UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 10, October 2017

# Enhanced Unwavering Routing for Optimized Throughput Algorithm (EUROTA) in Wireless Body Area Networks

**Anisha. M.D[1], Dr. S. Prema[2]**

M. Phil Research Scholar, Department of Computer Science (PG), K.S. Rangasamy College of Arts and Science (Autonomous), Tiruchengode, Tamilnadu, India[1]

Associate Professor, Department of Computer Science (PG), K.S. Rangasamy College of Arts and Science (Autonomous), Tiruchengode, Tamilnadu, India[2]

**Abstract:** Wireless Body Area Networks (WBANs) instigated healthcare applications offer valuable contributions at monitoring, diagnostic, or therapeutic levels. It deals with real-time medical information gathering obtained from different sensors with secure data communication and low power consumption. Given the present situation, the aim of this work is to design a protocol 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. EUROTA is deploys a hierarchical, multihop method which instigates the clustering in the routing. This algorithm considers two primary aspects: energy-awareness and node coverage preservation mechanisms. It utilizes the metrics of the link credit (LD) and signal strength (SS) to assess the node in-between distance. The method deploys the cluster based routing for the WBAN routing. The cluster will have the Cluster Head (CH), Cluster Nodes (C1,C2,…Cn), Cluster Message Agent (CMA) and Base Station (BS). The selection of CH can be done dynamically based on the minimal nearest distance and maximum residual energy which enhances the node lifetime. The proposed EUROTA algorithm is implemented with MATLAB. The power consumption is tested for the comparison. Dead and alive nodes are also compared for determining the performance. Number of packets sent to the sink, packets dropped, residual energy, path loss are monitored and compared. Finally delay factor is instigated for the performance determination.

**Keywords:** Routing, EUROTA, Multihop, Wireless Body Area Networks, Internet Control Message Protocol.

## I. INTRODUCTION

Wireless Body Area Network (WBAN) is playing an important role now days in all the fields mostly in the Health Care System. Wireless network set up is done by using radio signal frequency to communicate between computers and other network devices. A wireless network enables people to link and access applications and information without wires. It provides freedom of movement and the ability to spread applications to different parts of office block, city, or nearly anywhere in the world. Wireless Body Area Network (WBAN) is a type of wireless sensor network (WSN) which can be wearable or implantable in the human body. Nodes are used here for collecting data from the human body and sent to the systems. WBAN is a developing knowledge in the field of healthcare system. WBAN has received great care due to its requests in the field of health, medical, entertainment services and many more. It can also be mentioned to as Wi-Fi network or WLAN. This network is getting popular nowadays due to easy setup feature and no cabling are involved for making connectivity among Computers. Routing is the process of transporting packets across a network from one host to another. It is usually achieved by devoted devices called routers.

Packets are the important unit of information transportation in all modern computer networks, and increasingly in other communications networks as well. Routers use headers and sending tables to regulate the best path for forwarding the packets, and they use protocols such as ICMP (Internet Control Message Protocol) to connect with each other and configure the best route between any two hosts. Many drawbacks are been sorted out in the older implementation process in the field of health care. WBAN is playing a most important role in the field of health care system. So we must be concentrating on all those identified problems must be sorted out and solved by implementing the algorithm called EUROTA. Those problems which are sorted out in healthcare such as data path loss, dead node, packet loss, residual energy consumption, delay of time, parameter portray and so on. For addressing all these issues, this paper proposes EUROTA algorithm with the help of multihop. Let us discuss about the existing problems and the proposed work carried on in a brief manner by the following processes.

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 10, October 2017

## II. LITERATURE REVIEW

A. Wireless Body Area Network for Monitoring Body Temperature, Heart Beat and Oxygen in Blood

Al Rasyid et.al [1] focused on the implementation of WBAN for monitoring body temperature, heart beat rate and oxygen saturation in blood. They analysed the information received from sensing element nodes to server receiver with a spread of various distances.

B. Priority Based AODV Routing Protocol/or Critical Data in Wireless Body Area Network

Ambigavathi et.al [2] proposed a Priority Queuing formula with using AODV protocol to differentiate varied sorts of data traffic supported vital data. Simulation result performs comparison between traditional AODV while not priority and planned AODV with priority. In traditional AODV traditional FIFO planning formula is used that is typically making drawback for emergency case. In proposed AODV this drawback is solved with the facilitate of pre-emption and Non pre-emption condition.

