

Interference Mitigated Wireless Body Area Network System Using Windows Platform

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Abstract— Wireless Body Area Network(WBAN) has emerged as a new technology for e-healthcare that allows the data of a patient's vital body parameters and movements to be collected by small wearable or implantable sensors and communicated using short-range wireless communication techniques. WBANs could operate in dense environments such as in a hospital and leads to high mutual communication interference in many application scenarios. The excessive interferences will significantly degrade the network performance. Therefore, it is critical to mitigate the interference to increase the reliability of WBAN systems. There are many approaches towards the mitigation of interference and here we are using power-game approach.

Keywords—e-healthcare, Interference, Mitigation, Power-game approach.

I. INTRODUCTION

Nowadays WBAN systems are used to decrease the healthcare cost and to support disease prevention and early risk detection. WBANs are operated around human bodies for continuous real time monitoring of physiological signals such as ECG, pulse, temperature, respiration rate etc. The physical nature of WBANs lie in the fact that it operates on human body and requires sensing, control and Quality of Service (QoS). Some studies in cyber-physical WBANs system include a systemic design approach in [1] and Model based Engineering approach [2]. A cyber-physical game controller for WBANs is proposed to broaden users view and provide more realistic interaction experiences in [3].

Here we are going to eliminate the problem of interference that degrades the system performance. WBANs works in a dense network environment such as schools, hospitals etc. Therefore one WBAN may interfere with another if they are close to each other. This excessive interference called inter-WBANs interference will severely degrade the systems power quickly. In this paper, both the social interaction information and the movement of individuals are considered when a power game is used to mitigate the inter-network interference.

II. METHODOLOGY

A. Overview

The WBAN system proposed here uses various type of sensors like flex sensor, LM35, ECG electrodes etc. for the collection of biological signals. Signal conditioning is performed for the acquired signals which includes the

filtering and amplification. The analysed signals are then stored in the microcontroller. After that these are transmitted to the windows platform using Bluetooth technology.

B. Block Diagram

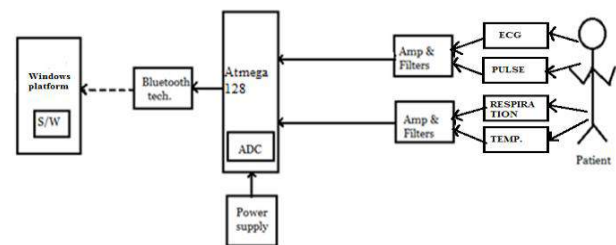


Fig. 1. Block Diagram of WBAN system

The parameters are measured by placing various sensors in different parts of the body. For measuring ECG signal we are using standard ECG lead system. Pulse is measured by placing an IR sensor on the finger tip. Normal reflectance method is used. LM35 sensor is used to measure the temperature. The main advantage of using this sensor is that the voltage is linearly proportional to temperature, so that we can easily analyze the temperature variations in the body. And it doesn't require any external calibration. A flex sensor is placed over the diaphragm to measure the respiration rate.

Here we are using a 2 pole adjustable high pass filter and 3 pole adjustable low pass filter for filtering. The amplification is done by using an instrumentation amplifier. ATmega128 microcontroller is used for the storage purpose. Here we are introducing a power game approach to mitigate the interference and consider many users instead of a single user at a time. We assume that a TDMA based media access control scheme is applied in order to avoid the intra-network collision.

C. Interfacing Both Hardware and Software

Forming a communication between hardware and software for effective management of sources that are available, the goals to meet are:

- Simple User Interface.
- Easily usability.
- Virtual reality must be updated time to time.

- Diagnosing multiple parameters.
- Multiple parameters.

For easy readability the interface we use is a Graphical User Interface (GUI). As seen through the years GUI has been very effective for easy understanding and manipulation.

III. ANALYSIS OF SIGNALS

The signals displayed on the pc screen can be analysed based upon the amplitude, frequency and time period of the signals. In this a social interaction detection strategy detects the nearby WBANs and the distance among them using both Bluetooth and acoustic wave technology. The effective communication range of the Bluetooth signal is 10 meters.

One device sends an acoustic wave and wait till it receives the acknowledge back. The procedure of the detection and distance measurement of WBAN is as follows:

- The mobile phone opens Bluetooth to search the nearby devices
- After the detection, the node records their ID
- Mobile phone runs acoustic meters [4] to send a acoustic wave and wait until the acknowledge is received.

The delay time multiplying the propagation velocity gives the distance between the two devices[5].

IV. EXPERIMENTAL RESULTS

The network is stimulated in a 20m x 20m square area.

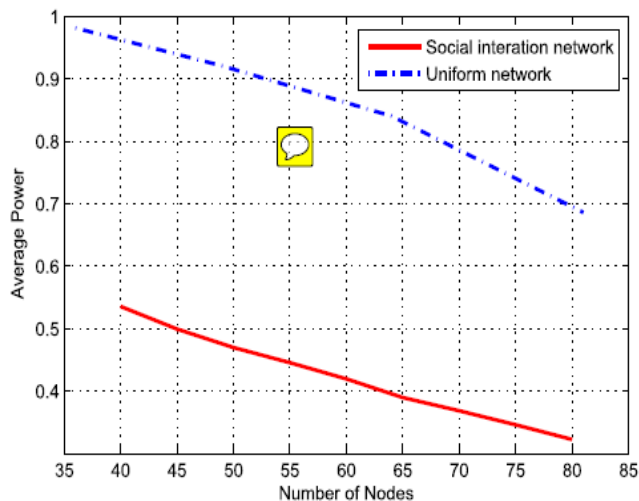


Fig. 2. Average power as a function of the number of nodes in the network

The nodes average power is a function of the number of the nodes in the network. From the figure the average power

decreases when the network consist of more number of nodes. If there are more nodes, the interference increases and most of the nodes need to decrease their power in order to reduce the interference.

V. CONCLUSION

Here we have presented a social interaction information based power control game for inter- WBANs interference mitigation. Unlike the previous works, power game is designed based on social interaction detection and prediction.

VI. FUTURE SCOPE

By introducing some modifications to this system we can implement this on android platforms which makes it more user friendly.

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