Journal of University of Anbar for Pure Science (JUAPS)   Open Access

The Mechanism of Monitoring and Tracking of Healthcare Systems

Muzhir Shaban Al-Ani   Raed I. Hamed   Khattab M. Ali Alheeti

University of Anbar - College of Computer.

A B S T R A C T

This work concerned with e-healthcare that transmit digital medical data through healthcare system. Online monitoring is concentrated on the process of monitoring and tracking of people at home, car, office, and any other location. e-healthcare deals with patients that they are located far from doctor jurisdiction. Healthcare monitoring including measurements of temperature, blood pressure / pulse monitors and ECG, etc. This works deals with the development of monitoring system via adding intelligent system to distinguish the emergency cases. This work try to keep patient data privacy, reduce attack or penetration of data, reduce processing time and at the same time increasing the efficiency of the overall system. The privacy of patient data is critical so this must maintain the confidentiality of information from intrusion.

INTRODUCTION

In the information society, electronic healthcare services (e-healthcare), the new concept of medical treatment has been introduced to improve health and healthcare. Monitoring and tracking of healthcare at home could be an important factor of care and support environment for older people (patient). With the development in the IT era, this is reflected on the medicine and private E-healthcare [17].

Healthcare monitoring including: Temperature, Blood pressure/pulse monitors and ECG, etc. communication interfaces allow data acquisition (especially at home) from motes to a one central station (or middleware). The central station may be used to process data to assess user state based on many parameters and inform a user relatives or healthcare professional (a nurse, GP) about the patient condition [5]. Means of communication will consist of technical and functional methods. Any monitoring system or track will be composed of sensors, microcontroller unit, the network protocol that automated the home with antenna (transmitter) tied to the elderly or patients (in the patient section). Furthermore the other part is consisting of personal computer (PC), GSM modem and the network protocol connects with antenna (receiver) in the section signal received of the patient (server section).

Motivation of this work 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 [4].

The main objective of this project is to demonstrate the importance of monitoring the healthcare and add an intelligent management system to one of the existing systems. Current surveillance systems transfer every case recorded, regardless of the data or scale you get. But our system will be base on the new political in the translate and transfer new registration based on the some of the factors (threshold) that we identify him. The purpose of this is to increase efficiency and maintain the database because of privacy issues are very mission to the patient, through development of E-control system, the following figure 1 shows the construct of the monitoring system in the patient section:
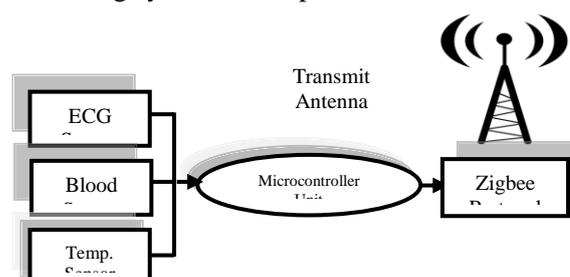

FIGURE 1 PATIENT SIDE

Journal of University of Anbar for Pure Science (JUAPS) Open Access

Furthermore, figure 2 demonstrates the construction of the monitoring system in the server

Receive
Antenna

Zigbee
Protocol

PC

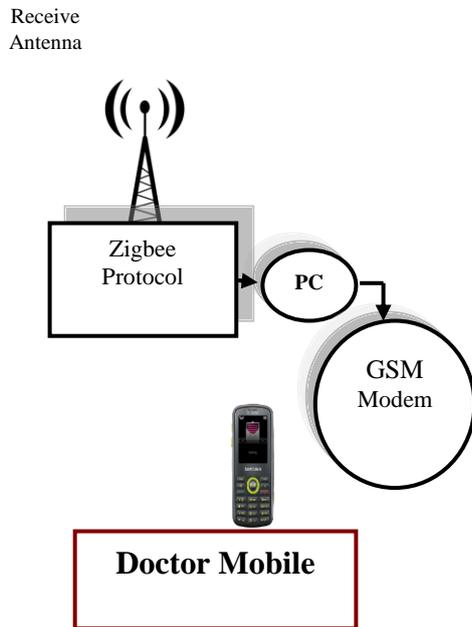GSM
Modem

Doctor Mobile

side.

