Raspberry Pi Based Wearable RFID Tag Design for Medical Care

SHAIK AMER SOHAIL
M.Tech Student
CMR Technical Campus
Kandlakoya (V), Medchal (M)
Hyderabad-501401.

Mrs. CH.SUDHAMANI M.tech
Associate professor,
CMR Technical Campus
Kandlakoya (V), Medchal (M)
Hyderabad-501401.

Abstract: **With the upcoming aging society and emerging of some newly discovered chronic diseases, the demand of hospital nursing for elderly patients had been significantly increased. It is a critical issue for health worker to provide a comprehensive, proactive health care in hospital, especially for those disabled patients who are unable to speak or behave themselves. This study proposes an innovative wearable RFID tag which embedded body temperature monitoring sensor, and equipped with automatic identification and localization, real-time emergency notification for healthcare workers. Additionally operating with the intelligent backend system architecture this system can also provide immediate physician advice in case if emergency situation happens without doctors near the side. The result of the study provides a ubiquitous medical care throughout whole hospital, and the newly invented tag may bring a significant change to normal health care process especially in patient care.**

Keywords: **RFID tag; Medical Care; Patient Monitoring; Raspberry Pi; Wireless sensors.**

I. INTRODUCTION

Health In these years, the phenomenon of population ageing has been a serious problem in this modern world. According to the survey by United Nations, the proportion of population 60 years or older at 2000 is 10 percent, and keep rising in these years. As a consequence, health care for the elderly and the long-term care for the patients with chronic diseases will become as important issues for the family and whole society. Currently, the focus of emergency medical care management are the pre-hospital emergency medical services, the medical care management for general in-patient are seldom mentioned.

Almost every medical equipment in the hospital is an embedded system. This equipment's include diagnostic aids such as ECG, EEG, blood pressure measuring devices, X-ray scanners; equipment used in blood analysis, radiation, colonoscopy, endoscopy etc. Developments in medical electronics have paved way for more accurate diagnosis of diseases.

An Embedded System is a combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a specific function. A good example is the microwave oven. Almost every household has one, and tens of millions of them are used every day, but very few people realize that a processor and software are involved in the preparation of their lunch or dinner.

This is in direct contrast to the personal computer in the family room. It too is comprised of computer hardware and software and mechanical components (disk drives, for example). However, a personal computer is not designed to perform a specific function rather; it is able to do many different things. Many people use the term general-purpose computer to make this distinction clear. As shipped, a general-purpose computer is a blank slate; the manufacturer does not know what the customer will do wish it. One customer may use it for a network file server another may use it exclusively for playing games, and a third may use it to write the next great American novel.

Frequently, an embedded system is a component within some larger system. For example, modern cars and trucks contain many embedded systems. One embedded system controls the anti-lock brakes, other monitors and controls the vehicle's emissions, and a third displays information on the dashboard. In some cases, these embedded systems are connected by some sort of a communication network, but that is certainly not a requirement.

At the possible risk of confusing you, it is important to point out that a general-purpose computer is itself made up of numerous embedded systems. For example, my computer consists of a keyboard, mouse, video card, modem, hard drive, floppy drive, and sound card-each of which is an embedded system. Each of these devices contains a processor and software and is designed to perform a specific function. For example, the modem is designed to send and receive digital data over analog telephone line. That's it and all of the other devices can be summarized in a single sentence as well.

If an embedded system is designed well, the existence of the processor and software could be completely unnoticed by the user of the device. Such is the case for a microwave oven, VCR, or alarm clock. In some cases, it would even be possible to build an equivalent device that does not contain the processor and software. This could be done by

replacing the combination with a custom integrated circuit that performs the same functions in hardware. However, a lot of flexibility is lost when a design is hard-cooled in this way. It is much easier, and cheaper, to change a few lines of software than to redesign a piece of custom hardware.

Nearly 99 per cent of the processors manufactured end up in embedded systems. The embedded system market is one of the highest growth areas as these systems are used in very market segment- consumer electronics, office automation, industrial automation, biomedical engineering, wireless communication, data-communication, tele-communications, and transportation, military and so on.

The RFID application in medical system has been developed and deployed in some previous plague, for example, the SARS plague in 2003. When suspicious disease case occurs, possibly infected patients may be quickly tracked and isolated. Personnel and equipment appear in the operation room at certain time; the result can be used as reference for medical care history tracking.

RFID tag which includes body temperature monitoring, automatic identification and localization, real-time emergency notification for health care workers. This tag may combine with backend system to support real-time emergency notification, making a ubiquitous health care service in hospital.

The temperature sensor may transfer its signal directly into tag memory and being read by reader together. The combination of physiological sensing device and wireless communication technology can measure a user's body temperature accurately so as to proceed with the application service of physiological signal processing and track the user's health status. And the RFID combined with mobile communications mechanism, and link to the health care information system, which forms the basis of intelligent health care service platform.

The communication interface may transfer that information to RFID reader. As a platform is developed to enable the communication and programmable function of the readers. The open data links and exchange interfaces are designed to use the storage and operation capability of the mobile health care function on the backend system.

II. DESIGN AND IMPLEMENTATION

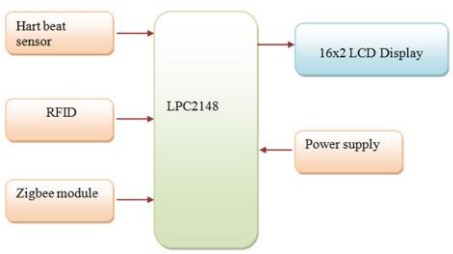

Figure 1: Block Diagram of Proposed System

In this project the hardware requirements are following:

- A Raspberry Pi 3 module
- MAX232
- Power supply
- LCD display
- Hart beat sensor
- Smart card reader
- RFID reader
- ZigBee module

We have used Python programming language for raspberry pi programming and the tool used was Putty Beta version.

