INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Technologies Involved In Monitoring Of Patient Health Using Wireless Sensor Network

Miss.Archana kokare
Student , M.E.(E & tc)
D.Y.Patil college of Engineering ,Pimpri,pune, India

Prof. S.D.Chavan
D.Y.Patil college of Engineering ,Pimpri,pune, India

Abstract:
In monitoring patient health "mobile technologies, medical sensor and communication technology " are involved. This emerging concept represents the evolution of e-health systems from traditional desktop "telemedicine" platforms to wireless and mobile configurations. Current and emerging developments in wireless communications integrated with developments in pervasive and wearable technologies will have a radical impact on future health-care delivery systems.
In this research paper, we presented the wireless Sensor network (WSN)for monitoring a patient having hole in the heart .The output of biosensor has to be transmitted via Zigbee and the same has to be sent to the remote wireless monitor for observing the condition of the patient having hole in the heart and for the same proper medical treatment should be given to him/her without surgery using alternative medicine to cure hole in the heart. Although Bluetooth is better than Zigbee for transmission rate, but Zigbee has lower power consumption. Hence, Zigbee is generally used for 24 hours monitor of communication transmission system.

Key words: *e-Health, WSN, Zigbee, mobile technologies, biosensors, wireless technologies.*

1.Introduction

The TERM m-Health(monitoring health) was first introduced implicitly as "Unwired e-med" in the first special issue of these transactions on wireless telemedicine systems . Since then, there have been significant advances in wireless communications and network technologies with parallel advances in pervasive and wearable systems . These advances have already made a significant impact on current e-health and telemedical systems. In general terms, m-Health can be defined as "mobile computing, medical sensor, and communications technologies for health care." The increased availability, miniaturization, performance, enhanced data rates, and the expected convergence of future wireless communication and network technologies around mobile health systems will accelerate the deployment of m-Health systems and services within the next decade. These will have a powerful impact on some of the existing health-care services and will reshape some of the mechanisms of existing health-care delivery routes. For example, development of smart intelligent sensors and drug delivery devices, some of them implanted, will allow communication with a personal server in complete mobility . The personal server provides global connectivity to the telemedical server using a wireless personal area network (WPAN), wireless local area network (WLAN), or wireless wide area network (WAN). Developments in these areas are mainly driven by the evolving mass markets for cell phones and Digital Object Identifier 10.1109/TITB.2004.840019 portable computing devices and represent an evolution of the previous generation of telemedical systems .

Traditionally, the "wireless concept" is associated closely with "biomonitoring." These have been used extensively in the last two decades to perform different data acquisition tasks mostly, without timely integration of data into the medical record; thus, no immediate action occurs if abnormalities are detected. Typical examples are Holter monitors that are routinely used for electrocardiogram (ECG) and electroencephalogram (EEG) monitoring. Historically, "wireless monitoring" includes physiological monitoring of parameters such as heart rate, blood pressure, blood oximetry, and other physiological signals. Other areas include physical activity monitoring of parameters such as monitoring of movement, fall detection, location tracking, gastrointestinal telemetry, and other physical activities. The benefits of the wireless technology have been illustrated in a number of different examples and applications. Today with wireless technology, patient records could be accessed by health-care professionals from any given location by connection to the institution's information system. Physicians' access to patient history, laboratory results, pharmaceutical data, insurance information, and medical resources would be enhanced by mobile technology, thereby improving the quality of patient care.

The researcher first chose the proper sensor for the above application to convert the Physiological signals into electrical signal which is in the form of analog signal. This analog signal was converted into digital signal by designing a proper circuit. This digital signal was fed into the PIC controller. The output of this PIC controller is fed into the serial communication circuit. The output of this serial communication circuit is fed into the zigbee device and output of this zigbee device is transmitted via transmitting antenna. In the receiver side the said transmitted signal is received through the receiving antenna and fed into the zigbee unit. The output of this zigbee unit is fed into the RS-232 serial port communication interface and output of this RS-232 is fed into personal computer (PC) sends global system for mobile communication (GSM) short message to the receiver. The receiver can use the PC or personal digital assistant (PDA) to observe the sensed signals in the remote place. The PIC microcontrollers are supported with a full range of hardware and software development tools. The researcher found the transmission section codes using various to operate the transmission of sensed digital signals. To operate the received signals using various the researchers found the same.

From the above it is very clear that the researcher designed not only circuits for the aboveapplications but required software's to operate the above projects and to get the good result output.

2.Sensors For m-Health Systems

With the aid of medical sensor technologies, m-Health can offer health-care services far beyond what the traditional telemedical systems (e.g., teleconsultation and teleconference) can possibly provide. A proper integration of medical sensors into m-Health systems would allow physicians to diagnose, monitor, and treat patients remotely without compromising standards of care. Advances in new materials and signal processing research would enable the design of smart medical sensors to realize the real-time data recording and processing of multiphysiological signals. Many different kinds of medical sensors are now available on the market ranging from conventional sensors based on piezo-electrical materials for pressure measurements to infrared sensors for body temperature estimation and optoelectronic sensors monitoring SpO , heart rate, HRV, and blood pressure.

