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An Rtos-based Health Monitoring System with Multi-processor Support

Magadevi[1], Ramya[2], Prabha[3] and Yukesh[4]

ABSTRACT

In the modern days, our way of living has been changed more, lead to health consciousness, so health monitoring system is most important part of our life. In this proposed method, an RTOS based Wireless Sensor Network architecture designed has been developed for the health monitoring, node act as a master node and another as normal data acquisition node to which sensors are connected. Data acquisition node uses the Peripheral Interface controller. Communications between two nodes are accomplished through IEEE 802.15. The RTOS is used to allocation resources to users in an orderly manner. The RTOS based technique is to reduce the possibility of collision.

Keywords: RTOS, IEEE 802.15.4, LPC2148, HL7, IHE, □C/OS II, GLCD**.**

1. INTRODUCTION

The patient health monitoring system with wireless sensor network is used for patient tele- monitoring and tele-medicine. In earlier days transmitting biomedical signal from patients to hospital was done through telephony network. continues observation was made to the patient was admitted in hospital . Today, wireless sensor network lend mobile tele-medicine which allows patients to enroll their daily routines while they are monitored continuously anytime, anywhere. In health care application wireless sensor network small, lightweight sensors are used to be placed on the patient's body. Benefits of patient health system are used for transmission of blood pressure, heart beat rate, level of oxygen, body temperature from patient to a web server using GPRS. possible applications of wireless patient health system are remote routine checkups, emergency alarm to doctor and caretakers in emergency situation and predication on patient's health condition. So that early disclosure of patient health condition can help doctor to take necessary action to avoid unusual situation in future .Doctor can regularly monitor patient's health condition and give advice message to patient on the basis of generated graph and insistence report. Doctors are also able to set new threshold vales for patient health parameter.

Advances in wireless sensor network technology manage tele-medicine and continuous health monitoring more possible within hospital and between hospital and mobile patients.

2. LITERATURE REVIEW

Patient Remote Monitoring provides improved quality of care as well as to reduce overall healthcare costs. Patient Remote Monitoring is employed to monitor chronic conditions, but may also need to detect actual conditions simultaneously [1]. RTOS (Real Time Operating System) is a Process which is done between hardware and application in order to provide time constraints. RTOS is used here to assign the priorities.

[1] Associate Professor, Dept. of EEE, S.A. Engineering College.

[2] Assistant Professor, Dept. of EEE, S.A. Engineering College.

[3] Assistant Professor, Dept. of EEE, S.A. Engineering College.

[4] Post Graduate, Dept. of EEE, S.A. Engineering College, *Email: yukeshbuji@gmail.com*

HART (Highway Addressable Remote Transducer) is used to overcome the collision while transmitting the packets through wireless LAN [2]. Three categories of sensors normally [3]. HL7 and IHE are currently used for provided guidelines on timestamps. It should be robust and reliable for remote patient monitoring in order for patient data to have context and to be correlated with other data. Timestamps should be synchronize with reliable time sources for synchronization, include devices with simple or no clock and may store data spanning significant periods before able to upload [4]. In real world application, mono- task processor without real time operating systems mechanism that hardly satisfies the current requirements.so we porting of µC/OS-II in ARM7 controller that performs multitasking and time scheduling mechanism. Hear we design an embedded that supports the µC/OS II features [5]. RTOS is basically divided into two category hard real time operating system and soft real time operating system. In Real Time Operating System the Scheduling is an important aspect for executing a various task at runtime. Runtime depends on their priority of the tasks, when it should be executing [6]. Design a wireless sensor network with RTOS porting capability, and sense value in range of 1Mhz. according to priority, schedule the task and display on pc.one node act as data acquisition node and another as master node to which RTOS and pc display are connected [7]. The idea of dynamic priority scheduling is to confine focus on algorithms that assign priorities based on temporal parameters and optimization of recourses; this utilization measurement of a dynamic scheduling, called schedulable utilization of resources, is scaled from 0 to 1, and the higher percentage of schedulable utilization means the better algorithm [8]. The concept of dynamic assignment of priorities to interrupts is used which reduces the time delay for a lower priority task under some circumstances becomes a higher priority task. ARM with combination of RTOS to minimize the complexity of system. Scheduling of the tasks are power appliances through Direct Memory Access (DMA) peripherals to optimization of performance of the CPU utilization [9]. The severity of symptoms, triggers, and responsiveness to treatment medication are often unique to each individual. The comprehensive guideline for an asthma action plan recommends focusing on monitoring asthma symptoms as a goal for asthma therapy [10]. Spirometer, peak expiratory flow measurement, and a non-invasive marker of airway inflammation known as fractional exhaled nitric oxide (FeNO) are now used by health care professionals for diagnosis and monitoring [11]. Portable technology focusing on full-body physiological monitoring using sensors and mobile devices is becoming increasingly prevalent. Recent research in this area has focused on monitoring various physiological functions such as sweat rates [12]. Outlines the development of the instrumentation and software application that enables portable and inexpensive real-time collection of lung function parameters. Future versions of these platforms may be particularly appropriate for pediatric patients who may have greater difficulty documenting their asthma symptoms during the course of a day.

