M.Saranya al. International Journal of Recent Research Aspects ISSN: 2349-7688, Vol. 4, Issue 4, Dec 2017, pp. 204-206

Real-time Monitoring of Narcolepsy Patients Using Neural Networks

M.Saranya [1], Sribavitha.N [2], Tamilselvi.C [3], Ranjitha.M[4],Vaishnavi.K.V[5]

[1]Assistant Professor, [2,3,4] UG-Final year

[1,2,3,4] Medical Electronics Engineering,Sengunthar college of Engineering,Tiruchengode, Namakkal.

Abstract- **Individuals with certain sleep disorders are subject to uncontrollable sleep episodes accompanied by cataplexy. These patients are more vulnerable to household and occupational accidents. Currently, narcolepsy has no cure, and this research pursues developing a portable medical device to assist in narcolepsy detection through providing diagnosis, real-time detection and logging of narcolepsy. The device uses accelerometer sensor, heartbeat sensor, GPS, EEG sensor. The raw data from the EEG sensors, heartbeat sensors and accelerometer sensor can be sent wirelessly to phones, tablets, etc., which enables individuals to collect their own data and allows both health professionals and individuals to view and monitor the data over time. In order to extract meaningful EEG signals, raw EEG device data has to be filtered and processed. EEG signal analysis consists of two phases. First is preprocessing, where noise and other impurities in raw EEG signal are removed or suppressed. Second phase is feature extraction where EEG data is analyzed and diagnostic information is obtained. Finally, the heart rate and location of the patient is send to the caretaker via GSM.**

Keywords: EEGSensor, Heartbeat Sensor, Accelerometer Sensor, GPS, GSM.

I. INTRODUCTION

A Neural network is a computer system modeled on the human brain and nervous system. An ANN is based on a collection of connected units or nodes called artificial neurons, analogous to biological neurons in an animal brain. Each connection between artificial neurons can transmit a signal from one to another. ANN is the biologically inspired simulations performed on the computer to perform certain specific tasks like clustering, classification, pattern recognition etc. The wearable devices like Zephyr BioHarness, which measures EEG along with other physiological parameters like skin temperature, respiration rate, level of physical activity and posture simultaneously. In recent years, many types of consumer electronic devices have been developed for personal or home network applications. A consumer home network usually contains various types of electronic devices like sensors and actuators, so that home users can control them in an intelligent and automatic way to improve their quality of life. Some representative technologies to implement a home network are Ultra Wide Band, Bluetooth and accelerometer. This helps in monitoring overall health of the person. This project presents the study of wearable physiological monitoring system by gathering, processing and analyzing the physiological data from these devices. To do so, a GSM system is developed which helps in monitoring the data. If there are any abnormalities found, an alert will be generated.

Accelerometer is suitable for consumer networks because various sensors can be deployed to collect home data information in a distributed, self organizing manner with relatively low power. The structure of projected fall detection system core structure relies on a Micro programmed Controller Unit (MCU). The heartbeat sensor, EEG sensor and accelerometer are integrated on one single board, recording real time acceleration and heart beat. Each acceleration and heart beat information is first captured by analog-to-digital converter (ADC). Then, the digital signal is transmitted to the MCU for any process. The system is complemented with a customer interface designed to watch information in period. This system is designed such that it can help the elder persons who are residing in the house. Global Positioning System consists of a constellation of 21 satellites orbiting the earth every 12 hours at a height of approximately 10,900 nautical miles. Six orbital planes contain four satellites each and have an angle of inclination of 55 degrees with respect to the plane of the earth's equator. Control of the system is aided by five globally located monitoring stations. These stations continuously evaluate the system's performance and upload timing and health data which is then rebroadcast to the user.

An enhanced fall detection system for patients monitoring through a consumer home network environment is based on smart sensors which are worn on the body. In the previous work the systems was dependent on the home network which poses an inherent risk of not delivering safety critical message at run time due to the fact that communication is done from hardware to home network to elder care control centre to medical server to WAN to user. This takes more than five hops for the data or the alert to reach the doctor or the home user. In our approach we intend to cut down the no. of hops and reduce the time needed for communication of the safety critical message. To do this we consider the fact that now days every individual is carrying a smart phone which has Bluetooth, GPS, GPRS and GSM capabilities. We will develop a network which contains accelerometer heartbeat sensor and EEG sensors and a GSM interface. This hardware will be connected to the phone via GSM module in case of any disruptions in the reading of accelerometer or heart rate the hardware will communicate the readings directly to the doctor and the family members via GSM and GPRS also

sending the location of the person. This paper proposes the new model by using advanced modern technology to detect the narcolepsy and also continuously monitoring the patients in various levels. And also when the fall is detected GPS is used to track the exact location of patients.

II. HARDWARE

Hardware system is constructed with power supply unit, Microcontroller –ATmega 8A which is High Performance, Low Power AVR, Advanced RISC Architecture and High Endurance Non-volatile Memory segments.

Heartbeat Sensor- This sensor monitors the flow of blood through Finger. These devices use light to track your blood. By illuminating capillaries with an LED, a sensor adjacent to the light measures the frequency at which your blood pumps fast .Heart Beat can be measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heart beat changes.

