INTELLIGENT HEALTH CARE SYSTEM USING BODY SENSOR NETWORKS

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Abstract - Many devices and solutions for remote ECG monitoring have been proposed in the literature. These solutions typically have a large marginal cost per added sensor and are not seamlessly integrated with other smart home solutions. Here we propose an ECG remote monitoring system that is dedicated to non-technical users in need of long-term health monitoring in residential environments and is integrated in a broader Internet of-Things (IoT) infrastructure. Our prototype consists of a complete vertical solution with a series of advantages with respect to the state of the art, considering both prototypes with integrated front end and prototypes realized with off-the-shelf components: i) ECG prototype sensors with record-low energy per effective number of quantized levels, ii) an architecture providing low marginal cost per added sensor/user, iii) the possibility of seamless integration with other smart home systems through a single internet-of-things infrastructure

Keywords: IOT, Heart Beat Sensor,ARM7LPC2148.

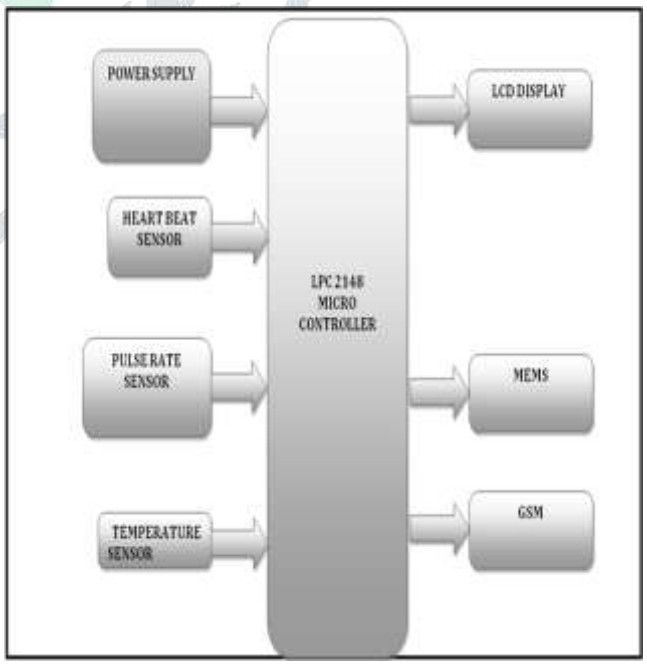
I. INTRODUCTION

In recent year, with the miniaturization of biomedical sensors, the fast development and population of information processing and wireless data transmission technology, the reaches of wireless medical monitoring system has become a hot topic. The aim of developing remote health monitoring systems is to monitor online medical parameters and to reach this information from anywhere. Because of the less cost in wireless communication technology implementation of them to monitoring system have become easier. By utilizing the wireless technique to transmit information between medical sensor and monitoring control centre, the free space of patients is enlarged, and the efficiency of the modern management of hospitals is improved.

II. SYSTEM STRUCTURE

The monitoring terminal, and generally consists of three modules: The sensor module, the control module, and the wireless communication module. The sensor module is used for accruing medical information from the outside, and then converts them to digital signals. The control module is in charge of coordinating the task of different modules, controlling the sensor, processing data, and executing communication protocols.

Fig1:Block diagram of implemented system



The control chip uses lpc2148. Lpc2148 is a model that belongs to ARM7 series, a fully integrated mixed-signal micro-controller. It has a high-speed signal core, 64k bytes of flash memory, and hardware implementation of the SPI interface. The wireless monitoring terminal block diagram is shown in fig 1. Whose core is the lpc2148 MCU. It is connected with GSM/GPRS by RS-232 interface, and can read and writing inner register of, realizing the wireless transceiver of information. It can get information such as psychological parameters from external sensors by ADC and DAC modules. It is connected with the simulator and pc by JTAG and UART series interface. Therefore realizing the download and online debug programs. Through the external interrupts, it could control the calling button to get the calling information from patients and process by interrupts

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III. HARDWARE DEVLOPMENT

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.

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.

MEMS:

Accelerometers are acceleration sensors. An inertial mass suspended by springs is acted upon by acceleration forces that cause the mass to be deflected from its initial position. This deflection is converted to an electrical signal, which appears at the sensor output. The application of MEMS technology to accelerometers is a relatively new development

In this project this can be used to find the vibrations of human body.

Temperature Sensor (LM35):

Temperature sensor senses the temperature in environment, in this project it is used to find the temperature levels. A threshold value has been assigned to this sensor. When it reaches the threshold value, Buzzer will turns ON, DC Motor will turns ON. Updates from this sensor will be displayed on LCD

Heart beat Sensor:

Heart beat sensor is used to detect the pulse rate of human body by placing it into the finger tips. Here the maximum rate of pulse is 72. If it exceeds then message can be sent to the person mobile number as well as on LCD.

Zigbee:

Zigbee is the transreceiver which transmit the updates from kit on to PC screen. One Zigbee placed on kit and other is connected to PC via RS 232 cable.

GSM:

GSM 800L modem is used to send the updates or alerts to the Person Mobile who are registered by sending SMS to inserted SIM on kit.

