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Coordinator position of Body node Algorithm intended for Wireless Body Area Networks

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Abstract *– This paper motivated us to work on an efficient node placement strategy for a BNC, within a WBAN; and therefore we propose 3 different BNC placement algorithms considering different options of available energy efficient routing protocols during a WBAN. In a WBAN, network longevity is a major challenge due to the limitation of the availability of energy supply in body nodes. Therefore, routing protocols can play a key role towards making such networks energy efficient. In this work, we exhibit that a routing protocol together with an effective body node coordinator (BNC) deployment strategy can influence the network lifetime eminently. Due to advancement in the telecommunication, wireless communication, wireless sensors, and other technologies a new field of research has been evolved and this area of research is termed as Wireless Body Area Networks.*

Keywords*: Body area network (BAN), body node coordinator (BNC) deployment, energy efficiency, human body, IEEE 802.15.6, Internet of Things (IoT), node deployment, wireless body area network (WBAN).*

I. Introduction

Due too many recent technological advances and new ideas, like wireless body area networks (WBANs) and low-power wireless communications, pervasive health monitoring and management services have become increasingly popular. However, efficient management of the big range of monitored information collected from numerous WBANs is a vital issue for their large-scale adoption in pervasive health care services. Since WBANs have limited memory, energy, computation, and communication capabilities, they need a powerful and scalable high-performance computing and large storage infrastructure for real-time processing and information storage, further as for online and offline information analysis.[3]

Wireless body area networks (WBAN) give an incredible chance for remote health observance. However, engineering WBAN health observance systems encounters variety of challenges as well as efficient WBAN observance information extraction, dynamically fine tuning the monitoring method to suit the quality of information, and to permit the translation of high-level necessities of medical officers to low-level sensor reconfiguration.[4].

A Body area Network is formally outlined by IEEE 802.15 as “a communication standard optimized for low power devices and operation on, in or round the physical body (but not restricted to humans) to serve a range of applications as well as medical, consumer electronics/personal entertainment and others” [6]. A WBAN connects freelance sensor nodes, known as body node (BN), by using a central controller, known as Body Node coordinator (BNC). the basic conception of WBAN is to continuously monitor a patient’s different bio-signals like EEG, ECG, blood pressure, sugar level, heart beat rate, body temperature by using sensors, placed at totally different elements of the human body, and provides an efficient mean of communication among body nodes (BNs) with the outside world. [6]

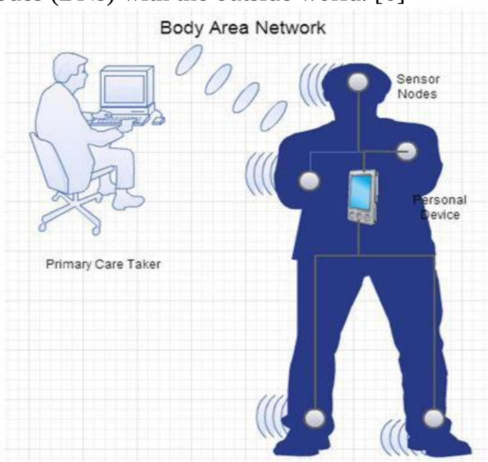

Fig.1.Body Area Networks

Body Area Networks(BAN) is a network of miniaturized sensors and actuators which are low in cost,

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intelligent and can be placed on or implanted in-body(or even in blood stream) to get timely feedback for health monitoring, and for other applications[1]. BAN is composed of number of wireless nodes varies as per the required application. Nodes are the building blocks of WBAN, these heterogeneous nodes communicate with each other using different technologies like Bluetooth, Wi-Fi, ZigBee. Several nodes consist of different components: hardware unit, a processor unit, transmitter, transceiver, memory and battery. Nodes differ from each other according to their functionality or role in the networks. On a broad basis, these can be categorized as sensors, actuators and personal device as demonstrated in figure 1.1.

II. Theory

II.1. History of BAN

In the 90's , different groups at MIT (Massachusetts Institute of Technology) start working on wireless personal area network (WPAN) with the aim to communicate between various information devices which are attached to human body either on the body or implanted [3].These groups were intended to use electrostatic field communication technology for data communication and processing. In 2001, Zimmerman [4] presented how electronic devices implanted or on the body can communicate with each other using capacitive coupling picoamp currents. PAN standards do not satisfy the medical requirements for BAN. So, to overcome the shortcomings of IEEE 802.15.1 and 802.15.4, a committee was established in January 2006 named as Wireless Next Generation (WNG) which focuses on new topics on wireless technologies. Later on, IG-WBAN (interest group) was established in May 2006, which was approved as SG-WBAN, a study group. This study group was further certified as TG6 (Task group) in January 2008 under 802.15.In May 2008, all submitted applications to TG6 was compiled into a single document and a draft for BAN was approved in December 2011.

