Chapter 50
A Study on Lifetime Enhancement and Reliability in Wearable Wireless Body Area Networks

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ABSTRACT

The wireless body area network (WBAN) which consists of wearable or implantable sensor nodes, is a technology that enables pervasive observing and delivery of health related information and services. The radio-enabled implantable medical devices offer a revolutionary set of applications among which we can point to precision drug distribution, smart endoscope capsules, glucose level observers and eye pressure detecting systems. Devices with WBAN are generally battery powered due to sensitivity and criticality of the data carried and handled by WBAN, reliability becomes a critical issues. WBAN loads a high degree of reliability as it openly affects the quality of patient observing. Undetected life-threatening circumstances can lead to death. A main requirement is that the health care professionals receive the monitored data correctly in emergency situations. The major objective is to achieve a reliable network with minimum delay and maximum throughput while considering power consumption by reducing unnecessary communication.

1. INTRODUCTION

Wireless technology has advanced to become a vital part of our lives starting from mobile communication to health care departments. Recently, there has been growing interest from system inventors application and researchers on a newly designed type of network architecture usually known as body sensor networks (BSNs) or body area networks (BANs), one made feasible by novel advances on ultra-low-power, lightweight, small-size and intelligent observing wearable sensors. In BANs, sensors are

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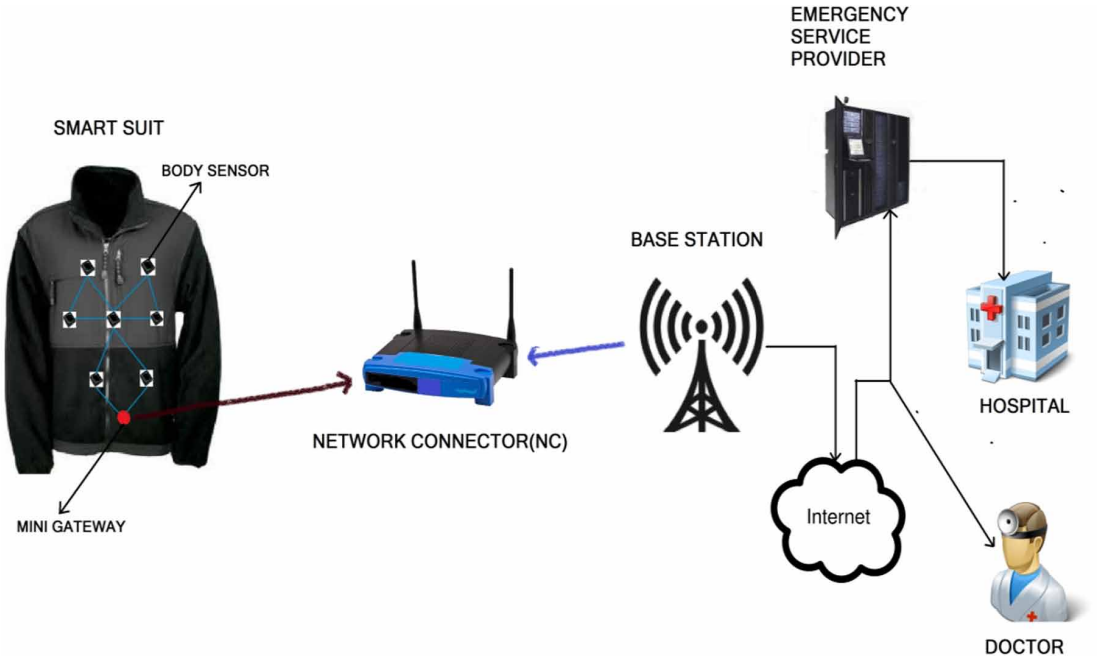
Figure 1. Data transmission in WBSN



used to constantly monitor human's functional activities and movements, such as health position and movement pattern. A wireless healthcare application offers and brings many benefits and challenges to the health care sector. These benefits provide a convenient-environment that can monitor the daily lives and medical situations of patients at anytime, anywhere and without limitations. The Figure 1 shows how WBAN provides a wireless connection between these devices and a Personal Digital Assistant (PDA) or a smartphone, which is responsible for the connection with other networks.For example, the obtained data can be forwarded to a hospital server.

1.1 Wireless BSN Scenario

Wireless BSN applications are in great demand in medical care (Movassaghi, Abolhasan, Lipman, Smith, & Jamalipour, 2014; Cavallari, Martelli, Rosini, Buratti, and Verdone, 2014; Davies, Sanjay, & Mohana, 2014), sports and entertainment (Conroy et al., 2009), the military-industrial sector (Kavitha, Balapriya, & Sundrarajan, 2016), and the social public field (Ahmad Dogar & Zafar, 2012; Akyildiz, Su, Sankarasubramaniam, & Cayirci, 2002; Patel & Wang, 2010), and BSNs have gradually become a research hotspot. BSNs is a type of WSN which is formed by physiological factors of sensors placed in the human body or on the body surface or around the body. The key performances it covers are sensors, data fusion, and network communication. It focuses on the advancements in universal health care, disease monitoring, and prevention solution, but also an essential component of the so-called Internet of Things. Its fore most purpose is to make available an integrated ubiquitous computing hardware, software, and wireless communication technology platform, and a vital situation for the imminent improvement of ubiquitous healthcare observing systems (Khan & Yuce, 2010). BSNs initiated from WSNs, so there are many resemblances between them. However, the features are consistently different as of their different

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