

Design and Implementation of Wearable RFID Tag for Real-Time Ubiquitous Medical Care

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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 vulnerable patients who are unable to speak or behave for themselves. This project proposes an innovative, wearable RFID tag which embedded body temperature monitoring sensor, heart beat sensor, and equipped with automatic identification and localization, real-time emergency notification for health care workers. Additionally, operating with the intelligent backend system architecture, this system can also provide immediate physician advices in case if emergency situation happens without doctor near the site. The result of this project provides a ubiquitous medical care throughout whole hospital, and the new-invented tag may bring a significant change to normal health care process, especially in patient care.

1.1 Introduction:

In recent years, in almost every country in the world, substantial financial resources have been allocated to the health care sector. Technological development and modern medicine practices are amongst the outstanding factors triggering this shift. Developed countries like South Korea, Japan, and China are currently facing a middle- and older-aged market place from a predominantly youth-driven marketplace. This trend is resulting in a greater demand for health care-related services and greater competition among health care providers. According to the U.S. Bureau of the Census based on International Data Base the number of adults age 65 to 84 is expected to double from 35 million to nearly 70 million by 2025 when the youngest Baby Boomers retire. One example was based on a recent study that almost one third of U.S.

adults, most of whom held full-time jobs, were serving as informal caregivers – mostly to an elderly parent. Providing patients with convenient health facilities at a low cost has always been a great challenge for health service providers. Moreover, the fast changing life style of the modern world and the problem of aging society pose an urgent need to modernize such facilities. This involves devising cheaper and smarter ways of providing healthcare to sufferers of age-related diseases. In addition, emphasis has to be paid on providing health monitoring in out-hospital conditions for elderly people and patients who require regular supervision, particularly in remote areas. Future trends in national healthcare services are expected to include shorter hospital stays and better community care. Another main concern of our society nowadays is the significant number of elderly patients head to nursing homes. We conducted thorough studies in order to find solutions to this problem and we found out that it is very important to build a remote u-healthcare monitoring system that can continuously, automatically, accurately, and cost effectively monitor patient's condition such as ECG and vital signs in order to provide a fast and efficient medical analysis and medication.

Our project offers an efficient architecture for ubiquitous healthcare monitoring system wherein, we integrate RFID and WSN. We based our goals and objectives in the previous related works and studies that focused on u-Healthcare system at the hospital, home, offices, and while the patient is travelling. There are several contributions we proposed in this paper. We design an efficient architecture for ubiquitous healthcare monitoring system architecture using RFID over WSN. Wherein, the patient is capable to scan his/her medical status by using RFID body sensor and wirelessly transmit at store his/her medical data to local workstation, then transmit it to the central database server. The workstation queries the central database which contains the proper administration for the giving medical prescriptions or medication.

In case of emergency with regards to the status of patient, they will be alerted on their wearable device or they can receive messages to their smart phones or healthcare devices. Additionally, the medical staff manning the workstation will also receive an alert message indicating that the patient status needs attention. The medical staff will take an action depending on the alert level status of the patient, whether they send a medical prescription and medication or personally check and apply medication to the patient.

1.2. Related Work:

Research about u-Healthcare system which enables us to monitor patients' status and receive medical services is being conducted. The most significant limitations of wireless network are the slow data transfer rate and lack of a single connectivity standard that enables devices to communicate with one another and to exchange data.

2.1. Design issues:

Other limitations include wireless devices, which are still in their infancy stages. The current medical systems are merely providing medical services when a patient who has already a bad health status visits medical facilities. However, a u-Healthcare system with sensor network enables patients to receive medical services from caregivers through mobile devices and remote clinic services anytime, anywhere. At the same time, the caregivers can provide medical services to prevent diseases by discovering the symptoms in advance through monitoring the patient continuously before her/his status is worsened. As examples of existing u-healthcare system based on sensor networks, a Location-Based Medicare Service (LBMS) was implemented in Taipei Medical University Hospital which used RFID tags to locate both patients and hospital assets with successful results.

2. PROPOSED METHOD :

We group various ubiquitous healthcare services depending on its functions and identify the crucial requirements for further enhancement. After thorough studies and analyzing the crucial requirements and related works, we have come up with a conceptual design for ubiquitous medical service management architecture using RFID over wireless sensor network by integrating various ubiquitous healthcare services and system application.

Further detailed explanation was illustrated and discussed on proposed architecture section.

