

“HANDHELD ASSISTIVE DEVICE FOR PEOPLE SUFFERING FROM TREMOR”

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Abstract: A handheld assistive device for people suffering from tremors produced in hands and to research further for developing assistive devices for tremors produced in various parts of body is designed. The device basically deals with the problem of tremor which is not a disease actually but effect of various diseases. Focus is on developing a device which is highly efficient in detection and correction of tremors in hands, having an ergonomic design for easy use and low cost.

Keywords - Tremor; Detection; Correction; Ergonomic

I. INTRODUCTION

Tremor is an involuntary, somewhat rhythmic, muscle contraction and relaxation involving oscillations of one or more body parts of body, ranging from slight to severe amplitude. It is nothing but vibration in body parts which is rhythmic. It can affect hands, legs, face, eyes, head or vocal cords. Most tremors occur in hands. Tremor is not a disease, but is a symptom which arises in human body through various diseases. (Plumb, 2006) The causes of tremors are diverse like various neurological diseases, alcohol and caffeine consumption, tobacco consumption, stress, etc. As per a medical survey report conducted by national health organization in 2014-15, there were more than 70 lakh people suffering from various health issues which cause production of tremors in human body, which has only increased in recent years.

People suffering from tremors face difficulty in doing their day to day routine work like holding material, eating food, writing, etc. properly. They can't even drink water on their own. These people always need assistance to do anything. This makes them feel embarrassed which leads to social isolation as they feel lowly of themselves. This is the motivation behind taking up this project, to help the people suffering from tremor to live a better and independent and to make them feel proud of themselves.

The main obstacle in smooth working of people is the vibrations produced in the hands. So, if the vibrations in the hands can be suppressed or nullified, they will be able to do their things on their own. The main objective of this project is to provide these people with an handheld assistive device which would detect vibrations produced in hands and nullify them with maximum efficiency. So, that these people can do their work on their own.

II. REVIEW OF LITERATURE

Electromyography (EMG) recordings are used as the current standard for recording of tremors of the tremulous limb. Cutting edge PC innovation empowered an expansive utilization of the Fourier transform and its expansions (spectral and cross-spectral analysis) to tremor time arrangement. In Spectral analysis the time arrangement is transformed into the frequency area. The analysis is sensitive to rhythmic movements and thus a peak is observed at the individual frequency and is not traced and perceived by visual investigation. (Kamble, B.B.Ahuja, Kulkarni, & Bakatwar, 2014)

The median nerve is one of the main nerves originating from the brachial plexus and extends up to the fingers. It originates before the third part of the axillaries artery at the lateral side. The median nerve

controls the forearm and hand muscles, thus allowing the wrist, thumb and fingers to bend and move. (Ramon G. Garcia, B, & S, 2016)

After analyzing all the problems faced by people suffering from tremor and the technology available with us, we have formulated a problem statement and a road map to follow as described below. To develop a device this would detect and nullify the effect of tremor and can be held in hand without much fuss which is compatible with a battery.

III.SYSTEM DESIGN

The proposed device is a tremor detection and correction device. Device will be having two terminals on two opposite ends, input and output. The input end will be in contact with the hand in the palm and the output terminal will be free space. The tremors(vibrations) produced in hands will be sensed through the sensor and provided to the micro-controller which in turn will direct the vibrator connected in the output side of the device to produce vibrations in the direction opposite to the direction of the input vibrations for stabilizing the device on the output end. Counterbalancing principle is used here.

The device consists of a tremor sensor, precisely vibration sensor(ADXL335) which will sense the vibrations produced in the hand, a microcontroller(AVR) to control the working of the whole device, vibrator to stabilize the other end of the device and a LCD display(16 x 2 LCD) to monitor the whole operation of device. Power supply of 5v is supplied to the device as the micro-controller works on a voltage of 5v.

The input will be taken from the human hand thorough the vibration sensor (ADXL335). The electric signal produced by the sensor will be given to the micro-controller (AVR). Microcontroller will analyze the signal and provide the vibrator with proportional signal.

Vibrator acts according to the signal provided and produces vibrations in the direction opposite to the directions of the input tremor, stabilizing the other end of the device in the process. The output terminal of the device is a flexible one i.e. it can be attached with a spoon, a hook, etc. depending on the work to be done. A battery is also provided in the device, So as the person can roam around anywhere freely.

IV.BLOCK DIAGRAM –

The block diagram of the device has been designed which consists of all the important components in the device.

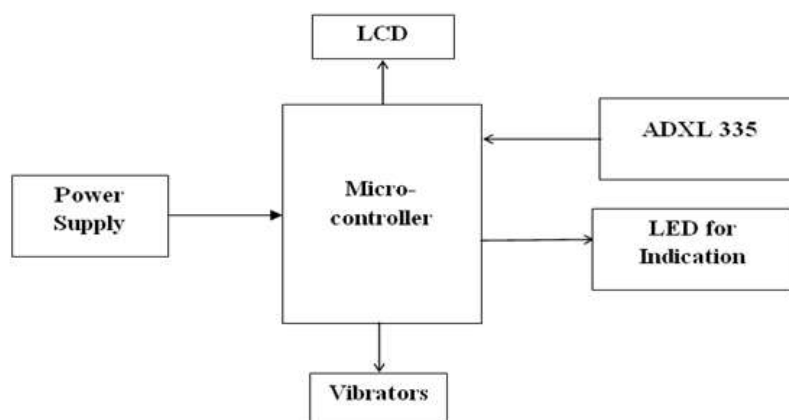


Fig.1:-Block diagram of proposed device

As can be seen in the above figure, the device consists of small sensors i.e. ADXL335 (accelerometers) that measure the user's tremor. The data sensed by the sensor is nothing but the frequency of vibrations, an analog signal. These analog signals are sent to microcontroller, which analyzes the input electrical signal and determines the direction and amplitude of tremors produced in hand.

