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GSM Based Electronic Device for Physiological Parameters

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Abstract: The design and development of a GSM [1] based device is used to monitor the physiological parameters[7] such as temperature, heart rate of the medically distressed. The risk person has worn the electronic device on the wrist and finger. Several sensors are connected wired or wirelessly to measure different vital signs, an impact sensor used to detect the medically distress person and sends an alarm to a receiver unit. So it helps to reduce the work of doctors without checking continuously. It operates on battery. The cost of device is less and easy to made and consumes low power. The drawback of this is, it has some interference problems and it sends signals continuously to the monitoring system.

Keywords: Physiological Parameters, Wireless Sensors, Impact Sensor, Body Temperature.

I. INTRODUCTION

In the recent years, wired and wireless [3][4][5] sensor networks are playing vital role in the human life. There are many sensors used for manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life. The advantages are its cost, easy maintenance, power consumption and reliability.

Now-a-days people are busy with their works, so it is not possible to check their old age parent's health conditions every time. Irrespective of interaction, if we can monitor the parent's health condition every day by testing in a simple method, it helps to live them happily and control over their lives. If any bad condition rises such as heart stroke and injury, it sends the information to the nearest hospital. So immediate medical help will be provided to the persons and it gives the attention when required.

In the device, the sensors are taking the data continuously and sending it to the control station. If any parameter value in the message goes abnormal, then the persons may alert according to the condition. In the manufacturing also it helps to find the faults by reducing the man power and helps in improving the productivity. Many sensors are available used for finding the drinking persons, and measuring the speed of the vehicles.

In the human health care system, patients are registered in the hospitals. The patient's data is maintained and sends the useful information daily to them. In this, it consists of a piezoelectric sensor, a two-axis accelerometer, a microcontroller, and a high quality low-interference GSM module. It records respiration activity for 24 hours. These data transmitted to the nearest hospitals wirelessly. The wireless [3][4] repeaters are helpful in increasing the range, it send data, including the patient's ID and the parameter values.

ID's are used to identify the patient. The patient health condition is stored in the host computer, which is used to analyze overall health condition. When the patient is in an emergency condition, the concerned person can take necessary actions using the alerts received on his/her mobile phone. It is not only useful in an emergency conditions but also monitoring her or his physiological parameters [7] and provides feedback to maintain an optimal health status.

II. OVERVIEW

The system is designed to measure physiological parameters [7] such as temperature, heart rate and medically distress of a human. So many inputs are taken, integrated and processed. The results are sent through the GSM [2] Module to a host mobile, which stores the data in the database. These data is used for analyzing the patient's health condition continuously.

If the person is medically distressed, an alarm may be generated and alert the staff. It generates the individual patient's health data and send to the hospital. These data helpful in maintain the health condition of the patient to give required treatment. If we add extra sensors for measuring and monitoring more parameters can be monitored.

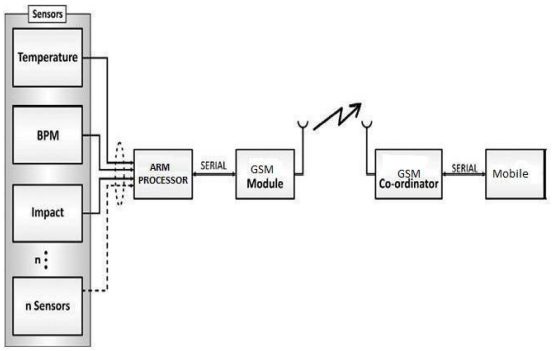

Fig 1.Functional Block Diagram

A.GSM

GSM is a mobile communication modem; it is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates. A GSM network consists of the following components: A Mobile Station: It is the mobile phone which consists of the transceiver, the display and the processor and is controlled by a SIM card operating over the network. Base Station Subsystem: It acts as an interface between the mobile station and the network subsystem. It consists of the Base Transceiver Station which contains the radio transceivers and handles the protocols for communication with mobiles. Network Subsystem: It provides the basic network connection to the mobile stations. The basic part of the Network Subsystem is the Mobile Service Switching Centre which provides access to different networks like ISDN, PSTN etc An Equipment Identity Register is maintained where mobiles can be identified by its own IMEI number.

B. Temperature Sensor

DS600 temperature sensor is used to measure the body temperature [8].A 12-bit Analog to Digital Converter (ADC) used to measure the voltage. It is mounted within the wrist strap, there are different methods to estimate the exact body temperature from skin temperature. Rather, relative changes are monitored within set threshold, which sets off the alarm. This allows the device to detect changes in body temperature that could indicate the patient's conditions such as trauma, injury, heart attack, stroke, heat exhaustion, and burns. In this, the ADC-value is first compared with the Reference Voltage of 2.4 V and then with the characteristic of the DS600 to get the Value for the Temperature "T". The sensor is at the wrist, upper arm and neck for many people. The temperature at three different

positions (wrist, neck and upper arm) was measured for three different persons. The temperatures were measured at different times with varying ambient conditions.

Fig 2. DS600 Temperature Sensor.

