A Real Time Telehelth Monitoring System

Authors

Ashwini A. Mankari[1], D. S. Bhosale[2]

[1]Savitirbai Phule Pune University, JSPM's BSIOTR E&TC, Pune Nagar Highway, Wagholli, India
Email: *ashwinimankari4050@gmail.com*
[2]Professor, JSPM's Bhivarabai Sawant Institute of Technology and Research,
Savitirbai Phule Pune University, Pune Nagar Highway, Wagholli, India
Email: *bhosale.dilip@rediffmail.com*

Abstract
Now a day's healthcare industry is to provide better healthcare to people anytime and anywhere in the world in a more economic and patient friendly manner. In the present paper the physiological parameters such as ECG, Pulse rate and Temperature are obtained, processed using ARM7 LPC 2138 processor and displayed in a MATLAB graphical user interface on the doctors worhsation. This system is low cost component and to transmit Temperature sensor, ECG sensor and PPG sensor data to physicians for monitoring, diagnosis purpose and patients care at a significantly low cost, regardless of patient's location.
Keywords: *ECG, PPG, Temperature, ARM, MATLAB.*

Introduction

Study reveal that among all the diseases the three major causes accounting for the increase in mortality rate in India are cardiovascular disease, Cancer and Kidney failure. Where death in India due to Cancer accounts for 19.6% each year and Kidney failure accounts for 16.9%.Cardiovascular disease is one of the main causes of death in India and it accounts for 35% of all death each year. Among patients who had heart attacks, about 60% of them reach hospital well after 60 minutes of the onset of the heart attack. Although heart attack can happen suddenly without apparent indications, cardiac rhythm disturbances can often be found before the event. They can potentially be used as the precursor to major cardiac episodes. Electrocardiography is a medical diagnostic procedure used to record the electrical activity of the heart and display it as a waveform. An electrocardiogram (ECG) is obtained by measuring electrical potential between various points of the body using an instrumentation amplifier linked to the body via leads attached to electrodes (electrical contacts). Electrodes are placed on different sides of the heartto measure the activity of various parts of the heart muscle and the voltage between pairs of these electrodes is what is returned as ECG in the form of a graph.

The monitoring of vital physiological signals has proven to be one of the most efficient ways for continuous monitoring of the health status of patients. Electrocardiogram monitors are often used in many medical service centers and hospitals to diagnose and monitor a person's health status by measuring their cardiac activity. An ECG is a non-invasive monitor, which can be utilized to evaluate the heart electrical activity, measure the rate and regularity of heartbeats, the position of the chambers, identify any damage to the heart and investigate the effect of drugs and devices used to regulate the heart.

Other physiological parameters such as PPG and temperature sensor. The principle of photoplethysmography (PPG) which is a non-invasive method of measuring the variation in blood volume in tissues using a light source and a diagnosing which can be interfaced with computer to bring it under a network system widely for the doctor to monitor the patient's condition sitting in his own office without being physically present near to the patient's bed.
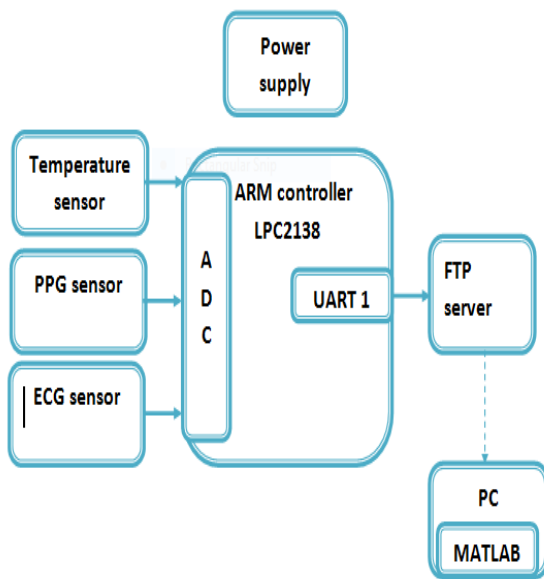
Hardware Implementation

Figure 1: Block Diagram of Monitoring System.

As shown in above fig. This system consists of three main sections. First unit consists of ARM LPC2138 along with ECG sensor, temperature sensor and PPG sensor. Complete board of ECG sensor has three sensing probes of silver chloride, instrumentation amplifier, notch filter, etc. The output of sensor is an analog voltage. This output is connected to ADC channels of ARM controller to read the data. The data is then collected in array using C code and then transmitted serially out using UART1 port of ARM to FTP server, which is second unit the Data will be received at PC terminal through FTP server. It will be accessed by MATLAB and plotted using GUI.

detector. Since the change in blood volume is synchronous to the heart beat, this technique can be used to calculate the heart rate.