The microcontroller then generates a set of instruction, digital signal and sends the electrical signal to the vibrators, which produces the vibrations in the opposite direction with respect to the input vibrations sensed and the attachment at the end of output terminal is stabilized. Cancelling tremors are sent both horizontally and vertically through motors within the handle.

The heart of the device is microcontroller to which all the peripheral are interfaced. We are using ATMEGA328 microcontroller which belongs to AVR family. !6 x 2 LCD display is also used in the device to display the actual vibrations in hand and the counter movement of the peripheral vibrators.

V.RESULT

The device developed through the process of defining the problem, specifying the system, circuit diagram design and PCB layout has been tested successfully and following results were monitored.

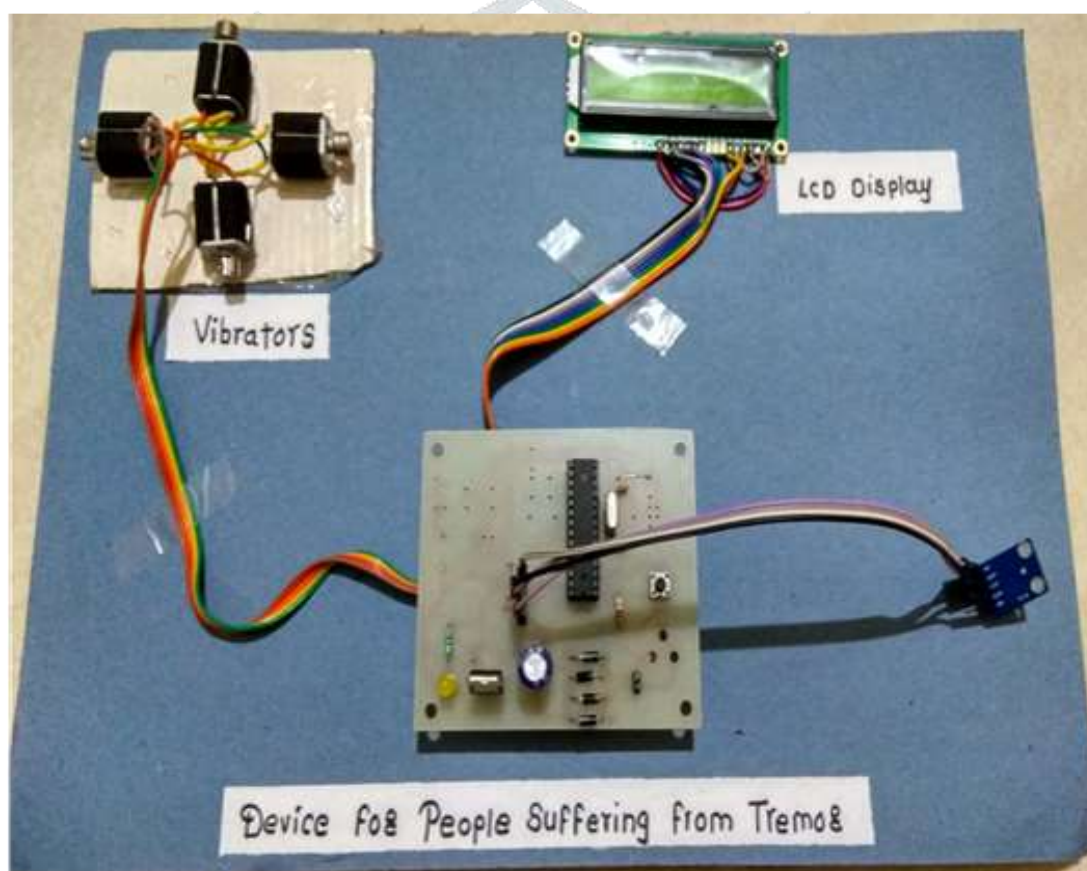


Fig.2 Prototype of developed device

The above picture shows the developed prototype of the proposed device, as can be seen in the picture the controller and the sensor along with the power circuit have been integrated on a PCB. For demonstration purpose, the Vibrator motors and the LCD have not been integrated on the PCB.

The Sensor when placed in a hand producing tremors will sense the vibrations being and provide the signal to the microcontroller. The microcontroller will read the input signal, analyze the vibrations and provide the vibrators with information signal of the direction in which it has to vibrate so as to counter balance the initial vibrations.

If we look at the vibrators section, we have used four vibrators basically one vibrator for each of the primary directions. LCD display will show the direction of the initial vibrations on the screen.

VI.CONCLUSION

A Handheld assistive device for tremor detection and correction has been developed. The device developed is compact in size and easy to use without any technical complications. Using this device people are able to bypass the effect of tremors in hands, able to perform their routine day to day tasks like eating, writing, etc. with relative ease. This device can be used by people from all the age groups. With reduced cost, the device is helpful for all the people .

VII.REFERENCES

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