

MONITOR HEALTH CARE THROUGH EMBEDDED & CLOUD

RAHUL ANAND

Department of ECE, Manipal University Jaipur, India

ABSTRACT

In the vast and complex world of healthcare technology, we must ask ourselves — what is the best way to deliver the benefits of the latest technology? Physicians today are under increasing pressure to see more patients in less time, a serious stressor that is compounded by expectations that doctors quickly evaluate and incorporate into clinical practice rapidly changing medical evidence. If healthcare decisions are cars, then physicians are the drivers. They dictate the place healthcare is delivered, the time frame of delivery and the amount of money spent on it. This perfect storm of too little time, too much information, and too few resources creates an environment more open to diagnostic error. As the population ages, there is a greater need to develop clinical and personal diagnostic tools. As wait times for medical attention increases, the automation of non-invasively collecting patient vitals could significantly improve the efficiency of modern health care. I am bringing concept of cloud and discussing in details about it.

KEYWORDS: Sensors, Micro-Controller, Arm-7, Gsm-Module, Wireless Sensor, Cloud Server

INTRODUCTION

In the field of health monitoring the current most important user groups are those aged 40 and more. The group of 40+ users shows more diversity in their health conditions than younger people. There are ring-type pulses monitoring sensor available in the market in which the measured data are displayed in the LCD and cannot be transmitted out of the ring. Thus, it is not possible to continuously monitor the vital parameters such as temperature, pressure and pulse from a distant location. In a hospital either the nurse or the doctor has to move physically from one person to another for health check, which may not be possible to monitor their conditions continuously. Thus any critical situations cannot be found easily unless the nurse or doctor checks the persons health at that moment. This may be a strain for the doctors who have to take care of a lot number of people in the hospital. In order to keep in track of critical health conditions, a real time health monitoring system of patient based on ZigBee, GSM, and SMS is presented. This finds vast application in the remote and urban places where the people are out of reach from the experienced doctors; keeping this factor in mind best effort is done to implement some of the basic test of pathological data on the system [1,2].

A real time health monitoring system of remote patient developed is 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 [1,2].At the receiver side (doctor side) the data will be wirelessly received using ZigBee. The doctor will monitor the measured parameter on the GUI designed using Visual Basic on PC. The data from the patient is collected continuously and stored in the database designed using SQL (Structured Query Language) if the doctor is not present at that instant of time, he will be intimated through an SMS (Short Messaging Service)also the relatives will receive a message in case of abnormalities. On detecting

the type of abnormality the doctor can call the patient and let him know the further course of action. The data captured is uploaded on the server cloud. The authorized person having the access Id can access data anytime. By this way hospital or doctor can monitor their patient easily and comfortably. They can monitor every observations such as pulse, blood pressure and different medical parameters. Through wireless sensors doctor can give different advice to the patient anytime. If doctor is at home can address patient sitting at home. I can say then, it is the only way a doctor is 24*7 monitoring patient. Figure1 shows the integrating different modules such as different sensors, different medical equipment's, with LCD and with wireless sensors and details about power supply grid to device.

