

Patient Tele-Monitoring Of Vital Parameters With Emerging Serve And Virtual Doctor Patient Using Cloud Server

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Abstract

In recent years a significant development has been seen in BASN (Body Area Sensor Network) which belongs to the category of WSN (Wireless Sensor Network). This system has contributed vast development towards Telemedicine and Tele-monitoring system. This article deals with tele-monitoring of patient with the help of Zigbee based sensor system. In the current system the patient biomedical parameter are measured in hospital and home by the use of BSN(Bio Medical Kit) designed by the wireless sensor network(WSN). The Personal Health Records(PHR) is an emerging patient centric in cloud computing server. There's no security and privacy of data and proper measures to be taken with the biomedical parameter noted. So in this proposed system to provide privacy and security to the PHR we implement Attribute Based Encryption(ABE) to encrypt each patient's PHR file. If any abnormality is identified immediate support is provided and virtual doctor-patient communication is made. The system contains Automated Alert Sms based on prioritization. Furthermore this article deals with the current problems and the direction for the future development of the telemedicine system.

I. INTRODUCTION

Significant development of wireless sensor in recent years have enabled the development of wireless sensor network to the field of telemedicine [7, 11, 16, 19]. The advance in the field of microcontroller sensing technology, Embedded System provides their significant support for the telemedicine and monitoring. Such advancement have enabled the development of compression of vital value served [6], Increasing the sensor [12], low power consumption system [14].

The main motive of this article is to provide remote diagnosis and treatment. The actual approach of this article focuses on.

- Patient monitoring inside and outside hospital.
- Providing secure PHR.
- Availability of emergency measures.
- Tele treatment system.

One of the previously mentioned approach of this article is patient tele-monitoring. This main idea is to get the vital parameter from the patient body and do appropriate emerging steps based on the values. For this tele-monitoring system. Body Sensor Network [BSN] are used to acquire vital parameter from the human body. The BSN comprises of zigbee protocol for transmission of vital value and sensor nodes to get the vital value and to store it.

We have also proposed the concept of Attribute Based Encryptions [1, 2] to provide privacy and security to PHR[17].This system also provide a virtual doctor-patient communication through webcams so that the patient can get a clear medical advice from the doctor through telemedicine. Finally this article analyzes the future development directions and possible benefits obtained by the implementation of the telemedicine system based on sensor networks

II. LITERAL SURVEY

During old times the patient monitoring was done I hospitals. But due to improvement in technology around us the patient tele-monitoring system was proposed. At first the monitoring system was developed with the help of cable interface. In order to improve the portability the Wireless Sensor Network(WSN) are used for the interface. TheZigbee protocol [15] is used to transfer the values noted by the medical kit to the system.

Later in order to improve the efficiency of the system many improvement has been done in monitoring system. Since the values taken has to be transferred at high-speed the values are compressed [6].In order to reduce the power consumption of the system Low Power Intelligent Sensor medical data processing are used [14].The nodes are fixed to the human body and their connection between the human and kit is done by IEEE 1451 [9] for the mobility of patient.

Later on the process to enhance the number of sensor node available in the kit is donr by adding number of sensor node to medical kit [12].In order to notify the fall of aging people or patient Fall Detection algorithm [8] are used. The place of the patient where he falls can also be found by he positioning system embedded to the sensor [19, 20].

Due to advance improvement in technology IPv6 networks [13], adhoc broadcast communication [4] are been adopted for the field of monitoring system. Then the medical values of the patient are stored in the general cloud server 9PHR) [17].This lacks privacy and security of data.In order to improve the security the concept of Attribute Based Encryption are been provided to enhance the security [1, 2].

III. SYSTEM OVERVIEW

This patient monitoring present the use of IEEE 1451[9] and Zigbee based [8, 14, 18] body sensor network to provide telemedicine and monitoring. This system provides telemedicine and monitoring outside the hospital, immediate service, emerging response. The telemedicine system is followed as given in the architecture fig.

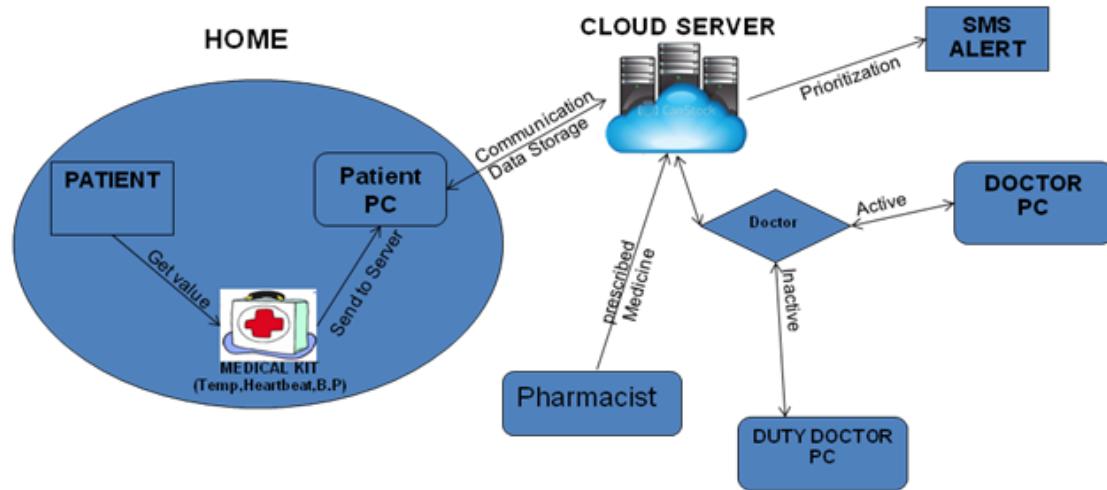


Fig. 1. Architecture Diagram.

