Life Saver System by Predicting Epilepsy Attack Using EEG, ECG and EMG

Mrs. R. Jayanthi,S. Krishnaveni,, S. Gokulraj , S. Kowsalya,A. Kiruthika
Associate Professor /ECE,Nandha college of Technology,Erode,India
UG Scholar/ECE,Nandha College of technology,Erode,India
UG Scholar/ECE,Nandha College of technology,Erode,India
UG Scholar/ECE,Nandha College of technology,Erode,India
UG Scholar/ECE,Nandha College of technology,Erode,India

***Abstract* - The major aim of the paper is predict the epilepsy in few minutes advanced. Epilepsy is major problem to youngsters. Our paper solved the problem and measures the variation of the human body signals such as heart rate, muscles movement and brain activity. Suddenly the signals are changed to intimate the person will be attack by epilepsy using alarm then send the message to doctor or any relatives and GPS is used to track the exact location of the patients .**

General terms:- Microcontroller – AT mega 8A, Heart Beat sensor, Muscle Resistance Sensor, LCD,GSM SIM 900A,Platform - AVR STUDIO ,Win AVR, Simulation – Proteus 7.7sp2a.

1.INTRODUCTION

Epilepsy is a very fatal condition which is caused as a result of imbalance in the nervous system. The very common symptoms of epilepsy includes sudden fluctuations in heart beat rate and involuntary muscular movements (seizures)and brain activity .To find the practical symptom of epilepsy includes fluctuations in heartbeat, nausea, dizziness etc. The wireless electronic diagnosing system designed here is exclusively meant for epilepsy patients. The system helps them in accurately predicting the occurrence of seizures. Sudden occurrence of seizures during driving may lead to accidents and its occurrence during sleeping hours can even lead to the patient's death, if no immediate, proper attention is provided by a bystander or a doctor. With the aid of this system, the patient can lead a normal life. Since the occurrence of seizures is unpredictable, it will be a very risky task to leave the patient alone. The electronic system presented here is a wearable device which predicts the occurrence of epilepsy in a few minutes advance. The device utilizes the signals from human body to detect the occurrence of epilepsy. As soon as the device detects the symptoms, it transmits a coded signal. The signal is decoded by a wireless receiver to produce control signals for switching an alarm device, mobile messaging device and an automatic vehicle control system appropriately. In future, GPS could be incorporated to trace out the exact location of the patient. "

Current technologies for acquiring signals from the patient's body are very much developed. Many sensors are available which can detect the heart beat and muscular movements non-invasively and accurately. Such non invasive technique for measuring heart beat is pulse oximetry. Using this technique, heart beat can be accurately monitored. Muscular convulsions are collected using micro electromechanical sensors (MEMS), brain activities are measured to use Ag/Agcl electrodes are strongly attached to the body .The sensors used are small in size and can be strongly attached to the body. The accelerations resulting from epileptic convulsions are sensed using MEMS accelerometer which is very accurate, precise and small in size. To provide wireless communication channel low cost network using MiWi protocol is utilized. Then Heart beats are to be monitored continuously. Any sudden variation in heart beat which is caused by the onset of epileptic seizures is detected and provide strong MEMS signal. When the seizure is confirmed, message is transmitted to the surroundings for initiating necessary protective measures for the patient. The device is designed as a wireless, wearable and personal equipment. The device can sense in a few minutes advance and takes the necessary safety measures automatically. Hence a technician's assistance is not required for the patient. Therefore this device will be extremely useful for patients (especially youngsters) who wish to be active in their life. The user gets absolute freedom from wires and can be used when moving. To practically implement the epilepsy prediction system, the following aspects should be implemented.

2.EXISTING SYSTEM:

The existing method of this paper totally uses two sensors they are EMG & ECG sensors .That sensors helps to analyze the electrical energy generated from muscles and heart few minutes advance .But it is used to find the high rate variability of heart rate and muscle movement .The design consists of hardware and software sections. The device hardware mainly consist of three parts namely, (i) Heart beat sensor, (ii) Seizure detector, (iii) Processor and (iv) Wireless transceiver.