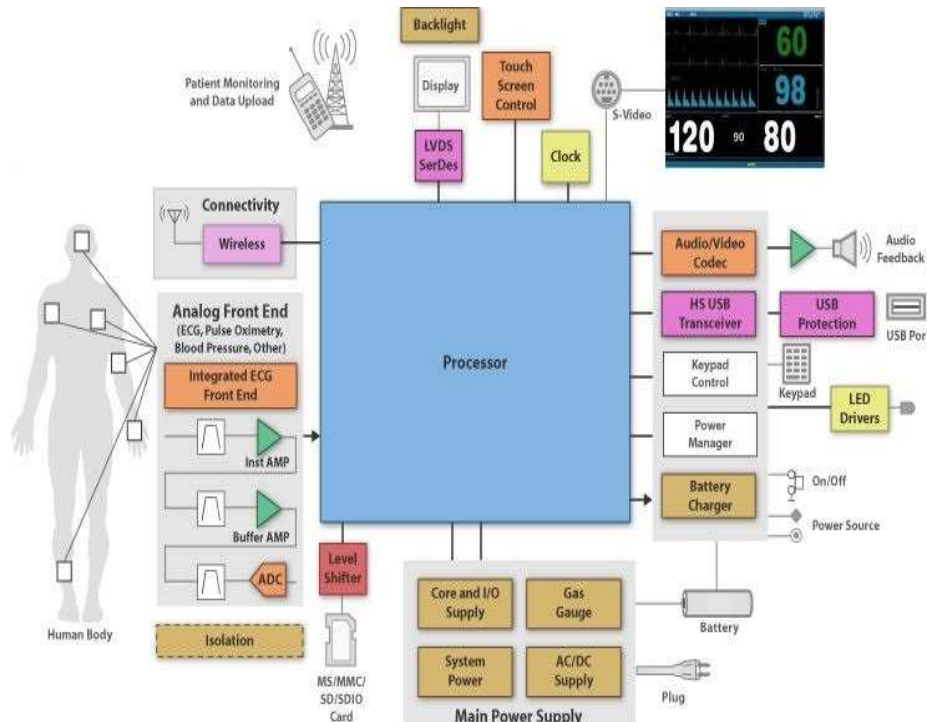


Figure 1: It Shows Block Diagram for Integrating Processor with Different Modules and Sensors Along with Wireless Network

Design Considerations

Over time, multitudes of portable, single parameter monitors/meters emerged for measuring such things as blood pressure, glucose levels, pulse, tidal carbon dioxide, and various other biometric values. Today, patient monitors are portable, flexible devices capable of being adapted to a variety of clinical applications, supporting various wired and wireless interfaces. Whether the monitor is a single or multi-parameter device; targeted capability, power consumption and system versatility are often key requirements. Nowadays, a monitor can move with the patient from the operating room to an intensive care unit, to the hospital room, and even into their home. This is paramount in today's world of health care.

The most important features in today's patient monitors are mobility, ease of use, and effortless patient data transfer. Mobility includes portability as well as the ability to interface with other medical devices such as anaesthesia machines or defibrillators. Ease of use can be achieved with touch screen displays and multilevel menu driven profiles that can be configured for the environment as well as the patient's vital statistics. Data transfer across everything from wireless to RS232 needs to be possible. Hospitals may support a specific infrastructure throughout all areas; however, ambulance, home and other environments may need support for different protocols. The ever-increasing need to minimize healthcare

costs is driving the healthcare providers to move the patient treatment and monitoring outside the hospital. Providing healthcare in highly populated rural and remote areas in emerging economies is driving the need for remote patient monitoring and telemedicine.

The challenges in implementing such patient treatment and monitoring equipment are strikingly similar to cellular phone systems. TI's OMA technology with embedded ARM and DSP processor cores directly addresses these challenges. TI has extensive analog front end solutions for essential signal conditioning. The OMAP 3 processor performs further digital signal processing, measurements and analytics to monitor patient condition. Powerful ARM processor runs a high-level OS (HLOS) which makes adding multi-modal monitoring easy and provides extensive user interface and system control. Detecting abnormal conditions and communicating to a central server is essential in providing timely and on-demand healthcare. OMAP 3 has extensive peripheral set to support various connectivity options such as Bluetooth, Wi-Fi, ZigBee and other emerging standards.

Modernizing Medical Requisitions

After doctor placed a particular order, the patients will be required to undergo the required tests. The requisitions, henceforth mapped to a particular test, will have all the patient information pre-filled stating all the pre-requisites if required, such as fasting.

There are two ways by which these tests can be done: in-house or out-house. In case of in-house tests, the results, any time on day or night, can be uploaded on a centralized server whereby the doctor will be notified as soon as the results are uploaded via SMS or Email, and the patients can be contacted and the relevant treatment process can be immediately started. In case, the tests are required to be performed outside a clinic's premises, the results from a particular laboratory can be accessed by the doctor in clinic with the help of our cloud-based information system. This ensures a hassle-free and quick access to the examination reports as well as effective time management. Shortening the waiting time for patients as well as doctors is part of our initiative towards empowering patients and improving healthcare.

Private Cloud: Patient Information System

Most people are already using the cloud in their daily lives, whether they realize it or not, cloud software and storage are "something you can access from anything that has an Internet connection. Think of your Yahoo, Gmail, or Hotmail account. You alone have the password, and you can access your email from any computer, Smartphone or tablet as long as it has an Internet connection. In its simplest form, that is cloud software.

