A GSM Based Patient Health Monitoring system using Raspberry pi

Marati Ramakrishna [1], Dr. Harikrishna kamatham [2]

[1] Marati Ramakrishna, MTech, Vidya Jyothi Institute of Technology, Aziznagar, Moinabad, Rangareddy, Telangana, India.

[2] Dr.Harikrishna kamatham, Ph.D, Vidya Jyothi Institute of Technology, Aziznagar, Moinabad, Rangareddy, Telangana, India.

Abstract:

Health is one of the global challenges for humanity. In the last decade the healthcare has drawn considerable amount of attention. The prime goal was to develop a reliable patient monitoring system so that the healthcare professionals can monitor the patients, who are either hospitalized or executing their normal daily life activities. Recently, the patient monitoring systems is one of the major advancements because of its improved technology. Currently, there is need for a modernized approach. In the traditional approach the healthcare professionals play the major role.

The concept of this project builds upon the integration of wireless communications into medical applications to revolutionize personal healthcare. The objective of this project is to build a patient health monitoring system based GSM Technology, which could potentially be an integral part of a suite of personal healthcare appliances for a large-scale remote patient monitoring system. As its name implies this is a Health monitoring system, with a feature of sending SMS to doctor and patients relative in event of emergency, hence the system can be used at hospitals as well as at home.

Keywords: *Microcontroller, GSM Module Temperature, ECG, BP Module.*

Introduction:

Care of critically ill patient, requires spontaneous & accurate decisions so that life-protecting & lifesaving therapy can be properly applied. Statistics reveal that every minute a human is losing his/her life across the globe. More close in India, everyday many lives are affected by heart attacks and more importantly because the patients did not get timely and proper help. This paper is based on monitoring of patients. We have designed and developed a reliable, energy efficient patient monitoring system. It is able to send parameters of patient in real time. It enables the doctors to monitor patient's health parameters (Temperature, BP, ECG) in real time. Here the parameters of patient are measured (temp, heartbeat, ECG) and wirelessly transmitted using GSM. This project provides a solution for enhancing the reliability and flexibility by improving the performance and

power management of the patient monitoring system. In the current proposed system the patient health is continuously monitored and the acquired data is analyzed at a centralized microcontroller. If a particular patient's health parameter increases above the threshold value, an automated SMS is sent to the pre-configured Doctor's mobile number using a standard GSM module interfaced to the microcontroller. Here, we are using GSM for wireless transmission.

System Block Diagram:

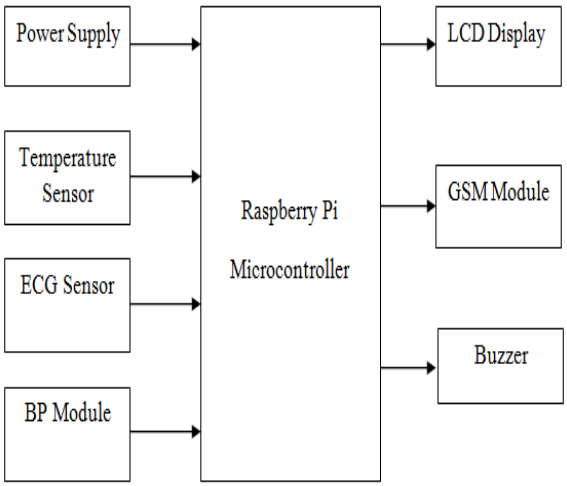

Fig.(1) System Block Diagram

System Overview:

Power Supply: This section is meant for supplying Power to all the sections mentioned above. It basically consists of a Transformer to step down the 230V ac to 9V ac followed by diodes. Here diodes are used to rectify the ac to dc. After rectification the obtained rippled dc is filtered using a capacitor Filter. A positive voltage regulator is used to regulate the obtained dc voltage.

Microcontroller: This section forms the control unit of the whole project. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written. In this project we using raspberry pi. The Raspberry Pi is a small but full-featured computer on a single board. It plugs into a monitor and you attach a keyboard, mouse and speakers. The Raspberry Pi can be used for browsing the web, creating documents and spreadsheets, playing games, watching videos and lots more. It also provides a great environment for learning programming and digital making. You can also connect up hardware to the Pi's GPIO (general purpose input/output) pins and learn to program using electronics components.

LCD Display: This section is basically meant to show up the status of the project. This project makes use of Liquid Crystal Display to display / prompt for necessary information. The LCD is an Alphanumeric Display it means that it can display Alphabets, Numbers as well as special symbols thus LCD is a user friendly Display device which can be used for displaying various messages unlike seven segment display which can display only numbers and some of the alphabets. The only disadvantage of LCD over seven segment is that seven segment is robust display and be visualized from a longer distance as compared to LCD. Here we have used 16 x 2 Alphanumeric

Display which means on this display we can display two lines with maximum of 16 characters in one line.

