WEB BASED PATIENT MONITORING SYSTEM USING ARM9 PROCESSOR

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Abstract - Embedded devices creating a great impression in the observing of patients located in secluded nonclinical environments like homes, military bases, ships. As part of this rising trend, in this paper, we present a real-time patient monitoring facility through Web using ARM processor. It creates an environment for the physicians to monitor their patient in remote sites using popular Web browser. It is important to continuously monitor the conditions of a patient and it becomes difficult to keep informed about the critical conditions developed in each of the patients. This project provides a device which will continuously monitor the vital parameters to be monitored for a patient and do data logging continuously and produces the information in the web. The perseverance of the system is the establishment of extended monitoring for patients beneath drug therapy after the infarction, data gathering in some specific cases, remote consultation, and low-price ECG monitoring for the aged and ICU patient conditions through web for the medical professionals in a large setup like a hospital or clinical center where a single doctor attends many patients.

Keywords - Embedded devices, ARM processor, Electro cardio graph (ECG)

I. INTRODUCTION

This is an endeavor to provide a device which will continuously monitor the body conditions and status of the patient. The hardware model in this project consisting of sufficient sensors interfaced with embedded processor.

Web based health remote monitoring system is one which provides medical service such as prevention, diagnosis, treatment, follow-ups in remote area for managing/supervising. In detail, biological information (ECG, EEG, temperature, Blood pressure, Blood glucose etc.) which are collected from wire detecting devices are delivered to remote health care practitioners and physicians in charge and the health care and medical service are provided through local area network. The detecting technology which senses biological information from various medical and health devices, collecting and transmitting technology which gathers detected information and transmits them through wire telecommunication, analyzing technology which analyzes collected biological information and, as last one, feedback technology which inform patients the change of health states after analysis[1].

In this study, transparent and simply designed transmission protocol for biological information is designed so that it can be easily combined with other systems and information is stored in server DB to be used conveniently.

Sensor based Real time Remote Patient Monitoring System model is going to be suggested where a web page is created in use of HTML5, a next generation standard language in server and local DB is automatically constructed when a doctor connects through the server device using WebSQL. Automated push function is equipped, network traffic demands are reduced and prior personal information of patients are searched and used by using local DB which is held in off-line environment. WebSQL is explained in chapter 3.

Finally conclusions and future subjects would be suggested in chapter 5. In order to maintain close supervision of the health conditions of chronically ill patients, long-term (chronic) care facilities provide accommodation and "hotel-style" services to these patients, in addition to long-term monitoring of their health conditions [1]. The rise in the number of chronically ill people has resulted in an ever-increasing burden on long-term care facilities, to the point that the cost of maintaining these facilities has or in the near future will become unsustainable [2]. Leveraging the fact that not all chronically ill patients require accommodation and assistive services provided by long-term care facilities, some patients can be offloaded from long-term care facilities, where their health conditions would be remotely monitored. Recent studies [3] show that not only consumers are willing to pay for remote/mobile health monitoring, throughout this paper, caregivers refer to healthcare professionals, physicians, and any relative in concern of a patient.

II. BACKGROUND

A number of wearable systems have been proposed for patient health monitoring. However, due to cost constraints, user convenience and technology limitations [4], wearable sensor systems, like most embedded devices, are designed for a specific application. These are typically used for simple, deterministic monitoring of patient’s biometric data.
and informing medical personnel of impending patient conditions. Many of these systems highlight innovations in hardware, such as new technologies for on-body sensing, and wireless networking interfaced with embedded devices. Others focus on new classification algorithms to identify patient states.

A. NEW SENSING TECHNOLOGIES

A variety of physiological sensors are now miniaturized, some using the latest micro electromechanical systems technology, and are available for use as small wearable sensors that can be attached to the body or can be embedded in clothing items [12,13]. These sensors include accelerometers, gyroscopes, magnetometers, piezoelectric sensors, electrocardiogram (ECG), electromyography (EMG), electroencephalography (EEG), pulse rate, blood oxygen saturation (S), blood pressure, respiration, foot pressure, voice, skin conductance and body temperature. It is important to note that these systems primarily focus physiological data acquisition and do not provide methods that assist medical professionals and the patients with data interpretation and diagnosis.