More technically, Cloud computing is a model for providing and sourcing information technology services on a "pay-per-use" basis through web-based tools and applications. Cloud services are elastic allowing them to be highly configurable, adaptable and scalable. With Private Cloud: Patient Information Centre, it opens up the prospect of patients' digitized health information medical histories, scan images, blood types, allergies etc. accessible via secure authentication to people authorized by the patient. Faster and global retrieval of data is possible by Cloud Solutions. In the event of any disaster; there is no fear of losing patient information because the entire records will be sitting on a remotely located server with enhanced security.

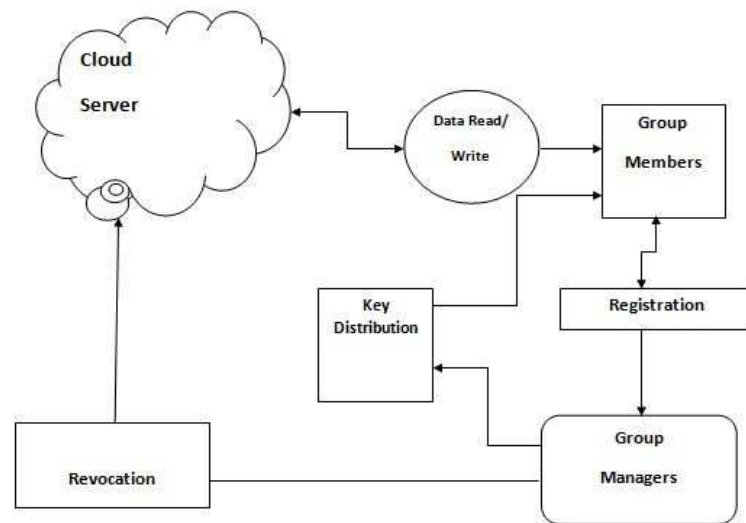


Figure 2: It Shows Overview of Cloud Server and its Working Flow

Most people are already using the cloud in their daily lives, whether they realize it or not, cloud software and storage are “something you can access from anything that has an Internet connection. Think of your Yahoo, Gmail, or Hotmail account. You alone have the password, and you can access your email from any computer, Smartphone or tablet as long as it has an Internet connection. In its simplest form, that is cloud software. More technically, Cloud computing is a model for providing and sourcing information technology services on a “pay-per-use” basis through web-based tools and applications. Cloud services are elastic—allowing them to be highly configurable, adaptable and scalable.

With Private Cloud: Patient Information Centre, it opens up the prospect of patients digitized health information medical histories, scan images, blood types, allergies etc. accessible via secure authentication to people authorized by the patient. Faster and global retrieval of data is possible by Cloud Solutions. In the event of any disaster; there is no fear of losing patient information because the entire records will be sitting on a remotely located server with enhanced security.

CONCLUSIONS

The work of healthcare professionals and physicians is largely a work of making decisions and solving problems. It is a work of choosing issues that require attention, setting goals, finding or designing suitable courses of action and evaluating and choosing among alternative action. The true essence of healthcare delivery is decision-making - what information to gather, which tests to order, how to interpret and integrate this information into diagnostic hypotheses and what treatments to administer.

It is difficult to offer the best solution for all situations. Every trade off of power consumption, available supplies, required resolution, portability, noise and more will play into the selection of the key components. Understanding the implications of device choice will ensure that the system safely delivers quality for the lifetime of the system. Introducing cloud based server, the communication between doctor, patient, relatives, hospital staffs will be quickly. Any authorised person can able to know about ongoing medication within just logging and visiting. Whole medical science will be under one roof of cloud. We don't have to wait outside and stand in queue for anything. Everything is just one touch away.

REFERENCES

1. Marimuthu A, Karthikeyan P. International Conference on Information and Network Technology IACSIT Press, Singapore.Remote Patient Monitoring An Implementation in ICU Ward, 2011.
2. Ting W, Jun-Da H, Chenjie G, Jia Z, Wei Y. Wireless Monitoring System Based on Bluetooth Smart Phones. International Conference on Networking and Digital society, 6th October 2010; Volume2.
3. Sahandi R, Noroozi S, Roushanbakhti G, Heaslip V, Liu Y. Wireless technology in the evolution of patient monitoring on general hospital wards.Journal of Medical Engineering and Technology 2010; 34(1): 51-63.
4. http://www.eetimes.com/document.asp?doc_id=1278246
5. http://www.ti.com/solution/patient_monitoring

