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THERAPEUTIC CUFF FOR VARICOSE VEIN

An IoT Based Therapy for varicose vein

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Abstract: According to the World Health Organization, around 2-73% of the world's population suffers against varicose veins. Varicose veins are common in many humans, with a general prevalence of 10.4-23.0% in men and 29.5-39.0% in women. Varicose veins are twisted and dilated veins. Veins close to the surface of the skin can cause varicose veins. Varicose veins most commonly affect the veins of the legs. Standing and walking drive up tension in the lower body's veins. This disorder is more common in women. Female hormones tend to relax the walls of veins, so hormonal changes before menstruation, during pregnancy, and during menopause can be a factor. Hormonal treatments, such as oral contraceptives, may increase the risk of varicose veins. We are here to develop a cuff model for varicose vein patients. Our goal is to develop a circuit that influences pressure in affected veins. The device can be used while standing or during everyday tasks. Comfortable enough for everyday wear.

Keywords: Pressure cuff, Arduino, BMP180, mini air pump motor, HC-05.

INTRODUCTION

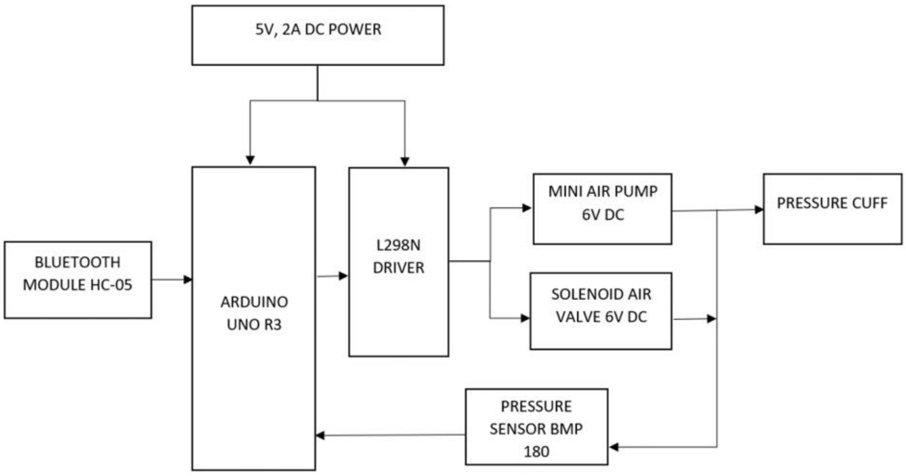
Varicose veins, which consist of spider-like telangiectasias, vascular veins, and actual varicosities, are every symptom of chronic venous the condition. Varicose veins are caused by hormonal, lifestyle, acquired, and genetic variables, as well as actual varicosities. The influence of estrogen on the risk of varicose veins may explain some of the increase in female prevalence. Using tobacco products is a substantial preventable risk factor for spider veins and more catastrophic chronic venous illnesses, especially venous ulcers. Post-thrombotic syndrome after deep vein thrombosis (DVT) may result in varicose veins in the absence of basic venous illness. By constructing the circuit to regulate pressure when vein inflammation occurs. The use of a pressure cuff improves venous hemodynamics by lowering venous reflux and ambulatory venous hypertension. The impact of a pressure cuff on the progression or recurrence of varicose veins is unknown due to a lack of evidence from randomized, controlled trials.

EXISTING SYSTEM AND PROPOSED WORK:

Compression stockings are usually advised as the first step in the treatment of varicose veins. By minimizing venous reflux and ambulatory venous hypertension, compression stockings improve venous hemodynamics. The influence of compression stockings on the progression or recurrence of varicose veins is unknown due to a lack of evidence from randomized, controlled trials. But in this system is primarily intended for varicose vein patients. The primary goal of this approach is to provide a cuff model for patients with varicose veins. The cuff model is made up of three major components: a pressure regulating mobile application, a pressure influencing motor unit, and a pressure sensor unit. The proposed system is made up of three major components: a Bluetooth module, an Arduino unit, and a motor unit. Bluetooth module - Required parameters like as pressure, time, and speed are configured in the mobile application and gathered and sent to the Arduino through Bluetooth module. This module takes input from the Bluetooth module and outputs in the form of inflating and deflating pressure cuffs based on the input. Motor unit - This module is in charge of inflating and deflating the pressure cuff based on parameters given to the motor driver through Arduino.

