Chapter 4
Wireless Body Area Networks:
Requirements, Characteristics, Design Consideration, and Challenges

M. Sridhar

Bharathiar University, India

N. Priya

Bharathiar University, India

A. Muniyappan

Bharathiar University, India

ABSTRACT

Wireless body area networks (WBANs) are valuable solutions for healthcare lifestyle monitoring applications which allow the continuous screening of health data and constant access to patients despite their current locality or activity, with a fraction of the cost of regular face-to-face examination. In such environments, entities are equipped with intelligence-embedded devices to collect data for providing pervasive information. WBANs can serve as passing reference for huge audience instance systems for architects, practitioners, developers, medical engineers, etc. In particular for the medical field, devices fixed inside the human body measure and transfer real-time data to the caregiver through the communication network. Many technologies have showed their efficiency in secondary WBANs application such as biofeedback, remote sensing, and QoS requirement. This chapter highlights the major applications, design, and security of WBAN.

OVERVIEW OF WIRELESS SENSOR NETWORKS AND AD-HOC NETWORKS

Wireless Sensor Networks (WSN) is a group of sensors that can be linked through a wired or wireless medium. Typically a wireless sensor network contains hundreds and thousands of sensor nodes which have to provide limitless future potential. The sensor nodes are fortified with sensing and computing devices, radio transceivers and power components. A single node in a wireless sensor network (WSN) is

fundamentally resource constrained: they have limited in processing speed, storage capacity, and communication bandwidth it is necessary to understand the architecture before deploying it in an application for this kind of networks. After the sensor nodes are deployed, they are liable for self-organizing and appropriate network infrastructure that often with multi-hop communication subsequently the onboard sensors start collecting information of interest. The sensors are permissible to communicate within its communication range using radio signals which contain one sink (or) base station able to handle all communication in the network (ChiaraBuratti, 2009). A sensor network must be able to manage under the unstable environment because in most cases, the sensor network must be operating unattended. Once the nodes have booted up and a network is formed, most of the nodes will be able to maintain a steady state of the operation and the working mode of the sensor nodes may be either continuous or event drove in a WSN. Wireless sensor networks (WSNs) enable new applications and require non-conventional paradigms for protocol design due to several constraints. On the other hand, a Wireless Adhoc network is a decentralized type of wireless network which can be used in many applications, ranging from sensors for the environment, vehicular communications, road safety, home, peer-to-peer messaging, disaster rescue operations, and robots. An ad-hoc network is a self-configuring network of wireless links connecting mobile nodes these nodes may be routers and/or hosts. The mobile nodes communicate directly with each other and without the aid of access point and therefore have no fixed infrastructure (C.Sandhiya, p. 2018). Considering all the intelligent properties of both the wireless and ad-hoc network can be combined together for developing many real-time fusion applications.

APPLICATION OF WIRELESS SENSOR NETWORK

Wireless Sensor Networks have gained substantial popularity due to their flexibility in solving problems in different application domains and have the potential to change our lives in many different ways through applications like:

Military Applications: Wireless Sensor Networks are an indispensable component of a military command, control, communication, computing, intelligence, battlefield surveillance, investigation and targeting systems. In Particularly battlefield surveillance critical areas and borders can be closely monitored using sensors to attain information about the attacks. Tracking military vehicles, sniper localization and self-healing is also the portion of the battlefield surveillance.

Area Monitoring: Deployment of sensor nodes over a region is performed based on some phenomenal monitorization. When the sensors notice the event being monitored (heat, pressure, etc), the event is stated to one of the base stations, which then takes suitable action. Especially in the greenhouses, the sensors are used to control the humidity levels.

Transportation: Real-time traffic information is being composed byWSNs to alert drivers about congestion and traffic problems as notification via mobile applications to avoid collision and queueing.

Health Applications: Wireless Sensor Networks help in supporting interfaces for the disabled, integrated patient monitoring, diagnostics, and drug administration in hospitals, Tele-monitoring of human physiological data, and tracking & monitoring doctors or patients inside a hospital.

Tele-Monitoring Human Physiological Data: The biological data collected by the sensor networks could be stored for a long period of time, and used for medical investigation when it is required for the patient's treatment (Sinha A, 2001).

Related Content

An Automatic MR Brain Image Segmentation Method Using a Multitask Quadratic Regularized Clustering Algorithm
Lei Hua, Jing Xueand Leyuan Zhou (2021). *International Journal of Health Systems and Translational Medicine (pp. 44-58).*
www.irma-international.org/article/an-automatic-mr-brain-image-segmentation-method-using-a-multitask-quadratic-regularized-clustering-algorithm/277369

Early Detection of Parkinson's Disease Using Deep Learning: A Convolutional Bi-Directional GRU Approach
Dhaya Chinnathambi, Srivel Ravi, Hariharan Dhanasekaran, Viswanathan Dhandapani, Ramana Raoand Saravanan Pandiaraj (2024). *Intelligent Technologies and Parkinson's Disease: Prediction and Diagnosis (pp. 228-240).*
www.irma-international.org/chapter/early-detection-of-parkinsons-disease-using-deep-learning/338826

Telehealth as an Innovative Supply Chain and Logistics Management Approach
Darrell Norman Burrell (2022). *International Journal of Health Systems and Translational Medicine (pp. 1-9).*
www.irma-international.org/article/telehealth-as-an-innovative-supply-chain-and-logistics-management-approach/306971

Estimating Biosafety of Biodegradable Biomedical Materials From In Vitro Ion Tolerance Parameters and Toxicity of Nanomaterials in Brain
Deniz Eren Erisenand Kadir Uludag (2024). *Transformative Approaches to Patient Literacy and Healthcare Innovation (pp. 201-221).*
www.irma-international.org/chapter/estimating-biosafety-of-biodegradable-biomedical-materials-from-in-vitro-ion-tolerance-parameters-and-toxicity-of-nanomaterials-in-brain/342827

Research on Denoising of Brain MRI of Alzheimer's Disease Based on BM3D Algorithm
Xin-lei Chen (2021). *International Journal of Health Systems and Translational Medicine (pp. 33-43).*
www.irma-international.org/article/research-on-denoising-of-brain-mri-of-alzheimers-disease-based-on-bm3d-algorithm/277368