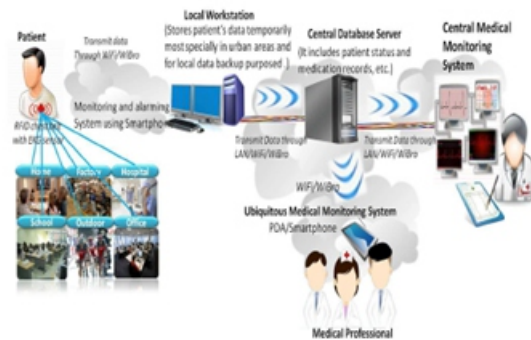
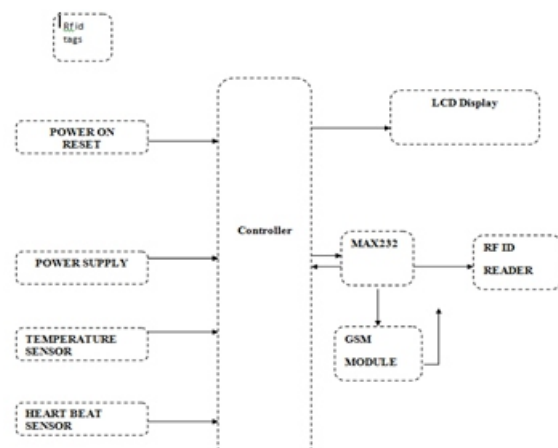


Fig :RFID-based u-healthcare monitoring system architecture over WSN

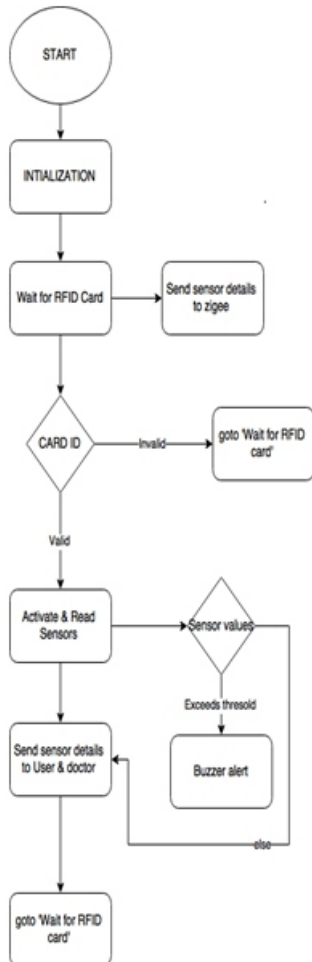
2.1 BLOCK DIAGRAM:



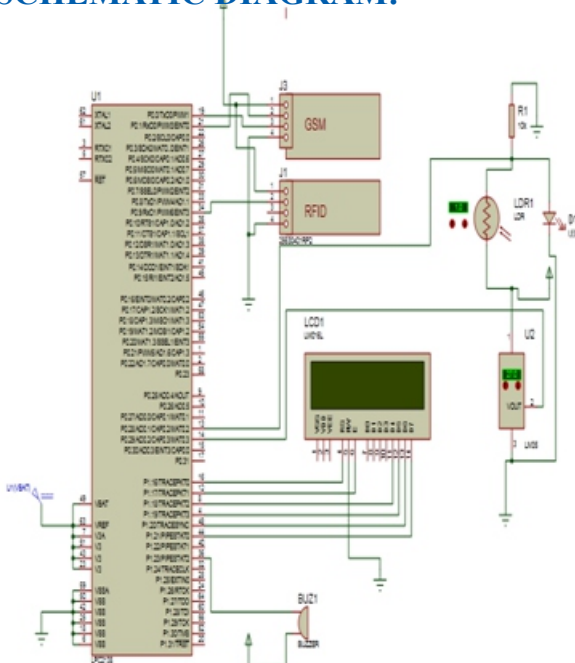
DESCRIPTION:

The system consists of RFID reader, sensor unit, display unit and information sending/receiving units. Whenever the person wants to check his/her health details, the person needs to show his/her RFID card. From that system, the person gets the personal details like 'name', Phone number, etc. After that, the system activates the sensors and gets the health details like temperature, heartbeat. And then the system sends the same information to the Doctor and user in the form of SMS. After that, the doctor sends the suggestions/treatment details to the user.

2.2 FLOWCHART:



2.3 SCHEMATIC DIAGRAM:



ADVANTAGES:

There are several advantages of using this system. A few of them are listed below:

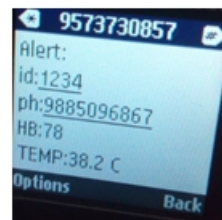
- » This system is very cheap and easy to implement in a large scale.
- » This system provides accurate information to the persons health condition .
- » This system can provide security.

APPLICATIONS:

- » Hospitals
- » Old age homes

3.RESULT AND CONCLUSION:

The proposed system was fully developed and tested to demonstrate its feasibility and effectiveness. The screenshots of the smart home app developed has been presented in Figure bellow.



CONCLUSION :

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.

One of the major challenges in wireless sensor network applications is remote continuous monitoring of patients or elderly persons staying at home or in hospital even though our system was developed in small size wireless sensor network environment for the elderly or patients with chronic disease who live with a few number of persons without caregivers or doctor's attention in house or small nursing home. Because healthcare applications typically deal with several types of waveform data, the use of wireless sensor network technology to u-healthcare is much more demanding than the use of WSNs for other real-time monitoring tasks.

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.

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