BLOCK DIAGRAM

This block diagram layout illustrates the connections between the driver, sensors, and the Arduino UNO R3 Microcontroller, in addition to how to connect the Bluetooth Module employing software. Connectivity is achieved through analyzing the operation of the sensors and software. With the use of jumper wires and tubes, the following schematic shows the subsequent clear connectivity of the sensors, the driver, the mini air pump solenoid valve to the pressure cuff.



COMPONENTS USED:

- Arduino UNO R3
- Driver- L298N
- Pressure Sensor – BMP 180
- Solenoid Air Valve – 6V DC
- Mini Air Pump – 6V DC
- Bluetooth Module – HC05
- Pressure cuff
- DC power

KODULAR

kodular.io was used to create the Android mobile app. In functionality, this is identical to MIT App Inventor; it also has a nice interface and many other capabilities. We can create a new project after joining up on the website. The project can be customized with a theme, color, name, and other properties that can be modified at any time. For this project, the configurations will be left at their default settings. Then we must click the end button, which returns us to the main dashboard. The user interface is simple to use, with drag and drop blocks and design. The design tab is where you may create a User Interface. Design elements include buttons, list pickers, time pickers, scrollers, and switches.

OUR PROPOSED SYSTEM

The system starts working when the user enters pressure into the mobile app. The required pressure is set once the corresponding pressure value is delivered to the Arduino UNO via Bluetooth. The L289N driver module is used to power the solenoid air valve and the small air pump. The Arduino will send control signals to the driver based on the app configurations. The present pressure figure serves as a threshold, and the pressure cuff inflates to that level. A solenoid air valve, which is similarly powered by L298N and controlled by UNO, works as a gateway and, when activated, does not allow air to escape, causing the cuff to inflate. The BMP180 sensor was used to monitor pressure. Because it has an I2C interface, it was simple to connect to Arduino. The sensor module was installed inside a 3D printed housing that included a nozzle for connecting the tube and was sealed on all sides to ensure consistent pressure readings.

FEEDBACK SYSTEM:

Instead of a human limb, the pressure cuff can be wrapped around a water bottle, and the pressure can be adjusted via a smartphone app. The BMP180 sensor will continually monitor the pressure when the cuff inflates and communicate the information back to the Arduino over the I2C interface. The Arduino will compare the actual pressure to the set pressure and change the solenoid air valve and tiny air pump to keep the set pressure level. The feedback system is represented by an LED that illuminates when the cuff achieves the desired pressure level and turns off when the pressure falls below the desired level.

BLUETOOTH SYSTEM:

One smartphone can be linked to the mobile app, while the other can be linked to a serial terminal application. The pressure level can be adjusted via the mobile app, and the relevant pressure value is transmitted to the Arduino over Bluetooth. The Arduino will then control the solenoid air valve and tiny air pump to inflate the cuff to the desired level of pressure. The pressure measurements from the BMP180 sensor will be communicated back to the Arduino and then through Bluetooth to the second smartphone. Using the serial terminal application, the pressure values may be viewed in real-time.

