International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

Wireless Sensor Network for Health Monitoring System Technique and Working Models

[1] S.Sathiya, [2]J.Surya

Abstract— Recent technological advances in sensors, low-power integrated circuits, and wireless communications have enabled the design of low cost, miniature, lightweight, and intelligent physiological sensor nodes. These nodes, capable of sensing, processing, and communicating one or more vital signs, can be seamlessly integrated into wireless personal or body networks (WPANs or WBANs) for health monitoring. These networks promise to revolutionize health care by allowing inexpensive, non-invasive, continuous, ambulatory health monitoring with almost real-time updates of medical records via the Internet. Though a number of ongoing research efforts are focusing on various technical, economic, and social issues, many technical hurdles still need to be resolved in order to have flexible, reliable, secure, and power-efficient WBANs suitable for medical applications. This paper discusses implementation issues and describes the authors' prototype sensor network for health monitoring that utilizes off-the-shelf 802.15.4 compliant network nodes and custom-built motion and heart activity sensors. The paper presents system architecture and hardware and software organization, as well as the authors' solutions for time synchronization, power management, and on-chip signal processing.

Keywords—Wireless sensor networks; Health monitoring; Hardware; Software; Signal processing; Time synchronization

---

1 INTRODUCTION

Current health care systems – structured and optimized for reacting to crisis and managing illness – are facing new challenges: a rapidly growing population of elderly and rising health care spending. According to the U.S. Bureau of the Census, the number of adults age 65–84 is expected to double from 35 million to nearly 70 million by 2025 when the youngest Baby Boomers retire. This trend is global, so the worldwide population over age 65 is expected to more than double from 357 million in 1990 to 761 million in 2025. Also, overall health care expenditures in the United States reached $1.8 trillion in 2004 with almost 45 million Americans uninsured. In addition, a recent study found that almost one third of U.S. adults, most of whom held full-time jobs, were serving as informal caregivers - mostly to an elderly parent. It is projected that health care expenditures will reach almost 20% of the Gross Domestic Product (GDP) in less then 10 years, threatening the well being of the entire economy. All these statistics suggest that health care needs a mayor shift toward more scalable and more affordable solutions. Restructuring health care systems toward proactive managing of wellness rather than illness, and focusing on prevention and early detection of disease emerge as the answers to these problems. Wearable systems for continuous health monitoring are a key technology in helping the transition to expenditures will reach almost 20% of the Gross Domestic more proactive and affordable.

- [1]S.Sathiya is currently pursuing Masters of Computer Application ins in Er. Perumal Manimekalai College of Engineering Hosur, PH-8883086431. E-mail: sathiyashankar888@mail.com
- [2]J.Surya, Masters of Computer Application in Er. Perumal Manimekalai College of Engineering –Hosur. PH-9500654651. E-mail: Lakshmisurya13297@gmail.com

2 LITERATURE REVIEW

The aim is to show how radio frequency identification, multi-agent and internet of things technologies can be used to improve people access to quality and affordable healthcare services, to reduce medical errors, to improve patient safety and to optimize the healthcare processes [1]. Sink mote technique is used in this paper. Body sensor network-A wireless sensor is a platform for pervasive healthcare monitoring [2]. To send the real-time data to health monitoring database, wireless local area network has been used [3]. A computer that can automatically detect the user's behavior could provide new context aware services in the home [4].

3 HEALTHCARE APPLICATIONS

Wirelessly networked sensors enable dense spatio– temporal sampling of physical, physiological, psychology- cal, cognitive, and behavioral processes in spaces ranging from personal to buildings to even larger scale ones. Such dense sampling across spaces of different scales is resulting in sensory information based healthcare applications which, unlike those described in Section II-A, fuse and aggregate information collected from multiple distributed sensors. Moreover, the sophistication of sensing has increased tremendously with the advances in cheap and miniature, but high-quality sensors for home and personal use, the development of sophisticated machine learning algorithms that enable complex conditions such as stress, depression, and addiction to be inferred from sensory information, and finally the emergence of pervasive • Assistance with motor and sensory decline Internet connectivity facilitating timely dissemination of sensor information to caregivers.

