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Design and Implementation of Real Time Embedded Tele-Health Monitoring System

Pola Aravind Kumar
M.Tech (Embedded Systems)
Department of ECE,
Farah Institute of Technology,
Chevella, R.R. Dist,
Telangana State, India.

D.Hemanth Kumar, M.Tech
Assistant Professor
Department of ECE,
Vidya Vikas Instititute of Technology,
Hyderabad.

Anil Sooram, M.Tech
Associate Professor & HoD,
Department of ECE,
Farah Institute of Technology,
Chevella, R.R. Dist,
Telangana State, India.

Abstract:

Now a day's health care 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 ARM7LPC 2138 Processor and displayed in LCD. If any vital parameter goes out of normal range then alert SMS Will be sent to Doctor Mobile. This system is utilizing Team Viewer Software and low cost component to transmit ECG data to physicians for monitoring, diagnosis and patients care at a significantly low cost, regardless of patient's location. The block diagram of system shown in fig. The system contains hardware and software components.

The body parameters are processed by ARM processor, it will display to the patient on LCD and Waveforms on Patient side. The same data on computer it can be viewed by physician in two ways. Firstly on Personal Computer using Remote Desktop sharing and secondly on Android mobile having application of Remote desktop sharing. If any parameter goes abnormal then the system will sent an alert SMS to the doctor through GSM modem. Reports indicating that system have been a great concern for physicians with a passion for technology, and barriers still remain for a low cost, comprehensive and integrated use in the daily operations. This system reduces costs by enabling in-horne monitoring of patients, eliminating the need for utilization of expensive facilities, and reducing the need for transportation of patients to physicians and medical centers. The system is user friendly and does not require any particular training aside from knowledge of widespread and standard Internet tools. Due to the interactive approach of the system, the physician is also able to make online consultation directly from the software provided on personal computer.

This proposed research work would be implemented using embedded system design methodology, which includes embedded hardware and firmware design modules. This project would be carried out with Low cost 32 bit LPC2148 Micro controller, PCB Design Software Tools and industry driven Embedded EDA Tool kit and Embedded 'C' Programming Language.

1. INTRODUCTION

The electronics technology has entered almost in all aspects of day-to-day life, and the medical field is not exception for that. The need for well-equipped hospitals and diagnostic centers is increasing day by day as the people are becoming more conscious about

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their health problems. In biomedical fields special units are used, such as intensive care unit or coronary care unit. All of these units are designed to offer the advantage of the low Nurse – Patient ratio and concentration of the equipment and the resources needed; to take care of critically ill or seriously injured units. The medical world today faces two basic problems when it comes to patient monitoring, frrstly the need of healthcare providers present bedside the patient and secondly the patient is restricted to bed and wired to large machines. In order to achieve better quality patient care, the above cited problems have to be solved. As the technologies are advancing it has become feasible to design to horne based vital sign monitoring system to display, record and transmit signals from human body to any other location.The computer based Signal Acquisition, processing and analysis system using MATLAB to display ECG Wavefonn and filtering tool for ECG waveform. This paper discusses the aspects of acquisition of physiological Parameters like ECG Temperature, Pulse rate, pre-processing them and displaying them in a graphical user interface for being viewed by the doctor and also observe the clinically useful data, Firstly on Doctors computer and secondly on Android Mobile which contains a Teamviewer application. This system is expected to monitor patient under critical care more conveniently and accurately for 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. In second section describes system Architecture, third section describes Hardware description of system, and last section describes result , describes future scope and conclusion.

2. System Architecture

The block diagram of system shown in fig.1. The system contains hardware and software components. The body parameters are processed by ARM processor, it will display to the patient on LCD and Waveforms on Patient side.The same data on computer it can be viewed by physician in two ways.Firstly on Personal Computerusing Remote Desktop sharing and secondly on Androidmobile having application of Remote desktop haring. If any parameter goes abnormal then the system will sent an alert SMS to the doctor through GSM modem.Reports indicating that system have been agreat concern for physicians with a passion for technology, and barriers still remain for a low cost, comprehensive and integrated use in the daily operations.This system reduces costs by enabling in-horne monitoring of patients, eliminating the need for utilization of expensive facilities, and reducing the need for transportation of patients to physicians and medical centers.The system is user friendly and does not require any particular training aside from knowledge of widespread and standard Internet tools.Due to the interactive approach of the system,the physician is also able to make online consultation directly from the software provided on personal computer.