C. Zone-Based Fuzzy Routing for Wbans

Yan et.al [3] proposed a wearable dual-band magneto-electric dipole antenna. The proposed antenna is planned for worn purpose therefore they will check antennas on body performance evaluated below bending conditions. Bending Evaluation is performed by simulating the antenna mounted on a vacuum cylinder with a varied radius r. This complementary antenna is capable of producing a stable performance in terms of gain, beam width and radiation pattern within a large operative waveband.

D. Routing of guaranteed throughput traffic in a network-on-chip

Pierre G. Jansen et.al [4] this paper examines the possibilities of providing throughput guarantees in a network-on-chip by appropriate traffic routing. A source routing function is used to find routes with specified throughput for the data streams in a streaming multiprocessor system-on-chip. The influence of the routing algorithm, network topology and communication locality on the routing performance are studied. The results show that the proposed method for providing throughput guarantees to streaming traffic is feasible. The announcement locality has the strongest power on the routing presentation while the routing algorithm has weakest pressure. Therefore, the mapping algorithm is of better weight for the system portion than the routing algorithm and it is lucrative to use a more complex mapping algorithm that conserve the statement locality in concert with a simple routing algorithm. The analysed summary of existing work is given in table 1.

TABLE 1 Summary of Literature Review

| S No | Title | Author, Publisher and Year | Working Platform | Objective | Future Scope |
|---|---|---|---|---|---|
| 1. | Wireless Body Area Network For Monitoring Body Temperature, Heart Beat And Oxygen In Blood | Al Rasyid et.al [1] IEEE [2015] | ZigBee Network | Monitoring Body Temperature, Heart Beat And Oxygen In Blood | Develop real time visualization monitoring application in desktop-based and web-based to get sensitive data. |
| 2. | Priority Based Aodv Routing Protocol/Or Critical Data In Wireless Body Area Network | Ambigavathi et.al [2] IEEE [2015] | AODV routing protocol | Priority Queuing Algorithm | Try with any other routing protocol to check the delivery time of critical data. |
| 3. | Zone-Based Fuzzy Routing For Wbans | Viittala et.al [21] IEEE [2015] | Zone routing protocol (ZRP) | Fuzzy logic | Focus on detailing membership functions for FLC and analyzing and simulating the performance of the protocol. |
| 4 | Routing of guaranteed throughput traffic in a network-on-chip | Pierre G. Jansen et.al[16] EEMCS | Extra distance | Time-Division Multiple-Access (TDMA) | simple routing algorithm but more complex and clever mapping functions that keep the traffic local |

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 10, October 2017

## III. IDENTIFIED PROBLEM FROM EXISTING SYSTEM

In the olden system WBANs is used for transferring of data in the field of healthcare applications. As it deals with real-time medical information gathering obtained from different sensors with secure data communication and low power consumption.

During transformation of data from sensor nodes, some problems are sorted out in this existing system

- Packets dropping
- Residual energy consumption

These identified problems are solved with the help of implementing a new algorithm named EUROTA (Enhanced Unwavering Routing for Optimized Throughput Algorithm) for WBANs in the proposed thesis work.

## IV. PROPOSED WORK: WIRELESS BODY AREA NETWORKS AND EUROTA FRAMEWORK

The EUROTA_WBAN algorithm involves in few processes to overcome the problems which are been identified in the existing work. So here for each and every parameter initialization we are also initializing (giving the ranges) the minimum energy consumption by increasing the transformation speed. Throughput is maximized for the purpose of avoiding the dropping of data.

### A. FACTORS TO BE CONSIDERED IN WBAN

Network lifetime is a dreary task due to the low energy and to make such networks energy proficient, routing protocol is chosen very carefully. Such routing algorithm is proposed in this work. This segment presents the proposed routing algorithm in which data of all nodes are transmitted to the destination. The destination node is understood to be enriched with energy and not to have energy limitation.

To send out data to the destination node this algorithm deploys the most feasible routing scenario depending upon the location and the residual energy details about each node. This algorithm has considered the neighbour count and node intensity along with the remaining energy and the distance parameters for routing in WBAN. These two parameters help in achieving maximum network lifetime when compared with the existing algorithms and curtail energy utilization in the WBAN as given in figure 1.

### B. PHASES OF THE EUROTA

Parameter settings in EUROTA are performed in the initial parameter settings phase. The functionality and processing of the algorithm are defined in the execution phase.