This system has two main blocks 1. To measure vital and 2. To store to the server. The vital values are taken from the BSN and the values are stored to the server through the WAN [Wireless Area Networks].

The BSN is used to measure several different values such as Blood pressure, Temperature, ECG. We can attach many number sensors to the Zigbee based medical sensor networks [12].

This system provides storing of the vital values of the patient to dedicated server called as PHR [17]. We have implied security and privacy to this system by using Attribute Based Encryption (ABE)[1, 2].

We are providing a emergency service based on the vital values such as SMS alert and. If the doctor pc is not available it will route to the duty doctor pc based on active sensor method [3, 21].

A. Body Sensor Network

This BSN describes above two standards which are used in this IEEE1451 standard and Zigbee standard and how they are implemented.

1) IEEE 1451

IEEE 1451 is a set of smart transducer interface standards developed by IEEE instruments that describes a set of open, common, network independent communication interface for connecting sensor to microprocessors, instrumentation.

The key elements of these standards in TEDS (Transducer Electronic Data Sheets) for each sensor. The TEDS is a memory device attached to the transducer, which stores transducer identification, calibration, data and related information. The main goal of IEEE 1451 family of standards is to allow the access of transducer data through a common set of interface whether the transducer are connected to system or network [9].

IEEE standard is divided in six subsections that describe the interface for different kinds of networks connections:

- **1451.0-2007**– Common Functions, Communication Protocols, and Transducer Electronic Data Sheet (TEDS) Formats
- **1451.1-1999**– Network Capable Application Processor Information Model
- **1451.2-1997** – Transducer to Microprocessor Communication Protocols & TEDS Formats
- **1451.3-2003**– Digital Communication & TEDS Formats for Distributed Multidrop Systems
- **1451.4-2004**– Mixed-Mode Communication Protocols & TEDS Formats
- **1451.5-2007**– Wireless Communication Protocols & Transducer Electronic Data Sheet (TEDS) Formats
- **1451.7-2010**–Transducers to Radio Frequency Identification (RFID) Systems Communication Protocols and Transducer Electronic Data Sheet Formats.

2) Zigbee

IEEE 802.15.4 is a standard which specifies the physical layer and media access control for Low-Rate Wireless Personal Area Network (LR WPAN)[10]. It offers short range and low bandwidth but with the benefit of low power consumption [14]. It is mainly used at industrial control, embedded sensor and it is also adequate for health care system [12, 15]. Healthcare system can benefit from this node can go to sleep and wake up when a new task is coming, saving battery with this behavior.

Zigbee is an implementation based in this standard. It provides low power [14] and low cycle sensor. Any number of sensors can be connected to this system [12]. The vital value may be compressed for the better transmission of values by the system [6].

The reason why zigbee is preferred in that it uses 15m frequency band mainly at the 2.4GHZ band and the cost of the hardware is cheaper than Bluetooth.

B. Attribute Based Encryption(ABE)

Attribute Based Encryption(ABE) is used to provide security and privacy to the patient data. The storing of patient data to the Personal Health Record(PHR)[17] is an emerging patient centric in cloud computing server. However there is no security in keeping privacy concern of the patient and to unauthorized parties. So provide security ABE is proposed [1, 22]. It encrypts each patient's PHR file in the following way at the encryption end. It provides the attributes of the users as a primary key and at description of the key matches to the security assigned to it. There it is descriptor[2] to the third party can view the data's ABE enables dynamic modification of access policy or file attributes.

C. SMS Alert System

The system provides a smart way to monitor the patient's condition when the patient is away from hospital [23]. The patient can be supervised by the medical kit attached to the patient. When the vital values goes critical, alert message is sent to the ambulance to provide emergency service to patient. If it is slightly high or low than normal GSM SMS alert can be sent to doctor and guardian. This system is very useful in telemedicine and monitoring where patient in treated away from hospital.

D. Health Care

This system is proposed for selecting best server [3, 21] based on the availability of doctor. If the patient needs to contact the doctor if he is not available he will be automatically directed to the duty doctor, more one the aged patient who lost mobility can use an audio video based remote patient monitoring for providing in home health care management[24].

IV. CONCLUSION

There has been presented a proposal for a telemedicine system. The BSN is designed to work with ZigBee because the low power consumption, increase the number of sensor used, value compression and various efficient process. Even ZigBee has been used for transfer of medical data and other applications since the data rate range is 300m. We have presented the IEEE 1451 which has been used as the interface between the human node and BSN kit.

We have presented and explained various terminologies to improve the efficiency and security. we described the ABE encryption concept to improve the privacy of PHR, Prioritized SMS alert to provide emergency service, virtual communication between doctor and patient to get a hospital environment anywhere. With these system we can provide a better tele-monitoring system to the patients. With this the future enhancement can be made by using the pain sensor to provide best service and care to the pregnant ladies.

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