II.2. Architecture of Body Area Networks

Leave Body Area Networks nodes communicate with each other through a number of wireless technologies like Zigbee, Bluetooth etc.

The architecture of BAN is divided into three tiers which consist of intra-body, inter-body and beyond WBAN communication. This system is composed of personal server and medical server. Different temperature sensors, electrochemical sensors, motion sensors, bioelectrical sensors collects data as per different parameters and sends it using some wireless technology to the personal device which act as a coordinator node. Then, through wireless communication, this health related collected data is sent to the medical server, which is controlled by a medical operator. The architecture of Body Area Networks is divided into three tiers as demonstrated in figure 1.2.

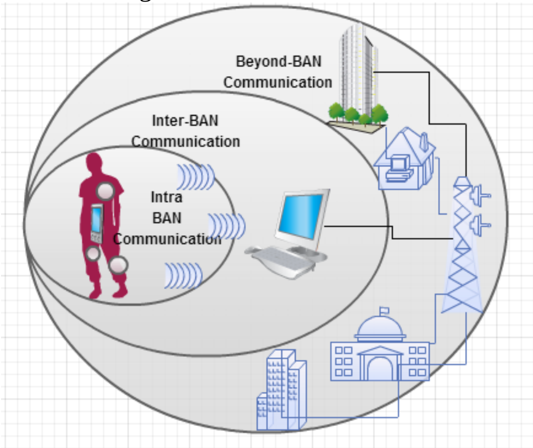

Fig.2 Architecture of Body Area Networks

III. Method

III.1. Body node coordinator (BNC) deployment

The nodes ought to be placed effectively in WBANs should possess the subsequent characteristics:

• Message exchange and computational complexity should be least as possible.

• The entire operation should be centralized one.

• Sensor nodes should involve less in- order to form the network energy efficient.

Most of the techniques usually need large amount of procedure support at the BNC. Heavy computation implies that the massive processing is processed in BNC. This information is gotten by existing node of the network. This expands the radio communication between a BNC and nodes that in turn depletes the energy of nodes. Therefore, network life decreases because of additional energy consumption and complexity in computation.

Modified Position-aware BNC coordinator placement algorithmic rule is possible only if the routing protocols knows the spatial data of the nodes. Since spatial data of the nodes is taken for the issues there's no got to determine the relative distance. Modified Position aware BNC Placement algorithmic rule (MPBP) involves low complexion compared to different node placement algorithms. The sole drawback is that it holds linear computational complexity. And additionally it takes into the account of the spatial coordinate location rather than considering their respective relative transmission distance with respect to BNC. Following are the issues made for the algorithm:

• All the nodes during a WBAN ought to be within the transmission vary of the BNC. The BNC should have the details about the spatial data of all the neighbor nodes within the network.

• In MPBP, the BNC should be placed within the network. Step by step details relating to the algorithmic rule.

- BNC computes the relative communication distances of nodes within the network that mainly considers their spatial coordinates.
- Relative communication distances (dr) and Utility factor (U) of all the nodes within the WBAN is computed by considering their respective available energy (E).
- BNC computes the maximum utility issue from the available UFs (1) that is calculated within the previous step.
- Body Node coordinator determines the most value of the Utility factor "u" from the offered ones so it normalizes the Utility factor "u" of every node with respect to the most value, that obtains χ. Therefore, each node has its own χ.
- At last, every and each node within the WBAN and multiply their own χ with their several coordinates and divides the resultant value with the entire number of nodes within the WBAN.