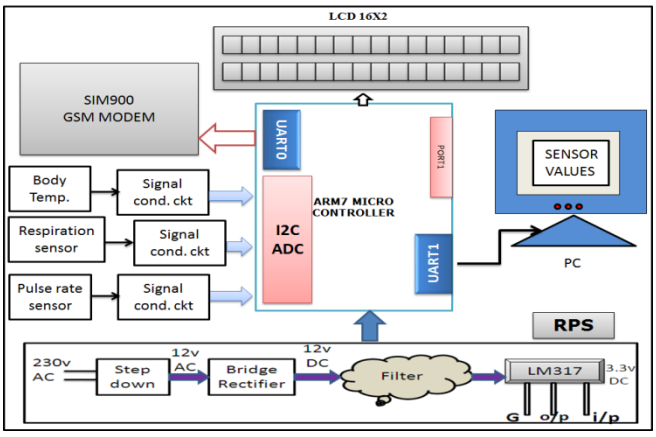

Fig.1 Block diagram

3. HARDWARE DESIGN OF SYSTEM

3.1 ARM (LPC 2148):

ARM stands for Advaced RISC Machine developed by ARM Ltd which is most widely used in number of Embedded systems. Today ARM family accounts for approximately 75% of all embedded CPUs making it one of the leading architecture in the world. Previous designs used 8 bit/16 bit devices, but the designers are looking for highly integrated high performance ARM based 32-bit microcontroller. Heart of the design is

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ARM 32 bit RISC processor, hence brief description was given about its specifications below.

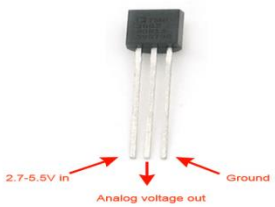
The basic block diagram of the system is as shown in fig 1, The body parameters are processed by ARM processor,it will display to the patient on LCD and Waveforms on Patient side The same data on computer it can be viewed by physician in two ways.Firstly on Personal Computerusing Remote Desktop sharing and secondly if any parameter goes abnormal then the ARM processor will sent an alert SMS to the doctor through GSM modem.

The LPC2148 board consists of ARM7TDMI as its core and it is designed by NSK. ARM7TDMI family has good performance in situations where the energy consumption is critical design goal. LPC2148 has ARM7TDMI as its core is called CPU core. The modules inside are connected by the CPU high performance bus called Advance High performance bus (AHB) and the peripherals are connected by VLSI peripheral bus (VPB) .

3.2 LCD DISPLAY:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. In our project we used two 16x2 LCDs which are used for displaying status of sensors present in field.

3.3 Temperature sensor:



The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.

The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies.

3.4 Humidity sensor (HR 201):

Our highly advanced technology of Humidity Sensors is presented by us with the efficient functionality and less maintenance features. These sensors are useful for determining the humidity content or relative humidity of air. Further, due to their optimum temperature, these converts relative humidity to output voltage without any hassle.

Our valued clients acclaimed the range for their easy operations and installations.Humidity sensor Made from organic macromolecule materials Can be used in occasions like: hospitals, storage, workshop, textile industry, tobaccos, pharmaceutical field, and meteorology

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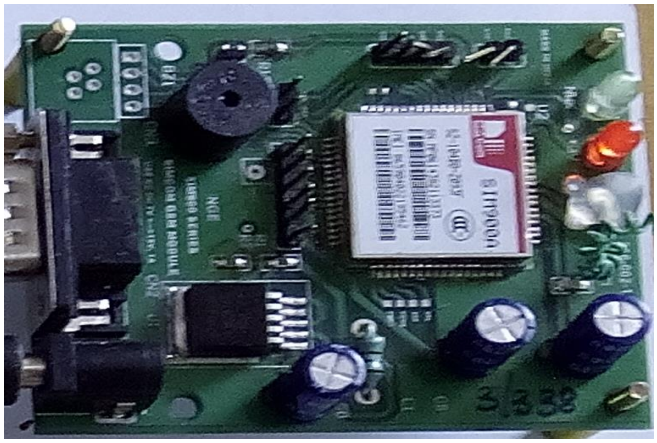
3.5 Heart Beat Sensor

A simple heart -beat transducer can be made from an infrared LED and an infrared phototransistor. It works because skin acts as a reflective surface for infrared light. The IR reflectivity of one's skin depends on the density of blood in it. Blood density rises and falls with the pumping action of the heart. So the intensity of infrared reflected by the skin (and thus transmitted to the phototransistor) rises and falls with each heartbeat.

3.6 GSM Module:



GSM supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service). GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3G in Australia, Canada and many South American countries. By having harmonized spectrum across most of the globe, GSM's international roaming capability allows users to access the same services when travelling abroad as at home. This gives consumers seamless and same number connectivity in more than 218 countries. Terrestrial GSM networks now cover more than 80% of the world's population. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available.

4. EXISTING METHOD

In the existing work, The medical world today faces two basic problemswhen it comes to patient monitoring, firstly the need of health care providers present bedside the patient and secondly the patient is restricted to bed and wired to large machines. In order to achieve better quality patient care,the above cited problems have tobe solved.As the technologies are advancing it has become feasible to design to home based vital sign monitoring system to display,record and transmit signals from human body to any other location.

5. PROPOSED METHOD

In this proposed system,This system is expected to monitor patient under critical care more conveniently and accurately for diagnosing which can be interfaced with computer to bring it under a network system widely for the doctor to monitor he patient's condition sitting in his own office without being physically present near to the patient's bed.

The system uses a compact circuitry built around LPC2148 (ARM7) microcontroller Programs are developed in Embedded C. Flash magic is used for loading programs into Microcontroller.

