INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume3, Issue3)
Available online at www.ijariit.com

A Hop To Hop Energy Efficient Transmission for WBAN (Wireless Body Area Network)

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***Abstract**: It is a familiar fact that conservation and preservation of network energy is one of the primary objectives of the sensor nodes in a wireless sensor network. This becomes even more important when we are talking about Wireless Body Area Network (WBAN). In this case, the sensor nodes are working either very close to or inside a human body. Hence performance is a very important task here. In this project, we aim to reduce the consumption of energy while a transmission is made. We tend to strategically toggle between working/non-working status of a sensor node while it is being involved or not involved in the transmission process. This was, we are able to increase the network time by a very good amount. Other deceptive parameters are also to be calculated.*

With the advancement in technology, we now have access to the wearable physiological monitoring system. In this concept, an individual will wear a fabric in which a collection of sensors will be embedded. All these sensors will be connected to a central monitoring system. Sensors will continuously send data to these central monitoring systems. Hence, wireless sensors are now being used as wearable gadgets. But the limitation here is that they have very limited amount of energy. And when it comes in medical terms, every fault in an instrument can be a factor in determining the cause of a healthy life or an unnoticed illness. Hence, it becomes very important to work on these sensors and give them a long lifetime so that their monitoring does not get affected. There are many ways we can achieve this. Good amount of research has been done in this domain.

We here are working on an algorithm in which a sensor node will be strategically switched on and off based upon its usage. This way, only the appropriate amount of energy will be used by the sensor and overall energy of the complete system or network will be preserved to a larger extent.

Keywords: WBAN, Transfer information, Duty Cycle.

I.INTRODUCTION

Wireless body area networks (WBANs) are emerging as one of the newest forms of Wireless Sensor Networks. In WBANs, sensor nodes accumulate human physiological data and transmit it to the sink node. However, transmission of physiological data to the sink node over a mobile route becomes a very daunting task for sensors due to their limited battery power. Moreover, replacement of critical sensor nodes is a major challenge in such scenarios. In order to increase network lifetime, some routing protocols have been proposed in the literature, but the majority of them are focused on coverage distance and residual energy of sensor nodes. In this work, we will propose an energy efficient routing algorithm for WBANs.

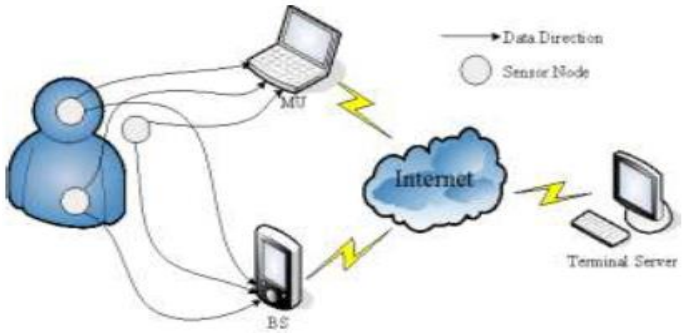

Figure 1: Example of Wireless Body Area Network

Wireless Body Area Network (WBAN) is emerging as one of the most advanced communication networks.WBANs serve a variety of applications including healthcare, personal entertainment, advance sports training, live events, aviation, natural disasters, consumer electronic devices, etc. Sensors in WBANs measure physiological parameters of human body, such as sugar

level, temperature, heartbeat, etc., and forward it to the concerned authorities using an intranet/internet facility. This kind of continuous monitoring is especially important in critical circumstances such as workers in coal mines and patients with serious medical conditions.

II.SHORTEST PATH TECHNIQUE

In graph theory, the shortest path problem is the problem of finding a path between two vertices (or nodes) in a graph such that the sum of the weights of its constituent edges is minimized. The problem of finding the shortest path between two intersections on a road map (the graph's vertices correspond to intersections and the edges correspond to road segments, each weighted by the length of its road segment) may be modeled by a special case of the shortest path problem in graphs.

A.Dijkastra's Algorithm

Dijkstra's algorithm is an algorithm for finding the shortest paths between nodes in a graph, which may represent, for example, road networks.

The algorithm exists in many variants; Dijkstra's original variant found the shortest path between two nodes, but a more common variant fixes a single node as the "source" node and finds shortest paths from the source to all other nodes in the graph, producing a shortest-path tree.

For a given source node in the graph, the algorithm finds the shortest path between that node and every other. It can also be used for finding the shortest paths from a single node to a single destination node by stopping the algorithm once the shortest path to the destination node has been determined. For example, if the nodes of the graph represent cities and edge path costs represent driving distances between pairs of cities connected by a direct road, Dijkstra's algorithm can be used to find the shortest route between one city and all other cities. As a result, the shortest path algorithm is widely used in network routing protocols, most notably IS-IS and Open Shortest Path First (OSPF). It is also employed as a subroutine in other algorithms such as Johnson's.