International Journal of Scientific & Engineering Research Volume 9, Issue 4, April-2018
ISSN 2229-5518

Fig. 1 Applications of wireless sensor networks

- Monitoring in mass-casualty disasters
- Vital sign monitoring in hospitals
- At-home and mobile aging
- Assistance with motor and sensory decline

4 System Architecture

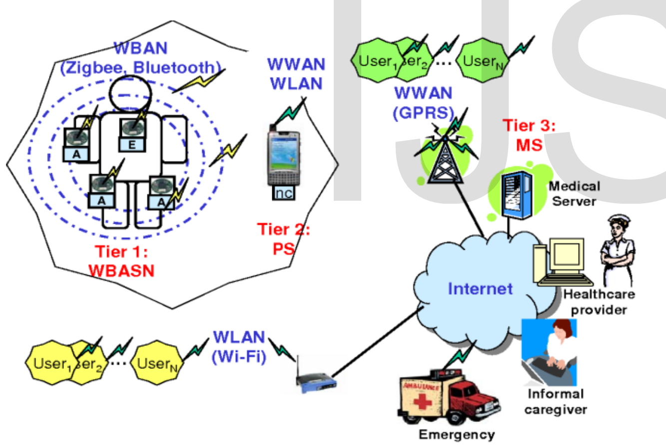

Fig.2 system architecture

4.1 Overview of system architecture

The whole system architecture is shown in figure. It is composed of medical sensor nodes, a hand-held personal server, a hospital server and related services. In this system, medical sensor nodes are used to collect physiological signals including bio-signals, medical images, and voice signals. These obtained signals are fed into the personal server through wireless personal area network (WPAN). The wireless communication between the sensor nodes and the hand-held personal server uses IEEE 820.15.4/Zigbee standard. After arriving at the hospital server, the data are either stored in the clinical data base, or available to a clinician through a hospital's local area network (LAN).

4.2 Medical sensors & Wireless personal area network

The main tasks of the medical sensors are to collect physiological signals and send them to the personal server. Typical medical sensors and characteristics of the signals are shown in table 1. In this system, the type and number of medical sensors are scalable depending on applications. C. The a hand-held unit which can be used to communicate parallels with a series of scalable medical sensor nodes as well as a remote hospital server. It maintains a communication bridge between patients and the hospital and data may be sent to the remote hospital server for further processing if necessary. In general, the personal server performs the following tasks:

1. Collecting data from medical sensors.
2. Processing physiological data and displaying results.
3. Keeping reliable communication with remote hospital server.

4 Providing a graphic user interface.

5 TECHNICAL CHALLENGES

In the paragraphs that follow, we describe some of the core challenges in designing wireless sensor networks for healthcare applications. While not exhaustive, the challenges in this list span a wide range of topics, from core computer systems themes such as scalability, reliability, and efficiency, to large-scale data mining and data association problems, and even legal issues.

5.1 Trustworthiness

Healthcare applications impose strict requirements on end-to-end system reliability and data delivery. For example, pulse oximetry applications, which measure the levels of oxygen in a person's blood, must deliver at least one measurement every 30 s . Furthermore, end users require measurements that are accurate enough to be used in medical research. Using the same pulse oximetry example, measurements must deviate at most 4% from the actual oxygen concentrations in the blood.

5.2 Privacy and Security

Wireless sensor networks in healthcare are used to determine the activities of daily living (ADL) and provide data for longitudinal studies. It is then easy to see that such WSNs also pose opportunities to violate privacy. Furthermore, the importance of securing such systems will continue to rise as their adoption rate increases.

5.3 Resource Scarcity

In order to enable small device sizes with reasonable battery lifetimes, typical wireless sensor nodes make use of low-power components with modest resources. Fig. 1 shows a typical wearable sensor node for medical applications, the SHIMMER platform [34].

