Review of Computer Engineering Research
2019 Vol.6, No.2, pp. 92-96
ISSN(e): 2410-9142
ISSN(p): 2412-4281
DOI: 10.18488/journal.76.2019.62.92.96
© 2019 Conscientia Beam. All Rights Reserved.

INTENSIVE PATIENT MONITORING USING LABVIEW

Manivasagam Rajendran

Department of Electrical and Electronics Engineering, K.Ramakrishnan College of Engineering, Samayapuram, Trichy, Tamilnadu, India.
Email: manivasagammn3@gmail.com

Article History
Received: 9 September 2019
Revised: 15 October 2019
Accepted: 20 November 2019
Published: 18 December 2019

Keywords
Intensive patient monitoring
Short message service
Virtual instrument
Threshold limits
Normal
Abnormal
Emergency personnel.

ABSTRACT

In modern years, numerous telemedicine applications have been effectively implemented over wired communication technologies like POTS (Plain Old Telephone Systems) and ISDN (Integrated Service Digital Network). However, nowadays, modern wireless telecommunication means, such as the GSM (Global System for Mobile communication), GPRS (General Packet Radio Service), the forthcoming UMTS (Universal Mobile Telecommunication Systems) mobile telephony standards, and satellite communications, allow the operation of wireless telemedicine systems, freeing the medical personnel and/or the subject monitored from being bound to fixed locations . To offer a comparably dependable and easy way of monitoring for those people using newly available telecommunication technologies, we have proposed an Intensive Patient Monitoring System with database trailing ability. It will observe the results of simulation and its Hardware implementation can coincide up to its maximum accuracy. The investigational results prove the continuous monitoring of vital signs and be corroborate to be successful as per the required conditions. Intensive Monitoring System for various parameters monitoring with database tracking capability promises to be a powerful aid in monitoring multiple patients concurrently.

Contribution/Originality: This study is one of very few studies which have investigated a new modular concept of patient monitoring system with multiple parameter monitoring and database tracking by exploiting the recent telecommunication technology. The Prototype of the proposed monitoring service was built-up and tested under various normal and abnormal conditions.

Abbreviations

T = Body Temperature (deg F).
BP = Blood Pressure (Hg/mm).
HB = Heart Beat rate (beats/min).
RR = Respiration Rate (breathe/min).
N = Normal.
AN = Abnormal.
TN = Trial number.
LV = Lab VIEW.
OBS = Observation.

© 2019 Conscientia Beam. All Rights Reserved.

1. INTRODUCTION

Classically, Patient monitoring will be performed to presage the Physician if there is a life-threatening event for a patient. I have proposed an Intensive Patient Monitoring System with database trailing ability. In designing this system,[1, 2].

1) The need for emergency treatment in unexpected state of affairs can be known immediately.
2) Medical personnel can monitor multiple patients simultaneously.
3) A person can keep an eye on his/her body condition.

2. GSM TECHNOLOGY

GSM is based on digital communication in the radio path and between the network entities. These networks have an enhanced scope with roaming services. GSM is the combination on FDMA (Frequency Division Multiple Access) and TDMA (Time Division Multiple Access) techniques. The operating band frequencies of GSM are 900 MHz, 1800 MHz and 1900 MHz[3, 4].

The GSM network architecture shown in Figure 1 consists of MS (Mobile Station), BSS (Base Station Sub-system), and NSS (Network and Switching Sub-system). MS is the radio handset used by subscriber. The BSS acts as an access network. It consists of one BSC (Base Station Controller) and one or more BTS (Base Transceiver Station). The NSS is the core network with Databases, Switches and SMS (Short Message Service) entity. Air interface is the communication medium between the MS and BSS. GSM A-interface is the medium between BSS and NSS. The Services offered by the GSM network can be broadly classified as Basic services and Supplementary services [5, 6].