FIGURE 2 SERVER SIDE

HEALTHCARE

Healthcare of things very important to human. It is therefore very important to human health and finds all the modern methods for the development of the deployment of health awareness. Since there relationship between information technology and healthcare needed to find a way embodies the communication through the creation of e-medicine.

The electronic healthcare is one of the branches of e-medicine or tele-medicine. there is a concerted effort among governments, trade unions, charities, religious, or other co-ordinate bodies to deliver planned health care services targeted to the populations they serve. However, health care planning has been described as often evolutionary rather than revolutionary.[18][19]

E-HEALTHCARE

E-health is a relatively recent term for healthcare practice supported by electronic processes and communication, dating back to at least 1999 [12]. Usage of the term varies: some would argue it is interchangeable with health informatics with a broad definition covering electronic/digital processes in health,[13] while others use it in the narrower sense of healthcare practice using the internet.[14][15][16].

An electronic health record (EHR) (also electronic patient record (EPR) or computerized patient record) is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations [8].

The E-healthcare industry gives recently close attention to ECG monitoring since it needs to be continuously made during a person's everyday life and provides vital and basic health information about chronic illness management as well as personal wellness care [6-7]. This recommended a lot of organizations or medical institutions using this technology to improve the performance of medicine and therefore reflected these epitomize healthcare. Figure 3 shows the infrastructure of the e-healthcare.
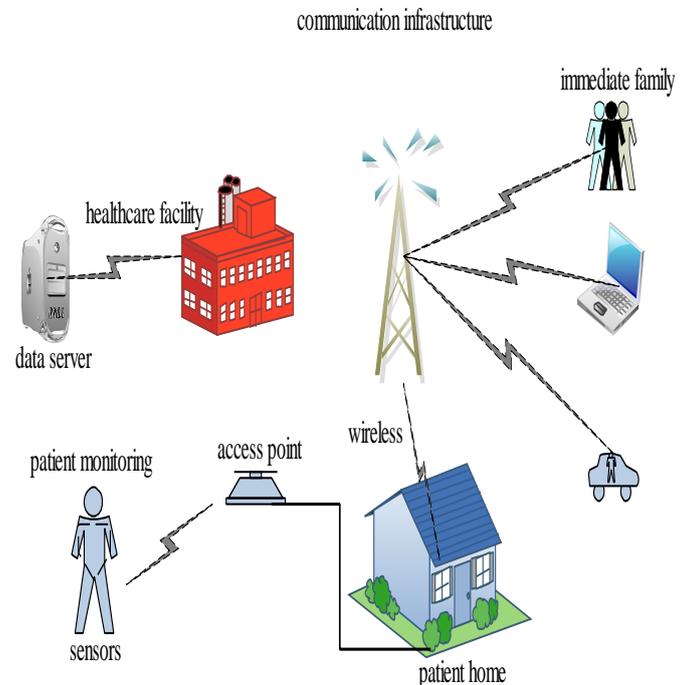
FIGURE 3 INFFRASTRUCTER of E- HALTHCARE

There are two operating modes of e-healthcare: asynchronous and synchronous. In the asynchronous mode information is send in case of alerts and alarms. This mode is also used to send a rescue message to public services (emergency calls). The synchronous mode is used to send information packages with a configurable frequency or using request- response model [5].

RELATED WORKS

In recent years, there is more interest in healthcare including e-healthcare and below some of these researches:

Xiaoxin Xu Mingguang et al., proposed an outdoor patients' healthcare monitoring system composed by Reference Nodes, Mobile Devices, a Gateway and Host servers for tracking patients, helping doctors and nurses to keep tabs on their patients' healthy remotely [1].