3. SYSTEM MODEL

In this chapter the block diagram and the main software tools that used in this project is been discussed. The main aim of this paper is to present an RTOS based Wireless Sensor Network architecture that help in health monitoring, In modern days, our way of living has been changed more, lead to health consciousness, so we design an WSN architecture which sense the parameter and convert sensed data to an required signal strength and transmitted by zigbee which utilize IEE802.15.4 standard for its transmission and reception. If any abnormal in sensed parameter, processor automatically activate respective devices.

3.1. µc/Os-II Using ARM

µC/OS-II, is an Real-Time Kernel that is highly portable, scalable, pre-emptive real-time, multitasking kernel for microcontrollers. Micro-controller operating system-II can manage up to 60 application tasks. Micro-controller operating system-II can execute task on a number of processor architectures and ports. The vast number of ports should convince that Micro-controller operating system-II is truly very portable and thus will most likely be ported to new processors as they become available. Micro-controller operating

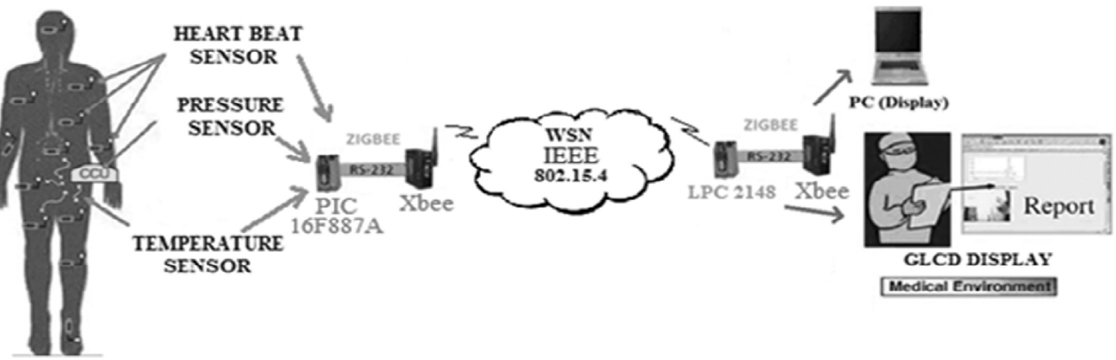

Figure 1: System workflow design

system-II can be scaled to only feature need for your application. Depending on the processor, on an ARM (Thumb mode) Micro-controller operating system-II can be reduced to as little as 5.99K bytes of code space and 500 bytes of data space (excluding stacks). The processing time for most of the services provided by Micro-controller operating system-II is both constant and deterministic. This means that the processing times do not depend on the number of tasks running in the application. □C/OS-II is started as shown in below flowchart. Initially the hardware and software are initialized. The hardware is the ARM cortex-4 and software is the □C/OS-II. The resources are allocated to all the tasks defined in the application. Then the scheduler is started and it aligns tasks in pre-emptive manner.