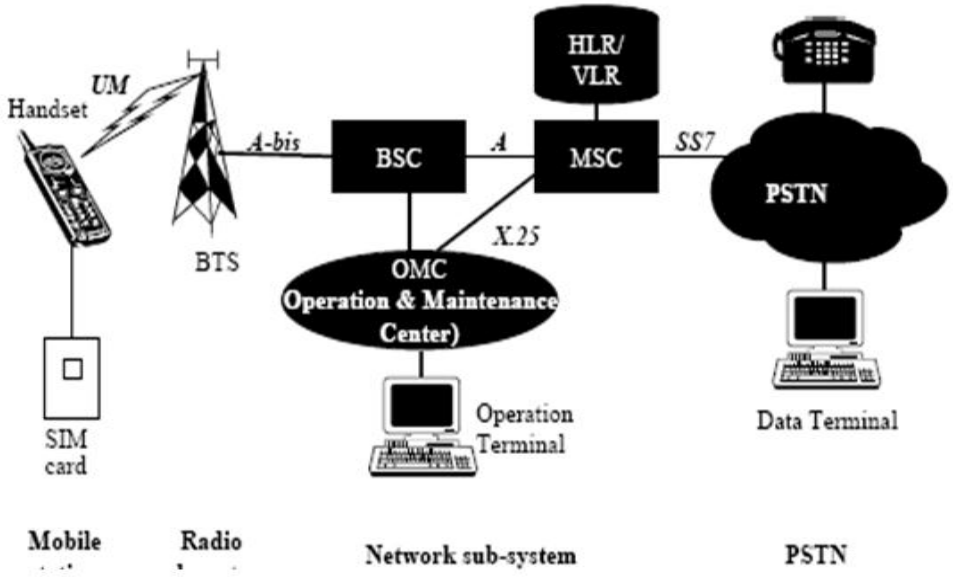

Figure-1. GSM network architecture.

Source: Lee, et al. [2].

The advantages of GSM are high speed wireless connection, highly secured and the data transfer rate can be increased from 9.6 kbps to 14.4 kbps using HSCSD (High Speed Circuit Switched Data)[7, 8].

The SMS entity of GSM technology supports the proposed Patient Monitoring System. The SMS aids us to drive the patient data effectively with an improved accuracy and transmission rate [9, 10].

© 2019 Conscientia Beam. All Rights Reserved.

3. PATIENT MONITORING SYSTEM USING LAB VIEW

3.1. Description

In this paper, Lab VIEW software has been utilized to virtually instrument a patient monitoring system so that various normal and unexpected states of affairs can be clearly stated. This would further lay groundwork for framing the programming algorithm of the proposed system.

3.2. Patient Monitoring VI

The Block diagram shown in Figure 2 was developed using LabVIEW which encompasses of a Prompt User Input (PUI) that accepts manual input of the body parameters and required Numerical Indicators to display it. Comparators weigh them against the threshold values and the Output Report icons furnish the corresponding comments based on the respective comparator results.

The Front panel shown in Figure 3 comprises of the LEDs giving the respective indications. The Random Number and Delay icons with the FOR loop controls the number of times to get the PUI and the time delay between two successive set of input parameters respectively.

Figure-2. Patient monitoring system –LV FRONT PANEL.

4. HARDWARE IMPLEMENTATION

4.1. Transmission End

Various Sensors for body temperature, blood pressure, heart beat rate and respiration rate are connected to the patient's body. The sensed signals are fed as input to the ADC through respective SCC (Signal Conditioning Circuits). The digitized outputs from the ADC (Analog to Digital Converter) are given to the microcontroller. The processed signals from the microcontroller are transmitted to serially interfaced modem.

4.2. Receiving End

The Hospital PC and any health care personnel with a mobile phone constitute the receiving end. An Alarm & a display facility are provided in the patient side.

© 2019 Conscientia Beam. All Rights Reserved.

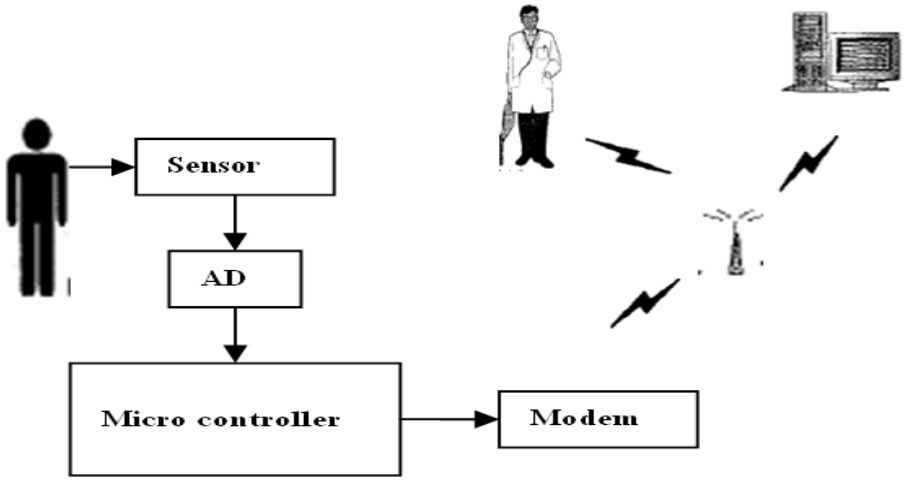

Figure-3. Hardware architecture.

Source: Lin [4].

4.3. Function

The Proposed Patient Monitoring System monitors a mobile patient using the GSM technology. Scores of parameters are sensed using varied sensors. The sensed signals are inured using SCC so that they are congruent to 89S51 Microcontroller. On getting processed and compared with the threshold values, the accustomed signals are then level converted by MAX232N. The apposite voltage level signals are transmitted through RS232 serial interface port to the GSM modem. The GSM Modem sends an SMS as per the following condition:

1. During normal body condition to Hospital PC.
2. During abnormal body condition to Hospital PC and prestored contact numbers in Assembly Language Program of the controller.