Initial Parameter Settings Phase:

Initial parameter setting of the algorithm is done as follows:

1. Number of nodes are counted before the cluster formation
2. The sensitivity of the node is determined in order to make the significance of the node

Communication count defines how many nodes' data can be passed up by a single node. A threshold is defined which sets a higher limit for the CommCount variable.

### C. EXECUTION PHASE

The commencement of the process is done with the fixed position of the sensor nodes in WBAN. One among them is selected as the destination node to which data of all other nodes, amassed by sensing within their coverage proximity are transmitted.

Nodes within exposure range of the destination send out data using the single hop transmission method. However, nodes which transmit outside the exposure range of the destination node adopt multi hop transmission method.

To address with the multi hop transmission, data from the source node to the destination node are send out via multiple next hops. In subsequent hop, neighbour list of the current node is generated. The neighbour list endow with the names of all nodes within the coverage range of the current node. One node among the nodes of the neighbour list is chosen as next hop.

The next hop selection is act upon in two steps.

Step 1: Compare the distance of the next hop to destination. It must be lower than the current nodes distance. The energy level of the next hop must be higher than the threshold.

Step 2: Step 1 condition has to be fulfilled. Examine the parameters: remaining energy of a node, coverage distance, communication count and node sensitivity. When all these conditions are contented, then this node is set as next hop and is supplementary to the path from source sensor node to the destination is accomplish.

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 10, October 2017

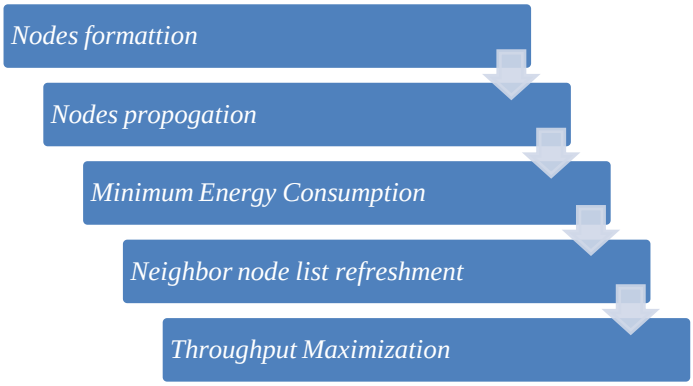


Figure 1: EUROTA Workflow

Given the present situation, the aim of this work is to design a protocol 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.

EUROTA deploys a hierarchical, multihop method which instigates the clustering in the routing. This algorithm considers two primary aspects: energy-awareness and node coverage preservation mechanisms. It utilizes the metrics of the link credit (LD) and signal strength (SS) to assess the node in-between distance.

The method deploys the cluster based routing for the WBAN routing. The cluster will have the Cluster Head (CH), Cluster Nodes (C1,C2,…Cn), Cluster Message Agent (CMA) and Base Station (BS). The selection of CH can be done dynamically based on the minimal nearest distance and maximum residual energy which enhances the node lifetime. The proposed EUROTA algorithm is implemented with MATLAB.

The power consumption is tested for the comparison. Dead and alive nodes are also compared for determining the performance. Number of packets sent to the sink, packets dropped, residual energy, and path loss are monitored and compared. Finally delay factor is instigated for the performance determination.

## V. EUROTA ALGORITHM IMPLEMENTATION

A. Algorithm for EUROTA_WBAN

Let N is the set of nodes, f is the forwarder node and sink S

Function: Propagation (N, S, D)

For i=1 to N

{

Nodes(i). Position=AreaPos(x, y)

Nodes(i). Type = (Info or Video)

Nodes(i). Energy=1J

Nodes(i). CommCount=0;

}

Set PTR=SrcWhile PTR! = D do

Set C, capacity of the wireless link

B. Parameter for Minimum Energy Consumption

The data generated by sensors is denoted by $d_{is}$

$$X_{con_{source}} = \{ \text{Value}_{0 \text{ otherwise}}^{1 \text{ if the sensor can establish link with the destination}}$$

$$X_{con_{sink}} = \{ \text{Value}_{0 \text{ otherwise}}^{1 \text{ if the sensor can establish link with the sink}}$$

$$\text{Min} \sum_{con_{source} \in N} E_{final}(i) = \sum_{con_{source}, con_{sink} \in N} E_{con_{source}} + E_{con_{sink}}$$