MOTOR SYSTEM:

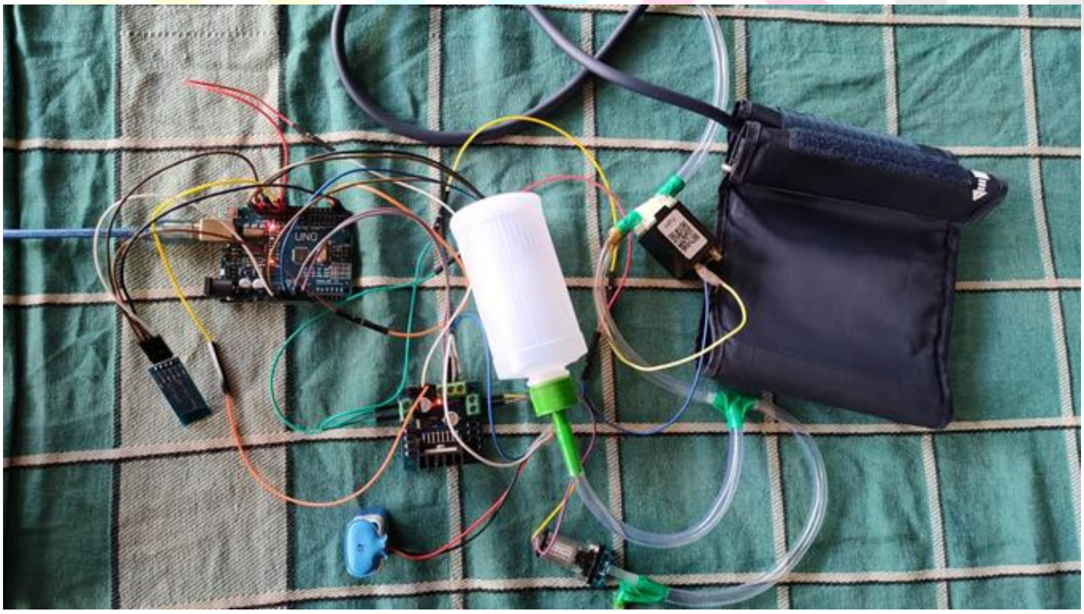
To replicate the solenoid air valve and tiny air pump, a motor can be utilised. Instead of an L298N driver module, an H-bridge motor driver can be used to control the motor. Instead of an air source, the pressure cuff can be inflated and deflated using the motor. Instead of using the smartphone app, a potentiometer can be used to adjust the motor speed. The potentiometer can be used to change the motor speed, which corresponds to the speed of pressure cuff inflation and deflation. The BMP180 sensor and Arduino can still be used to monitor the pressure values.

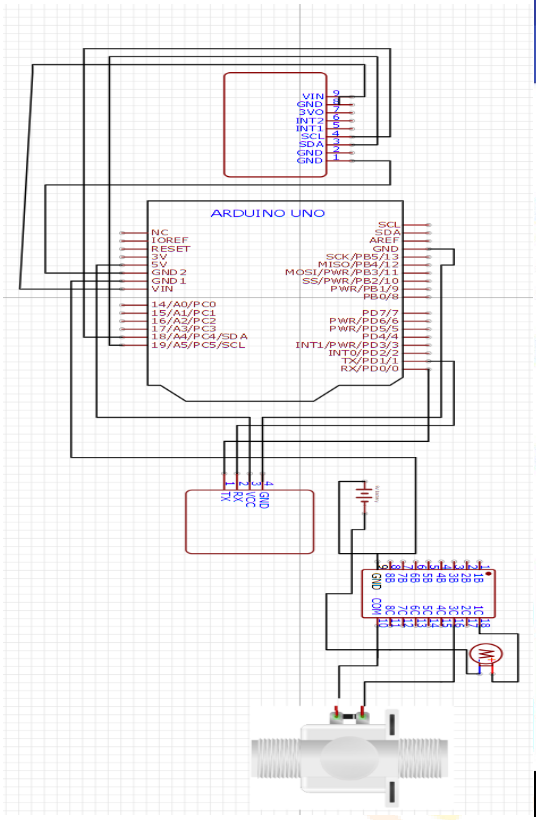
SMART PHONE-BASED SYSTEM:

