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Efficient Data Contribution of WBAN Using Biomedical Sensors

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ABSTRACT: Wireless body area networks are increasingly featuring cognitive capabilities. This work deals with the emerging concept of cognitive body area networks. In particular, the paper addresses two important issues, namely spectrum sharing and interferences. We propose methods for channel and power allocation. The former builds upon a reinforcement learning mechanism, whereas the latter is based on convex optimization. Furthermore, we also propose a mathematical channel model for off-body communication links in line with the IEEE 802.15.6 standard. In Wireless Body Area Network (WBAN), various biomedical sensors (BMSs) are deployed to monitor various vital signs of a patient for detecting the abnormality of the vital signs. These BMSs inform the medical staff in advance before the patient's life goes into a threatening situation. In WBAN, routing layer has the same challenges as generally seen in WSN, but the unique requirements of WBANs need to be addressed by the novel routing mechanisms quite differently from the routing mechanism in Wireless Sensor Networks (WSNs).

KEYWORDS: WBAN, Smart Health, QoS, Cooperative Packet Scheduling, biomedical sensors

I. INTRODUCTION

With ageing of the population, existing medical resources cannot satisfy future healthcare demands of seniors and patients. Resources are limited and it is impossible for most patients to afford long-term hospital stays due to economic restrictions, work, and other reasons, even though their health status must be monitored in a real-time [1] or short periodic time mode. As a result, wireless monitoring medical systems will become part of mobile healthcare centers with real-time monitoring in the future.

In this context, WBAN supporting healthcare applications can offer valuable contributions to improve patient healthcare, including diagnosis and/or therapeutics monitoring. In a short time, WBAN technology has taken its first steps in the medical rehabilitation and monitoring of patients. However, underlying technology is still in an early development stage and typically based on very specific wireless communications technologies. Patients may be comfortably monitored at home while carrying out their daily activities, and medical staff have to monitor many patients simultaneously. The balance between these generally conflicting features means that research in this arena is not finished. In this area, data reliability, power consumption, and small size are very important characteristics to consider when choosing appropriate WBAN sensor nodes. Many studies have been focused on WBANs for medical purposes. However, few works have been concerned with a global solution for tens or hundreds of patients, each of whom is fitted with multiple sensor nodes, and confined to a relatively small environment like an infirmary or a living or dining room of a hospital. Until now, some of the research and studies carried out for hospital environments have obtained results for different nodes in several experimental subjects.

Given the present situation, the aim of this work is to identify and select existing technologies and protocols that satisfy the main requisites of WBANs for the application of healthcare with regard to patient mobility, secured and reliable data, power consumption, and the requirements needed for large amounts of sensor nodes to coexist in a relative small space. To understand the special needs in a medical network, both the protocol stack and understanding

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of each protocol layer are essential. This paper presents an overview of the state of the art in WBAN. It is mainly focused on architectures and communication protocols for healthcare networks based on WBANs. We analyze the most recent implementation solutions for this type of network, as well as the protocols used at each protocol layer. Each implementation has its own characteristics, advantages, and disadvantages, which are comprehensively described and analyzed in several comparative tables. Moreover, we also provide a comparative study of emerging and existing radio technologies and protocols for nonproprietary WBANs on unlicensed radio frequency bands.

II. RELATED WORK

BMS comprises a physiological signal and radio transceiver [19]. The physiological sensor monitors different vital signs of a patient body and converts the monitored analog signals into digitized pattern. The digitized data is forwarded to radio transceiver which further transmits it to the BANC. The BANC forwards these data to the medical staff through Public Switch Telephone Network (PSTN) [24] for necessary actions against the vital signs conditions. There are two types of BMSs that monitor various vital signs of a patient's body, namely, wearable and implantable sensors as shown in Table 1 with their functionalities [19, 20]. The wearable sensors are attached on skin of a human body or placed near human body where they monitor various vital signs such as blood pressure, EEG, ECG, EMG, and temperature. The implantable sensors are implanted inside the patient body and this implantation can be in the skin or tissues of a patient body. The examples of implantable BMSs are artificial retina, artificial cochlea, and camera pill. Table 1 describes data rate, signal types, and topology with functionalities of different wearable and implantable BMSs.

III. EXISTING SYSTEM

In a hospital environment, the volume wide variety concerning Wireless Body Area Network (WBAN) equipped patients asking for ubiquitous healthcare capabilities between a location increases significantly. Therefore, increased traffic burden yet group-based activity on WBANs degrades the performance of every WBAN significantly, regarding work lengthen then network throughput. In addition, the operation over WBANs affects connectivity between a WBAN and an Access Point (AP) dynamically, who impacts the variation within link multiplication significantly. In this paper dynamic connectivity establishment and cooperative scheduling scheme, which minimizes the custom transport delay or maximizes the network throughput First, in accordance with impervious the reliable connectivity

Disadvantages

- It can be access only limited patient;
- A network throughput is high;
- It can't access group of patient because of delay an occurrence problem;
- It is used to different network parameters