The rapid development in microelectronics and digital wireless technology makes it now possible to realize wireless medical sensors with networking capability to facilitate the joint processing of spatially and temporally collected physiological information from different parts of the body and the external communication for mobile health care. Such medical sensor networks greatly enhance the ability of physicians to timely examine and treat complex biological systems at a distance and effectively reduce the infrastructure cost at the hospital side and the travel expense at the patent end. m-Health equipped with medical sensors has the potential to transform the way health care is currently provided.

As sensor and computing technologies continue to evolve, their integration into wearable medical devices for the monitoring, diagnosis, and treatment of illnesses will become commonplace. To monitor human health constantly without disturbing users' normal daily activities, the wearable sensors and devices for physiological data collection should be designed to be so small that they will not affect the appearance and function of the user in which they are embedded. Miniature biomedical sensors and devices can also be embodied in or integrated with other wearable carriers (such as a finger ring), as shown in Fig. 2. This concept is being implemented in a project concerned with wearable intelligent sensors and systems for E-medicine (WISSE) with a body area network (BAN) forming the communication infrastructure. Operation of WISSE should be user-friendly, and require very little prior training, knowledge, and skills. Monitoring will be carried out actively but discreetly without the user or the people close by being aware of it. The ability of the terminals to communicate with each other will ensure a "one-stop-service," where measurements and data collected at different positions are centralized in a single location for user review and onward transmission to the external world. Wireless communication will be used for accessing health-care database wherever appropriate to allow free movement of the user . Last but not least, power consumption will also be taken into consideration in the overall design of wearable devices so that the frequency of recharging or replacement of batteries will not be a nuisance to the user. All of the above technical challenges must be solved in the development of wearable devices and systems in addition to the apparent issues of multisensor medical data fusion, system optimization, real-time wireless transmission, and information security. Recent advances in micro fabrication, integration of physical sensors, and new sensing and stimulation technologies have the potential to revolutionize sensors and their integration, and create a new generation of sensor networks suitable for health monitoring applications. Ultimate examples include implanted sensors and implanted therapy devices such as drug infusion pumps.

3.Mobile Communication

Today with wireless technology, patient records could be accessed by health-care professionals from any given location by connection to the institution’s information system. Physicians’ access to patient history, laboratory results, pharmaceutical data, insurance information, and medical resources would be enhanced by mobile technology, thereby improving the quality of patient care. Handheld devices can also be used in home health care, for example, to fight diabetes through effective monitoring. A comprehensive overview of some of these existing wireless telemedicine applications and research can be found in recent publications in the area However, there are some limitations to existing wireless technologies that mostly depend on general packet radio service (GPRS) technologies and on their deployment strategies in health care. Some of these issues can be summarized as follows:

- The lack of an existing flexible and integrated “m-Health-on-demand” linkage of the different mobile telecommunication options and standards for e-Health services. This lack of linkage and compatibility for telemedical services exists due to the difficulty of achieving operational compatibility between the telecommunication services, terminals and devices standards, and “m-Health protocols.”
- The high cost of communication links, especially between satellites and global mobile devices and the limitation of existing wireless data rates especially for the globally available 2.5G and third-generation (3G) services for some e-Health services. This is also combined with the availability of secure mobile Internet connectivity and information access especially for e-health systems.
- Health-care is a very complex industry that is difficult to change. Organizational changes are very often required for health-care institutions to benefit from e-Health and
- m-Health services.
- The short-term and long-term economic consequences and working conditions for physicians and health-care experts using these technologies are not yet fully understood or properly investigated.

- The methods of payment and reimbursement issues for e-Health and m-Health services are not yet fully developed and standardized.
- There is a lack of integration between existing e-Health services and other information systems, e.g., referral and ordering systems, medical records, etc.
- The demonstration projects so far have failed to show that m-Health services result in real savings and have cost effective potential.
- These represent some of the factors that have hindered the wider applications of m-Health technologies thus far across health-care systems. However, it is hoped that the current deployment of universal mobile telecommunications system

3.1.Other Advances In Mobile Networks

In recent years, other mobile network technologies such as WLAN and WPANs have become popular. These technologies are implemented as an extension to or as an alternative for wired LAN to make the communication more flexible and powerful. WLAN allows users to access a data network at high speeds of up to 54 Mb/s as long as users are located within a relatively short range (typically 30–50 m indoors and 100–500 m outdoors) of a WLAN base station (or antenna). In t he U.S., WLAN operates in two unlicensed bands a) 802.11b and 802.11g operate in the 2.4GHz band, together with many other devices including Bluetooth and cordless telephones.