3.PROPOSED SYSTEM:

In proposed system overcome the disadvantage of existing system ..there are three bio metric signals are measured heart beat and muscular convulsions, and brain activity. The main reason is used the three bio metric signal any one signal is change the pacient will be affected by epilepsy so in proposed system three signals are measured by sensors.any changes in human body immediately alart using alarm,sendsms and tracking the location of patient using gps.Then device is designed aswireless and find the epilepsy in few minites advance.

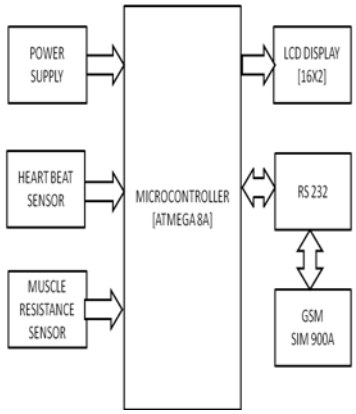
To practically implement the epilepsy prediction system, the following aspects should be implemented.
Sensing biometric signals three types of biological signals are required for processing. They are heart beat, muscular convulsions and brain activity. The heart beat can be measured using pulse oxy meter.Muscular movements can be measured using MEMS sensor and Ag/Agcl electrode is used to measure the brain activity accurately.

1.Processing of the signals is done by software programmed into a microcontroller. The software is designed in such a way that it detects the exact symptom of epilepsy.

2.Communication is set up using a transmitter and receiver module with MiWi protocol

3.Automatic vehicle control system, mobile messaging device and an alarm device is integrated to the receiver for protecting the patients

Block diagram



3.1Microcontroller – atmega8

The programmer used is a powerful programmer for the Atmel 89 series of microcontrollers that includes 89C51/52/55, 89S51/52/55 and many more.It is simple to use & low cost, yet powerful flash microcontroller programmer for the Atmel 89 series. It will Program, Read and Verify Code Data, Write Lock Bits, Erase and Blank Check. All fuse and lock bits are programmable. This programmer has intelligent onboard firmware and connects to the serial port. It can be used with any type of computer and requires no special hardware. All that is needed is a serial communication port which all computers have.

High-performance, Low-power AVR® 8-bit Microcontroller, Advanced RISC Architecture, High Endurance Non-volatile Memory segments, Peripheral Features, Special Microcontroller Features, I/O and Packages and its operating voltage is about 2.7 - 5.5V (ATmega8).

Pin configuration.

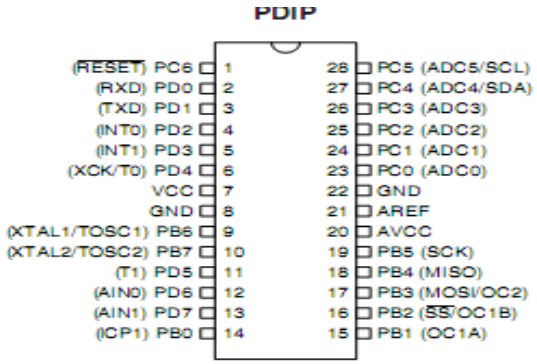


Fig:1 Pin diagram of ATMEGA microcontroller

3.2MicroElectroMechanicaleSensor:

Fig:2 Sample picture of fixing MEMS sensor

Fig:3 MEMS sensor to measure muscle movement

An accelerometer is used as a convulsion sensor. Muscular convulsions are detected using single axis MEMS IC MMA1260EG. The sensitivity of the sensor is set to 1.55g. The circuit is implemented as shown in the circuit diagram. The output of the sensor is filtered out using a low pass RC filter externally. The value of R is selected as 1KΩ and C as 0.1µf.

3.3Heart Beat Sensor:

Fig 4 :Puls oxy meter

The Heart Beat Sensor provides a simple way to study the heart's function. This sensor monitors the flow of blood through Finger As the heart forces blood through the blood vessels in the Finger, the amount of blood in the Finger changes with time. The signal is amplified, inverted and filtered, in the Circuit .By graphing this signal, the heart rate can be determined, and some details of the pumping action of the heart can be seen on the graph.