C. Parameter for Throughput Maximization

$$\text{Max} \sum_{con_{sink} \in N} dist^{t}_{con_{source}}$$

Refresh and Generate the Neighbor node list for PTR called NODELIST

Set PTRNXT = NODELIST (1)

UGC Approved Journal
IARJSET
ISSN (Online) 2393-8021
ISSN (Print) 2394-1588
International Advanced Research Journal in Science, Engineering and Technology
ISO 3297:2007 Certified
Vol. 4, Issue 10, October 2017

For i=1 to NODELIST. Length
{
If (N(i).Energy>Threshold And DIST(i, D)<Dist(PTR, D))
{
{
Set PTRNXT=i;
}
Else If (NODELIST(i).Energy>N(PTRNXT).Energy and NODELIST(i).Type=Data and NODELIST(i). DIST<Sensing Range)
{
Set PTRNXT=i;
}
Else If (NODELIST(i).CommCount<Threshold and NODELIST(i).Type=Data and NODELIST(i). Distance<Sensing Range)
{
Set PTRNXT=i;
}
}
}
Nodes (PTRNXT). Energy= Nodes (PTRNXT). Energy-ForwardingEnergy;
Path. Add (PTRNXT)
Nodes (PTRNXT). CommCount= Nodes (PTRNXT). CommCount+1
Set PTR= PTRNXT

As point out earlier, wireless communication is the foremost consumer of battery power in WBANs. So, in order to widen the battery life and condense the frequency of replacing the battery, power spent in send out data from the sensor nodes to the Access Point (AP) should be curtailed. A proficient routing protocol which boosts battery life is critical to diminish the protection requirements coupled with recharging batteries.

## VI. RESULT AND DISCUSSION

### A. FINDINGS AND DISCUSSION

The EUROTA algorithm is implemented in the MATLAB subsequently presented and discussion is done in previous section. The key finding in each phase has been highlighted in this section.

Phase 1

- Sink broadcasts its location with short information packet.
- Sensor nodes hoard the location of sink.
- Each sensor broadcast short information packet to sink which contains node_ID .
- Sink propagates information to all sensors.

Phase 2

- Minimum cost function value is worn to pick finest data forwarder.
- A node with lofty residual energy and fewer distance to sink has minimum cost function

Cost Function (i) = distance (i) /Residual Energy (i)

- Cost function value makes certain new forwarder in each round.

Phase 3

- Forwarder node consigns TDMA agenda to its children node.
- Children nodes transmit their data in owed time slot.
- TDMA scheduling put aside energy of sensor nodes.

Thus in each phase the main aspects are happening as afore mentioned. The important factors which have been influenced with the EUROTA are network lifetime, residual energy and path loss.

### B. SIGNIFICANT ASPECTS OF THE EUROTA

Factor 1: Network lifetime

- Increase in immovability period due to apposite selection of forwarder node in each round
- Balanced energy consumption amid all nodes in stable region

Factor 2: Residual Energy

- Nodes exploit less energy in solidity period
- Nodes devour energy more rapidly in unstable region

Factor 3: Throughput

- Throughput is the number of packets received productively at sink

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 10, October 2017

- More alive nodes have a say towards higher network throughput

Factor 4: Path loss

- Multi-hop topology curtail the Path loss
- Direct distant communication grounds maximum path loss

This research has offered an algorithm EUROTA, which will perform routing effectively and efficiently than existing routing protocols in wireless body area networks (WBANs) with limited energy nodes. The proficient points regarding EUROTA are:

- EUROTA is a Stable and high throughput routing protocol for WBANs
- A node with lowest amount cost function is selected as forwarder.
- Cost function is opted on residual energy of nodes and its distance from sink.

