

## A Review : Classification of Radio Signals in Wireless Body Area Network for Human Movement using Artificial Intelligence

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**Abstract:**-Attributable to the expanding enthusiasm for the incorporation of the therapeutic innovation and the data and interchanges innovation, research on remote body region systems (WBANs), which apply a sensor system to the human body, is by and large effectively directed. Existing sensor system innovation can possibly be utilized as a part of a WBAN; notwithstanding, it has a few impediments. Specifically, a WBAN has an altogether different system environment contrasted with a sensor system that uses free space, since remote sensors in a BAN transmit through parts of the human body. Along these lines, research on WBANs includes an assortment of exploration territories that contrast marginally from those of traditional sensor systems and consider the attributes of the human body. This study researches the ecological attributes of a WBAN that contrast from ordinary sensor organizes and looks at the zones that have been contemplated in the educated community to acknowledge more effective WBANs. From studies distributed following 2001, when the idea of the WBAN was presented, research patterns in WBANs were examined utilizing the precise writing audit (SLR) procedure.

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### Introduction:

Due to the increase in the number of elderly people with chronic disease in many countries, the medical care becomes more insufficient. However, the advance in development of minimized sensor and wireless communication could bring about new boundary of technology to provide affordable and easily accessible medical cares. Wireless Body Area Network (WBAN) is a network of sensors attached on human body or implanted inside the human body. The usage of BAN system is now not only limited to medical application, but also adopted in sport, emergency service or even personal entertainment [1], [2]. The human movement identification has gained more attention in recent few decades. The information about human activities is helpful for self-awareness tools and/or used as a medical profile. The human movement information is not only useful for medical purpose, but also used for estimating the propagation channel status. The communication in WBAN could be improved when the propagation channel status is known. The performance of BAN can be optimized in terms of power consumption, as well as communication reliability, by using the information of propagation channel status [3], [4].

The accelerometer has been widely used for human activity recognition system [5]–[7]. The evaluation of the human activity classification shows that data from the accelerometer are one of the most effective parameters in terms of separability of the human activity. Although the accelerometer well classifies dynamic human activities such as walking or running, it hardly differentiates slow movements such as sitting and standing. Therefore, the proximity between body segment estimated by Radio Signal Strength Indication (RSSI) value could be used. The combination of accelerometer and RSSI in the human posture identification was investigated in [8]. The activity classification using empirical RF propagation modeling and inertial sensor in BAN was also investigated in [9]. It was found that there is a promising potential that the radio signal strength could be used in the human activity recognition in WBAN as well. However, to the best extent of our knowledge, only few research considered using only the

radio signal strength to identify the human movement. Prior research is found in [10], [11]. This paper aims to investigate the human movement identification using only the radio signal strength. The radio signal strength of individual movement was collected by the WBAN measurement. Noticeable advantage of the identification system proposed in this paper is that the human movement can be identified on available sensors without any additional tools such as the accelerometer. The neural network and the decision tree were applied to the human movement identification in this paper. The construction of the neural network and feature selection was included in this work. Afterward, the performance of the neural network and the decision tree in this problem was compared.

### **Brief Literature Survey:**

**Paper [1]:**- "An LBP Based Key Management for Secure Wireless Body Area Network (WBAN)"

(BANs) gained immense consideration due to its applicability in the medical field. In their paper we propose a Hybrid type of Key management technique which uses human Physiological Values based generated keys as well as some preloaded keys in order to secure the wireless communication of BAN. They assume BAN to be a heterogeneous sensor network having the capability of measuring different physiological values from human body. The process is made efficient by using LBP for feature generation from Electrocardiogram (EKG/EKG) signal. The security analysis is evaluated through NIST -- a randomness testing suite.