3.2. Sensors

In proposed system, three sensor are used they, (1) Micro-Electro-Mechanical Systems (MEMS) is an acronym for Micro electro Mechanical Systems, it defines mechanical structures fabricated with IC processing on (most often) silicon wafers. In Europe, MEMS is labeled Microsystems and in Japan it is labeled Micro machines. Prior to that period the technology was labeled silicon micromachining. MEMS defines the technology; not specific products. This technology encompasses a collection of a variety of processes enabling three-dimensional shaping of wafers or stacks of wafers. While most of the applications use silicon wafers, many other materials have been used, including glass and quartz wafers. As a result of batch manufacturing technology (using multiple devices photo lithographically defined on a wafer), the cost of the single device depends on its size; wafer processing cost is fixed for a given process. The cost difference between a 1 × 1mm device and a 10 × 10mm device is 100 times, as the first device would yield about 16 000 devices on a 6-in diameter wafer, and the larger device would yield only about 160 devices on the same wafer. It is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through micro fabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible “micromachining” processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices. MEMS are made up of components between 1 to 100 micrometers in size (i.e. 0.001 to 0.1 mm) and MEMS devices generally range in size from 20 micrometers (20 millionths of a meter) to a millimeter. They usually consist of a central unit that processes data, the microprocessor and several components that interact with the outside such as micro sensors. (2) Blood pressure sensor is to monitor the blood pressure of the patient. (3) The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. LM35 temperature sensor is used to measure the temperature. It has 3 pin Vcc, Ground and Output. It is a 8 pin package(Schematic), operating ranges from -55 to +150 C It has +5v DC for its operation Due to the input temperature, LM35 give the corresponding output. Low impedance, linear output. The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. We can measure temperature more accurately than a using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc

3.3. RS232 Channel

Data To allow compatibility among data communication equipment made by various manufacturers, an interfacing standard called RS232 was set by the Electronics Industries Association (EIA) in1960. In 1963 it was modified and called RS232A. RS232B and RS232C were issued in 1965 and 1969, respectively .The standard was set long before the advent of the TTL logic family, its input and output voltage levels are not TTL compatible. In RS232, a1is represented by -3 to +25v, while a 0bit is +3 to +25v, making -3 to +3 undefined. Main advantage are its low cost and its speed.Its main drawbacks are the limited potential for system expansion and the fact that the computer has to be located close to the signal source.

3.4. Data Acquisition Node

Data RPM systems that are designed to generate alarms in the case of an emergency must be able to guarantee that they can do so immediately upon discovering a problem. GPOS are not up to this task, especially when under heavy processing load (as is often the case with devices such as personal computers, tablets and smart phones). Additionally, devices used for purposes other than remote monitoring activities run the risk of potentially significant downtime should some other process crashes the system.

3.5. Master Node

Master node consist of ARM7 BASE KIT and LPC2148 processor. □C/OS-II RTOS is used for assigning priority to each task, schedule each task and allocate resources in an orderly manner. The data sensed by data acquisition node is transmitted to master node by zigbee module. According to task priority master node display in GLCD and in touchscreen display. According to the level of data, corresponding device are buzzer is activated.

