International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 2 Issue 9, September - 2013

Intelligent Mobile Patient Health Monitoring System (IMPHMS) A Survey Approach

Ishani Dutta
Student,EEE

Kaveri Rai
Student,EEE

Shraddha Kesharwani
Student,EEE

Dr. Anup Mishra
HOD,Electrical &Electronics Dept(EEE)

Bhilai Institute of Technology,Durg

Abstract

In this paper we present Intelligent Mobile Patient Health Monitoring System (IMPHMS), which can provide medical feedback to the patients through mobile devices based on the biomedical and environmental data collected by deployed sensors. Our aim is to create a working model which incorporates sensors to measure parameters like body temperature, heart beat rate, and diabetic sensor. The system promises cost effective, ease of implementation, automatic and continuous monitoring of patient.

Keywords: Mobile Health care, patient Health Monitoring System, GSM network

1.Introduction

Mobile computing describes a new class of mobile computing devices which are becoming omnipresent in everyday life. Handhelds, phones and manifold embedded systems make information access easily available for everyone from anywhere at any time. The goal of mobile health care is to provide health care services to anyone at anytime, overcoming the constraints of place, time and character.

In 20th century, personal health monitoring system like Holter monitors, were used only to collect data. In this system, analysis and data processing were performed offline, making such devices impractical and non real time for continuous monitoring. Also systems with multiple sensors for physical rehabilitation often feature unwieldy wires between the sensors and the monitoring system. These wires may limit the patient's activity and level of comfort and thus negatively influence the measured results. It is also difficult to keep track on abnormalities in heartbeat count for patient itself manually.Patients are not well versed with manual treatment which doctors normally use for tracking the count of heartbeat. So there must be some device which would help patient to keep track on their health by themselves.

The devices currently present are quite heavy and expensive.

To overcome these limitations a device use to keep track on heartbeat count of patient should be easy to use, portable, lightweighted, small size so that it give freedom of mobility for patient. The devices which can be carried everywhere to keep track on patient's health. This device that is a heartbeat sensor would help them to keep track on heartbeat counts of a patient and check for any abnormalities. If any varied change takes place it is notified. This notification would help to take an appropriate action at an instance of a time. This would save patients from the future health problem which would arise. This would also help patient's concern doctor to take an appropriate action at proper time.

2. The Existing System

.

Currently the system used for patient monitoring is the fixed monitoring system which can be used only when the patient is on bed. The available systems are huge in size and only available in the hospitals in ICU**.**

Fig .1. Existing System

3. Proposed System

. This project describes the design of a simple, low-cost microcontroller based heart rate, body temperature measuring device as well as checking glucose level concentration with LCD output. Heart rate of the subject is measured from the index finger using IRD (Infra Red Device sensors and the rate is then averaged and displayed on a text based LCD).

The device alarms when the heart beat & the body temperature exceed the provided threshold value. This threshold value is defined by the programmer at the time of programming the microcontroller 89C8051. The threshold value given for the project can be is as 50 to 150 pulses per minute for heart beat indication & 18°C to 38°C for temperature.

This information i.e. the Heart Rate , the Body Temperature and the glucose level concentration(if required)is then transmitted wirelessly to the doctor which in not in the vicinity of the patient through GSM technique. The sensors measure the information and transmit it through GSM Modem on the same frequency as on which cell phones work.

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.Matrix Simado GDT11 is a Fixed Cellular Terminal (FCT) for data applications.

Applications and Advantages of GSM:

1. This project can be used in home for patients or ill person or old person.
2. Same project can be used in hospitals.

Future Development on GSM:

1. We can send this data to a remote internet
2. We can add the module of voice alarm system to indicate parameters crossing the threshold value

4. Parameters to be monitored

As the statistics revealed earlier that Heart Attack causes the most number of Deaths in the world, it was decided that have Heart Beat Monitoring as one of the Parameters. Below it is explained as to How Heart Beat is monitored:-

- The heart beat rate of the patient is constantly monitored.
- The normal range of heart rate is 60 to 135.
- If at all the rate increases above 145 or decreases below 55, it may be fatal.
- If the parameter(s) deviate from the standard range, it will indicate the doctor via a message consisting parameters of the patient.

Also High/Low Body Temperature can cause such illness that can prove Fatal. It plays a very important part in maintaining Blood Pressure etc.

Below it is explained as to How Body Temperature is monitored:-

- The temperature of the patient is said to be normal above 95^F and below 104^F.
- If the temperature falls below 95^F, that means the blood circulation has fallen below reqd. level and hence it may prove fatal.
- As soon as the temperature falls below 95^F the doctor is notified via SMS.