b) 802.11a (Wi-Fi 5.2 GHz) operates in the 5.2 GHz band, which at this point is relatively free of interference from other electrical devices operating in this band. WPANs are defined with IEEE standard 802.15 . The most relevant enabling technologies for m-Health systems are Bluetooth and ZigBee [15]. Bluetooth technology was originally proposed by Ericsson in 1994, as an alternative to cables that linked mobile phone accessories. It is a wireless technology that enables any electrical device to communicate in the 2.5-GHz ISM (license free) frequency band. It allows devices such as mobile phones, headsets, personal digital assistants (PDAs), and portable computers to communicate and send data to each other without the need for wires or cables to link the devices together. It has been specifically designed as a low-cost, low-size, and low-power radio technology, which is particularly suited to the short range personal area network (PAN). The main features of Bluetooth are:

a) Real-time data transfer usually possible between 10–100 m.

b) Supports both point-to-point wireless connections without cables between mobile phones and personal computers, as well as point-to-multipoint connections to enable ad hoc local wireless networks.

c) 400 kb/s of data symmetrically or 700–150 kb/s of data asymmetrically. ZigBee (IEEE 802.15.4 standard) has been developed as a low data rate solution with multimonth to multiyear battery life and very low complexity. It is intended to operate in an unlicensed international frequency band. Potential applications include home automation, industrial control, and personal health care. The standard uses 16 channels at 2.4 GHz, ten channels at 902–928 MHz, and one channel at 868–870 MHz. The maximum data rates for each band are 250, 40, and 20 kb/s, respectively. The 2.4-GHz band operates worldwide while the sub-1-GHz band operates in North America, Europe, and Australia/ New Zealand.

4.Communication Technology

The name ZigBee is said to come from the domestic honey bee which uses a zig-zag type of dance to communicate important information to other members. This communication dance is what engineers are trying to emulate with this protocol a bunch of separate and simple organisms that join together to take complex tasks. The Zigbee protocol is implemented on top of the IEEE 802.15.4 radio communication standard. The Zigbee specification is managed by a non-profit industry consortium of semiconductor manufactures, technology providers and other companies, all together designated the Zigbee alliance. The alliance currently numbers more than 150 members. The Zigbee specification is designed to utilize the features supported by IEEE 802.15.4. In particular, the scope of Zigbee is applications with low requirements for data transmission rates and devices with constrained energy sources. The intended market spaces for Zigbee products include home control and building automation. Imagine the intelligent building, controlling the lighting and temperature as needed, monitoring the building structure and performing surveillance tasks with a minimum of user interaction. This is the potential of Zigbee.

	Zigbee	**Bluetooth**	**Wi-Fi**
Standard	802.15.4	802.15.1	802.11b
Memory	4-32KB	250KB	1MB+
Requirements	Years	Days	Hours
Battery	65000+	7	32
Nodes per master	250Kb/s	1Mb/s	11Mb/s
Data rate range	300m	10m	100m

Table 1: Comparison of wireless technologies

Two message types are defined

- Key value pair (KVP) service which uses a standardized way of representing message using binary XML.
- Message (MSG) service which gives full control over the messages being sent for application specific needs.

ZigBee Protocol supported by IEEE 802 15.4

5.Reference

1. Yu-Chi Wu, Wei-Hong Hsu, Pei-Fan Chen, Cho-Hsu Chang, “Physiological signal measuring system via multiple communication protocols”, Prognostics and Health and Management Conference, Jan 2010 .
2. Jovanov. E,O'Donnell Lords.A., Raskovic. D, “Stress monitoring using a distributed wireless intelligent sensor system”,IEEE Trans. In Medicine and Biology,vol.22, no.3,pp.49-55,June 2003 .
3. Mao-Cheng Huang,Jyun-Ciang Huang,Jing-Cyun You, “The Wireless Sensor Network for Home-Care System Using ZigBee”, International Conference in Intelligent Information Hiding and Multimedia Signal Processing ,pp.643-646, Nov. 2007 .
4. Hongliang Ren,Meng, M.Q.-H, Xijun Chen, “Physiological information acquisition through wireless biomedical sensor networks”,IEEE International Conference in Information Acquisition July2005. S.Josephine Selvarani / International Journal on Computer Science and Engineering (IJCSE)
5. Zigbee-Alliance. Zigbee specification. http:// [Online] Available: zigbee.org/2005.
6. Ze Zhao & Li Cui. (2005). EasiMed: Aremote health care solution. Proceeding of the 2005 IEEE Engineering in medicine and Biology 27th annual conference, Shanghai, China.
7. T. F. Budinger, “Biomonitoring with wireless communications,” Annu.Rev. Biomed. Eng., vol. 5, pp. 383–412, 2003.