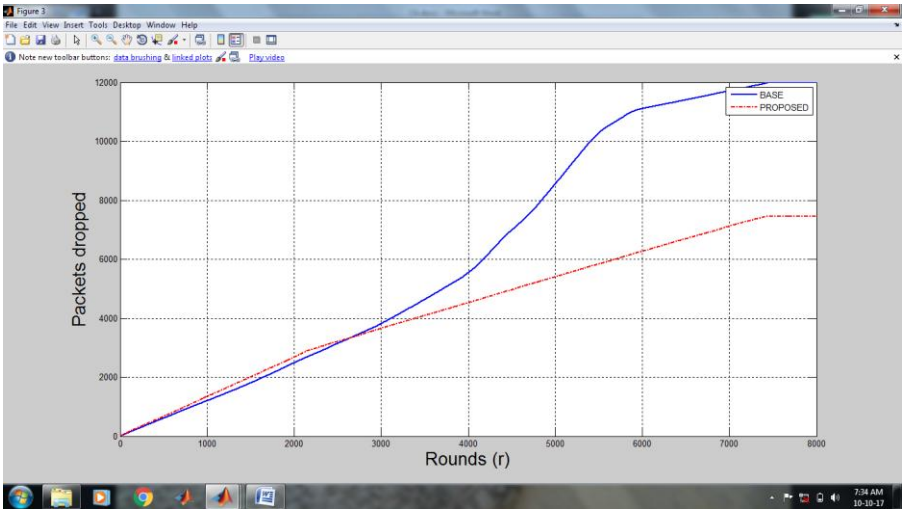


Figure 2: Packets Dropping

In the existing system one of the main problems identified is packet dropping. Due to the problem of packet dropping as it is high, it may lead us to loss important data collected from human body. As the data collected from human body are much more important for giving treatment. If main data collected are not received properly. So by implementing EUROTA algorithm packet dropping is decreased is denoted in the figure 2.

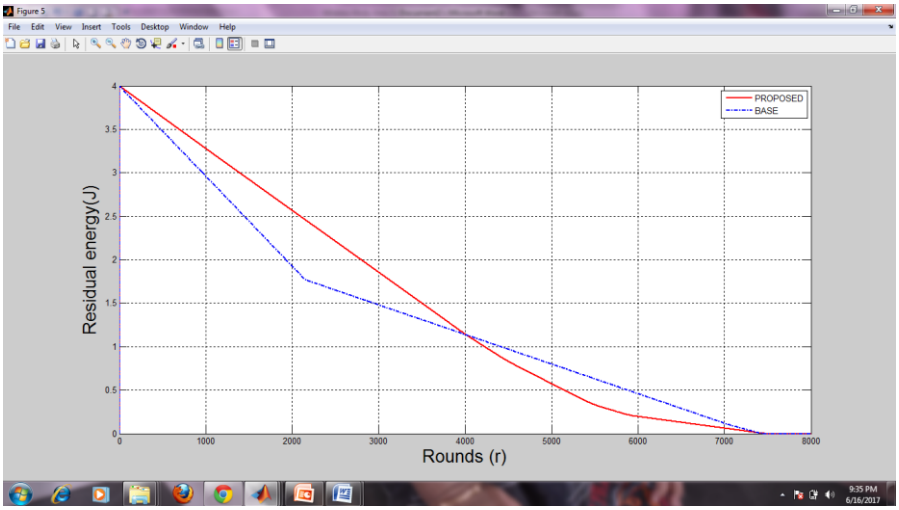


Figure 3: Residual Energy

In the existing system another one of the main problems identified is residual energy. Due to the problem of residual energy as it is high, it may lead us to loss of more power consumption. While collecting of data collected from human body huge energy may be wasted. So by implementing EUROTA algorithm packet dropping is decreased is denoted in the figure 3.

In the existing system another main problems identified is path loss. Due to the problem of path loss as it is high, it may lead us to loss important data collected from human body no to be received properly to the machine.