For blood glucose concentration-

- Normal blood sugar level is 4.4 to 6.1 mmol/L (79.2 to 110 mg/dL).
- If it reaches below 4mmol/L or reaches above 6.5/7 mmol/L then it requires immediate checkup,thud alarm system will indicate the abnprmality and sms would be sent to the doctor.

5. Block Diagram

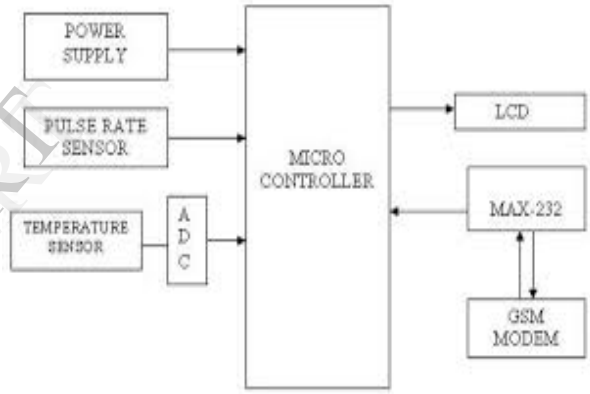

Fig. 2.-Block Diagram of Patient Monitoring System

6. Block Description/Components Used

6.1 Transmitting Model: The different parameters of patients such as heart rate, temperature and blood pressure are sensed by their respective sensors and send to microcontroller. This microcontroller displays the parameters on a LCD and simultaneously transfers it to a remote PC via a TX module. TX module is interfaced with microcontroller using IC MAX 232.

6.2 Receiving Model: The remote PC continuously monitors these parameters and in case of emergency and dangerous situations we have to alert the doctor immediately

6.3 Components Used

Here the different components used are-

a) Microcontroller 8051-Here we are using microcontroller AT89C051 for its higher speed of operation n interfacing.
b)MAX232 chip is used mainly for interfacing
c) LM35-is a precision IC Temperature sensor with its output proportional to the temperature (in Celsius).
d)ADC0804-Analog to Digital Converter
e)A 16x2 LCD for displaying 16 characters per line and there are two such lines.
f)SIM 300 GSM MODEM
g)Crystal 11.0592 MHz
h)Buzzers
i)Capacitors
j)Resistors
k)Connecting Wires
l)Power Supply
Further,we are willing to use Near Infrared Sensors for measuring blood glucose level concentration.

7. Tranmission Technology

.
Traditional health systems were connected using wired techniques, this were messy connections to the devices as well as it would confine the patient to bed only, that means even if patient is able to move in house itself (for e.g. one room to other room) the connections would need to be removed which is tedious job.
Thus solution was to make use of wireless technology as GSM/Wi-Fi.

2.4 GHz Technology Comparison

	Data Rate	Number of channels	Interference Avoidance Method	Minimum Quiet Bandwidth Required
Wi-Fi (802.11b)	11 Mbps	13	Fixed channel collision avoidance	22 MHz (Static)
Bluetooth	723 Kbps	79	Adaptive frequency hopping	15 MHz (Dynamic)
WirelessUSB	62.5 Kbps	79	Frequency agility	1 MHz (Dynamic)
Zigbee	128 Kbps	16	Fixed channel collision avoidance	3 MHz (Static)

8.Charecteristics and Discussion

The characteristics of IMHMS are described below:
8.1.1 Simplicity
The system architecture of IMPHMS is a simple one with no complex system or communication architecture. Though the setup of WBSN is quite sophisticated but to get help from such intelligent health monitoring systems bio-sensors need to implant or wore to the patient's body.
8.1.2 Cost-Effective IMHPMS is cost effective. GSM setup consists of some low cost bio-sensors.configuration or low cost cell phones. patients support.
8.1.3 Secure
Security is a major issue in IMPHMS. Suppose a heart patient's data is manipulated by the malicious attackers. The normal reading can be changed as a serious one and the heart patients can be affected by the faulty result that may even cause him serious heart attack. Moreover large volumes of data need to be transmitted between the three components of the IMPHMS. So data must be transmitted in encrypted form between the components to protect from security vulnerability.
8.1.4 Flexible communication protocol
The communication protocols of IMHMS are flexible. IMPHMS using any of the three ways: GPRS / Edge / SMS. So we can see a large number of alternative ways of communication is supported in IMPHMS making the communication protocol a real flexible one.
8.1.5 Capability to predict spread of diseases
The intelligent IMS can predict spread of diseases in a specific locality. The IMS contains some strong and efficient data mining algorithms that can be used for this purpose.
8.1.6 Capability to help authority to determine general health policies
The IMS is capable to help authority to determine general health policies. For example, in a specific locality a large number of people (who are the client of IMS) are affected by diseases that occur due to the lack of a specific vitamin, the IMS can track this situation and can generate alert messages for the authority to inform them. Then the authority can determine the health policy by forcing the market to bring and sell foods having the specific vitamin as well make people aware of their vitamin deficiency..

