A STUDY OF RESEARCH NOTIONS IN WIRELESS BODY SENSOR NETWORK (WBSN)

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Abstract - The Body Sensor Networks is captivated in gathering the communication module in a more reliable manner along with efficiency in terms of energy, more secure than earlier schema’s, ands enhanced utilization of resources. Wireless BAN (WBAN) has the tendency to be placed even inside the human body. The significance of BSN has the tendency to go through all aspects such as fitness of a person, his/her health issues, caring in critical level, and so on. In 2014 [1] the elevation of body sensors has been grown upto 420 millions from 11 million units in 2009. In this research work, we addressed BAN from On-Body to Body-to-Body cooperative networks at different levels: propagation, protocols and localization applications.

Keywords: Wireless Sensors, Body Sensors, Security and Research Trends.

1. Introduction

WSN has a wide range of applications including monitoring of environment in remote locations and tracking the targets in all aspects. The sensors of WSN will communicate with each other to form a network and to share or forward the information or collected data via it. In WSN, there are two different types of network with it, one is structured and the other in unstructured. In terms of structured network the sensors are planted in an effective pre-planned way. In unstructured network, the deployment of sensors will be in random manner [1]. Each sensor node has three basic components: a sensing subsystem, a processing system and communication system [2].

WSNs have been successfully applied to many industrial and civil domains, including industrial process, monitoring and control, environment and habitat monitoring, home automation, traffic control, machine health monitoring and healthcare applications, environmental monitoring, biological detection, industrial diagnostics [3], [4] also different types of sensors are useful to gather multiple parameters together, such as body temperature, blood pressure, pulse, heartbeat and blood sugar. The sensor network should have a lifetime long enough to fulfil the application requirements [5], [6].

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The development of Body Sensor Networks (BSN) has been facilitated by the rapid advances in Wireless Sensor Networks in recent years. Body Sensor Networks nodes provide a versatile environment for wireless sensing research and development. In addition to providing continuous monitoring and analysis of physiological parameters, the recently proposed the Body Sensor Networks incorporates context aware sensing for increased sensitivity and specificity [7]. BSNs can be wired (interconnecting with smart fabric) or wireless (making use of common wireless sensor networks and standards). Research in computer, networking, and medical fields are working together in order to make the broad vision of smart Body sensor network. After the introduction of dedicated BSN platforms, such as the BSN node, Pluto, Shimmer, purposely built platforms have been used in BSN research. [8]. The similar set of works can be found in [9-14].

![WBSN Architecture](image)

**Figure 0.1** WBSN Architecture

### 2. Related Work:

<table>
<thead>
<tr>
<th>Author</th>
<th>Title of the paper</th>
<th>Description</th>
</tr>
</thead>
</table>

**Table 1 Summary of Literature Review in Related Works**

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<table>
<thead>
<tr>
<th>Authors</th>
<th>Methodology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JIN Mu-Jung &amp; QU Zhao-Wei [15]</td>
<td>Optimised scheme of the neighbour collaboration algorithm SM-WSN.</td>
<td>It has been deployed in a number of fields including monitoring of environments, detection of problems in biological sectors etc.</td>
</tr>
<tr>
<td>Zhyan Xie [16]</td>
<td>Clustering using WBAN with clique-based method.</td>
<td>A scheduling schema based on the colors has been proposed.</td>
</tr>
<tr>
<td>Ousmane Diallo [17]</td>
<td>Cloud based WBAN’s with statistical modelling techniques.</td>
<td>For effective processing of queries and to optimize the overall storage infrastructure</td>
</tr>
<tr>
<td>Yena Kin &amp; SuKyoung Lee [18]</td>
<td>Maximises the Life time of the whole integrated wireless hospital sensor network.</td>
<td>The theme of this research is intended to enhance the network with high efficiency of power in large networks.</td>
</tr>
<tr>
<td>Mehmet R Yuce [19]</td>
<td>Wireless Body Area Network System.</td>
<td>Designed for health care applications. In the medical stream a fully equipped body sensor has been deployed.</td>
</tr>
<tr>
<td>Steven Jovica Marinkovi [20]</td>
<td>A novel- low power reliable MAC protocol.</td>
<td>The outcome of this research work states that this proposed methodology along with WBAN has the tendency to work on EEG.</td>
</tr>
</tbody>
</table>

### 3. Methodology

Wireless-body-area-networks (WBAN) is one of the network that has the tendency to collect the information’s such as temperature of the body, blood pressure (BP), pulse, heartbeat of the person and the blood sugar level. This proposed methodology is intended to track the patients in these aspects in order to find the emergency level of any patient.