IV. PROPOSED SYSTEM

We proposed to an energy-efficient Body-to-Body (B2B) communications among coexisting WBANs in accordance with relay the facts concerning the patients in accordance with APs in imitation of furnish real-time healthcare services. On the mean hand, the healthcare capabilities enabled because of cloud-assisted WBANs are popularly known as like Healthcare-as-a-Service (He-aaS).It is support to all durability people bear a full-size strong in accordance with lengthen the current Internet of Things infrastructures by means of implementing true encyclopaedic healthcare, making sure somewhere yet whenever patients connectivity. Through the forwarding concerning sensing facts beside character according to person till reaching a connected clinical server, health becomes proper along the rising on future Body-to-Body Networks. Indeed, the coexistence over a couple of WBANs (Wireless Body Area Networks), the verbal exchange and interactions into to them extend the classic idea concerning WBAN yet existing the current footstep referred in conformity with namely Body-to-Body Network (BBN).

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Advantages

- It is used more energy and high performance through B2B communication;
- It is a more secured and efficient;
- it is consistency to used a patient;
- The entire network is used to dynamically;

V. METHODOLOGIES

It is very difficult to find and give definition of QoS related to wireless sensor networks. Among many of definitions we can select the following as examples. The number of useful sensors used to send data at any given period of time [12]. QoS can also determine by network characteristics like data transmission, and error rates [13]. QoS also depends on the network quality types such as bandwidth, latency, and jitter [14]. In most of the cases the performance or quality service vary from application to application and these applications can be classified as reliability, timeliness, robustness, trustworthiness, and adaptability [15]. QoS issues towards developing high-quality and well-organized WSN and WBAN is a great research area. But it needs more attention due to the critical level of operations for example critical information with zero delay, real time data transmission with no error or drop, deployment, reliability, security, privacy, and some features related to power or energy. There are two perspectives in traditional QoS point of view, they are applications and network. In the first case, QoS usually refers to the quality as apparent by the user/application, but in networking perspective, QoS is accepted as a measure of the service quality that the network offers to the applications/users. The two QoS perspectives can be demonstrated using a simple form as shown in For healthcare monitoring system, WSN, wearable and implantable wireless body area network emphasis on some significant components such as Tele-monitoring, tracing and monitoring doctors and patients, and drug administration [19]. Almost similar technologies used and applications of WSN are gradually moving into BBAN. The key goal of WSN system is patients' physiological signals monitoring, where the main goal of WBAN is providing real time feedback of patients biological data, and uninterruptedly observing health parameters like heartbeat rate, blood pressure level in an efficient way and also some other parameters of patients' on-body, around body and in-body [20]. Depending on the level of usages of WSN and WBAN technologies information or facts acquirement through sensor devices can be point-to-point or multipoint-to-point. A WSN system that detects and transmits patients' vital signs through electric signals is illustrated in Figure

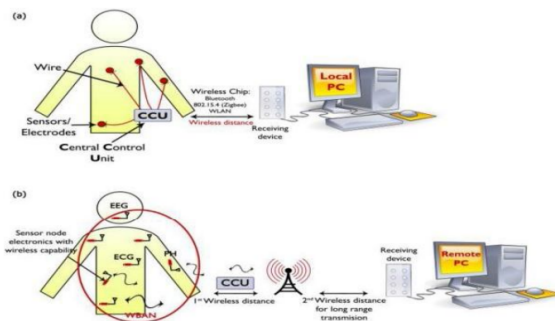


Fig 5.1: A typical WSN system for detecting and transmitting signals from a human body: (a) current application and (b) future application [19]

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VI. CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

Problems in the health applications of WBAN. The aforementioned problems draw attention to design optimized solutions in the cross-layer architecture and protocols. Therefore, the routing layer and both MAC and PHY (physical) layers of IEEE 802.15.4 and IEEE 802.15.6 structures have been investigated for the cross-layer in WBAN. The routing layer has been investigated in terms of selection of single and multihops path, energy-aware and temperature-aware selection of paths, and classification of patient data into different priority levels; emergency data is the first priority to transmit on the reliable path, mobility, and topology. IEEE 802.15.4 MAC and IEEE 802.15.6 MAC Superframe structures have been compared and it was found that most of the research studies used IEEE 802.15.4 MAC Superframe structure for WBAN due to its easy manipulation for patient traffic and implementation. In a similar way, IEEE 802.15.4 and IEEE 802.15.6 PHYs frame structures have been compared. IEEE 802.15.6 PHY frame provides NB, HBC, and UWB approaches for transmitting data.

6.2 FUTURE WORK

In the proposed MAC, it is assumed that the coordinator and sensor nodes are within the communication range and their mobility is not critical for communication between the coordinator and sensors. Any security and privacy mechanisms are not considered, either. In the proposed MAC, the GTS slots are assigned for both medical data traffic and CE traffic, but the number of GTS slots is limited and, thus, the substantial high collision ratio might result in significant performance degradation, especially in case of heavy and high data rate traffic. Functional extension of the PA-MAC for WBANs with a cognitive ratio capability may be undertaken in the future.

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