Baik-Woo Lee and et al., explored the technology to embed discrete passive components into a multilayered flexible substrate, which can significantly contribute to achieving thin and flexible bandage-like E-healthcare sensors that are worn on users' body to acquire bio-signals from their body during their everyday life [2].

Hsin-Lu Chang nad et al., In the information society, electronic healthcare service (e-health), the new concept of medical treatment, has been introduced to improve health and healthcare, e-health has become a trend of new type of medical treatment and healthcare especially in remote area. Since it can reduce many kinds of resources and provide more convenient services for patients, it is important to make the entire service process more efficient and improve the performance of the entire service delivery system [3].

S.Josephine Selvarani, we have analyzed the on-line health monitoring system of temperature and pulse of humans using Zigbee, GSM, SMS. Any abnormalities in health conditions are informed via SMS to the indicated mobile number through GSM. The hardware is implemented and the output is studied[4].

J. Ruminski, T.Kocejko and et al, this paper is to present a design of the multimodal, integrated platform for communication, training and health monitoring at home. Communication includes technical and functional methods of a user communication with his/her environment as well as processing of alerts from a home/user sensor network. The training is mainly related to promote mental activity of a group of patients in danger (e.g. patients with dementia) [5].

BACKGROUND of THE MODEL

A. Zigbee

The name of Zigbee comes from the zigzagging path a bee (a data packet) takes to get from flower to flower (or node to node) [9]. Zigbee is primarily intended low power and low duty-cycle sensors [1]. Figure 4 shows the Zigbee protocol stack architecture.
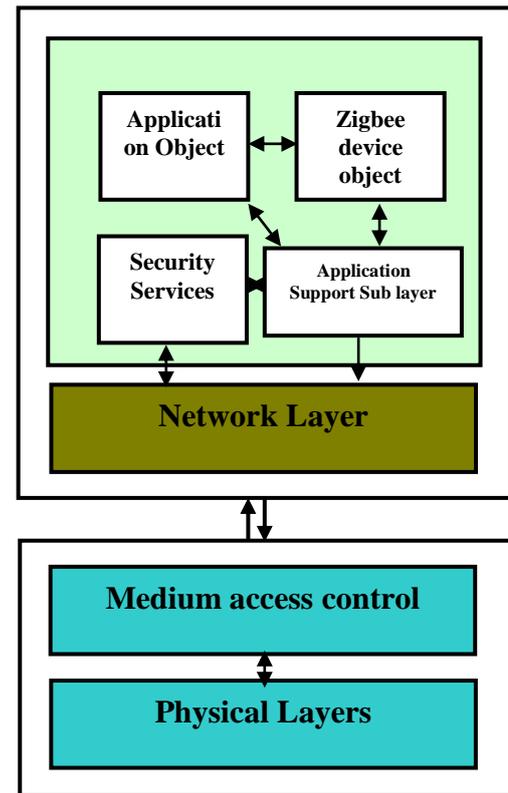

FIGURE 4 ZIGBEE PROTOCOL STACK ARCHITECTURE

B. Microcontroller and sensor

A microcontroller can be considered a self-contained system with a processor, memory and peripherals and can be used as an embedded system [11]. Memory consists of flash program, RAM, EPROM and data memory [4].
In additional the sensor provides a simple way to read the

c. Back propagation technique

Back propagation is a neural network learning algorithm. A neural network is a set of connected units following a particular topology. Been building an intelligent system using neural networks, this system has the ability to identify the signals that are sent to the health center, i.e. not every signal is sent only signals that are concerned [10].

PROPOSED APPROACH

This work proposes a system that provides e-healthcare monitoring. All the current existing systems deals with the process of continuous monitoring. But this work concern that not recorded all cases sending from patient home to the healthcare center. The purpose of this work is to keep patient data privacy,

reduce attack or penetration of data, reduce processing time as possible and at the same time increasing efficiency and reduce the load of the network.