EEG Sensor- the EEG Sensor is a Single-channel sensor with bipolar differential measurement and provides a Pre-conditioned analog output. The EEG Sensor continuously monitors the patient's brain activity. The EEG sensor senses provides the difference between normal and abnormal waves and send a signal to the microcontroller. The bipolar configuration, with two measurement electrodes detects the electrical potentials in the specific scalp region with respect to a reference electrode, which should be placed in a region of low muscular activity. The resulting signal is the amplified difference between these two signals, eliminating the common unwanted signals detected by the surfaces.
Accelerometer Sensor- This sensor is used to detect the motion of the patient. The displacement of a small proof mass etched into the silicon surface of the integrated circuit and suspended by small beams. Consistent with Newton's second law of motion (F = ma), as an acceleration is applied to the device, a force develops which displaces the mass. The support beams act as a spring, and the fluid (usually air) trapped inside the IC acts as a damper, resulting in a second order lumped physical system. This is the source of the limited operational bandwidth and non-uniform frequency response of accelerometers.

GPS-Global positioning system is used to identify the patient's location. It is a network of 30 satellites orbiting the earth at an altitude of 20,000 km once it has information on how far away at least 3 satellites of your GPS receiver can pin point your location using a process called trilaterartion.
GSM- 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.

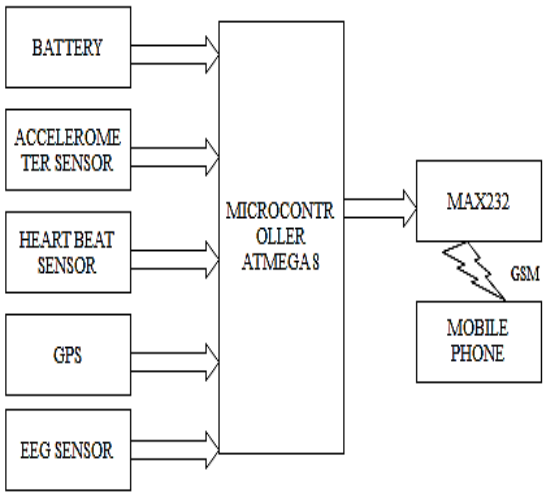

Fig.1: Block diagram of narcolepsy detector.

III. SOFTWARE

Platform - AVR STUDIO EEPROM, and SRAM are all integrated onto a single chip, removing the need for external memory in most applications. Some devices have a parallel external bus option to allow adding additional data memory or memory-mapped devices. Almost all devices (except the smallest TinyAVR chips) have serial interfaces, which can be used to connect larger serial EEPROMs or flash chips.
In System Programmer - ProgISP 172- The Atmel Dragon is an inexpensive tool which connects to a PC via USB. The Dragon can program all AVRs via JTAG, HVP, PDI, or ICSP. The Dragon also allows debugging of all AVRs via JTAG, PDI, or DebugWire; a previous limitation to devices with 32 kB or less program memory has been removed in AVRstudio 4.18. The Dragon has a small prototype area which can accommodate an 8, 28, or 40-pin AVR, including connections to power and programming pins. There is no area for any additional circuitry, although this can be provided by a third-party product called the "Dragon Rider".
JTAGICE mkI

The JTAG In Circuit Emulator (JTAGICE) debugging tool supports on-chip debugging (OCD) of AVRs with a JTAG interface. The original JTAGICE mkI uses an RS-232 interface to a PC, and can only program AVR's with a JTAG interface. The JTAGICE mkI is no longer in production, however it has been replaced by the JTAGICE mkII.

Compiler – Win AVR- Micro Vision must be instructed to generate a HEX file upon program compilation. A HEX file is a standard file format for storing executable code that is to be loaded onto the microcontroller. In the "Project Workspace" pane at the left, right–click on "Target 1" and select "Options for 'Target 1' ".Under the "Output" tab of the resulting options dialog, ensure that both the "Create

Executable" and "Create HEX File" options are checked. Then click "OK".

Next, a file must be added to the project that will contain the project code. To do this, expand the "Target 1" heading, right–click on the "Source Group 1" folder, and select "Add files…" Create a new blank file (the file name should end in ".asm"), select it, and click "Add." The new file should now appear in the "Project Workspace" pane under the "Source Group 1" folder. Double-click on the newly created file to open it in the editor. All code for this lab will go in this file. To compile the program, first save all source files by clicking on the "Save All" button, and then click on the "Rebuild All Target Files" to compile the program as shown in the figure below.

IV.CONCLUSION AND FUTURE WORK

In this paper, an enhanced fall detection system based on Wearable device was proposed and implemented that successfully detected accidental falls in a consumer home application. By using information from an accelerometer, smart sensor the impacts of narcolepsy can successfully be distinguished. Wearable device is completely safe because it is worn on the outside of the body not inside the body. This work is of low cost, very effective, and productive. But there is always room for improvement. This merchandise has been designed as a prototype and requires further developments for using it in assorted applications. This system can be further expended in developing a Windows application which can support windows phone and the wearer device must be small and unobtrusive in the form of compact watch and it should not label people.

V.REFERENCES

[1] Neha R. Singh, P.R. Rothe, A. P. Rathkanthiwar, " Android Based Fall Detection Alert System using Multi-Sensor", 6 April 2017.

[2] S. Manigandan and Suresh R. Norman, "Fall Detection System for Elderly Person Monitoring Using GSM Network", 17 February 2015.

[3] Q. Zhang, L. Ren, and W. Shi, "HONEY a multimodality fall detection and telecare system," Telemedicine and e-Health, Apr. 2013.

[4] F. Bagalà, C. Becker, A. Cappello, L. Chiari, and K. Aminian, "Evaluation of accelerometer-based fall detection algorithm in real world falls," PLoS ONE, May 2012.

[5] S. Abbate, M. Avvenuti, F. Bonatesta, G. Cola, P. Corsini, and A.Vecchio, "A smartphone-based fall detection system," Pervasive and Mobile Computing, Dec. 2012.