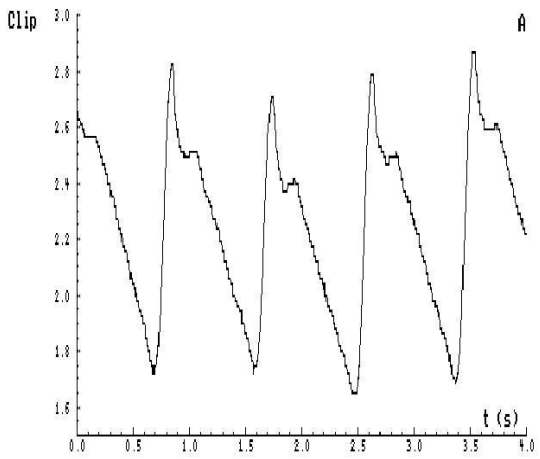


Fig 5: sample measurement taken with the heartbeat sensor.

Figure shows that the blood flowing through the Finger rises at the start of the heartbeat. This is caused by the contraction of the ventricles forcing blood into the arteries. Soon after the first peak a second, smaller peak is observed. This is caused by the shutting of the heart valve, at the end of the active phase, which raises the pressure in the arteries and the earlobe.

3.4Liquid Crystal Display (LCD):

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector.

Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other.

Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

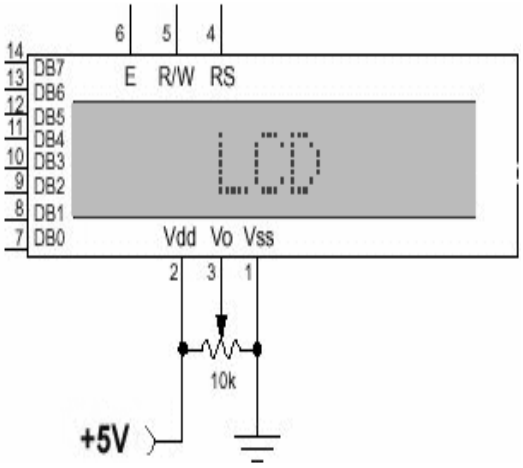


Fig 6:LCD display

3.5GSM Modem:

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip(MAX232). The baud rate is configurable from 9600-115200 through AT command.

The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface.

The onboard Regulated Power supply allows you to connect wide range unregulated power supply . Using this modem, you can make audio calls, SMS, Read SMS, attend the incoming calls and internet etc. through simple AT commands

3.6GSM Modem Features:

High Quality Product (Not hobby grade)

Dual-Band GSM/GPRS 900/ 1800 MHz

RS232 interface for direct communication with computer or MCU kit

Configurable baud rate

Wire Antenna (SMA connector with GSM Antenna Optional)

SIM Card holder.

Built in Network Status LED

Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.

Normal operation temperature: -20 °C to +55 °C
Input Voltage: 12V DC

3.7 EEG sensor

EEG sensor is used to measures the electrical activity of brain . ag/agcl electrodes are attached to head for find the change in brain waves.

Fig7:Ag/Agcl electrode

4. FEATURES:

The benefit of the project is that a lightweight, rugged, low-cost, wearable (on the wrist) device is developed which helps a victim of epilepsy to do all sorts of activities like others do.

The device will be extremely cost effective since it uses simple sensors and technology for the detection.

The sensors are small in size and can be firmly attached to the body.

Batteries can last long as the device consumes only little energy .

The device doesn't restrict the movement of the patient.

The system is easily expandable paving the way to incorporate much more sophisticated devices like ECG detector in the future Standalone application

5. CONCLUSION

The device is very useful for epilepsy patient and particularly for the youngsters because they can be able to move in and around world freely like normal people without any fear about saving their life from epilepsy attack. It is light weight device, low- cost and effective wearable device.

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