B. NETWORKED SENSOR SYSTEMS

Another important innovation within the system area is the development of networked sensing infrastructures. Before the development of WBAN, sensors located on various parts of the patient body were connected to the computer via cables. These early systems provide reliable sensing platforms for research in user context detection and context aware computing, but are not ideally suited for applications in patient health monitoring due to the wearer inconvenience. In contrast, bulky wiring issues can be alleviated by incorporating a WBAN into the wearable systems. As an example, a wearable patient monitoring system for deployment at disaster sites has been developed for the emergency first responders [14] with the goal of monitoring vital signs to produce simple alerts for centralized medical monitoring [15] as well as providing real-time triage data.

III. RELATED WORK

Healthcare institutions have recently exploited the advancements in information and communication technology to provide electronic healthcare services, and in particular remote health monitoring. Over the past few years, research in the domain of remote health monitoring can be categorized into three main streams, how data is collected, how data is communicated, and where data processing is performed. We focus here on work concerning the role of mobile devices and their related technologies. Kulkarani et al. [16] developed a mobile patient healthcare system that aligns with the essential requirements and design spaces they derived for pervasive healthcare systems. The role of mobile devices in this system is limited to a mobile client terminal used to browse healthcare records. The paper proposes a role-based access control mechanism to assign the right access privileges to users at login time. Our proposed approach places the patients at the core of data access control. The prototype we have developed enables patients to allow or deny access to their own personal data to registered users at the service method level based on the users’ access privileges. Dagtas et al. [17] present a framework for remote health monitoring systems in which mobile devices collect vital signs from a Body Sensor Network (BSN) via ZigBee-based communication links. Oleshchuk and Fensli [18] highlight some aspects and new possibilities in the domain of remote health monitoring within the framework of future 5G networks. Agarwal et al. [19] propose a simple conceptual architecture for remote patient health monitoring, in which a Web service serves as a communication medium between a patient’s mobile terminal and an online database where health records are stored. Pawar et al. [20] focus on seamless vertical handover for multi-homed mobile devices while providing remote health monitoring. To the best of our knowledge, no system exists which utilizes Web services provisioning in remote health care monitoring.

IV. SYSTEM ARCHITECTURE

The Web Based Patient Monitoring Using ARM Processor system architecture has been developed to support the local sensing, signal processing, and autonomous decision support associated with local diagnostics, as well as the required ability for remote configuration and control.

A. HARDWARE ARCHITECTURE

The system architecture consists of three network tiers and is shown in Fig. 1. The system relies on the established Internet network infrastructure in the first tier, and then standard, ubiquitous wireless or GPRS or cellular data technologies (Wi-Fi or general packet radio service (GPRS)) in the second tier. The first two network tiers connect the personal server and the servers at hospitals or clinics. Raw sensor data or patient events and context can be transmitted to servers for storage or streamed to medical personnel for real-time monitoring of the patient condition. Based on the data received from one or more patients, new statistical models can be developed on the servers and sent back to the personal server for local signal processing along with other personalized patient information such as the patient’s electronic medical record (EMR) via the GPRS or Wi-Fi connection. In addition, medical personnel can send commands to the
wearable system and configure the sensors used by the patient. The third network tier consists of a WLAN technology for the doctor’s main pc. The system also consist of an electrocardiograph that detects and amplifies the heart electrical activity sensed through Electrodes attached to the skin surface in arms, legs and intercostal spaces. It is used to measure the rate and regularity of heartbeats, the size and functioning of heart chambers and cardiac muscle [3], what, in turn, allows the diagnosis of cardiovascular diseases, metabolic alterations and predisposition to sudden cardiac death.

