University Research Resource Journal
Jayoti Vidyapeeth Women's University, Jaipur
Volume – 1, Issue – 4 (October - December - 2018)
Page No: 10 - 14

ISSN: 2581 - 3730

Role of Health monitoring system in WSN

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Abstract

Wireless Sensor Networks (WSN) has appeared and engages in today's business, education, social and healthcare field. There is many more approach developing in this fields using Wireless Sensor Network. Due to the enlarge tension in healthcare industry specifically health monitoring application. WSN plays a essential job. Using six different wireless sensors in health monitoring system; patient's statistics can be represent casually. There is no requirement for doctors inspect to a patient repeatedly. This paper consider about the primary wireless technologies of medical applications like Wireless Body Area Network (WBAN), WIMAX, and Wireless Local Area Network (WLAN) etc. The model used for mobile sensor networks in health monitoring system also existing system architecture is also discussed in this paper.

Keywords: DFSM, DFSA, WLAN, WBAN, WMAX, WSN.

Introduction

A Wireless sensor network (WSN) accommodates small, portable and thin multiple sensor nodes. The sensor nodes are detection stations that comprised with a microcomputer, transducer, transceiver and power source. In case of health monitoring system, the electrical signals based on the physical effects of human body are generated by transducer, processed and stored by microcomputer and commands received and transmitted by transceiver. Battery is the power source for each sensor node.

The wireless sensor network has great role in healthcare applications such as medical data access, medical monitoring and communications with doctors through SMS or GPRS. The emergency condition of patients can be determined by continuous health monitoring with clothing-embedded transducers or body sensor networks. These systems are able to monitor the patient's physiological signals without hampering their normal life and tend to increase their life quality. In current bed side equipments, the limitation is found like sensors should be placed beside monitors also patient is able to move only certain distance. Naturally, Commercial 3G networks or WLAN are used for current health monitoring system.

The WSN is able to monitor the various health parameters for detecting the emergency condition by specialists. The varieties of sensors like BP, pulse rate, body temperature, ECG etc. are attached with portable devices of WSN. These cost-effective sensors have radio communication capabilities that are able to capture real time health data from patient's body and transmitted these to the specialist's devices (cell phone or PDA).

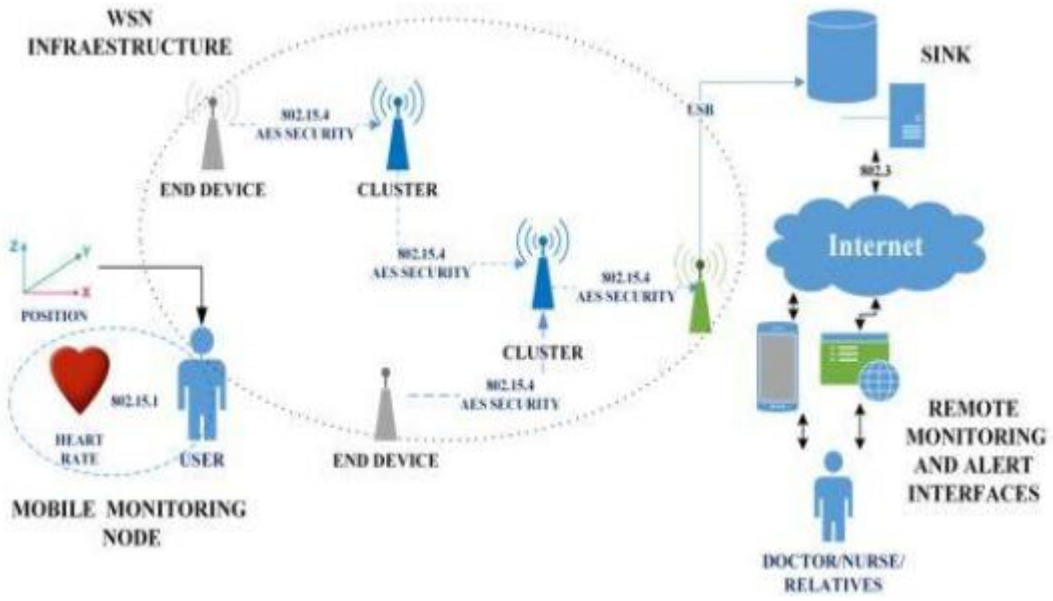

Fig.1: Wireless Sensor Network Infrastructure

Basic Technologies of Medical Applications

With the arrival of recent technology also an enslavement of wireless medical application; the big-scale wireless and mobile computing explanation in healthcare application are enlarge. With the help of cellular 3G, WIMAX, caregivers; the vital information can be accessed at anytime and anyplace with the healthcare networks. The innovative medium of data transfer in healthcare application is developed as Bluetooth, RFID, ZigBee and WSN ETC. The various technologies are described as follows,

WBAN: - A Wireless Body Area Network (WBAN) is a special purpose sensor network designed to operate autonomously to connect various medical sensors and appliances, located inside and outside of a human body.

The body-integrated network based on ZIGBee standard that is developed as small, lightweight and ultra-low-power monitoring device. It is combined with physiological sensors that are helpful to monitor critical conditions of patients in hospitals. This network is also capable to transmit patient's vital conditions outside hospitals to the specialists through internet in real-time. The data transmission is done by intelligent sensors to the server that is running on a laptop, PDA or 3G Smartphone.