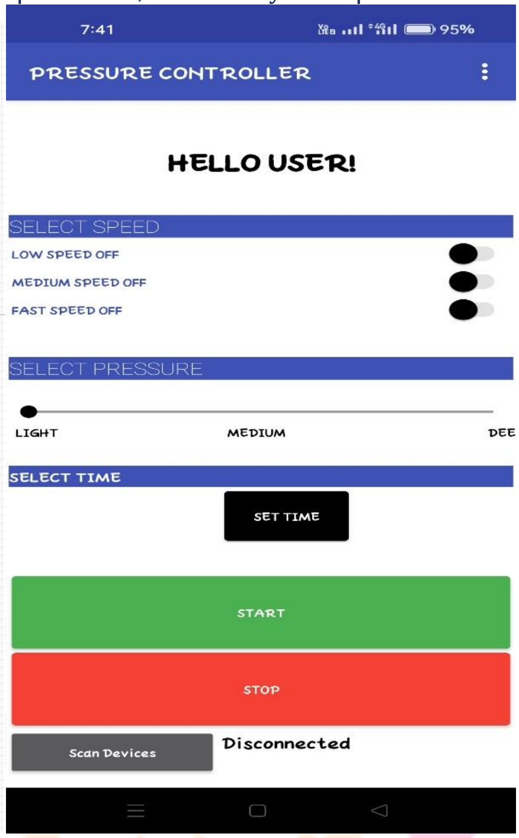
The android application allows the user to adjust all parameters such as Pressure, Speed, Time, and Start the device by clicking on the Start button. If the gadget must be stopped, a stop button is provided. The user must first link her phone with the Bluetooth module by inputting the HC-05's default pin, "1234", and keeping Bluetooth turned ON.

RESULTS & DISCUSSION

The required pressure can be set using a scroll bar in the Mobile App. It has three pressure settings: light, medium, and deep. Once the relevant pressure value is communicated to the Arduino Nano through Bluetooth, the required pressure is set. The timing diagram depicts the functionality of the pressure setting. The pressure setting (Light-0, Medium-1, or Deep-3) serves as a threshold, with the pressure cuff only inflating to that level. The pressure value is converted to the actual pressure level using Arduino. The App's switch button can be used to change the speed. The user can select one of three speeds: low, medium, or fast, which correspond to the length of time it takes the pressure cuff to inflate and deflate. The pressure cuff inflates and deflates slowly when set at Low speed. When the pressure cuff is set to Fast speed, it quickly inflates and deflates. The app will send to Arduino the values 0, 1, and 2 for Low, Medium, and Fast Speed settings, respectively. The speed mapping would be accomplished with Arduino. The switch button on the App can be used to adjust the speed. When the pressure cuff is set to Low speed, it inflates and deflates slowly. When the pressure cuff is set to Low speed, it inflates and deflates slowly. When the pressures are set to Fast, they are increased at a rapid rate. The future work is Improve feedback by including voice warnings. Making a suitable ABS casing for the device Making the mobile app more engaging by including statistics.







FUTURE WORKS AND CONCLUSION

The varicose vein therapeutic cuff can be used in conjunction with health monitoring devices such as fitness trackers, heart rate monitors, and blood pressure monitors. This would provide consumers a more comprehensive picture of their health and allow them to follow their progress over time. The pressure control system can be optimized using machine learning algorithms. This would entail analyzing pressure data from various users and building algorithms that can alter pressure levels automatically based on individual demands. The varicose vein therapeutic cuff can be incorporated with telemedicine platforms. Doctors would be able to remotely monitor and alter pressure levels, eliminating the need for in-person visits. In this study, we present a therapeutic cuff for varicose veins that can be controlled using a smartphone app and an Arduino Nano. There are three pressure settings (light, medium, and deep) as well as three-speed settings (low, medium, and fast) on the cuff. The app connects to the Arduino Nano over Bluetooth and configures the required pressure and speed parameters. The pressure and speed mapping are done using Arduino. Future development will involve increasing feedback with voice warnings, creating an appropriate ABS shell for the device, and making the mobile app more interesting with data. The proposed system is a simple and effective technique to manage varicose veins, and future improvements such as integration with health monitoring devices, machine learning-based pressure control, and connectivity with telemedicine platforms may improve its capabilities even more.

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