6. EXPERIMENTAL RESULTS:

These are the results obtained when the patient parameters are like temperature, Humidity and heartbeat sensor information will be updated on the lcd and PC. If the sensors value gets abnormal it will send the message to the mobile.

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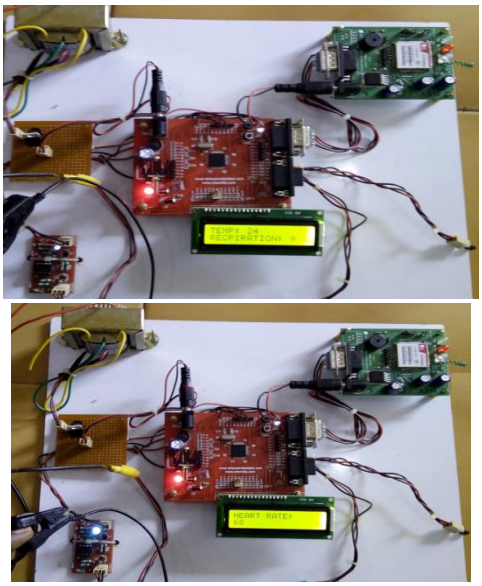
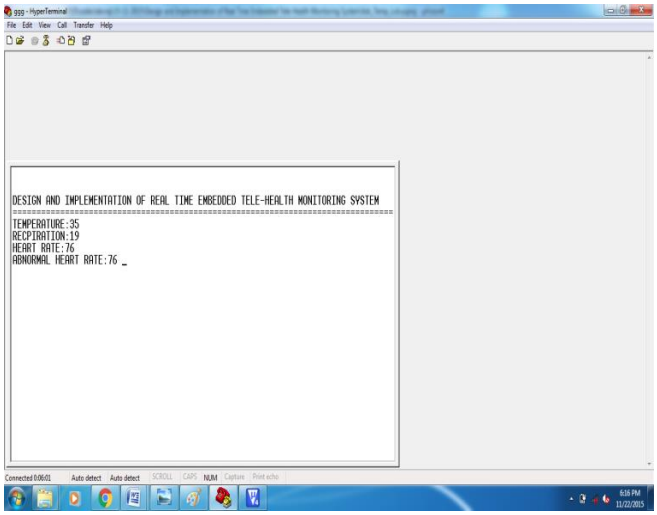
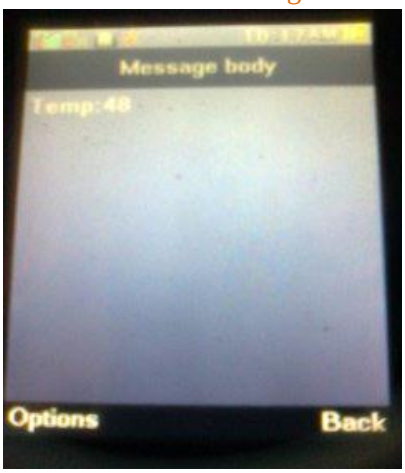


Sensor values displayed on LCD



Sensor values receiving on PC



Sensor values receiving on mobile

7. CONCLUSION:

A new remote management system for buildings lighting automation has been presented. With the use of wireless sensor networks we could be able to extend initial capacity of 64 devices to a number big enough to be used in real scenarios such as residential areas and large buildings without additional investments in different loop. The control through the PAN coordinator of the wireless sensor network also enables a centralized control system. The use of devices with wireless sensor network allows a half-duplex communication which can provide many parameters about the lighting and lamp status, this is very useful for saving energy and maintenance purposes, as it can detect any single lamp fault allowing a predictive maintenance and group replacement or schedule power consumptions rules enabling the integration of then lighting system in home and buildings into Smart Grid approaches.

8. FUTURE SCOPE:

Future work will include a comparative study between the proposed system and other wired system, focusing on energy efficiency, Smart Grid capabilities and installation and Maintenance costs.

Further implementations will be done in order to extend the proposed system to other standards or technologies of lamps, luminaries or lightning communication and control protocols.

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Author Details

Pola Aravind Kumar Persuing M.Tech (Embedded Systems) in Farah Institute of Technology, Chevella, R.R. Dist Telangana State, India and Graduated in B.Tech (Electronics and Communication Engineering) in 2013 from JNTU Hyd.

D.Hemanth Kumar, working as an Assistant Professor in Vidya Vikas Instititute of Technology, Post Graduated in ECE (Embedded Systems) M.Tech. from JNTU Hyderabad, Graduated in ECE B.Tech. from JNTU Hyderabad. Have more than 5 years experience in Teaching; Areas of interest are embedded systems and image processing.

Anil Sooram Graduated in B.Tech ECE in 2007 from JNTU Hyd. He received Masters Degree in M.Tech [ECE] from JNTUH University, Hyderabad. Presently he is working as Associate Professor in ECE Dept. in Farah Institute of Technology, Chevella, R.R. Dist Telangana State, India. His research interests include Wireless Communications, Embedded Systems. He has published 3 research papers in International Conferences, Journals. He has received best Teacher award from Farah Group.