The system consists Wireless sensor network containing the ARM7 as master controller along with the various sensors such as Heart Beat, Temperature. The ARM hardware is built on single chip module.A regulated power supply is provided to the overall system as shown in fig.1

All the sensors sense the respective data about patient and send this data towards the controlling unit. Thus all the data is collected by the ARM7 and is maintained at this location.

Here, the data is stored in the data base. At this stage signal conditioning is done and only required amount of data is sent forward. Thus a successful communication is achieved between a server and client side by using this type of system. Thus personal computer & a Smartphone will continuously monitor all the data from remote processing unit and compare with the value preloaded process structure.

HARDWARE DESIGN:

To implement the overall system we used different hardwares.

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3.1. ARM7 Processor:

The ARM7 is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory

SOFTWARE DESIGN

A. Embedded C:

Embedded C is a widely used general-purpose, high-level programming language. Its design philosophy emphasizes code readability, and its syntax allows programmers to express concepts in fewer lines of code than would be possible in languages such as C. It supports multiple programming paradigms, including object-oriented, imperative and functional programming or procedural styles. It is a scripting Language and it's executing the code line by line.

B. Keil Compiler:

In this Kiel software, program is written in the embedded 'c' language and execute it., after completion of execution hex file program is dumped into the controller using flash magic. Keil provides a broad range of development tools like ANSI C compiler, macroassemblers, debuggers andsimulators, linkers, IDE, library managers, real-time operating systems and evaluation boards for Intel 8051, Intel MCS-251, ARM families.

IV. RESULTS & DISCUSSIONS

In the proposed system, parameters such as heart beat and Temperature of the body can be calculated by using wireless sensors and devices can be controlled by using manual operation or by using web server.

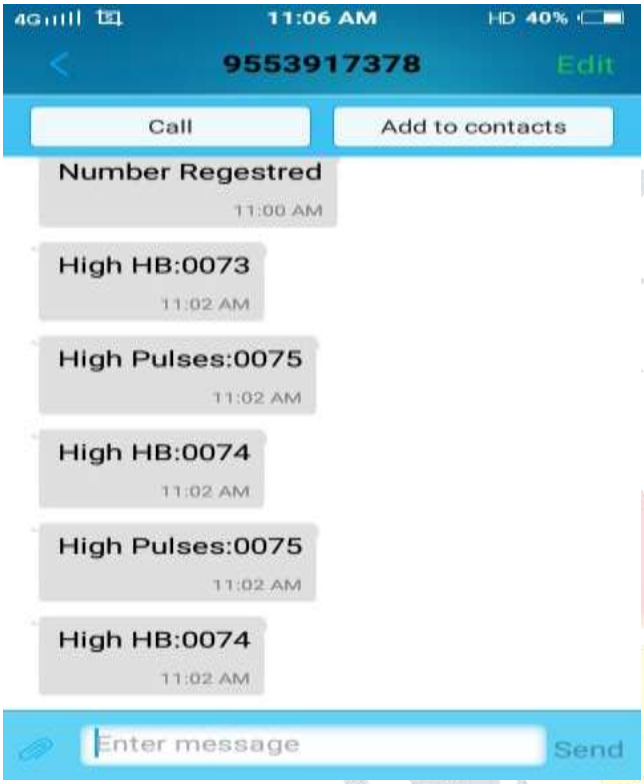
Procedure for monitoring the values:

i. When we turn on the kit it shows project name on LCD. Now we press the RST button on kit for mobile number registration.
ii. In the registration process, A sim with message balance has been placed on GSM modem. And we have to send a messsge like " *<Mobile Number> " To Sim number to get the updates to registered mobile number.
iii. After completion of registration process, mobile number has been displayed on LCD. And message can be sent to mobile like below figure.
iv. Now place the finger tips in pulse sensor clips to get the pulse rate & Heart beat values
v. Values of heart beat, pulse, Temperature and MEMS values has been displayed on LCD. STB Means stability of mems sensor when no movement observed on person body.
vi. If the person moved or vibrated then MEMS alert can be displayed like "MVD" on LCD.
vii. When high values occurred on heart beat and pulse values then it shows on LCD like below figure as well as a message can be sent to the person mobile number.

Fig 2: Prototype of proposed system

Fig 3: : Getting the sensor values on LCD

Fig 4: SMS Shows the high sensor values



V. FEATURE ENHANCEMENT

There is always chance to improve any system as research AND development is an endless process. Patient voice recognition system: IC HM2007 can be used to recognition the voice samples of the patients for the better security purpose.
A camera can be fitted into the system so as to enable the base station to get a real time view of the battlefield. Automatic surveillance robot: A robot with all the medical future as well as advanced feature like ammunition can be build.

VI. CONCLUSIONS

Tests find that this system can successfully set up the GSM network. The monitoring terminal can precisely check the heart rate and body temperature of patients, and send them to coordinator and then surveillance center through wireless network. The error of the monitored body temperature, heart rate, and other information is very slight, which satisfies practical usage, and meets the demand of the design. By extending other sensor module, it could realize the monitoring of more psychological parameters and reliable transmission.

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. Continuous monitoring of health and cost effective disease management is the only way to ensure economic viability of the healthcare system. This paper presents an integrated health monitoring mobile platform for connected

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