Ambulatory wireless EEG using single channel.

Parth Joshi[1], Jeetesh Garsund[2], Dr. D.U.Shinde[3]

[1]*Parth Joshi, student, dept. Of instrumentation engineering, All India Shri Shivaji Memorial Society's Institute of Information Technology, Maharashtra, India*

[2]*Jeetesh Garsund, student, dept. Of instrumentation engineering, All India Shri Shivaji Memorial Society's Institute of Information Technology, Maharashtra, India*

[3]*Dr. D.U. shinde, professor, dept. Of instrumentation engineering, All India Shri Shivaji Memorial Society's Institute of Information Technology, Maharashtra, India*

---***---

Abstract- *We have designed an ambulatory wireless EEG monitoring device using single channel . The device monitors a patient's brain activity which is the electroencephalograph EEG from various parts of brain by connecting electrodes over the electrode montage. Features of the device include wireless data transmission by using RF transmitter and receiver . This portable device can be used anywhere to measure EEG of the patients.*

Keywords:Ambulatory, wireless, Electroencephalograph, RF transmitter and receiver., single channel ,monitor.

1.INTRODUCTION

Electroencephalogram (EEG) is an instrument for measuring electrical activity of brain, by suitably placing surface electrodes over the scalp. There are total 21 electrodes which could be placed over scalp to measure various activities of brain. EEG is used in diagnosis of various neurological disorders and diseases like sleep apnea, epilepsy seizures, tumours and various sleep disorders. Based on the graph and waveform which is recorded doctors can predict disorders and diseases.

1.1 Block diagram explanation

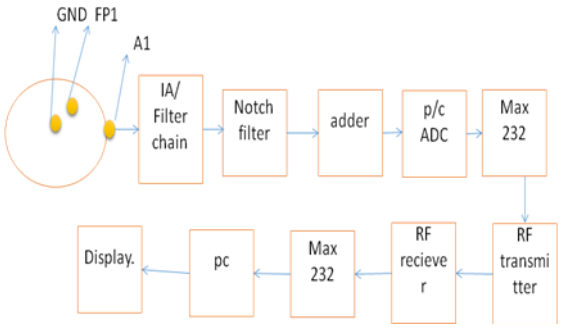

Fig-1: Block diagram of Ambulatory wireless EEG device using single channel.

1. Electrode placement:

We are using only 1 electrode which is placed at front of the scalp called frontal electrode (FP1) for measurement along with 2 other electrodes for reference and ground. We are using silver electrodes for picking bioelectric signal from the scalp which has high conductivity and less resistivity.

2. signal conditioning:

We get 2-200 micro-volt of the bioelectric signal from our scalp. Hence various filters chain and amplifiers are used to increase the strength of the voltage signal. Here we have used high pass and low pass filters , notch filter , instrumentation amplifier and adder circuit. For analog to digital conversion we are using 10 bit peak controller.

3. Max 232:

It is used for TTL to Rs232 conversion..

4. RF transmitter and receiver:

We are using RF zigbee module for transmission and receiving of signal. It is 2.4GHz wireless transceiver . Its range is 30m.

5. Display:

EEG waveform is monitored and displayed on laptop or personal computer in visual basics. This allows the person whoever is monitoring to get a good pictorial view in the form of EEG wave.

2.HARDWARE DESIGN AND IMPLEMENTATION

The hardware of our project has following components

- Electrodes
- Instrumentation amplifier and filter chain
- Adder
- Peak controller
- Max 232
- Zigbee transceiver
- PC with visual basics

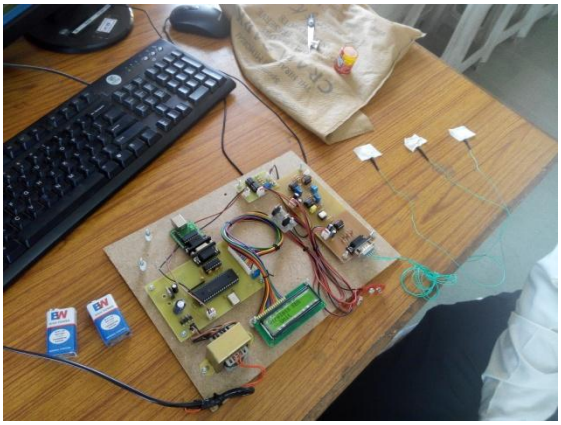

Fig-2: Hardware of the Ambulatory wireless EEG using single channel.