UGC Approved Journal

IARJSET

ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified

Vol. 4, Issue 10, October 2017

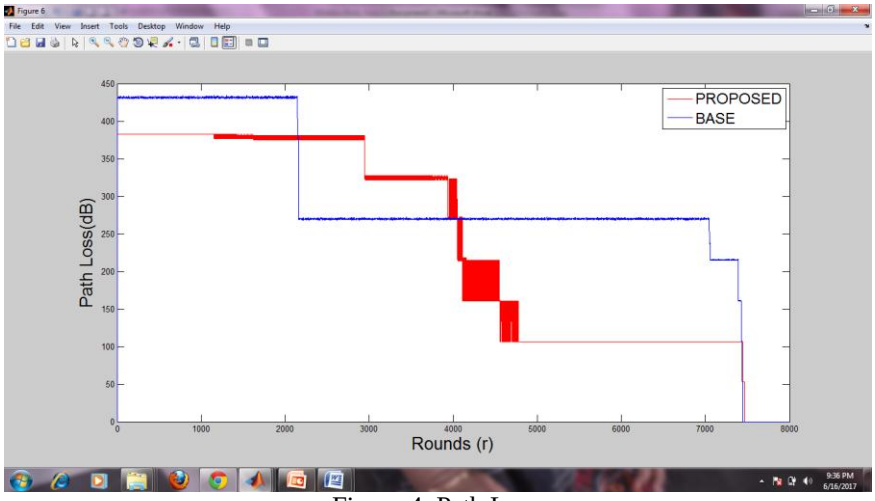


Figure 4: Path Loss

As the data collected from human body are much more important for giving treatment. If main data collected are not received properly perfect treatment cannot be given to the patients. So by implementing EUROTA algorithm path loss is decreased is denoted in the figure 4.

## VIII. CONCLUSION

Given the present situation, the aim of this work is to design a protocol 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. The proposed protocol makes optimal use of the network energy and increases the network lifetime. EUROTA is deploys a hierarchical, multihop method which instigates the clustering in the routing. This algorithm considers two primary aspects: energy-awareness and node coverage preservation mechanisms. It utilizes the metrics of the link credit (LD) and signal strength (SS) to assess the node in-between distance.

## IX. FUTURE WORK

Future work in WBAN for healthcare applications embrace gathering all the features previously notorious into a single protocol stack, thus allowing for noteworthy improvement of this type of network for use in real environments.
A future modification could employ the capacity of actual battery level status. This would be constructive when dealing with diverse platforms with dissimilar battery sizes and various power harvesting methods. Another future amendment would include the combination of the actual power harvesting board in the investigational setup.

## REFERENCES

[1] Harun Al Rasyid, M. Udin, Bih-Hwang Lee, and Amang Sudarsono. "Wireless body area network for monitoring body temperature, heart beat and oxygen in blood." In Intelligent Technology and Its Applications (ISITIA), 2015 International Seminar on, pp. 95-98. IEEE, 2015.
[2] Ambigavathi, M., and D. Sridharan. "Priority based AODV routing protocol for critical data in Wireless Body Area Network." In Signal Processing, Communication and Networking (ICSCN), 2015 3rd International Conference on, pp. 1-5. IEEE, 2015.
[3] Yan, Sen, Ping Jack Soh, and Guy AE Vandenbosch. "Wearable Dual-Band Magneto-Electric Dipole Antenna for WBAN/WLAN Applications." Antennas and Propagation, IEEE Transactions on 63, no. 9 (2015): 4165-4169.
[4] Rahman, Abdul Fuad Abdul, Rabiah Ahmad, and Sofia Najwa Ramli. "Forensics readiness for wireless body area network (WBAN) system." In Advanced Communication Technology (ICACT), 2014 16th International Conference on, pp. 177-180. IEEE, 2014.
[5] Froehle, Patrick, Tyler Przybylski, Christopher McDonald, Milad Mirzaee, Sima Noghanian, and Reza Fazel-Rezai. "Flexible Antenna for Wireless Body Area Network." In Antennas and Propagation & USNC/URSI National Radio Science Meeting, 2015 IEEE International Symposium on, pp. 1214-1215. IEEE, 2015.
[6] Gambhir, Sapna, Vrisha Tickoo, and Madhumita Kathuria. "Priority based congestion control in WBAN." In Contemporary Computing (IC3), 2015 Eighth International Conference on, pp. 428-433. IEEE, 2015.
[7] Ansari, Abdul Rahim, and Sunghyun Cho. "Human body: The future communication channel for WBAN." In Consumer Electronics (ISCE 2014), The 18th IEEE International Symposium on, pp. 1-3. IEEE, 2014.
[8] Pathak, Shashwat, Mayur Kumar, Amrita Mohan, and Basant Kumar. "Energy Optimization of ZigBee Based WBAN for Patient Monitoring." Procedia Computer Science 70 (2015): 414-420.
[9] Pereira, António, Nelson Nunes, Daniel Vieira, Nuno Costa, Hugo Fernandes, and João Barroso. "Blind Guide: An Ultrasound Sensor-based Body Area Network for Guiding Blind People." Procedia Computer Science 67 (2015): 403-408.
[10] Sangari, A. Siva, and J. Martin Leo. "Polynomial based light weight security in wireless body area network." In Intelligent Systems and Control (ISCO), 2015 IEEE 9th International Conference on, pp. 1-5. IEEE, 2015.