WLAN: - A wireless local area network (WLAN) is a wireless computer network that links two or more devices using wireless communication within a limited area such as a home, school, computer laboratory, or office building

This technology arrived in 1997 as IEEE 802.11 standard. The initial version of this standard is IEEE802.11a and IEEE802.11b has capacity of 100 ft and 350 ft respectively. Then the Wi-Fi alliance started work as wireless based devices. Later, IEEE802.11g standard is developed in 2003 with 54Mbps data capacity as well as 2.4GHz band of 350 ft outdoor range. Again, IEEE802.11n has developed with higher throughput rate of 200Mbps and IEEE802.11i has arrived with enhanced security feature in 2004. The standard IEEE802.11s is released in Mesh Network.

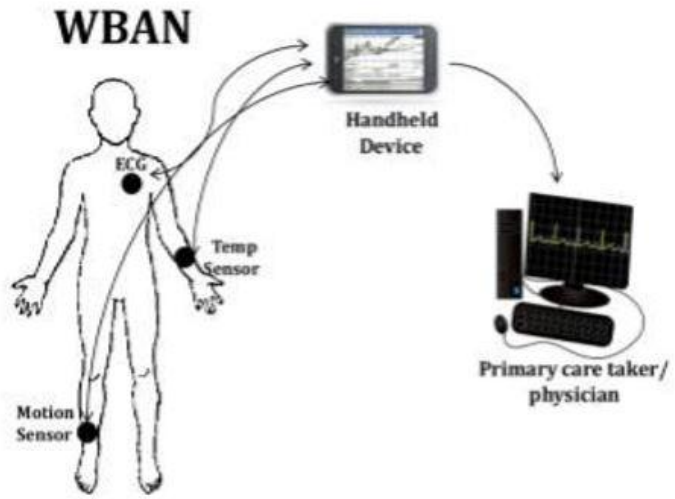

Fig 2 Wireless Body Area Network

WIMAX: - It is wireless MAN standard based on the IEEE 802.16 standard that has the capacity up to 50 km data transmission with high data rate up to 70 Mbps. It has strong security of mobile data transfer up to 150km/hour. The advanced radio technologies like QoS framework, AMC (adaptive modulation and coding), ODFM (orthogonal frequency division multiplexing) are incorporated with it.

WPAN:- A wireless personal area network (WPAN) is a personal area network - a network for interconnecting devices centered around an individual person's workspace - in which the connections are wireless.

This technology arrived with ZigBee or Bluetooth standard for physiological monitoring based on the motes. Besides patient health monitoring, this standard is also able to track patient's location wise like mass casualty incidents too. The WPAN ZigBee standard based on IEEE 802.15.4 is an ultra-low power and low data rate that is used for controlling and monitoring applications.

RFID: - Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects.

The RFID chip is used first in Food and Drug Administration in October 2004. Since, the various U.S hospitals were using this technology for monitoring medical equipments as well as positioning patient and hospital staffs. By applying wearable vital sign sensors with it, the physiological status of patients can easily achieved

Cellular system: - A cellular network or mobile network is a communication network where the last link is wireless

This system with the standard like 2.5G, 3G and beyond 3G used to gather information from sensors, servers and monitoring devices that improve the telemedicine service. It has the main feature of connecting heterogeneous network and offers flexibility for end-to-end telemedicine service.

Methodology of Wireless Sensor Network

1. Telehealth: Telehealth encompasses a broad variety of technologies and tactics to deliver virtual medical, health, and education services. Telehealth is not a specific service, but a collection of means to enhance care and education delivery .

The doctor consultation, remote monitoring of patient's vital parameters, e-prescription by doctor as well tracking remote patient's conditions periodically are done by this method.

2. Telecare: Telecare is support and assistance provided at a distance using information and communication technology. is the facility by which patient can stay safe in his/her home. This technology with the help of wireless sensor network provides continuous remote monitoring of patients as well as real time alerts in case of emergency to the hospital.

3. Telemedicine: Telemedicine is the use of telecommunication and information technology to provide clinical health care from a distance. Technology provides remote health care and health education facilities through electronic communication and information technology. This technology offers video consultation with doctor, patient's evaluation remotely and digital transmission of patient's records.

Proposed system

Using the WSN, the following proposed systems can be developed in future,-

Rural healthcare service based on WSN or Mobile BAN: The block diagram of this proposed system will be as depicted in Fig 3. The figure will be relevant for rural based health monitoring and treatment. Patient when goes to check up at mobile health care, the assistant attaches the sensors onto the patient's body to collect data of various parameters. The machine is attached with unusual types of sensors for calculate various parameters. If patient have normal diseases like fever or cough then Medicine dispenser service will offer the appropriate medicine. If any abnormal measure is found, then machine displays recommendation to the patient for doctor's visit also an assistant can connect with the PSTN network to call doctor. In this way, after completing all patients' data in a village, the healthcare personnel can move to another village with this mobile BAN.

Conclusion

Wireless sensor network has great used in healthcare application as well as health monitoring system for the benefits of patients, medical staffs and all society. This system is allowed to perform continuous health monitoring, detection of any abnormal condition, knowledge acquisition and recommendation by data mining of all collected data. The body area network (BAN) is very much effective for monitoring the patient's data using various sensors and communicating them with the doctor and it can be placed at patient's house or hospital. The WSN system can connect the central server remotely to provide wide facility in the medical service for hospitals. This review paper discussed the basic wireless technologies used in medical applications.

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