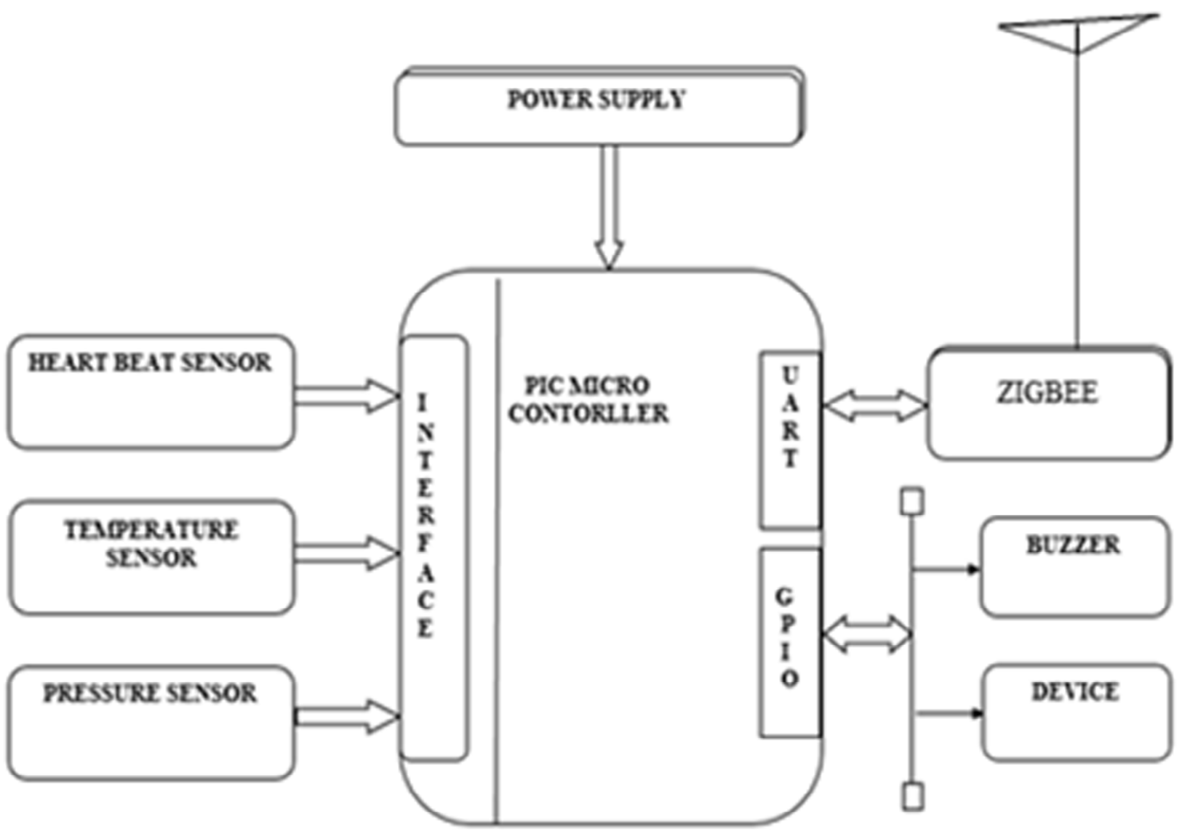

Figure 2: Data Acquisition Node

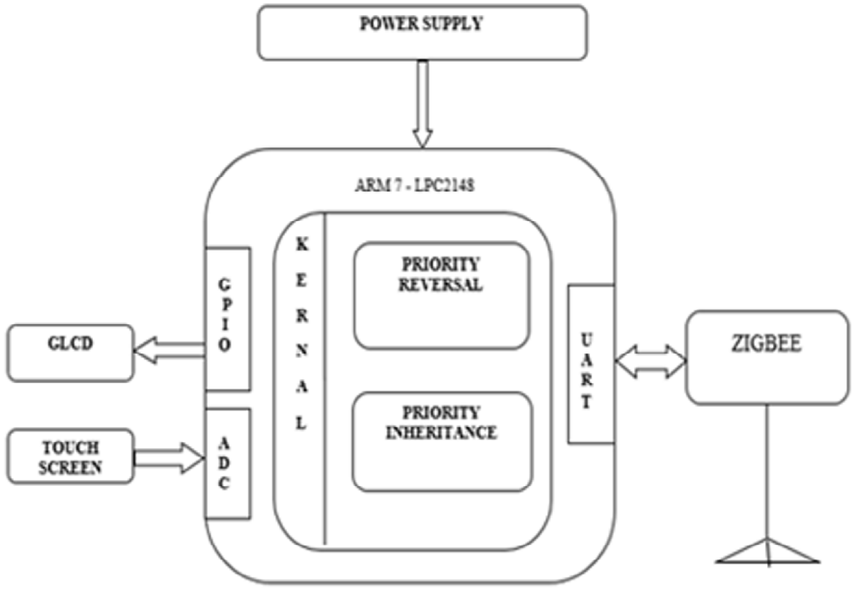

Figure 3: Master Node

4. RESULT AND DISCUSSION

4.1. Simulation Result

In this simulation we acquired data from sensor's and priority each sensed data and process to get an value. Based on the sensor level processor will actuate corresponding output devices. Below proteus model show the health monitoring wireless node acquiring data from the Sensor and process It and produce the result.

