Wrist Wearable Health Monitoring System for Mentally Retarded Persons

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Abstract **- In recent years, intellectual disability affects about 2 – 3% of the general population 75 – 90 % of the affected people have mild intellectual disability. Intellectual disability once called Mental Retardation (MR), is characterized by below average intelligence or mental ability and lack of skills necessary for day to day living. Nowadays Mentally Retarded persons are facing many problems in our society because of their health condition, these problems are a little bit heavy for mentally retarded women because of menstruation cycle. The aim of this paper is to provide health status of the mentally retarded person through message. This concept is very useful for the mentally retarded women to intimate their mensus and also for Mentally Retarded persons to intimate the occurrence of seizure (fits). So there is no need to worry about the health problems of Mentally Retarded persons and we can avoid risk. The system is less expensive and it is very useful for MR persons. For more applications, this system can be improvised, by incorporating temperature and Heartbeat monitoring systems and Memes Sensor annunciation systems, menstrual cycle identification, thereby the Guardian can easily able to know about the mensus period of MR women and Monitoring the MR person's health condition can be done by using biomedical telemetry method.**

Keywords- **Mentally Retarded persons, *MR, GPS, Women,* telemetry**

I. INTRODUCTION

A. Overview

In our modern world, we need all the devices in the form of digital. The aim of the project is to provide the MR person's health status indication through message in mobile. This concept is very useful for the MR women and it intimates the health related problems regarding to the responsible person, the women no need to worry regarding the health.The Presence of Powerful Processing units Embedded Sensors as well as the availability of many standard communication interface has recently attracted the interest of the scientific community.Several projects based on Smart phone system have been proposed in different fields and many more application scenarios are being explored. Due to their nature of consumer devices, Smart Phones provide digital and high level communication interfaces. Monitoring the MR women condition can be done by using biomedical telemetry method where there is a mobile communication between microcontrollers.The digital output is given to microcontroller. The microcontrollers transmit the signal through GSM and send the data from GSM modem to responsible person, and GPS used to identify the person location.

II. EXISTING SYSTEM

The user has been maintaining their person manually is a tedious job. All the process must be done manually. The users are interested to speed up the operations and all the operations must be done automatically. Existing system is the manual one which has the following drawbacks waste of time for manual operations device to monitor the ECG and PPG of a person in hospitals alone. In home the special nurse need for monitor and take care the persons. There is no wireless system for data transfer; it is not possible without care givers.

III. PROPOSED SYSTEM

In our modern world we need all technologies in the form of smart and digital. The latest technology will be used in the proposed system.In this System the WBN is designed to monitor the status of the physical parameters. While monitoring there is data updating is

happened the system will send the data to the monitoring section, they can immediately give recover treatment to the patient to save their life. It's used in military, sports and individual purpose. Time will not be wasted in the process. Low cost, wireless and High speed. Wastage of manpower is reduced.

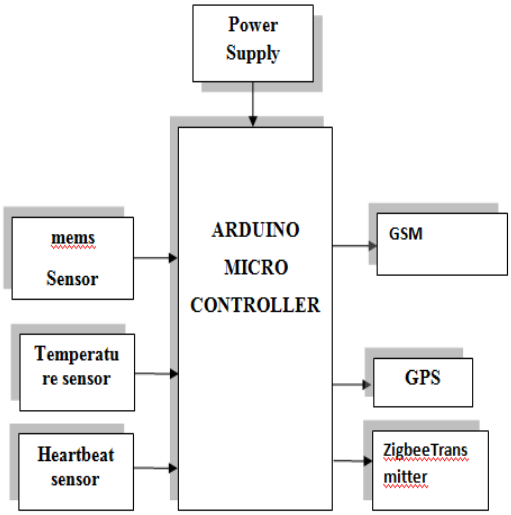

Fig.1. Block Diagram

A. *Working Principle*

This system is to monitoring the Mentally Retarded persons continuously by using wearable sensors. This system consists of many sensors such as temperature, heartbeat, and mems sensor. The temperature sensor is used to measure the body temperature. Heart beat sensor has calculated the pulse rate of the person. Data are collected and analyzed using microcontroller. Based on the predefined values it compares and displays the information about the patients with stage in liquid crystal display using embedded C coding. If it exceeds that condition immediately send the information to the authenticated persons or parents via SMS or phone calls using GSM technology and here the GPS technology is used to identify the MR person's current location and the status of the sensor's which placed in the person's body will display the status in LCD and it transmit the value to the monitoring section through Zigbee.

IV. EXPERIMENTAL METHODS

In this system we are going to monitor the heartbeat, temperature of the MR persons and MEMS sensor is also fixed in the fore arms or wrist or chest and finger of that person. The ARM microcontroller which has inbuilt ADC is used to convert the analog value to digital form. The status will display in LCD. The methodology is based on Global System for Mobile Communication (GSM) this is used for monitoring and analyzing the performance of MR people. A Liquid Crystal Display (LCD) this is used for displaying all the functions of MR people.

A. *Temperature sensors*

These sensors use a solid-state technique to determine the temperature. That is to say, they don't use mercury (like old thermometers), bimetallic strips (like in some home thermometers or stoves), nor do they use thermistors (temperature sensitive resistors). Instead, they use the fact as temperature increases, the voltage across a diode increases at a known rate. (Technically, this is actually the voltage drop between the base and emitter - the Vbe - of a transistor. By precisely amplifying the voltage change, it is easy to generate an analog signal that is directly proportional to temperature.

Fig.2. Overall System

There have been some improvements on the technique but, essentially that is how temperature is measured.Because these sensors have no moving parts, they are precise, never wear out, don't need calibration, work under many environmental conditions, and are consistent between sensors and readings. Moreover they are very inexpensive and quite easy to use.