B. AM1810 ARM Microprocessor

The device is a Low-power processor that is specifically targeted for Profinet applications like industrial automation and medical applications. The device supports free operating system which can support all sensors, opulent user interfaces, and high processing performance. It has 32-bit RISC processor core and it performs 32-bit or 16-bit functions and processes 32-bit, 16-bit, or 8-bit data. It also has an 8KB RAM and 64KB ROM. It offers 10/100 Mb/s Ethernet MAC with Management Data Input/output module and four 64-bit general-purpose timers which can be easily configurable. Furthermore a Management Data Input/output interface is offered. The SATA provides interface to mass data storage devices with high speed. The important feature of the ARM9 is it has Dual Gigabit Ethernet Ports with Integrated Switch and inbuilt Wi-Fi/Bluetooth Connectivity enhances the feature of our module. It also consists of Resistive touch LCD display which supports rotation and tilt capabilities via the on-board accelerometer.

A. WEBSQL DATABASE

Web SQL Database of HTML5 published by W3C (World Wide Web Consortium) HTML (Hyper Text Markup Language) Working Group uses a free data base engine, SQLite which is a technology which forms database of local side in web browser and was not supported by any other web language. SQLite is not relatively good at mass works than general relation-type database but can store structural mass systemized relation-type data in a local flexibly if an engine is imbedded in web
browser in small and medium scale and process data using standard query. W3C which are preparing HTML5 spec asserted they are going to extend local database with Indexed Database API, a new spec which is easier for standardization as an alternative while excluding Web SQL Database which has been marked a promising technology due to problems of WebSQL (Flexibility of stored data scheme is low and there are standardization among browsers and compatibility problems as it is based on independent language, SQL). But WebSQL is still receiving attention as there is any other formal web browser which supports Indexed DB[7]. CPU and RAM were very high. 'Bio monitoring' which uses the most system resource are demanding the largest resource due to the work of processing biological information with 'Internet'. It was found that certain amount was reduced in comparison with system resource consumption amount which arose in searching total DB and storing. The conventional system should connect to DB, search DB by query and stored in a system whenever there is any need of information.

V. RESULTS

Figures from 3 to 5 show the sequence of the web pages according to the measurements process. Figure 3 requires the user name and password to access the system web site. Then after these pieces of information are typed in, the page for view the patient’s ECG history and current online patients are given in figure 4. Zero indicates that the patient is offline status whereas one indicates the active mode, the physician can click on the patient who appears online to view the patient’s measurements as shown in Figure 5. Figure 5 shows the patient details such as name, age, address and ID, the current heart beat rate, heart beating history and temperature.

CONCLUSION

The involvement of multiple factors in healthcare systems including diverse professionals and embedded devices has made web-based healthcare systems which uses internet technology. Internet technology makes it possible to interconnect independent devices and systems in an efficient and economical way. In order to develop dynamic, flexible, distributed and cost-effective applications, service-oriented computing, which relies on services, can be used. The key features of Web-based tools include timeliness in the dataflow (beyond national level) and the capability to handle complex health concerns which arise from a multiplicity of factors. Furthermore, since almost all clinicians have easy access to the Internet, the establishment of a Web-based registry and a Web-based reporting is usually feasible. Indeed, it represents an approach to enhancing the capacity to perform public health surveillance and, at the same time, it empowers users by providing them easy access to information that has been reviewed by work group members for accuracy.
and content. In particular, Safe Web-Registry, being a numerator count database, even if not a probability sample, can be considered a valuable tool for early warning problems with new products. This work provides the conceptualization for knowledge in emergency management and the representation of a device entity along with its attributes that can enable information and knowledge interoperability among other systems.

FUTURE WORK

Our architecture, however, allows the usage of any other secure data transfer method, system with increasing patient data volume and system with fully wearable wireless sensor methods with automated diagnostics system with threshold based safety alarm methods which we plan to explore in our future work.

REFERENCES


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