III. DUTY CYCLE

A duty cycle is the fraction of one period in which a signal or system is active. Duty cycle is commonly expressed as a percentage or a ratio. A period is the time it takes for a signal to complete an on-and-off cycle. As a formula, a duty cycle (%) may be expressed as:

$$D = \frac{PW}{T} \times 100\% \qquad D = \frac{PW}{T}$$

Equally, a duty cycle (ratio) may be expressed as:

Where D is the duty cycle, PW is the pulse width (pulse active time), and T is the total period of the signal. Thus, a 60% duty cycle means the signal is on 60% of the time but off 40% of the time. The "on time" for a 60% duty cycle could be a fraction of a second, a day, or even a week, depending on the length of the period.

Duty cycles can be used to describe the percent time of an active signal in an electrical device such as the power switch in a switching power supply or the firing of action potentials by a living system such as a neuron. The duty factor for periodic signal expresses the same notion, but is usually scaled to a maximum of one rather than 100%.

IV. PREVIOUS METHOD SOLUTION

Figure 2 is showing about the time, time about transmission and actual time. Transmission time is tells, what time is consume while the data is transfer between the sender or receiver. And actual time is the fix time that is set by the user

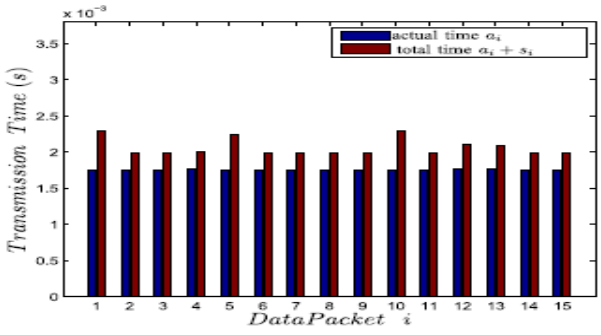

Figure 2 Transmission time and actual time

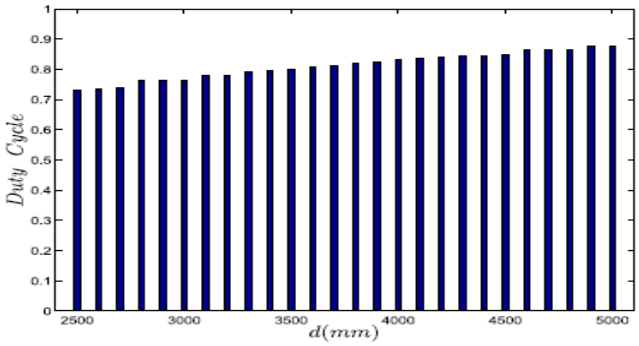

Figure 3 Duty cycle over the different transmission

Figure 3 is showing the duty cycle over the different transmission. Data is transferring over the different –different distance and with different duty cycle. This figure is showing the duty cycle Duty cycle is all about time period and work period that is handling by the system. It tells about period is taking more energy to transferring the data and also tells how many energy will save with transferring the data.

TABLE I
Performance of energy consumption over the different transmission

Serial Number	Distance over transmission	Energy saving
1	2500	60.81%
2	3000	32.59%
3	3500	16.98%
4	4000	8.44%
5	4500	4.01%
6	5000	1.57%

This table I is showing the pervious result of base paper .it is clearly shows the, what energy is saving during the performance. The maximum energy is saved by the pervious paper is 60.81% over the distance 2500.

V. METHODOLOGY

Step1: We start with selecting total number of nodes to be deployed in a given area
Step2: Nodes are deployed randomly in a given area
Step3: We then select a sender and a receiver for information transfer
Step4: Information start from the sender towards the receiver, through the shortest path formation
Step5: Information transfer occurs using a hop by hop mechanism
Step6: Every node will switch on only the next node which lies in the route
Step7: This way, only the concerned nodes will be used while complete transfer
Step8: Hence, energy could be consumed with strategically switching the nodes on and off

VI. RESULT AND DISCUSSION OF CURRENT WORK

We are showing the result through the bar graph and line graph .These graphs are showing the better result that how to produce energy and how many energy is consumed when information is passing through the send and receiver. These graphs are showing below:

Figure 4. Is showing the shortest path over the transmission. This result obtained by the algorithm i.e. we used to improve the efficiency of energy. Dijkastra's algorithm is a part of shortest path technique. By using this algorithm data is transfer with in less time over the the few nodes with shortest to shortest path.