Temperature Sensor: Temperature sensor is the sensor that measures the amount of heat that it observes. There are contact and non-contact type of temperature sensors. The commonly used contact type sensors are thermocouple RTDs, thermistors, thermometers IC's, diodes etc. The non contact type sensors are radiation and optical pyrometers**.** Thermistors are a temperature sensing devise. It is used to sense the temperature. In this project temperature sensor used to measure temperature of patient, and it will display on LCD Display.

GSM modem Section: This section consists of a GSM modem. The modem will communicate with microcontroller using serial communication. The modem is interfaced to microcontroller using MAX 232, a serial driver. The Global System for Mobile Communications is a TDMA based digital wireless network technology that is used for communication between the cellular devices. GSM phones make use of a SIM card to identify the user's account.

ECG Sensor Section: This section basically contains the ECG electrodes which are placed on the body of the person. These signals are given to the controller as inputs and are manipulated by the microcontroller to be displayed on the LCD. The Smart E.C.G. (Electro-Cardio-Gram) Sensor monitors the electrical energy produced during a heartbeat. The change in electrical energy is detected by two leads and referenced to a ground signal. The changes in energy are displayed as a waveform. The ECG Sensor is supplied with a pack of 100 ECG electrode patches for making attachment to the test subject's skin.

BP Module: The Venire Blood Pressure Sensor is used to measure systemic arterial blood pressure in humans (non-invasively). When used with the appropriate software, it can measure mean arterial blood pressure and calculate both the systolic and diastolic blood pressure using the oscillometric method. The sensor produces an output voltage that varies with the pressure measured in the cuff. It includes special circuitry to minimize errors caused by changes in temperature. We also provide a filtering circuit that conditions the signal from the pressure transducer. The output voltage from the Blood Pressure Sensor is linear with respect to pressure. The software used with the sensor calculates the blood pressure parameters.

Buzzer Section: This section consists of a Buzzer. The buzzer is used to alert / indicate the completion of process. It is sometimes used to indicate the start of the embedded system by alerting during start-up.

Conclusion:

As health care services are important part of our society, automating these services lessen the

burden on humans and eases the measuring process. Also the transparency of this system helps patients to trust it. When threshold value is reached, the alarm system that consists of buzzer and SMS alerts the doctor and he can act more quickly. The objective of developing monitoring systems is to reduce health care costs by reducing physician office visits, hospitalizations, and diagnostic testing procedure.

References:

[1] Chaya Khandelwal S. and Manish Patil M., Implementation of Patient Monitoring System Using GSM Technology, International Journal of Electronics and Communication technology, 4(1) 18-24 (2013).

[2] Qun Hou, Research and Implementation of Remote Heart Rate Monitoring System Based on GSM and MCU, Institute of Electrical and Electronics Engineers, 978-1-4244- 7618-3 (2010).

[3] Edwards S., Heart rate Monitor Book", Leisure systems international, 1(3), 122-134 (1993).

[4] Chiranjeevini Kumari B. and Rajasekar K., Implementation of SMS based Heartbeat monitoring system using PSoC Microcontroller, 2230-7109, International Journal of Electronics and Communication technology, 2(1), (2011).

[5] Mohammad Ari Mazidi and Janci Gillispie, the 8051 Microcontroller and Embedded Systems, (2), 5-17 (2007) [6] Lee. W.C.Y, Mobile Cellular Telecommunications, (2), 463-467 (1995).

[6] A. Dohr, R. Modre-Osprian, M. Drobics, D. Hayn, G.Schreier, "The Internet of Things for Ambient Assisted Living", Seventh International Conference on Information Technology, pp 804-809,2010.

[7] M. Wcislik, M. Pozoga, P. Smerdzynski "Wireless Health Monitoring System", IFAC (International Federation of Automatic Control) Hosting by Elsevier Ltd. pp 312–317, 2015.

[8] Amir-Mohammad Rahmani, Nanda Kumar Thanigaivelan, Tuan Nguyen Gia, Jose Granados, Behailu Negash, Pasi Liljeberg1, and Hannu Tenhunen, "Smart e-Health Gateway: Bringing Intelligence to Internetof-Things Based Ubiquitous Healthcare Systems",IEEE consumer communications and networking pp 826-834, 2015.

[9] Hoi Yan Tung, Kim Fung Tsang, Hoi Ching Tung, Kwok Tai Chui and Hao Ran Chi, "The Design of Dual Radio ZigBee Homecare Gateway for Remote Patient Monitoring", IEEE Transactions on Consumer Electronics, Vol. 59, No. 4, November 2013.