In this proposed methodology, an algorithm named SBWS and a technique on cloud namely WBAN has be hybridized. In the initial sector the SBWS, clustering will takes place where the set of sensors will be grouped in order to avoid the overlap. In this method scheduling method which works based on the priority has been imposed. The gathered information will then be processed through cloud network for effective processing of required queries.
In the second phase of the proposed system, a real cloud structure based on the storage and optimization on processing of queries will be placed in order to minimize the overall energy and to reduce the query latency. An effective Contiguous Link scheduling algorithm has been imposed for effective processing of queries.

Figure 3. A Typical WBSN communication

Table 0.1 Physiological signals range by sensors in WBAN

<table>
<thead>
<tr>
<th>Physiological Signal</th>
<th>Signal frequency range/Bandwidth (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG signal</td>
<td>0.01-250</td>
</tr>
<tr>
<td>Blood pressure (BP)</td>
<td>0-50</td>
</tr>
<tr>
<td>EEG</td>
<td>0.5-60</td>
</tr>
<tr>
<td>Body temperature pulse</td>
<td>0-0.1</td>
</tr>
<tr>
<td>Blood oxygen levels</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td></td>
<td>30 - 235 bpm</td>
</tr>
</tbody>
</table>
### Table 0.2  
**Technical requirements**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Medium</td>
<td>Wireless channel</td>
</tr>
<tr>
<td>Communication protocol</td>
<td>MAC (Media Access Control)</td>
</tr>
<tr>
<td>Modulation/coding techniques</td>
<td>FSK (Frequency-Shift Key)</td>
</tr>
<tr>
<td>Frequency band specification</td>
<td>10 kHz - 1 MHz</td>
</tr>
<tr>
<td>Topology information</td>
<td>Star topology</td>
</tr>
<tr>
<td>Attenuation</td>
<td>0.625 volts</td>
</tr>
<tr>
<td>SNR</td>
<td>16db</td>
</tr>
<tr>
<td>Layer</td>
<td>PHY layer, MAC layer and Network layer</td>
</tr>
</tbody>
</table>

**Distributed Local Clique Finding Algorithm**

In DLCF algorithm the neighborhood-based cliques will be found using n-clique method. On the off chance that all sensors of n-Clique originate from a solitary WBAN, we can discover the nearby Clique effortlessly by the sensors' identifier. Something else, if the sensors of t-Clique originate from various diverse Cliques, we discovered all the nearby Cliques by finding neighborhood Clique Algorithm.

By and large, we can present an answer to the issue of discovering the t-Clique in an appropriate manner as takes after. We proposed a methodology that possess the data table in each of it, and the ID’s of neighbor sensors. Also, a set of k sensors are passed in WBAN to pass body maladies. Then DLNF algorithm is used to find local n-Clique. For each sensor, say t1 does as the following.
4. Experimental Results

In this section the overall simulation results of the proposed method and its mechanism of query with optimization in the real time has been evaluated. In our research, the actual sensors have the tendency to group in different manner in order to eliminate interference by flagging it with different colors. And these scheduled sensors will be secured and used it in the real time environment. By using these techniques, we achieved high throughput, low query latency and less energy consumption.

SOFTWARE: MATLAB

Version : MATLAB 8.1 R2013a

HARDWARE:

OS: Windows 10

PROCESSOR: Intel® Pentium® CPU G2030 @ 3.00GHz

RAM: 4.00GB

SYSTEM TYPE: 64-bit OS

4.1 Throughput

The throughput can be defined as an actual transmission per slot (TPS) which calculates data transmissions of all sensors in the system and is the performance index used to estimate WBAN scheduling. We compare the system throughput of our DLCF method with CPN-based RIC in small, medium, high, and very high WBAN densities.
Figure 2 shows that the system throughput decreases along with the increase in total sum of the colors since the scheduling process will be increased with the increase in number of colors. By compared to the worst case our proposed DLCF is better in small WBAN densities.

Figure 3 shows that as the number of colors increases, the system throughput also increases. However, the proposed DLCF outperforms RIC in medium WBAN densities.
Figure 3 show that the system throughput is slightly decreases along with the increase in total sum of the colors since the scheduling process will be increased with the increase in number of colors. By compared to the worst case our proposed DLCF is better in medium WBAN densities.

![Graph showing system throughput with increasing number of colors](image)

**Fig.5 Throughput of WBAN scheduling system with very high density**

Figure 5 show that the system throughput is tremendously increases along with the increase in total sum of the colors since the scheduling process will be increased with the increase in number of colors. By compared to the worst case our proposed DLCF is better in highly WBAN densities.

**Conclusion**

In this paper we proposed a clique-based scheduling algorithm and cloud-based scheduling algorithm. In clique-based technique, the sensors can be clustered in to groups to avoid interference to Distributed Local Clique Finding In cloud-based technique, the stored information should be secure and also used it in the real time environment which demands to use Multi Queue Scheduling. By combining these two techniques we achieved better throughput, energy consumption and query latency compared to the previous cases and also it will be optimized in real time environment.

**References:**


