derive relays.Therefore relay driver circuits IC is used to derive relays properly. Depending on the signals received from the microcontroller or other control circuits the relay controls the load. The relay consists of continuous power supply and whenever it gets driven or gets control signal then the relay gets activated and loads can be turned ON or OFF.

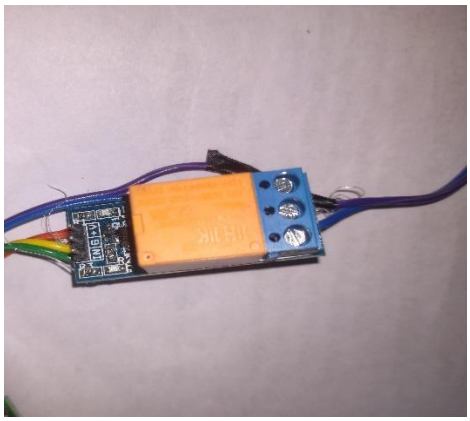

Figure.3. Driver relay

4.3. Power Supply

We will incorporate an Arduino and a sensor into our proposed system. Thus, a 5 V DC source is needed. In general, we utilise an AC supply of 230V 50Hz, but in order to provide power to various types of devices, this power needs to be transformed into the necessary form with the necessary values or voltage range. First, we are stepping down a 230V AC supply to 12V AC using a step-down transformer.

The 12V AC is then rectified using a diode bridge rectifier to 12V DC. Following the rectifier, the ripple in the circuit was filtered using capacitors and sent to the input of the 7805voltage regulator. 7805 regulates the 12volt DC to 5 Volt DC and at the output of 7805 IC, we get constant 5 Volt DC output.

4.4. Accelerometer:

Breakout board for Analog Devices' ADXL335 three-axis sensor. This is the most recent analogue sensor in a lengthy, well-established line. The ADXL335 is a triple axis MEMS accelerometer that uses only 320uA of power and has extremely low noise levels. Proper acceleration is measured using an accelerometer, which is different from coordinate acceleration. (rate of change of velocity). This is positioned in the patient's wrist, knee, and

ankle. An accelerometer placed flat on the surface of the Earth will, by definition, measure an acceleration of g = 9.81 m/s2 straight upwards. However, accelerometers in free fall (dropping at a speed of around 9.81 m/s2) will register zero. The sensor has a detection range of +/-3g.The board is fully constructed and tested, and all external components are included. The bundled 0.1uF capacitors set the bandwidth of each axis to 50Hz, with a 3.3volt onboard regulator.

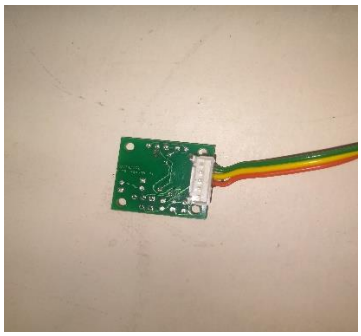

Figure 4 :Accelerometer

4.5. SPO2 Sensor

To extract the pulse signal from the fingertip, a basic reflectance SpO2 probe is used. The relative SpO2 sensor is an optical sensor that uses red and infrared light to track oxygen saturation. This sensor can be used to do pulse oximetry, which is a test that determines how much of the oxygen-carrying molecules in the blood (called haemoglobin) are actually carrying oxygen. This is referred to as oxygen saturation, or SpO2. The body requires a particular level of oxygen in the blood in order to function properly. Pulse oximetry, an indirect, non-invasive technique, can be used to monitor SpO2. (meaning it does not involve the introduction of instruments into the body). It operates by emitting, then absorbing a light wave that travels through capillaries or blood vessels in the fingertip.

Figure.5. Spo2 sensor

4.6. Force Sensor

The force imparted to an object can be measured with the use of a force sensor. The applied force can be determined by measuring how much the resistance values of force-sensing resistors vary. The characteristic of force sensors is that they react to applied force and transform its value into a quantifiable quantity. Based on diverse sensing components, there are numerous types of force sensors on the market. Force-Sensing Resistors are used to design the majority of Force Sensors. These sensors are made up of electrodes and a sensing film. The concept of "Contact Resistance" serves as the foundation for force-sensing resistors. In force-sensing resistors, a conductive polymer sheet changes resistance when force is applied to its surface in a predictable way.

Figure.6. Force sensor

4.7. Peltier Crystal

The Peltier effect is used in thermoelectric cooling to produce a heat flux at the junctions of two different kinds of materials. A Peltier sensor is a solid-state active component that, depending on the direction of the current, transfers heat from one side to the other while using electrical energy. They can be used for cooling or for heating, however cooling is typically the primary use. It may also be used to manage the temperature and can heat or cool. An array of Bismuth Telluride semiconductor pellets that have been "doped" so that one kind of charge carrier, either positive or negative, transports the bulk of current makes up a Peltier thermoelectric module.

Figure.7. Peltier crystal

4.8. Vibrator

The vibration motor is a small, coreless DC motor that can warn a blind person when it is detected. This motor's primary function is to vibrate or make a sound to warn the user when they receive a call. The primary characteristics of the vibrator motor are type, maximum working torque, and maximum. The cylinder-shaped vibrator motor is another name for the bar type. In essence, this motor's balance is off. The motor is moved by this force, which causes the

motor to vibrate because to its high-speed dislocation. This can be changed by adjusting the attached weight's mass, distance from the shaft, and motor speed.The motor will throb in two axes, such as the X-axis, due to the unbalanced weight's rotation's generated centrifugal force. The centrifugal strength which is produced by the unbalanced weight rotation will cause the motor throb in two axes like X-axis and Z-axis.

