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Design of Family Health Care Monitoring System Using Wireless Communication Technology

R.Aravind[1], Syed Musthak Ahmed[2]

M-Tech Student, Embedded Systems, S R Engineering College, Warangal, India[1]

Professor & HOD, Dept of ECE, S R Engineering College, Warangal, India[2]

Abstract*:* Health monitoring is repeatedly mentioned as one of the main application areas for Pervasive computing. Mobile Health Care is the integration of mobile computing and health monitoring. It is the application of mobile computing technologies for improving communication among patients, physicians, and other health care workers. As mobile devices have become an inseparable part of our life it can integrate health care more seamlessly to our everyday life. It enables the delivery of accurate medical information anytime anywhere by means of mobile devices. Recent technological advances in sensors, low-power integrated circuits, and wireless communications have enabled the design of low-cost, miniature, lightweight and intelligent bio-sensor nodes. These nodes, capable of sensing, processing, and communicating one or more vital signs, can be seamlessly integrated into wireless personal or body area networks for mobile health monitoring. This paper, presents a mechanism for estimation of elderly well-being condition based on usage of house-hold appliances connected through various sensing units. Two new wellness functions are defined to determine the status of the elderly persons on performing essential daily activities. The developed system for monitoring and evaluation of essential daily activities was tested at the homes of four different elderly persons living alone and the results are encouraging in determining wellness of the elderly.

Keywords: SMS, GPRS, Zigbee Technology, GSM, RF Communication, Wireless Sensor Network (WSN)

I.INTRODUCTION

The problem found in most hospitals is that the physician has to frequently visit the patient and asses his/her condition by measuring the parameters such as temperature, blood pressure, drip level etc. In case of emergencies, the nurse intimates the doctor through some means of communication like mobile phone. A growing selection of innovative electronic monitoring devices is available, but meaningful communication and decision supports are also needed for both patients and clinicians [1].

Health care monitoring systems can help people by providing healthcare services such as medical monitoring, memory enhancement, medical data access, and communication with the healthcare provider in emergency situations through the SMS or GPRS. Continuous health monitoring with wearable or clothing-embedded transducers and implantable body sensor networks will increase detection of emergency conditions in at risk patients. Not only the patient, but also their families will benefit from these. Nowadays, more and more urban residents living in the Community and the communities became ever larger. There is a medical center in a medium community in general which can provide some treatment to those common diseases. With the aging society in China, more and more elderly will live in urban community. Community health centers can also be a feature that is perfect for the elderly on a regular basis to provide some basic health care, such as measurement the blood pressure and heart rhythm once a month for the elderly, and keep record of the physical condition for them. Meanwhile, the elderly are also looking for this kind of health care, and hope to have a professional to make some reminders according to his own body status.

Usually the medical center could allocate some medical staff to examine on-site for elderly regularly, but with increased number of older persons in the community, such on-site service is becoming increasingly costly. Therefore, we want to design a family telemedicine system, will enable residents examine the health themselves in home with electronic Sphygmomanometers and other home medical tools, and coupled with simple operation, the original body health data could transmitted to the community medical center automatically. Replaced those staff but improve the efficiency of community medical center services.

II.SYSTEM ARCHITECTURE

The System Architecture has two sections. They are

1. Patient Section
2. Control Room Section

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1. Patient section:

Fig.1 represents the patient section. Here patient data is observed unceasingly by victimization wireless device networks, i.e., Temperature and heart beat of patient. This data is forwarded to the room section by victimization Zigbee technology [3].