Our proposed system is designed in two steps. First we design a RFID tag with Reader module and second step is to design interfacing of raspberry pi to RFID reader along with LCD display, temperature sensor, Heart beat sensor and ZigBee transmitter on a single board.

Thus the obtained design is used to implement the proposed system called Raspberry pi based wearable RFID tag design for Medical care.

ZigBee receiver is a separate module used in receiving the data obtained from the entire operation and interfaced with the laptop through serial cable, we can monitor the patients heartbeat, temperature and other parameters on a web page or an application designed in future particularly for this purpose.

The total proposed system is designed and prototype is presented as follows

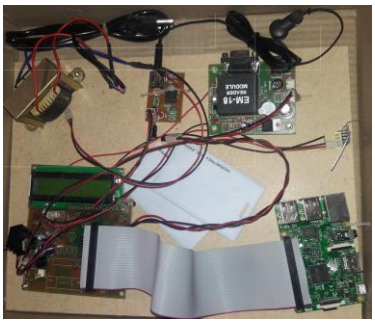

Figure 2: Design of Proposed system

In real time this RFID tag can be designed and used as follows

Figure 3: RFID tag usage along with RFID reader

And the ZigBee receiver kit is designed as follows

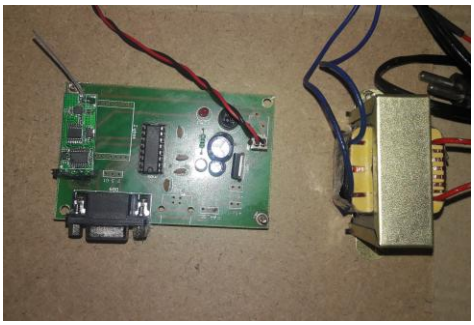

Figure 4: ZigBee receiver module with serial DB9 port

With the help of our proposed system doctors can view and monitor the patients' health conditions from anywhere.

This ubiquitous design helps medical attenders of physically handicapped patients those who are unable to move from their bed.

RFID tag along with heart beat sensor, temperature sensor and more sensors are connected to patient's hand.

RFID readers are located on different points for patient's convenience so that the nurse or medical attender can move the patient's bed near to the RFID reader and just swipe patient's hand RFID tag. Thus the total patient's current health condition can be monitored and checked by the doctor in emergency conditions.

This is one of the efficient way of monitoring patient's health. Thus we have proposed this system designed and implemented without any hassles.

III. CONCLUSION AND FUTURE SCOPE

The emerging field of radio frequency identification and wireless sensor networks combines sensing, computation, and communication into a single tiny device. The power of wireless sensor networks lies in their ability to deploy large numbers of tiny nodes that assemble and configure themselves.

The proposed architecture we designed is to present new capabilities for both remote and real-time monitoring of patients. We have identified important characteristics required in ubiquitous medical service management systems in order to get some clues for ubiquitous healthcare service system architecture design. We identified the required components of a robust u-healthcare monitoring system and discussed the system components according to the categories of services such as, client services, physicians' services, personal healthcare services, and data interoperability services. It tells which service modules are required for service infrastructure establishment, and which task-specific service modules are useful for each category of services. This proposed service management architecture possesses the essential elements of each future medical application that are integrated with existing medical practices and technologies in real-time, remote monitoring, in giving medication, and patient status tracking system assisted by embedded wearable wireless sensors which are integrated in wireless sensor network.

IV. REFERENCES

[1]. JoaqunGutirrez, Juan Francisco Villa-Medina, Alejandra Nieto- Garibay, And Miguel ngelPorta-Gndara, "Automated Irrigation System Using A Wireless Sensor Network And Gprs Module", Ieee Transactions On Instrumentation And Measurement, Vol. 63, No. 1, January 2014.

[2]. Vimal.P, Priyanka.V, Rajyasree.M, SanthiyaDevi.P.T, Jagadeeshraja.M, SuthanthiraVanitha.N,"A Novel Approach for Automatic Irrigation and Fertigation Using Embedded System," International Journal of VLSI and Embedded Systems-IjvesVol 05, Article 03257; March 2014.

[3]. Sathiyabama P, Lakshmi Priya C, Ramesh Sm, Preethi B, Mohanaarasi M, "Embedded System Design For Irrigating Field With Different Crops Using Soil Moisture Sensor," International Journal Of Innovative Research In Computer And Communication Engineering Vol. 2, Issue 8, August 2014.

[4]. LiaiGao, Meng Zhang, GengChen,"An Intelligent Irrigation System Based On Wireless Sensor Network and Fuzzy Control, "Journal of Networks, Vol. 8, No. 5, May 2013.

[5]. K.Prathyusha, M. ChaitanyaSuman,"Design of Embedded Systems for the Automation of Drip Irrigation," International Journal of Application or Innovation in Engineering Management (Ijaiem) Volume 1, Issue 2, October 2012.

[6]. Orazio Mirabella, Senior Member, IEEE, and Michele Brischetto,"A Hybrid Wired/Wireless Networking Infrastructure for Green house Management,"IEEE Transactions on Instrumentation and Measurement, Vol. 60, No. 2, February 2011.

[7]. B.Sivakumar, P.Gunasekaran, T.Selvaprabhu, P.Kumaran, D.Anandan, "The Application of Wireless Sensor Network in the Irrigation Area Automatic System", IjctaJan-Feb 2012.

[8]. S.MuhammadUmair, R. Usman,"Automation Of Irrigation System Using Ann Based Controller," International Journal Of Electrical Computer Sciences Ijecs-Ijens Vol: 10 No: 02.May2010.