**Paper [2]** Power and Area Efficient Wavelet-Based On-chip ECG Processor for WBAN

This paper proposes a power and area efficient electrocardiogram (ECG) signal processing application specific integrated circuits (ASIC) for wireless body area networks (WBAN). This signal processing ASIC can accurately detect the QRS peak with high frequency noise suppression. The proposed ECG signal processor is

implemented in 0.18 $\mu$ m CMOS technology. It occupies only 1.2mm<sup>2</sup> in area and 9 $\mu$ W in power consumption. Therefore, this ECG processor is convenient for long-term monitoring of cardio-vascular condition of patients, and is very suitable for on-body WBAN applications.

**Paper [3]** "Performance Analysis of Medium Access Control Protocol for Wireless Body Area Networks",

In recent years, very interesting researches are concentrated to develop patient monitoring systems for revolutionizing health monitoring. A wireless body area network (WBAN) needs a MAC protocol, which obey to the BAN requirements and specifications. The design of a medium access control is a challenge due to the characteristics of wireless channel and the need for minimization of consumption. For medical applications, WBAN should collect and transmit information of patient in a reliable manner and in a timely manner to monitoring entity. In this paper, they present the specifications and characteristics of medium access protocols for WBAN. A showing of the most efficient MAC protocols and some simulations results are presented to further illustrate the performance of the three MAC protocols namely IEEE 802.15.4 (Zigbee MAC), TMAC and IEEE 802.15.6 (Baseline MAC).

**Paper [4]** "Certificate less Remote Anonymous Authentication Schemes for Wireless Body Area Networks",

Wireless body area network (WBAN) has been recognized as one of the promising wireless sensor technologies for improving healthcare service, thanks to its capability of seamlessly and continuously exchanging medical information in real time. However, the lack of a clear in-depth defence line in such a new networking paradigm would make its potential users worry about the leakage of their private information, especially to those unauthenticated or even malicious adversaries. In this paper, they present a pair of efficient and light-weight authentication protocols to enable remote WBAN users to anonymously enjoy healthcare service. In particular, their authentication protocols are rooted with a novel certificate less signature (CLS) scheme, which is computational, efficient, and provably secure against existential forgery on adaptively chosen message attack in the random oracle model. Also, their designs ensure that application or service providers have no privilege to disclose the real identities of users. Even the network manager, which serves as private key generator in the authentication protocols, is prevented from impersonating legitimate users. The performance of their designs is evaluated through both theoretic analysis and experimental simulations, and the comparative studies demonstrate that they outperform the existing schemes in terms of better trade-off between desirable security properties and computational overhead, nicely meeting the needs of WBANs.

**Paper [5]**:- "Characterization of the Path Loss near Flat and Layered Biological Tissue for Narrowband Wireless Body Area Networks

This paper discusses the path loss between two halfwavelength dipoles near flat, biological tissue at 2.4 GHz. Both homogeneous and layered media are investigated. The influence of the antenna height and the thickness of the layers are characterized and identified as important factors for the determination of the path loss. Measurements and simulations are performed to validate the results.

**Paper [6]**:- "Posture-Predictive Power Control in Body Sensor Networks Using Linear-Quadratic Gaussian Control",

This paper presents a novel transmission power assignment mechanism for on-body wireless links formed between severely energy-constrained wearable and implanted sensors. The objective is to develop a model based framework in which RF signal strength is predicted and is regulated at a reference value. In particular, the body movement has been modeled as a stochastic linear system and a quantized Linear Quadratic Gaussian control with an Integrator (LQGI) approach has been utilized to achieve this objective. Experimental results from linear and binary search based closed-loop design along with simulation results from LQGI approach are presented and compared. It is shown that the LQGI approach with quantizer is able to enhance the performance of the system.

### **Conclusion:**

In this paper we have examined different security ways to deal with secure Body Area Network. We have talked about numerous symmetric, Asymmetric and cross breed key security components in BAN. The point of interest examination among these methodologies is additionally done in this paper. Albeit different methodologies are utilized to secure BAN yet more work must be done to make it more secure and productive system. In future there is a necessity of a convention which is more proficient and more secure than existing conventions for Body Area Network.

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