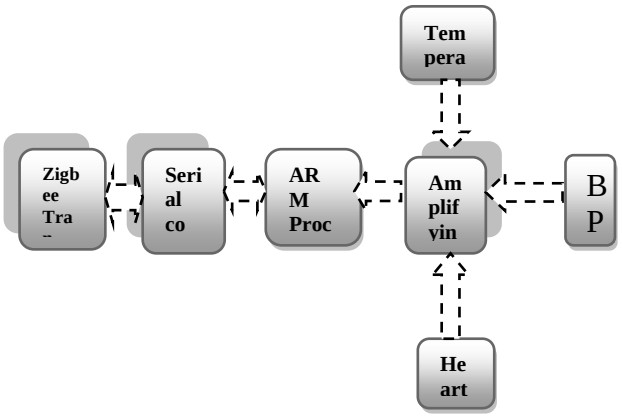

Fig.1 Patient section

2. Control room section:

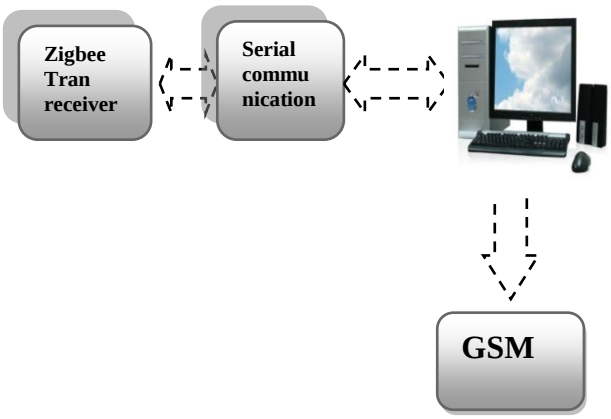

Fig.2 Control Room section

Fig. 2 represents the control room section. Here patient data from patient section is received by Zigbee receiver in control room section. Here system program will checks the patient information and stores in the database also send this data by GSM technology if any condition occurs. A real time health monitoring system a wearable device. This device will be wearied by the patient and parameters such as ECG, Temperature and Heart Beat will be continuously transmitted and monitor through wireless technology Zigbee[3].

3.ARM Processor:

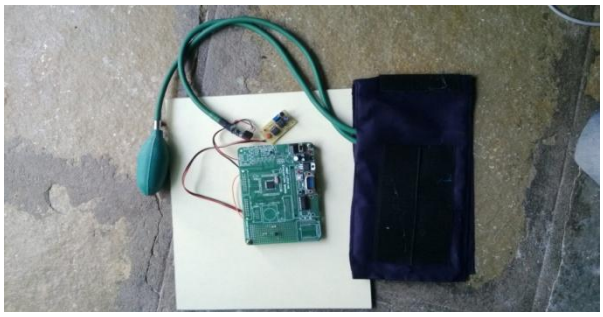

Fig. 3 Fabrication kit

ARM7 Processor as shown in fabrication kit Fig.3. The ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry's most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications.

The ARM7TDMI core uses a three-stage pipeline to increase the flow of instructions to the processor. This allows multiple simultaneous operations to take place and continuous operation of the processing and memory systems.

(1) Operating modes: The ARM7TDMI core has seven modes of operation

- User mode is the usual program execution state
- Interrupt (IRQ) mode is used for general purpose interrupt handling
- Supervisor mode is a protected mode for the operating system
- Abort mode is entered after a data or instruction pre fetch abort
- System mode is a privileged user mode for the operating system
- Undefined mode is entered when an undefined instruction is executed.

The interrupt settings of ARM support the DHLS to response to the interrupt coming from the server section.

(2) Interrupt controller: The Vectored Interrupt Controller (VIC) accepts all of the interrupt request inputs from the home server section and categorizes them as Fast Interrupt Request (FIQ), vectored Interrupt Request (IRQ), and non-vectored IRQ as defined by programmable settings. So ASRS system can able to separate the command signals and easily will select the speed in the vehicle.

III.SENSOR NETWORK

A **wireless sensor network (WSN)** consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to pass their data through the network to a main location. The more modern networks are bi-directional, also enabling *control* of sensor activity. The

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development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding [3].

In this health care monitoring system we are using two sensors

1. Heart Beat Sensor

2. Temperature Sensor

1. Heart Beat Sensor

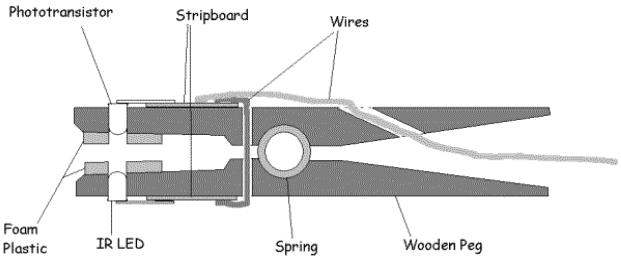

Fig.4 Heart Beat Sensor

The Heart Beat sensor is shown in Fig. 4 consists of a light source and photo detector; light is shone through the tissues and variation in blood volume alters the amount of light falling on the detector. The source and detector can be mounted side by side to look at changes in reflected light or on either side of a finger or earlobe to detect changes in transmitted light. The particular arrangement here uses a wooden clothes peg to hold an infra red light emitting diode and a matched phototransistor. The infra red filter of the phototransistor reduces interference from fluorescent lights, which have a large AC component in their output.

