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Design of an EEG-based transceiver with data decomposition for IoHT applications

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Abstract— **Recently the importance of the Internet of Things (IoT) has opened up the possibility of developing new applications related to mobile-Health. These include real-time monitoring of various physiological data such as EEG and ECG. Due to the complexity of remote monitoring applications, the need for continuous sensing is often overwhelming. This causes data processing to consume a large amount of energy. This research work introduces a data specific transceiver design, which takes the advantage of physical layer data collection characteristics. The proposed design shows excellent performance in terms of low complexity and signal distortion with high data gain.**

Keywords— EEG signal; data Compressio;, IoHT; signal decomposition; transceiver.

I. INTRODUCTION

The emergence of various technologies such as Big Data, IoHT and Edge Computing led to the development of E-health systems that enable the gathering, dissemination and recovery of health information [1]. The version 4.0 is a set of principles that aims to enable the healthcare industry to transform itself by delivering better outcomes and lower costs through the use of artificial intelligence and machine learning. The healthcare industry has gained huge popularity due to the increasing number of electronic medical records. However, the challenges of handling and storing the huge volume of data collected in healthcare have emerged. This load on the system's design is usually significant due to the amount of processing power and storage space required to handle the huge volume of data that can be transmitted in real time [2]. Since most m-health devices are battery-operated, they require continuous energy consumption to transmit the data. The lack of flexibility in the design of physical layer modules is one of the main factors that constrain the performance of future networks and IoHT environments [3]. An efficient and cost-effective transceiver is proposed to provide both high-quality and cost-effective solutions. This research study argues that the characteristics of a convinced type of information, such as EEG, can be utilized efficiently in a devoting transceiver design. This benefit can reduce the cost and energy consumption of the device. These signals are the main resource about the electrical activities related to the brain [15]. It plays a critical responsibility in the identification of various brain disorders and has a secondary responsibility in the development of BCI [14]. An efficient and compact EEG-based transceiver that can provide high-quality transmission and minimize data compression is proposed. It utilizes the existing OFDM technology to perform the data compression task [10] [11]. Decompose processed data into multiple streams and discovered the dependency of different streams in terms of compression ratio [12]. Through simulations, the proposed design is evaluated against various constraints.

II. RELATED WORKS

In recent years, the health 4.0 has the rapid emergence and evolution of cloud storage and networking has enabled data processing to be performed at unprecedented levels. Data processing is a key aspect of Industry 4.0 that requires the proper management and processing of collected data. This is evidenced by the number of patents related to this field in the International Patent Classification. To minimize transmission energy, it is necessary to decrease the information count when it is transmitted. The high computational cost of signal reconstruction often restricts the CS need in concurrent applications. For instance, the OMP technique involves heavy matrix computation [13]. If a data-driven algorithm is used to improve accuracy in signal recovery, less energy consumption is expected. However, the high accuracy is achieved using non-data-driven method.

This research work study about the various techniques that are commonly used in e-health applications. Most of existing techniques are focused on the top layers while ignoring the