C. Heart Rate Sensor

A heart rate sensor helpful in measuring the patient's heart beats per minute (bpm). Its cost is low and measure the heart rate based on near-infrared spectroscopy (NIR). NIR uses the wavelength of 700–900 nm to measure blood volume. The amount of absorbed IR light detected and varied with the flow of blood, which is directly linked to the heart rate. The microcontroller takes the inputs from amplifier & filter circuit output. Header pin-ribbon cable connection is used to connect three sensors outputs fed directly to the microcontroller. The operational amplifiers were used to extract the heart rate signal, and the signal was fed to comparator. The form of pulses is interfaced with microcontroller for further processing. The total tick count in one period (BPM_T_COUNT) is measured and displayed. The frequency and heart rate per minute is obtained by

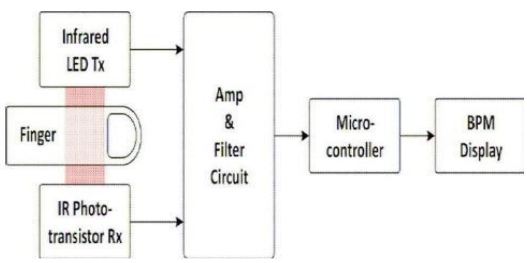

Fig 3. Functional block diagram of the heart rate sensor

$$\text{Frequency} = \frac{1000000}{(\text{BPM\_T\_COUNT} * 10)},$$

$$\text{BPM} = \text{Frequency} * 60.$$

Fig 4. Heart rate sensor.

D. Impact Sensor

An ADXL213 accelerometer was used as an impact sensor.

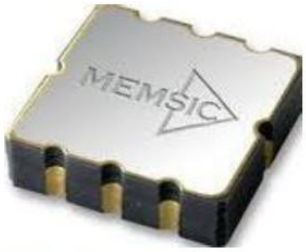

Fig 5. Accelerometer

This is fitted onto the wrist strap.

$$\text{Acceleration} = \frac{\frac{t_1}{t_2} - \text{ZeroGBias}}{\text{Sensitivity}}$$

Its output is proportional to acceleration and is in pulses and duty cycle can be calculated. It detects when patient falls suddenly due to the heart stroke, disease etc. In the normal condition the duty cycle

is 50%. Wireless communication is used between wrist and receiver unit. GSM is used for this purpose. MEMS combine electrical and mechanical components. While moving it forms the gaps between the first stationary beam and the second. Serial interface is used. When SCL and SDA are high, then the interface is not busy. The device has a factory set I2C slave address. When it recognizes its slave address it acknowledges and is then ready for continued communication.

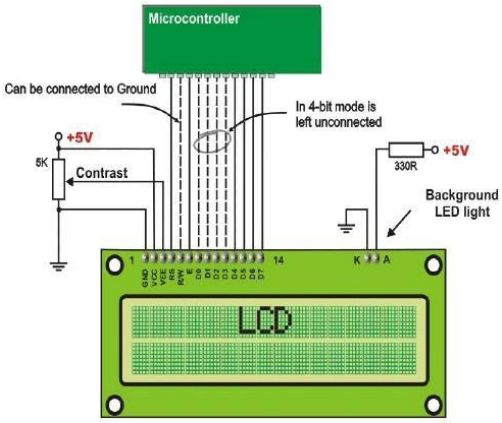

Fig 6. LCD

D. LCD

When LCD is off, light rays are rotated by the two polarisers and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes the liquid crystal molecules would be aligned in a specific direction. The polarizer is used to rotate the light rays passing through the LCD to activate and highlight the desired characters.

III. EXPERIMENTAL RESULTS

The GSM gives the standardized solutions for sensor and control systems. The network layer has been designed to allow the network to spatially grow without requiring high power transmitters. The MAC layer uses the Advanced Encryption Standard (AES). The analog processing circuitry and the sensors were assembled on PCBs which were placed within the wrist strap. The wrist unit consumes 20mA/3.3V power supply, supplied from microcontroller. The GSM module connected to ARM microcontroller. It has sleep mode to save the power when no data is transmitted

IV.CONCLUSION and FUTURE SCOPE

Skin temperature, heart rate, and body impact parameters are monitored. It was successfully developed and tested; it gives the accurate and reliable design miniaturized with low cost. The detection of medical distress, panic button will give better results over the commercial products. The power consumption also reduced. The design of the IR sensors could be improved to decrease its susceptibility. Blood-oxygen sensor would allow the system to more accurately detect medical distress by measuring the amount of oxygen in the blood (HbO). This could be implemented by the addition of another diode operating at a different wavelength. The receiver unit would ideally be enhanced so that it can connect to either the local or cellular phone network and in case of emergency would contact an ambulance. Beyond the application for elderly patients is the use by anyone who is at-risk, with a mental or physical disability. Monitoring of athletes whilst exercising would be possible if the sensitivity to movement was decreased.

V. REFERENCES

[1] Global System for Mobile Communications (GSM) , Wiley Telecom, 2014

[2] GSM and EGPRS, Ajay R. Mishra, Appendix B: Energy in Telecommunications, Cellular Technologies for Emerging Markets:2G, 3G and Beyond , Year: 2010

[3] G. W. Irwin, J Colandairaj, and W. G. Scanlon, "An overview of wireless networks in control and

monitoring," International Conference on Intelligent Computing, Kunming , CHINE (2006), Vol. 4114, 2006, pp. 1061-1072.

[4] Medical alert systems with TeleHealth & telemedicine monitoring using GSM and GPS technology, J. Suganthi.; N. V. Umareddy; Nitin Awasthi, ICCCNT, 2012 Third International Conference. Year: 2012

[5] A. Dittmar, F. Axisa, G. Delhomme, and C. Gehin, "New concepts and technologies in home care and ambulatory monitoring," Studies in Health Technol. Inform., pp. 9– 35, 2004.

[6] A. Gaddam, S. C. Mukhopadhyay, and G. Sengupta, "Smart home for elderly using optimized number of wireless sensors," in Advances in Wireless Sensors and Sensors Network. : Springer-Verlag, 2010, vol. 64, Lecture Notes in Electrical Engineering.

[7] K. Malhi, "Wireless sensors network based physiological parameters monitoring system," M.S. thesis, Massey University, Palmerton, New Zealand, 2010.

[8] R. Lenhardt and D. I. Sessler, "Estimation of mean-body temperature from mean-skin and core temperature," Anesthesiology, vol. 105.

