

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2015

Implementation of GSM Based Real Time Patient Monitoring System

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ABSTRACT: Statistics reveal that every minute a human is losing his/her life across the globe because of various diseases. The main reason is, the patients do not get timely and proper help. So a device is required by which the patient health is continuously monitored by the Mobile multi patient monitoring system and the acquired data is transmitted to a centralized place. By utilizing the wireless technique to transmit information between medical sensor and monitoring control center, the free space of patients is enlarged, and the efficiency of the modern management of hospitals is improved. To remove human errors and to lessen excessive burden of continuously monitoring patient's health from doctor's head, we are proposing patient monitoring system using GSM.

KEYWORDS: Patient Monitoring, wireless data acquisition & processing, ARM, GSM.

I. INTRODUCTION

The present patient monitor systems in hospitals allow continuous monitoring of patient vital signs, which require the sensors to be hardwired to nearby, bedside monitors or PCs, and essentially confine the patient to his hospital bed. Even after connecting these systems to a particular patient, a paramedical assistant need to continuously monitor and note down all the vital parameters of a given patient by keeping track of all of his/her records manually. Adopting such a method is error prone and may lead to disaster in the case of a human error. In order to keep in track of critical health conditions, a real time health monitoring system of patient based on GSM, and SMS is designed and developed in this project. This finds vast application in the remote places where the people are out of reach from the experienced doctors; keeping this factor in mind best effort is done to implement some of the basic test of pathological data on the system. Hence the entire project can be broadly divided into four sections firstly, the parameters measured from the patient and transmitted, secondly the signal processing and conversion to digital form; thirdly decision making with the help of an algorithm where they obtained signal values are compared with the standard values and finally the transmission of the condition of the patient to the doctor. The concept of this paper is builds upon the integration of wireless communications into medical applications to revolutionize personal healthcare. The objective of this project is to build a wireless heart beat monitoring system using 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 Patient 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. Remote patient monitoring will not only redefine hospital care but also work, home, and recreational activities.

The choice of sensors in many cases is the most essential step while creating monitoring systems. Implementing different scenarios (indoor or outdoor monitoring) demands deploying different types of sensors. However, there are two major categories: wearable and non-wearable. The first includes all devices which require contact with the patient's body in order to provide measurements. They can often be attached to a different body parts or integrated with some clothes and represent, for instance, a common article of T-shirt. A main reason for close communication with person's body is peculiarity of the medical data, measured by wearable sensors. The most considerable parameters are: heart rate, blood pressure and body temperature. It is possible in some cases to avoid using wearable devices for measuring this data, and use, for instance, sensors embedded in pillows or blankets; however this

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approach is highly limited in terms of usage and can only be employed for monitoring at night. The second category contains all the sensors that can be appropriately used to provide information about surrounding environment. In many situations this data can make a huge impact for the overall analyses and play a vital role in maintaining patient's health condition. One of the examples could be blood pressure sensor which was incorporated into a wireless platform and provide user within formation on blood pressure level in the room. In this particular project it is embedded into the user's piece of equipment (e.g. fire-fighter boot), however other ways of usage are not excluded. There is also a several number of techniques for posture recognition and activity measurements implemented with cameras integrated in the living environment. Usually non-wearable sensors are combined into a sensor network which provides all kind of information, appropriate for overall analysis, but at the same time can significantly reduce patient's mobility and monitoring area. At the same time, one of the major aims of the project is to provide a person with a sophisticated system which will maintain his/her activity level including outdoor activities (like shopping or taking a promenade). The second types of sensors are not capable of working in terms of permanently changing environment and therefore cannot be used.

II. RELATED WORK

While implementing the proposed system important issue is the number of measuring devices. The more sensors we use the wider spectrum of possible scenarios and events we are able to cover. However, overloading patient with electronics can cause inconvenience and affect his mental condition. Moreover, a power consumption problem is a serious consequence in this case, which was previously addressed and leads to unnecessary complexity of the system. At the next stage, sensor layer of every remote monitoring system is typically connected to the processing device. This communication can be either wired or wireless, depending on initial goal of the application. The wireless communication is usually provided by GSM confection. The opposite to wireless is a wired sensor network, where each sensor in the system is connected to a processing device. Normally, it is a wearable sensor network which integrates sensors, electrodes and wired means of communication in order to monitor patient's health. Since the overall mobility and unobtrusiveness of the system together with patient's active life are among the highest priorities of the project, we have to consider wireless communication as the only appropriate approach.