2. Temperature Sensor

The Temperature Sensor is LM35 shown in Fig.5. The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

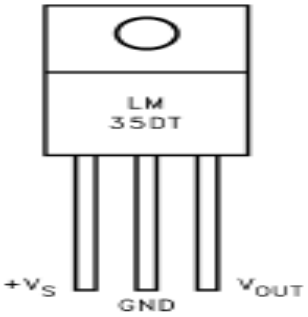

Fig.5 Temperature Sensor.

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. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

IV. WIRELESS COMMUNICATION

A. GSM Technology

Fig.6 represents GSM Modem. The GSM/GPRS Modem comes with a serial interface through which the modem

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can be controlled Using AT command interface. An antenna and a power adapter are provided.
The basic segregation of the modem is as under:

- Voice calls
- SMS
- GSM Data calls
- GPRS

To achieve important information of cars, one GSM Module is added into the car security system. Siemens TC35I GSM modem can quickly send SMS messages to appointed mobile phone or SMS server. So the owner and the police can be informed at the first time. If another GPRS module is added in, the image data could also sent to information. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem.

Fig.6 GSM modem

GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

B. Zigbee module

Fig.7 Zigbee Module

Fig.7 reprents the Zigbee module. The Xbee/Xbee-PRO RF Modules are designed to operate within the ZigBee protocol and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between remote devices. The modules operate within the ISM 2.4 GHz frequency band and are compatible with the following:

- XBee RS-232 Adapter
- XBee RS-232 PH (Power Harvester) Adapter
- XBee RS-485 Adapter
- XBee Analog I/O Adapter
- XBee Digital I/O Adapter
- XBee Sensor Adapter
- XBee USB Adapter
- XStick
- Connect Port X Gateways
- XBee Wall Router.

The XBee/XBee-PRO ZB firmware release can be installed on XBee modules. This firmware is compatible with the ZigBee 2007 specification, while the ZNet 2.5 firmware is based on Ember's proprietary "designed for ZigBee" mesh stack (EmberZNet 2.5). ZB and ZNet 2.5 firmware are similar in nature, but not over-the-air compatible. Devices running ZNet 2.5 firmware cannot talk to devices running the ZB firmware [5].

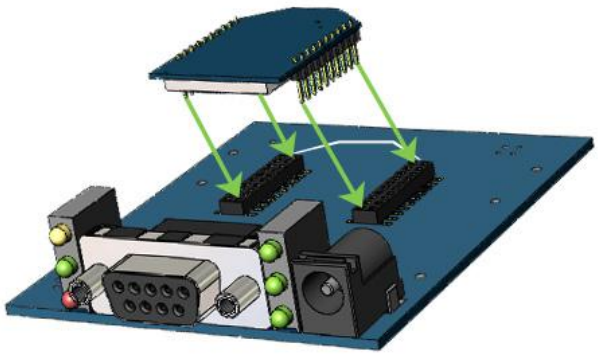

Fig. 8 Zigbee Module Mounting to an RS232 Interface Board

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The XBee modules were designed to mount into a socket and therefore do not require any soldering when mounting it to a board is shown in fig .8.

V.Medical Section

The patient data from patient section is received to the monitoring section by RF communication. This RFcommunication consists of two types.

1. RF Transmitter
2. RF Receiver

1. RF Transmitter:

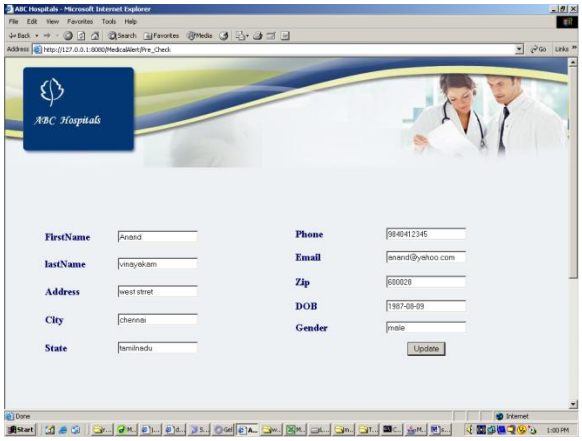
The TWS-434 extremely small, and are excellent for applications requiring short-range RF remote controls. The TWS-434 modules do not incorporate internal encoding. If simple control or status signals such as button presses or switch closures want to send, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding functions.