During abnormal conditions, the alarming helps the patient to keep an eye on his/her own body condition. An added advantage of this system is that the physician can retrieve the history of patient's body condition from the hospital PC at any point of time, through his mobile phone.

5. ALGORITHM – CONTROLLER PROGRAMMING

Step 1: Start the process.
Step 2: Pre-determine the threshold values and get it stored.
Step 3: Perform Logical OR on the parameters.
Step 4: Acquire the current values.
Step 5: Compare with the threshold values.
Step 6: Ensure whether it is abnormal, if yes go to step 8, else go to next step.
Step 7: Send message to hospital PC, go to step 4.
Step 8: Send message to both PC & prestored number.
Step 9: Commence a delay of specified time for acknowledgement from expected number.
Step 10: Check whether acknowledgement is received, if no go to next step, else next step.
Step 11: Send message to next prestored number in priority, go to step 9.

6. ALGORITHM – VISUAL BASIC PROGRAMMING

Step 1 : Start the Process.
Step2 : Open a new Project and design a suitable form, window to display the patient status.
Step3 : Create an MS Access database to store the patient data.
Step4 : Connect the Mobile Phone to the Hospital PC through the COM port.

© 2019 Conscientia Beam. All Rights Reserved.

Step5 : Display the SMS received in the Message text box.

Step 6 : Simultaneously check for any request SMS is received if yes, go to next step else repeat step 5.

Step 7 : Check the Request SMS for its validity to retrieve the data. If not valid, go to next step, else go to step 9.

Step 8 : Send the reply message as 'Invalid Request'.

Step 9 : Retrieve the corresponding data from database and send the same as a reply.

Step 10 : Repeat Steps 5 to 9.

7. CONCLUSION

This paper has presented a new modular concept of patient monitoring system with multiple parameter monitoring and database tracking by exploiting the recent telecommunication technology. The Prototype of the proposed monitoring service was built-up and tested under various normal and abnormal conditions. It was perceived that the results of simulation and its Hardware implementation coincided up to its maximum accuracy. The experimental results prove the continuous monitoring of vital signs and were corroborated to be successful as per the required conditions. Thus Intensive Monitoring System for multiple parameters monitoring with database tracking capability promises to be a powerful aid in monitoring multiple patients concurrently. Compatible developments can be accomplished with the proposed system.

Funding: This study received no specific financial support.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

[1] J. G. Webster, *Encyclopedia of medical devices and instrumentation*. New York: Wiley & Sons, 1988.

[2] H. Lee, S. Park, and E. Woo, "Remote patient monitoring service through World-Wide Web Proceeding," in *IEEE EMBS '97, 19th Annual International Conference., Chicago*, 1997, p. 97.

[3] R. Manivasagam and V. Dharmalingam, "Power quality problem mitigation by unified power quality conditioner: An adaptive hysteresis control technique," *International Journal of Power Electronics*, vol. 6, pp. 403-425, 2014.Available at: https://doi.org/10.1504/ijpelec.2014.067442.

[4] J. C. Lin, "Applying telecommunication technology to health-care delivery," *IEEE Engineering in Medicine and Biology Magazine*, vol. 18, pp. 28-31, 1999.Available at: https://doi.org/10.1109/51.775486.

[5] I. Lacovides, C. S. Pattichis, and C. N. Schizas, "Editorial: Special issue on emerging health telematics applications in Europe," *IEEE Transactions on Information Technology in Biomedicine*, vol. 2, pp. 2-8, 1998.

[6] R. Manivasagam, "Saturation analysis on current transformer," *International Journal of Pure and Applied Mathematics*, vol. 118, pp. 2169-2176, 2018.

[7] S. Tachakra, R. Istepanian, and K. Banistas, "Mobile e-health: The unwired evolution of telemedicine," in *Proceedings of Health Com 2001, Italy, July*, 2001.

[8] R. Manivasagam, "Modeling of a grid connected new energy vehicle charging station," *International Journal of Applied Engineering Research*, vol. 10, pp. 15870- 15875, 2015.

[9] S. Pattiches and E. Kyriacou, "Wireless telemedicine systems: An overview," *IEEE Antenna's & Propagation Magazine*, vol. 44, pp. 143-153, 2002.

[10] T. S. Rappaport, *Wireless communications: Principles and practice*. USA: PHI Publication, 2008.

Views and opinions expressed in this article are the views and opinions of the author(s), Review of Computer Engineering Research shall not be responsible or answerable for any loss, damage or liability etc. caused in relation to/arising out of the use of the content.

© 2019 Conscientia Beam. All Rights Reserved.