In this paper the aspects of acquisition of physiological

Case Study of Hardware Parameters

Temperature Sensor Measurement:- The temperature sensing is performed by using an IC LM35. The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ^{o}C). The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration. We can use LM 35 because you can measure temperature more accurately than a using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

$$T(°C) = Vout \times \left(\frac{100°C}{Vcc}\right)$$

PPG Sensor Measurement

As the light doesn't have to penetrate the body, the reflectance PPG can be applied to any parts of human body. The photoplethysmography are two basic types of Transmittance and reflectance. For the transmittance PPG, a light source is emitted in to the tissue and a light detector is placed in the opposite side of the tissue to measure the resultant light. Because of the limited penetration depth of the light through organ tissue, the transmittance PPG is applicable to a restricted body part, such as the finger or the ear lobe. However, in the reflectance PPG, the light source and the light detector are both placed on the same side of a body part. The light is emitted into the tissue and the reflected light is measured by the detector.
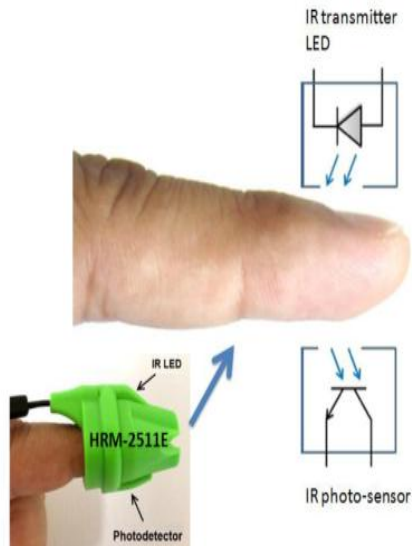
Figure 2: HRM-2511E as A Transmission PPG Probe

ECG Sensor

The electrical activity can be represented as a dipole (a vector between two point charges). The placement of the electrodes on the body determines the view of the vector as a function of time. The most basic form of the electrode placement which is based on Einthoven's triangle. Lead I measure the differential potential between the right and left arms, Lead II between the right arm and left leg, and Lead III between the left arm and left leg.

Conclusion

This system will be used for real time monitoring of different parameters of health like ECG, PPG and temperature of remotely located patient and can be used to provide on spot medical help when required. This system reduce costs by enabling in-home monitoring of patients, eliminating the need for utilization of expensive facilities, and reducing the need for transportation of patients to physicians and medical centers.

References

1. Suhas Kale, C. S. Khandelwal, Department of Electronics and communication, Jawaharlal Nehru Engineering College, Aurangabad, India, Design and implementation of real time embedded tele-health monitoring system,IEEE.March 2013 page No 771 -774.

2. Mohamed Fezari, Mounir Bousbia-Salah, and Mouldi Bedda "*Microcontroller Based Heart Rate Monitor*" The International Arab Journal of lnfonnation Technology, Vol. 5, No. 4, October 2008

3. J. Yoo, L. Yan, S. Lee, Y. Kim, and H. J. Yoo, *"A 5.2 mW self-configured wearable body sensor network controller and a 12uW wirelessly powered sensor for a continuous health monitoring system,"* IEEE J. Solid-State Circuits, vol. 45, no. 1, pp. 178–188, Jan. 2010.

4. Liang Kai, Xu Zhang, Yuan Wang, Huang Suibiao, Guan Ning, "*A system of portable ECG monitoring based on Bluetooth mobile phone" IEEE international Symposium on IT in medicine and education*" Dec 2011.

5. *Enhancement of real-time multi-patient monitoring system based on wireless sensor networks*, International Journal of Physical Sciences Vol. 6(4), pp. 664-670, 18 February, 2011.

6. M. B. 1. Reaz"*Tele-Health ECG Monitoring System: A Low CostApproach*" Internationallslamic University Malaysia, Kuala Lumpur,Malaysia

7. C.S. BUffUS, R.A. Gopinath, H. Guo, (\997) *Intraductian to Wavelets and Wavelet Transfarms. a Primer, Prentice Halllnc.*

8. Kaiyu Zhang, Lixin Song and Di Lu *"Design of Remote ECG Monitoring System Based on GPRS"* International Conference on Computer Science and Network Technology 2011.