

Wearable Tremor Suppression Device for Parkinson People

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ABSTRACT: Traditional treatments, medication and surgery, for tremor management in Parkinson's disease have shown varying effectiveness carry a risk of significant side effects. A tremor is somewhat rhythmic motion that may occur in various body parts. The device is designed as wearable and personal equipment using wireless communication. Tremor is continuously monitored with help of heart beat sensor and accelerometer. Sensor output is given to controller which is used to control the valve with help of driver circuit for controlling tremor action and heartbeat is monitored. Non return valve is used to arrest the air pressure in the valve for get back to the normal relaxed state. If the tremor doesnot suppressed within the few seconds of duration then the alert signal is send to the caretakers or doctors through GSM.

KEYWORDS: Parkinson's Disease, Tremor, Pic Micro Controller, Heart Beat Sensor, Temperature Sensor, Accelerometer, Tremor suppression, GSM module..

I. INTRODUCTION

Recent research and development of wearable tremor suppression technology have shown a promising third solution for tremor management. Tremor is a rhythmical and involuntary oscillatory movement of a body part and it is one of the most common movement disorders. Orthotic devices have been under investigation as a noninvasive tremor suppression alternative to medication or surgery. TheChallenge in musculoskeletal tremor suppression is estimating and attenuating the tremor motion without impeding the patient's intentional motion. The device is designed as wearable and personal equipment using wireless communication. Tremor is continuously monitored with help of heart beat sensor, temperature sensor and accelerometer. Sensor output is given to controller which is used to control the valve with help of driver circuit forcontrolling tremor action. Non return valve is used to arrest the air pressure in the valve. SMS to the doctor or relatives using GSM modem automatically if the heart beat is high and tremor is not controlled by maximum times of suppression.

II. METHODOLOGY

This method deals with the measurement and controlling way for the tremor caused mainly due to theParkinson's disease. In this project we continuously monitor the patient's health with the help of three sensors. We here use accelerometer, temperature sensor and the heart beat sensor. We use ADXL 345 accelerometer, IR heartbeat sensor and LM 35 temperature sensor.The accelerometer senses the movements of the patients in three axial directions and sends its output to the microcontroller. The heartbeat sensor uses the IR radiations to monitor heartrate by passing the IR rays through the hand and measuring the blood flow. The temperature sensor senses the temperature and converts it into voltage and produces output to the controller.A pressure cuff is placed in the patient's hand and the patient's body temperature, heart beat and the movements are continuously monitored using these three sensors. And the output of these sensors is given to the microcontroller where a threshold value for the tremor is preset depending on the patient's body condition. If any increase in the threshold value is detected then the microcontroller activates the solenoid valve through the drivers and relays. Thus the cuff is subjected to an air pressure through the solenoid valve which results in the inflation of the pressure cuff helping in the suppression of the tremor. This pressure can be maintained for few seconds and the procedure is repeated for 2-3 times. If the tremor is not controlled by following this procedure an Iot is set which sends SMS to the doctor or the relatives of the patient.

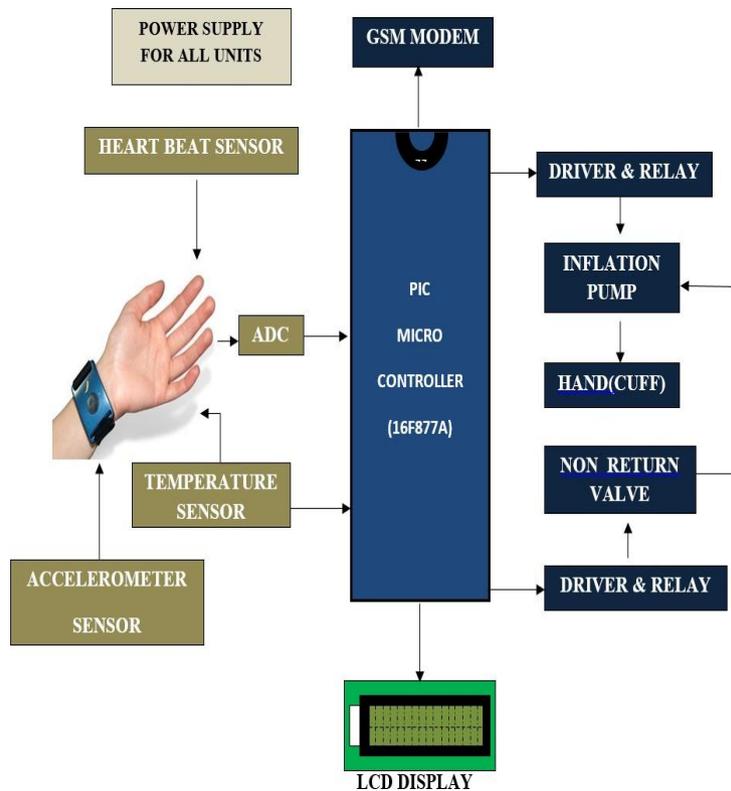


Fig.1. Proposed Model

Tremors

A tremor is an unintentional and somewhat rhythmic oscillation of a certain moving body part. It is most commonly found on the limbs, head, but also on the body. There are several kinds of tremors in medicine that we can classify. The frequency content of voluntary movement is generally concentrated at frequencies below 2 Hz. However, the most forms of tremor occur at frequencies greater than 3 Hz; ranging from 3 to 10 Hz including fast, medium, and slow tremors.

The proposed system consists of four functional parts:

- An accelerometer sensor module that is suitable for recording tremors directly from the affected hand.
- A heart beat sensor to detect the change in blood flow.
- A temperature sensor to sense the body temperature.
- A microcontroller to control the entire system.

Accelerometer

An accelerometer is a device that measures proper acceleration, proper acceleration is not the same as coordinate acceleration. Here the patient’s movements are sensed especially in two or three axes. If the movements are very continuous and within a particular time, then the microcontroller activates the relay. Here we use ADXL 345 accelerometer as because the sensitivity of it is comparatively much higher and it measures the acceleration caused all the three axes X, Y and Z.

Heart Beat Sensor

Here we are using IR sensor for detecting the HEART BEAT. IR has less noise and ambient light than at normal optical wavelengths. The light is produced only when current passes through in the forward direction and block current in the reverse direction. It measures the change in volume of blood through any organ of the body which causes a change in the light intensity through that organ.

Temperature Sensor (LM35)

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C). The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

PIC Microcontroller

PIC is a family of Harvard architecture microcontrollers made by Microchip Technology, derived from the PIC1640. Originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to "Programmable Interface Controller". Microcontroller is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer. It receives output from various other components such as the sensors and combines their outputs and compares it with the preset threshold value and if it exceeds the threshold value then it indicates it as tremor to either the doctor or the relative of that patient.

III.CONCLUSION AND FUTURE SCOPE

Here we are introducing a continuous monitoring cuff for parkinson's peoples suffering from tremor. So the patients will be safe at any time and anywhere. Through this method the previously having sophisticated robotic arms technology for tremor suppression is reduced to a simple of heart beat sensor and accelerometer for continuous monitoring and controlling excess tremor using a cuff. If the tremor rate gets adversely increased the alarm system automatically enabled and alert message sends to the doctors via GSM. Future work will use more patient data to assess the WTSC after the identified problems have been addressed to improve the performance of the WTSC. In addition, a whole upper limb tremor suppression device will be developed and validated whereas here we only deal with hand tremor.

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