This work is concentrated on the way of transfer the emergency or abnormal cases. An intelligent system is built which has the ability to determine the nature of abnormal cases. The proposed system is constructed using artificial intelligent technique based on neural networks (Back propagation) as shown in Figure 5, and the algorithm of the proposed system is shown in algorithm 1.
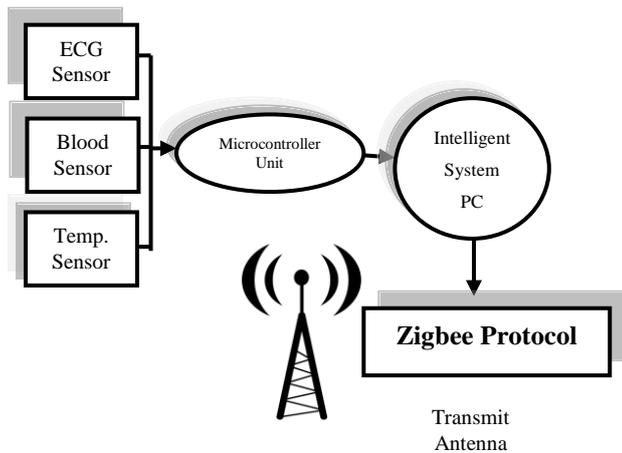

FIGURE 5 PROPOSED SYSTEM IN THE PATIENT SIDE

Algorithm 1 the proposed system algorithm

Input: ECG signals, Blood pressure, Temperature value;

Input: Age, Weight, Historical data;

Output: Alarm to e-healthcare center;

Procedures:
- Acquisition the input signals.
- Convert the input signals into digital data.
- Read the digital input data.
- Compare the digital input data with historical data.
- Send an alarm with abnormal data to the e-healthcare center.
- Confirm the action from the center.
- Repeat sending the alarm when non-acknowledgement received

End

RESULTS and ANALYSIS

The intelligent system is implemented that depends on some factors to determine the type of case which is either normal (non-emergency) case or abnormal (emergency) case. Table 1 shows the factors that will be adopted in the system:

TABLE 1 TYPE OF MEASURES

Monitor type	Range	Status	Range	Status
Temperature	Over or under 36 - 37	Abnormal	36 - 37	Normal
Blood pressure	Over or under 8-12	Abnormal	8 - 12	Normal
Blood pulse	Over or under 72-76	Abnormal	72-76	Normal

Neural networks will be trained on table 1 and then tested for the purpose of making sure that the system works in intelligent aspect. All of the sensors read the situation and then send an alert message to the e-healthcare computer (contain the intelligent system). An arrangement done by the center computer by storing the received data. There is no problem in normal range in which no message send that means no alarm send to the health center, but in abnormal case statue, an alarm will be send to the health center to solve the mentioned problems.

CONCLUSIONS

Through this work an interactive intelligent e-healthcare system is proposed to overcome the monitoring and tracking of healthcare signals. This system leads to number of benefits as mentioned below:

- People around the world are found in isolated areas and healthcare centers are far away from them.
- Offers services when the health centers has a limited number of doctors or health services.
- Providing advanced services in case of emergency.
- Reduce healthcare costs by improving the routing (evidence) process patient.
- offer specialist doctor wherever this is to reduce the cost of transporting patients to doctors' consultants.
- Facilitate cooperation between the hospitals in the provision of medical care.

REFERENCES

[1]. Xiaoxin Xu Mingguang and et al, " Outdoor Wireless Healthcare Monitoring   System for Hospital Patients based on ZigBee', *5th IEEE Conference on Industrial Electronics and Applicationsis*, china, 2010.

[2]. Baik-Woo Lee and et al," Embedded Discrete Passives Technology for Bandage-Type Medical

Journal of University of Anbar for Pure Science (JUAPS)   Open Access

Sensors of E-Healthcare System", Electronic Components and Technology Conference, ©2011 IEEE.