Fig.3. Temperature rate

B. *Heartbeat Sensor*

Heart rate measurement indicates the soundness of the human cardiovascular system. This project demonstrates a technique to measure the heart rate by sensing the change in blood volume in a finger artery

while the heart is pumping the blood. It consists of an infrared LED that transmits an IR signal through the fingertip of the subject, a part of which is reflected by the blood cells. The reflected signal is detected by a photo diode sensor.

The changing blood volume with heartbeat results in a train of pulses at the output of the photo diode, the magnitude of which is too small to be detected directly by a microcontroller. Therefore, a two-stage high gain, active low pass filter is designed using two Operational Amplifiers (OpAmps) to filter and amplify the signal to appropriate voltage level so that the pulses can be counted by a microcontroller. The heart rate is displayed on a 3 digit seven segment display. The microcontroller used in this project is PIC16F628A.

Heart rate is the number of heartbeats per unit of time and is usually expressed in beats per minute (bpm). In adults, a normal heart beats about 60 to 100 times a minute during resting condition. The resting heart rate is directly related to the health and fitness of a person and hence is important to know. You can measure heart rate at any spot on the body where you can feel a pulse with your fingers. The most common places are wrist and neck. You can count the number of pulses within a certain interval (say 15 sec), and easily determine the heart rate in bpm.

This system describes a microcontroller based heart rate measurement system that uses optical sensors to measure the alteration in blood volume at fingertip with each heart beat. The sensor unit consists of an infrared light-emitting-diode (IR LED) and a photodiode, placed side by side as shown below. The IR diode transmits an infrared light into the fingertip (placed over the sensor unit), and the photodiode senses the portion of the light that is reflected back. The intensity of reflected light depends upon the blood volume inside the fingertip. So, each heart beat slightly alters the amount of reflected infrared light that can be detected by the photodiode. With a proper signal conditioning, this little change in the amplitude of the reflected light can be converted into a pulse. The pulses can be later counted by the microcontroller to determine the heart rate.

Fig. 4. Heart Beat Rate

C. MEMS SENSOR

Micro-electromechanical systems (MEMS) is a technology that combines computers with tiny mechanical devices such as sensors, valves, gears,mirrors, and actuators embedded in semiconductor chips. Paul Saffo of the Institute for the Future in Palo Alto, California, believes MEMS or what he calls analog computing will be "the foundational technology of the next decade." MEMSis also sometimes called smart matter.

Nowadays, MEMS-based devices range from simple arrangements with no moving parts, to complex electromechanical systems with several moving elements under the control of integrated microelectronics. It is worth mentioning that MEMS technology has consistently been successful in the physical sensing context (i.e., exploiting the control capabilities of microsensors). Moreover, the technology advancements of MEMS sensors have been strongly pushed and move together with the integration of low power circuits, wireless communication modules and wireless sensor information and communications technologies, with networks, enabling the design of compact, high performance, low power and low cost solutions for a wide range of applications.In a global MEMS market, expected to reach one trillion units per year within the next decade, several applications and scenarios are nowadays leading the scene in industry and research. This paves the way to the continuous integration and development of smart MEMS technologies able to merge the measuring capabilities with other key features, such as digital signal processing and elaboration for embedded intelligence.

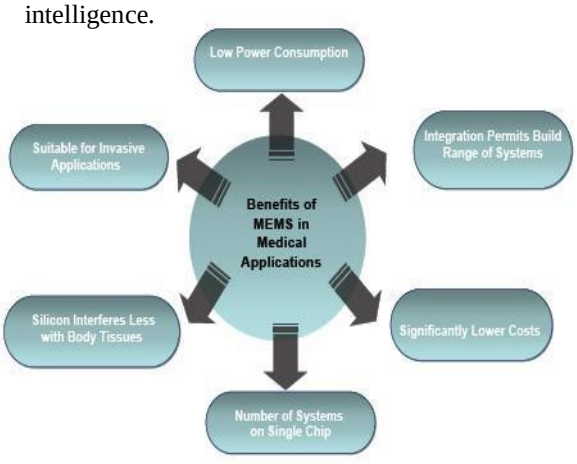

Fig. 5. MEMS Sensor architecture

D. GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA,

GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

E. GPS

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

F. ZIGBEE

ZigBee is an open global standard for wireless technology designed to use low-power digital radio signals for personal area networks. ZigBee operates on the IEEE 802.15.4 specification and is used to create networks that require a low data transfer rate, energy efficiency and secure networking. ZigBee is a cost- and energy-efficient wireless network standard. It employs mesh network topology, allowing it provide high reliability and a reasonable range .One of ZigBee's defining features is the secure communications it is able to provide. This is accomplished through the use of 128-bit cryptographic keys. This system is based on symmetric keys, which means that both the recipient and originator of a transaction need to share the same key. These keys are either pre-installed, transported by a "trust center" designated within the network or established between the trust center and a device without being transported. Security in a personal area network is most crucial when ZigBee is used in corporate or manufacturing networks.

G. HYPERTERMINAL

HyperTerminal can be used to set up a dial- up connection to another computer through the internal modem using Telnet or to access a bulletin board service (BBS) in another computer. It can also be used to set up a connection for data transfer between two computers (such as your desktop computer and a portable computer) using the serial ports and for serial-port control of external devices or systems such as scientific instruments, robots, or radio communications stations. You can send commands through HyperTerminal to make sure that your modem is connected properly.

V. CONCLUSION

This system is very useful for Mentally Retarded Persons and it is cost effective, very easy to monitor MR people. The information of the MR person health status can be easily sent through GSM. Information which is received in mobile can be shared easily to PC and data are updated periodically. GPS is used to identify the Person Location. Any features can be easily added in future versions.

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