6 Sensor Nodes And Hardware Designs

Sensor nodes are designed to collect raw signals from a human body. The signal from a human body is usually weak and coupled with noise. First, the signal should go through amplification and filtering process to increase the signal strength, and to remove unwanted signals and noise. After which, it will go through an Analog to Digital conversion (ADC) stage to be converted into digital for digital processing. The digitized signal is then processed and stored in the microprocessor. The microprocessor will then pack those data and transmit over the air via a transmitter.

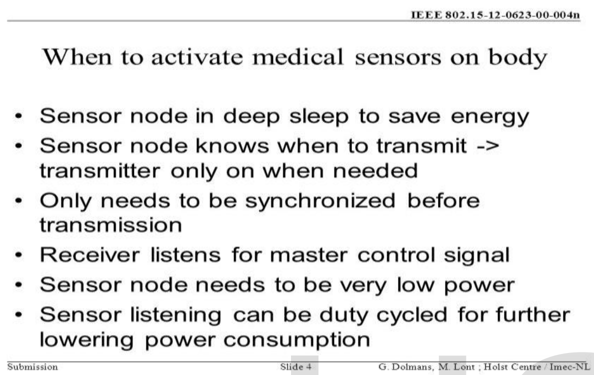

Fig 3 when to activate medical sensor on body

7 Advantages

Wireless sensor network are used in these harsh and hostile environments where wired networks can't be deployed. For example in a forest, wireless sensor nodes are dropped from the air because going down there and deploying a wired setup is not possible. Another advantage is that the wireless sensor networks are scalable. That is why they are actively health monitoring where there is a need of dense deployment and with a dense wired set up, it may lead to a dense wired set up will prove to be very costly. On the other hand, wireless sensor nodes can easily be deployed without any hustle.

8 Disadvantages

Limited computation and communication resources are the only disadvantages in wireless sensor networks. They have limited batter Y power, limited storage and computation capabilities, to the security attacks and have limited bandwidth to communicate.

9 Conclusion

This paper demonstrates the use of WSNs as a key infrastructure enabling unobtrusive, continual, ambulatory health monitoring. This new technology has potential to offer a wide range of benefits to patients, medical personnel, and society through continuous monitoring in the ambulatory setting, early detection of abnormal conditions, supervised rehabilitation, and potential knowledge discovery through data mining of all gathered information. We have described a general WWBAN architecture, important implementation issues, and our prototype WWBAN based on of-the-shelf wireless sensor platforms and custom-designed ECG and motion sensors. We have addressed several key technical issues such as sensor node hardware architecture, software architecture, network time synchronization, and energy conservation. Further efforts are necessary to improve QoS of wireless communication, reliability of sensor nodes, security, and standardization of interfaces and interoperability. In addition, further studies of different medical conditions in clinical and ambulatory settings are necessary to determine specific limitations and possible new applications of this technology.

References

[1] K.C. Kavitha, A. Bazila Banu "Wireless Health Care Monitoring"
[2] Swati Gawand Prof. Santosh Kumar "Wireless Sensor Network Based Healthcare Monitoring: A Review"
[3]R.M.Madhumathi,Dr.A.Jagadeesan S.Kaushik"Healthcare Monitoring System Using Body Sensor Network"
[4] V. Barath, P. Anithapriya "A Survey on health care for aged people based on sensor network"
[5] Praveen Halapeti, prof.ShantalaPatil"Healthcare Monitoring System Using Wireless Sensor Networks"
[6] sunil l. rahane, prof. ramesh s. pawase"A healthcare Monitoring System Using Wireless Sensor Network with GSM"
[7]Robert steele, Amanda lo, chrissecombe, yuk kuenwong"elderly persons' perception and acceptance of using wireless sensor networks to assist healthcare"
[8] aleksandarmilenkovic, chrisotto, emiljovanov "wireless sensor networks for personal health monitoring: issues and an implementation"