III. PROPOSED METHOD

To build an independent system that automatically logs vital parameters of patients for easy access. The data is accessible to doctors through mobile device for convenience. Data of patient is stored in a database. Mobility of the equipment is improved by making the equipment more portable. In the current proposed system the patient health is monitored by the Mobile Patient Monitoring System and the acquired data is transmitted to a centralized ARM server using Wireless Sensor Networks. GSM module is connected to patient monitor system that consumes very low power and is extremely small in size. These slave nodes are specifically designed for low power consumption, with minimal circuit components. Therefore, WPANs seem to be a perfect fit for remote patient monitoring. Upon system boot up, the mobile patient monitor system will monitor the patient's vital parameters like Heart rate, Blood pressure and body temperature and will periodically send those parameters to a Doctors mobile. If a particular patient's health parameter falls below the threshold value, doctor intimates a patient. An automated SMS is posted to the preconfigured Doctors mobile number using a standard GSM module interfaced to the ARM server. The Doctor is continuously connected to the ARM server using GSM Module and he/she can get a record of a particular patient's information by just posting a SMS message to the centralized ARM server. This will reduce treatment time, cost and power consumption to a greater extent. The ARM server will first check for a valid doctor's mobile number which is provided to the GSM module during system boot up time. If the mobile number requested by the doctor matches with the one present in the ARM server then a SMS response will be sent back to the doctor based on the request.

Figure shows the block diagram of the Patient Monitoring System. Various physiological signals such as body temperature, blood pressure, heart rate are monitored as well as controlled remotely with this system.

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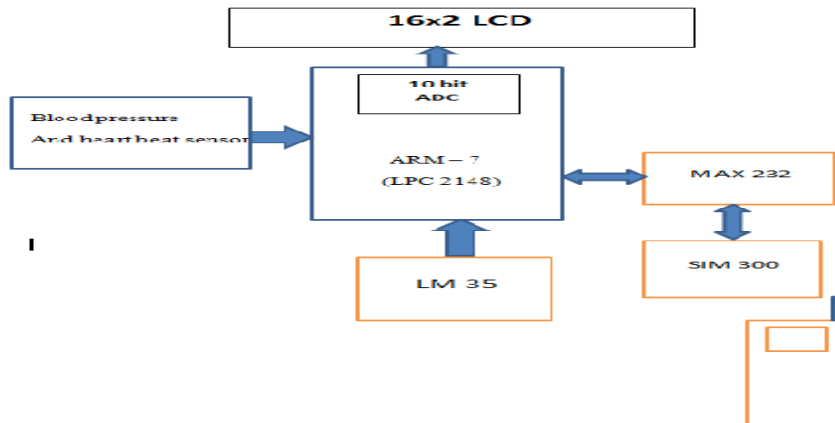


Fig 1. Block Diagram

Fig .1 shows Block diagram of our system where parameter sensors are interfaced with ARM 7 (LPC 2148).The display is used to indicate the parameters. Also GSM module is used to send the information via SMS. GSM module is interfaced with Processing unit using MAX 232.