Figure.8. Vibrator

5. Results and Discussion

The determination of the disease is done using non-invasive diagnostic techniques with the help of sensors.Data is continuously gathered using sensors (SpO2 sensor, accelerometer sensor, and force sensor) attached to the patient's leg and fingertip. The CPU processes the data after it has been wirelessly delivered from the sensors in order to identify varicose veins. LabVIEW Fig.11 receives the sensor values. The bodily tissues that result in many therapeutic effects can be treated with several therapies that use heat or other forms of energy.

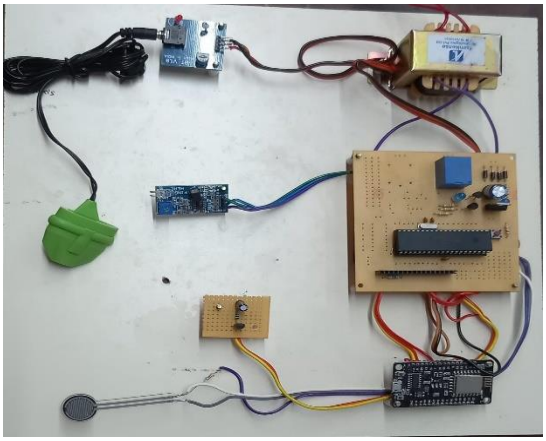

Figure.9. Overview

It accomplishes the desired therapeutic effect by raising the tissue's temperature to between 45 and 50 °C. By massaging the affected area with the vibrator, you can enhance blood flow and lessen swelling.

Thus the result were accurate and treatments were best be able to give by peltier crystals and mechanical vibrator. The sensor values and variations were successfully made visible and storable for further medical records and needs too.

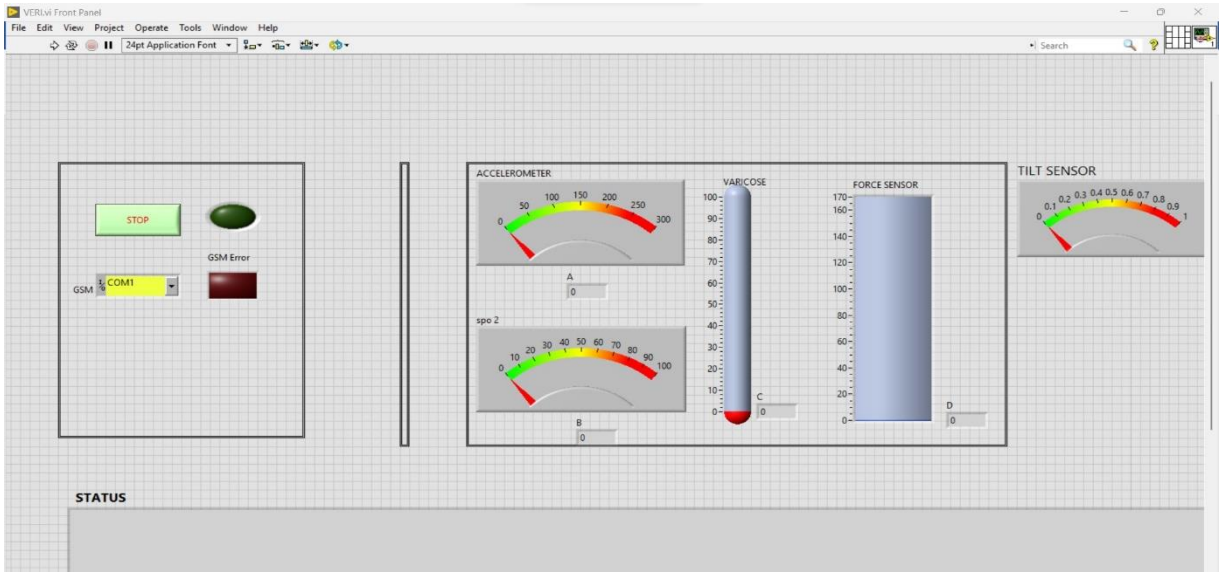

Figure.10. Lab VIEW front panel

6. Conclusion

Multiple sensors were successfully used to construct the project. The ultimate goal of this effort was to forecast varicose veins early and to shield the bottom part of the veins from the condition. The fundamental issue that causes blood vessels to reverse and obstruct is blood flow. In this study, LabVIEW is used to compare and analyse the output data from the various sensors. Within its execution, this initiative overcame several issues. We come to a conclusion and use certain fundamental data to anticipate the disease after checking some doctor recommendations. The appropriate sensor can periodically check the blood flow.

The peltier module, which is activated by the relay driver circuit and concurrently changes the heat and cold states for the regular blood flow, is used in the preventive process. We test the functionality of sensor circuits such the accelerometer and spo2 in addition to connecting the vibration motor to the relay circuit, which activates if the flow is interrupted. Consequently, it is highly affordable and versatile. The treatment is incredibly convenient for consumers and produces excellent results because it is delivered in the shape of socks.

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