8.2.1 Heart beat sensor

It is based on simple LED and LDR. Whenever blood pumps into the finger tip it makes finger tip opaque and less light reaches to LDR from bright LED through finger.

There are some distortions and glitches in the output of sensor which we tried to minimize by placing a RC filter circuit at the output.
The temperature ranges are also shown below with targeted range in beats per sec (bps).

8.2.2 Temperature Sensor

To measure the body temperature LM35 is used as it coversthe range of entire human body temperature. The temperature is linearly varying giving output proportional to 10mV/ deg CentigradeThe results are displayed on local LCD.
This data is transmitted to laptop via GSM and is Displayed.

9. Conclusion

The most important part of the project is that it monitors a moving patient rather than a stationary or a bedridden patient. This system ensures that the patient receives medical attention in the nick of time before it is too late. The patient does not Continuous monitoring of health and cost effective disease management is the only way to ensure economic viability of the healthcare system. Apart from that we replacing the traditional methods like pricking of finger for measuring blood sugar level which creates pain,discomfort and may cause infection in patient with non-conventional method by adopting use of IR sensors. Patients are not well versed with manual treatment which doctors normally use for tracking the count of heartbeat. So there must be some device which would help patient to keep track on their health by themselves.

10. References

1. O. Lauer, G. Neubauer, M. R¨o¨osli, M. Riederer, P. Frei,E. Mohler, J.Fr¨ohlich, "Measurement setup and protocol for characterizing and testing radio frequency personal exposure meters" Bioelectromagnetics DOI:10.1002/bem.20687, July 2011.

2. Dr. Neil Townsend, "Medical Electronics" in Michaelmas Term 2001, pp. 1-6

3. Emil Jovanov, Aleksandar Milenkovic, Chris Otto and Piet C de Groen, "A wireless body area network of intelligent motion sensors for computer assisted physical rehabilitation", Journal of NeuroEngineering and Rehabilitation 2005

4. Warsuzarina Mat Jubadi, Siti Faridatul Aisyah Mohdahak",Heartbeat Monitoring Alert via SMS", 978-1-4244-4683-4/09/$25.00 ©2009 IEEE

5. Sándor Miklós Szilágyi, László Szilágyi, Attila Frigy,Levente Gorog and Zoltán Benyó "Spatial Heart Simulation and Adaptive Wave Propagation" (2008). Encyclopedia of Healthcare Information Systems (pp.1253-1260).

6. Biswadip Ghosh (2010). "Improving the Quality of Healthcare Research Data Sets" Health Information Systems: Concepts, Methodologies,Tools, and Applications (pp. 1826-1841).

7. P. Binkley, "Predicting the Potential of Wearable Technology," *IEEE Engineering in Medicine and Biology Magazine*, Vol. 22, No.3, May/June 2003, pp. 23-24

.

8.Park Set aI, Real-time monitoring of patient on remote sites. Proceedings of the 20th annual international conference on IEEE EMBS, vol. 20, No.3; 1998.

9. Sahandi, R., Noroozi, S., Roushanbakhti, G., Heaslip, V. & Liu, Y., 2010. "Wireless technology in the evolution of patient monitoring on general hospital wards". Journal of Medical Engineering and Technology, 34(1), 51-63.

10. IEEE TRANSACTIONS on Biomedical Circuits and Systems, VOL. 4, NO. 1, FEB 2010-11 "An Energy-Efficient ASIC for Wireless Body Sensor Networks in Medical Applications" Xiao Yu Zhang, Hanjun Jiang, Member, IEEE, Lingwei Zhang, Chun Zhang, Zhihua Wang, Senior Member, IEEE, and Xinkai Chen.

11. "Design and Implementation of Wireless Biomedical Sensor Networks for ECG Home Health Monitoring", International Conference on Electronic Design December 1-3,2008, Penang, Malaysia Rozeha A.Rashid, Mohd Rozaini Abd Rahim, Mohd Adib Sarijari, Nurhija Mahalin