IV. EXPERIMENTAL RESULTS

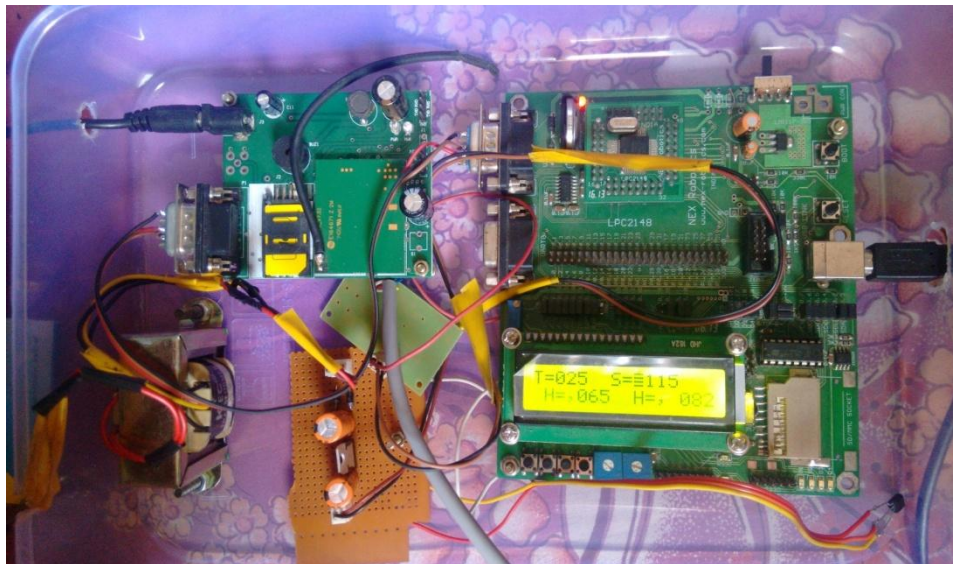


Fig.2 Original Implemented System

Fig.2 shows original implemented system showing Embedded Hardware along with GSM module, Display is used to show the parameter values. Also the required power supply circuit is implemented.

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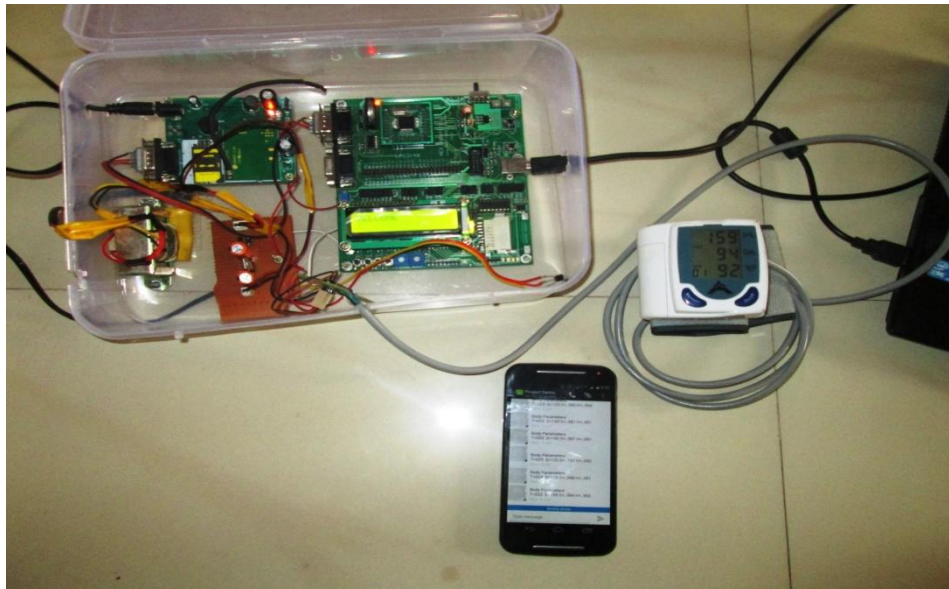


Fig. 3 Implemented Systems with Results

Fig.3 shows the actual results of blood pressure sensor as well as the same results are received at the receiver end which shows successful implementation of proposed system. Here we can verify the accuracy of our system.

V. CONCLUSION

The present system can support doctors with real-time, low-power, low-cost, long-distance, and dual-mode monitoring, which is suitable for patients who require continuous monitoring. The real-time monitoring system for patient physical states is based on GSM technology. It can be taken by patient and keep the patient movement intact because it is miniature and portable. The system can monitor and record the physical states and movement parameters real-time, and then provide an auxiliary means for the correct diagnosis of doctor.

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