1.Silver electrodes:

We have used 3 silver electrodes for picking signal from the scalp because silver electrode has high conductivity and less surface resistance.

2. Instrumentation amplifier and filter chain:

We have used AD620 as instrumentation amplifier and OP07 as high pass and low pass filter. Notch filter is used to reduce noise of 50 Hz.

3.Adder :

We have used OP07 as adder for level shifting.

4. Peak controller :

We have used 16F877A as a 10 bit peak controller for analog to digital conversion.

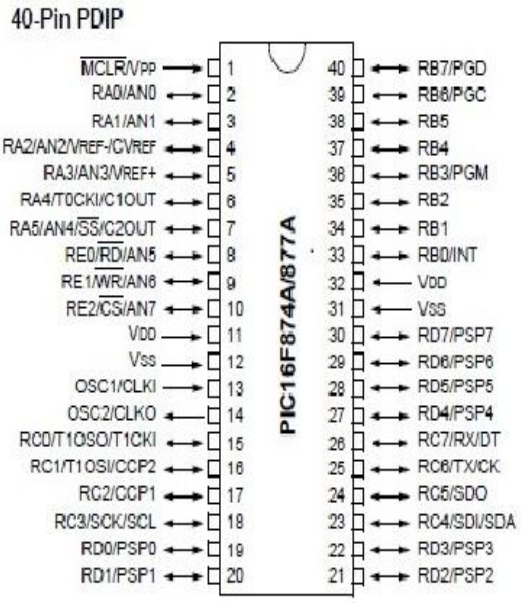

Fig-3: pin diagram of PIC16F877A

5. Max 232 :

It is used for TTL to RS232 conversion.

6. zigbee transceiver :

We have used 2.4 GHz wireless zigbee transceiver with range of 30 m.

7. PC with visual basics :

We are displaying EEG wave on PC or laptop in visual basics.

3.RESULT AND CONCLUSION

Our project has the following results and conclusion-

- It monitors EEG wave accurately.
- Waveform of eyes opening and closing is prominently seen.

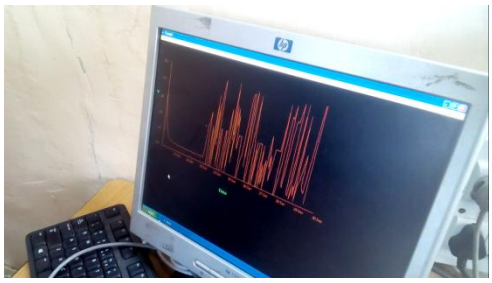

Fig-4: final EEG wave.

Therefore we have developed a portable and accurate device that monitors EEG of the patient. Because of the components used in making the device, it is a low cost device.

4.ADVANTAGES

- The designing of our project and the components used make it a very cost effective product to use.
- Simplicity of design makes the device very easy to use.
- The best advantage of our project is the compact design which makes it portable. Hence it can be used while travelling as well.
- Being wireless patient is not wired up to a chair for long monitoring. Hence less discomfort.

ACKNOWLEDGEMENT

We are very much thankful to our Head of the department Prof. H.P. Chaudhari for his continuous encouragement, moral support and facilities provided to us. We express sincere thanks to our project guide DR. D.U. Shinde who has continuously guided us in the technical aspect of the project like circuit designing, component mounting, testing etc. during the development stage of our project.

REFERENCES

[1] Joon Park, Ling Xu, Vishnu Sridhar, Mike Chi, Gert Cauwenberghs, "Wireless dry EEG for Drowsiness Detection,"Department of Bioengineering, University of California, San Diego