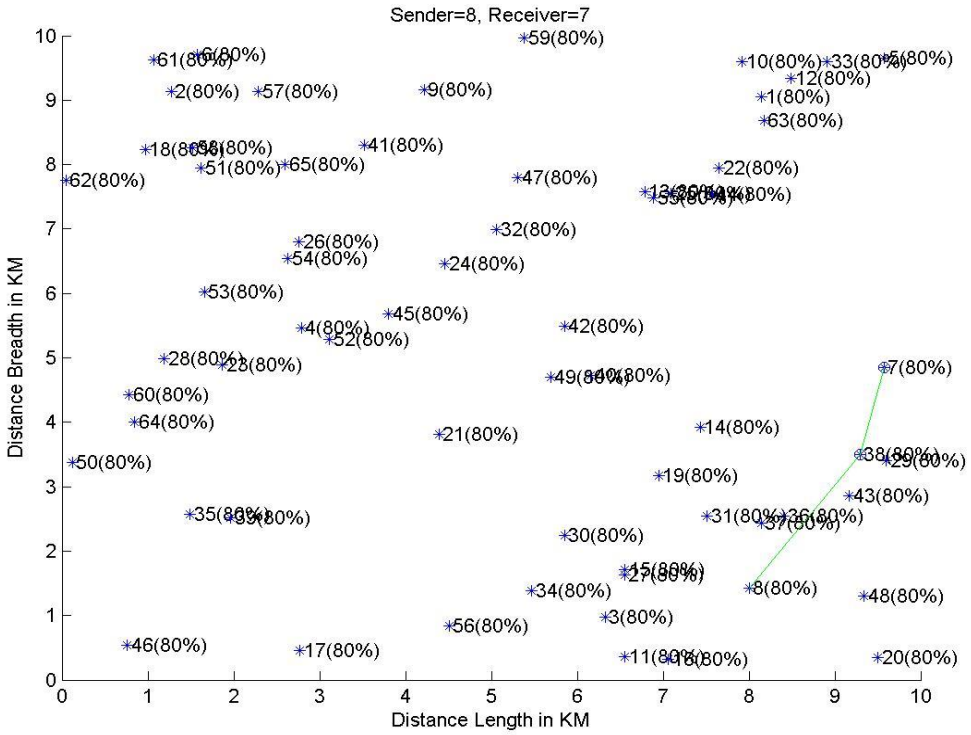

Figure 4 Shortest path over the transmission

TABLE II
Transmission over the shortest path

Sender nodes	Receiver nodes	Total nodes of path	Total data transfer
1	1	3	80%

This Table is showing, how much data is transferring using the algorithm.

Now the figure no.5 shows the total energy in the network and what amount energy in consume over the transmission and how many energy is saved. This is showing clearly in the table. It shows the how much energy is consumed with according to the nodes. The white are tell the consumed energy and the blue are is tell the how many energy is saved. This factor is clearly shows the, where the nodes are working, then energy is consumed, and if the nodes are not used by the sensors then energy will saved.

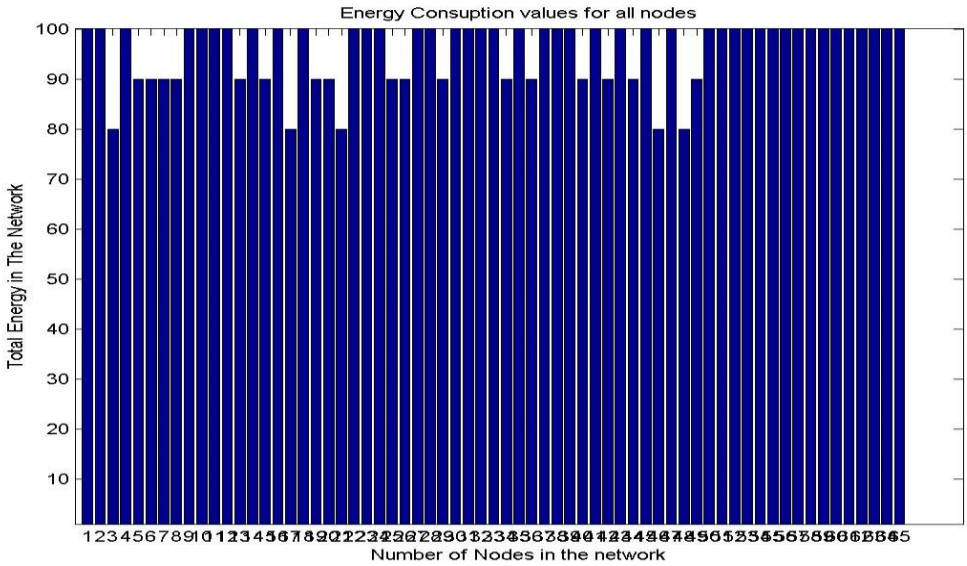

Figure 5 Energy Consumption

TABLE III
Energy Efficiency over the Transmission

Actual Energy	Energy Consumed by nodes over transmission	Total energy saved over transmission
100%	10%	90%
100%	20%	80%

VII. CONCLUSION AND FUTURE SCOPE

We discussed about various techniques used by different authors for Energy Efficient Transmission Approach for WBAN. And achieve the shortest transmission distance between sender and receiver, we can assume a network where one or multiple nodes are movable. In that case, due to continuous routing, energy conservation could be difficult. So we can try to work around this problem where strategically turn the network nodes on and off based upon the network and routing requirements also calculate performance of energy consumption.

For future work, we can consider a network where 1 or multiple nodes are mobile. In that case, due to continuous routing, energy conservation could be difficult. So we can try to work around this problem where the sink, source or multiple nodes are continuously moving.

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