[3]. Hsin-Lu Chang nad et al," Factors that Impact the Performance of e-Health Service Delivery System", International Joint Conference on Service Sciences © 2011 IEEE.

[4]. S.Josephine Selvarani," online health monitoring system using zigbee", International Journal on Computer Science and Engineering (IJCSE), ISSN: 0975-3397 Vol. 3 No. 4 Apr 2011.

[5]. J. Ruminski, T.Kocejko and et al," Multimodal platform for communication, training and health monitoring at home", Digital Object Identifier:104181/cstpervasivehealth, 2009.

[6]. M. Chan, D. Esteve, C. Escriba and E. Campo, "A review of smart homes—Present state and future challenges," *Computer Methods and Programs in Biomedicine*, Vol. 91, pp. 55-81, (2008).

[7]. J. Yoo, L. Yan, S. Lee, H. Kim and H.-J. Yoo, "A Wearable ECG Acquisition System with Compact Planar- Fashionable Circuit Board-Based Shirt," IEEE Transactions on Information Technology in Biomedicine, Vol. 13, No. 6 (2009) pp. 897-902.

[8]. Gunter, T.D. and Terry, N.P. "The Emergence of National Electronic Health Record Architectures in the United States and Australia", Models, Costs, and Questions in J Med Internet Res7, 2005.

[9]. ZigBee Networks Open the Door to More Wireless Medical Devices, Medical   Design, April 2005.

[10]. Khattab M. Ali," Enhancement of Intrusion Detection Using Back Propagation Algorithm", conferences in the college of the engineering, Anbar university, 2011.

[11]. Heath, Steve," Embedded systems design", EDN series for design engineers two edition. pp. 11–12. ISBN 9780750655460, 2003.

[12]. Della Mea. "What is e-Health (2): The death of telemedicine?" J Med Internet Res 2001;3(2), 2001.

[13]. International Telecommunication Union, "Implementing e-Health in Developing Countries: Guidance and Principles, 2008.

[14]. HIMSS SIG develops proposed e-health definition", HIMSS News, 13(7): 12.

[15]. Eysenbach G, Diepgen TL. The role of e-health and consumer health informatics for evidence-based patient choice in the 21st century. Clin Dermatol. 2001 Jan-Feb.

[16]. Ball MJ, Lillis J. E-health: transforming the physician/patient relationship. Int J Med Inform. 2001 Apr;61(1):1-10.

[17]. Ton A. M. Spil, Roel Schuring, "E-health systems diffusion and use: the innovation, the user and the Use IT Model", 2006.

[18]. ""Health care system"". Liverpool-ha.org.uk. Retrieved, 2011-08-06.

[19]. New Yorker magazine article: "Getting there from here." 26 Jan 2009.

آلية المراقبة والتتبع لنظم الرعاية الصحية

مزهر شعبان محمد   رائد ابراهيم حمد   خطاب معجل علي

muzhir_shaban@yahoo.com

الخلاصة:

تهتم ورقتنا البحثية بالعناية الالكترونية التي تنقل البيانات الطبية الرقمية من خلال نظام الرعاية الصحية. المراقبة عبر الانترنيت هي تهتم بمراقبة وتتبع الاشخاص حيث ماكان في المنزل او الدائرة او باي مكان اخر. العناية الالكترونية تتعامل مع المرضى الموجودين بعيدا عن الدكتور. المراقبة للعناية الكترونية تتضمن قياس درجة الحرارة وضغط الدم ودقات القلب. هذا العمل يقوم بتطوير نظام نظام مراقبة العناية عن بعد من خلال اضافة نظام ذكي للمراقبة وبنفس الوقت ان هذا النظام يقوم بالمحافظة على خصوصية بيانات المرضى ويقلل عدد الهجمات على بيانات المرضى من خلال النظام الذكي ويزيد من كفاءة الانظمة الموجودة حيث ان بيانات المرضى تعبر من الامور المهم جدا والحفاظ عليها من الاختراق هو اهم.