The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls. The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy

2. RF receiver:

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The WS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.

A 0 volt to Vcc data output is available on pins. This output is normally used to drive a digital decoder IC or a microprocessor which is performing the data decoding. The receiver's output will only transition when valid data is present. In instances, when no carrier is present the output will remain low. The RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch closes, you can use the encoder and decoder IC set described above. Decoders with momentary and latched outputs are available.



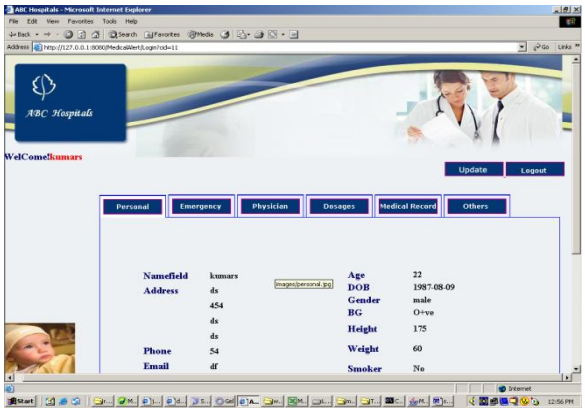


Fig.9 Medical observations

Fig.9 represents the patient health conditions of his body Temperature, Blood Pleasure and Heart Beat which are stored in the data base by using visual basics and also every time we can monitor the patient information.

VI.CONCLUSION

This paper illustrates an approach of how to design and implement an ARM-based embedded system, which is simple, stable, very easy to use at home for the elderly persons in a community and also very convenient to all of the community residents. The system has a good scalability. The residents can access the community server to check themselves' health information without others software but a computer with IE. Doctors can review a patient's former health information via internet too when they diagnose the patient. As a result, this system would have a widely use in future.

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REFERENCES

[1] " International Conference on Information and Network Technology", IPCSIT vol.4 (2011) IACSIT Press, Singapore.

[2] Zhou Xiao, Li Jiaming, Pu Junjia, Yang Zhi, " The design and implement of Mobile Remote Medical Ward System." Computer Engineering. 2010.

[3] Sahandi, R., Noroozi, S., Roushanbakhti, G., Heaslip, V. & Liu, Y., 2010. "Wireless technology in the evolution of patient monitoring on general hospital wards". Journal of Medical Engineering and Technology, 34(1), 51-63 pages.

[4] Wu Xingyong, Zhao Jiasong, Wu Wendou, Zhou Bing, Wu Xingyu, "The research of country remote medical platform base on component," 2010.

[4] Krejcar, O., Janckulik, D., Motalova, L., Kufel, J., "Mobile Monitoring Stations and Web Visualization of Biotelemetric System - Guardian II", Europe Comm 2009, LNICST vol, 16, pp. 284-291. R. Mehmood, et al. (Eds). Springer, Heidelberg (2009).

[5]Safaric S., Malaric K., "ZigBee wireless standard",Multimedia Signal Processing and Communications, 48th International Symposium ELMAR-2006, Zadar, Croatia, June 2006.

BIOGRAPHIES

R.Aravind was born in Karimnagar district, A.P, India. He received B-Tech in Electronics and Communication Engineering from Ganapathy Engneering College, Warangal (dist), A.P, India. Pursuing M. Tech in Embedded Systems at SR Engineering College, Warangal, A.P, India.

Dr. Syed Musthak Ahmed (Prof) completed B.E (Electronics) and M.E (Electronics) from Bangalore University (Karnataka) and PhD from Vinayaka Mission's University (Tamil Nadu). He has 28 years of teaching experience in reputed engineering colleges and he is presently working as Prof &HOD (ECE), SR Engineering college, Warangal, A.P. He is Doctoral committee member as well as Indian examiner in reputed universities. He is a member of various professional societies viz SMIEE, MISSS FITEE, MISTE, MIAENG, MIATM. He has various publications in National & International Journal/Conferences.