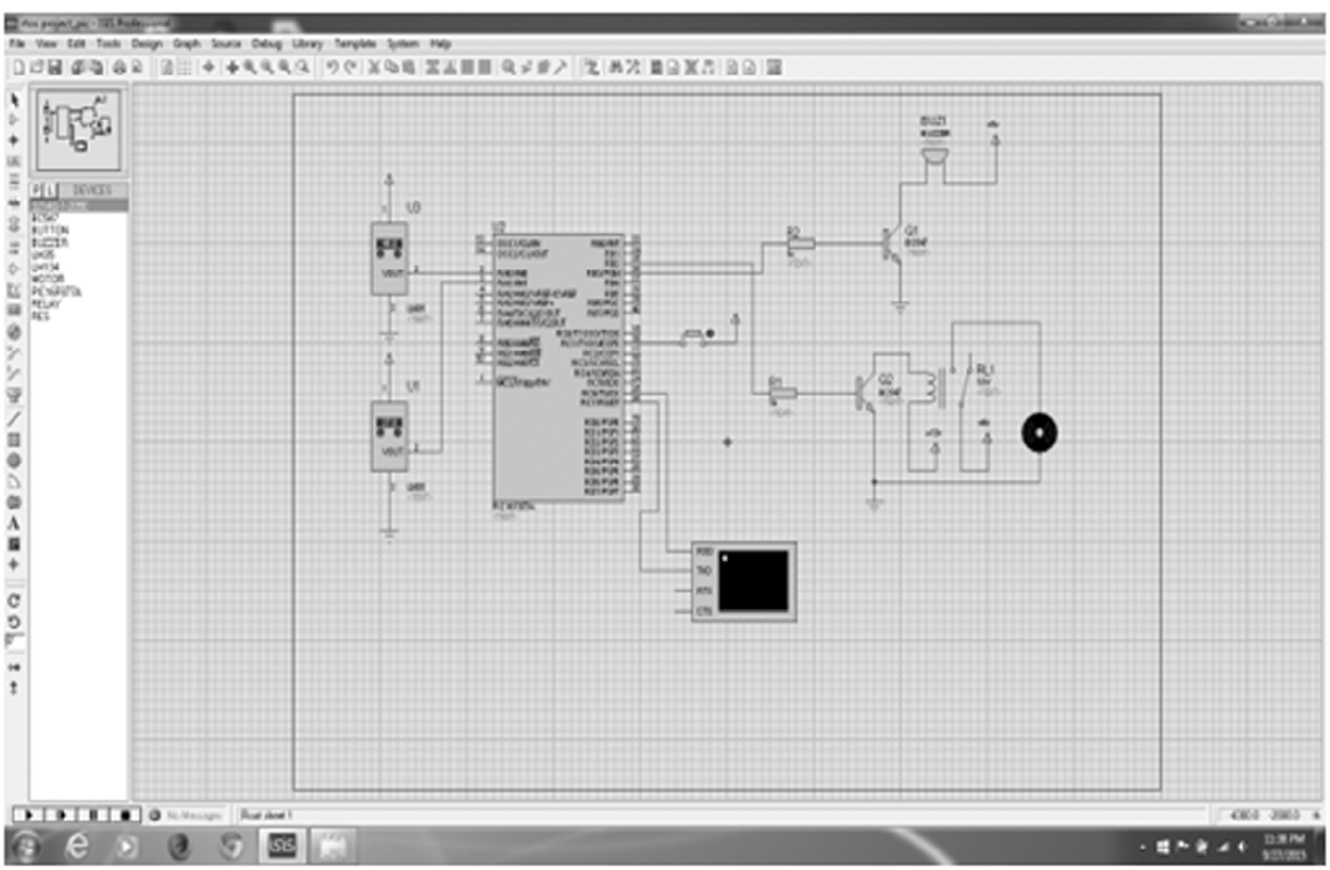

Figure 4: Simulation Result

5. CONCLUSION

To In existing system health monitoring system design by using wireless sensor network. But it could not perform two task simeltaniously.in proposed system by using RTOS we can perform two task simultaneously.

In proposed system, successfully simulated the wireless sensor architecture design for health monitoring system with RTOS and successfully transmitted and received the data acquire by data acquisition node and display according to priority in GLCD and touchscreen.

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