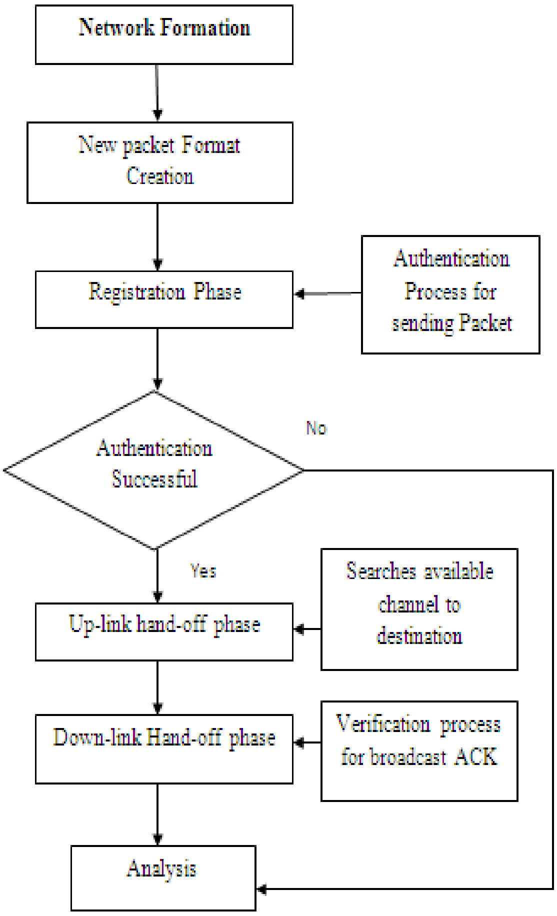

Fig.3 Flow diagram of proposed system

IV. Result

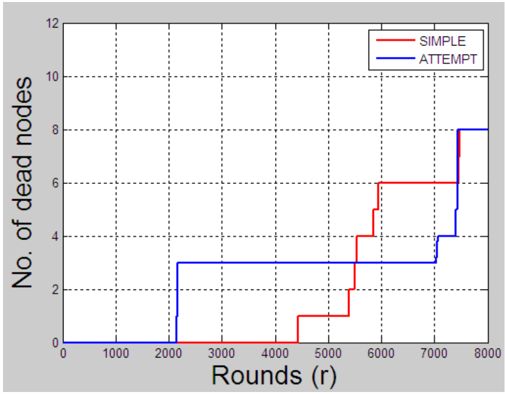

Fig.4 graph of no. of nodes v/s rounds

Figure 4 represents the graph of dead node of the network with the no. of round taken by node, it shows comparison between simple and attempt technique

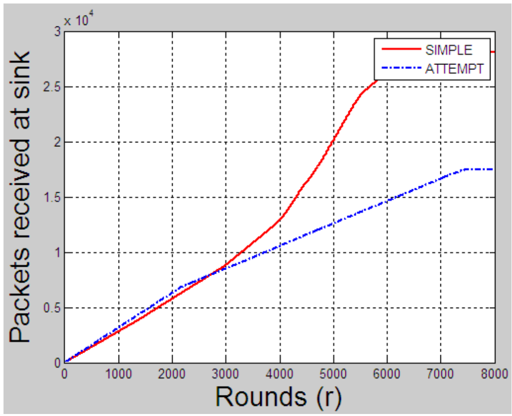

Fig.5 graph of packets received at sink v/s rounds

Figure5 represents the graph of packet received at sink of the network with the no. of round taken by node, it shows comparison between simple and attempt technique

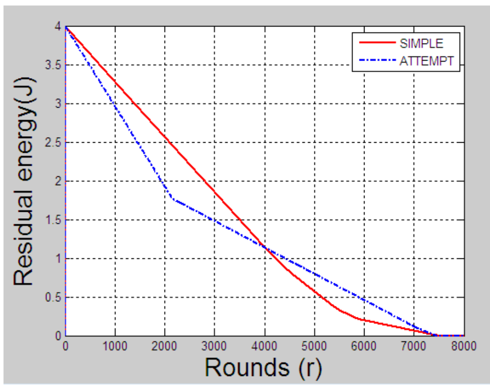

Fig.6 graph of residual energy v/s rounds

Figure6 represents the graph of residual energy of the network with the no. of round taken by node, it shows comparison between simple and attempt technique.

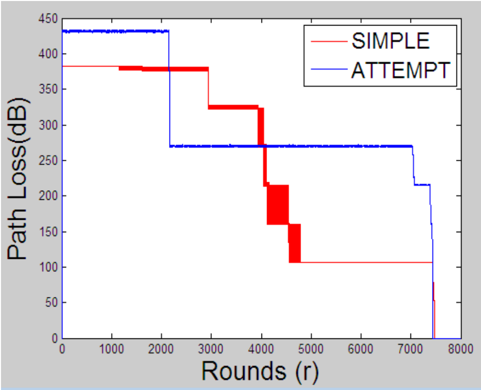

Fig.7 graph of path loss v/s rounds

Figure7 represents the graph of path loss of node in the network with the no. of round taken by node, it shows comparison between simple and attempt technique.

V. Conclusion

This proposed work has presented an algorithm which will perform routing more effectively than existing routing protocols in wireless body area networks (WBANs) with limited energy nodes. In this proposed algorithm, four attributes coverage distance, residual energy, communication count and node criticality are taken into account for energy efficient routing in WBAN. Node criticality and communication count parameters emphasize on reducing the burden on highly critical nodes and try to balance energy consumption evenly on all the nodes. This will largely lower the energy consumption and enhance the working lifetime of the network. The proposed algorithm appears to be a novel algorithm among existing algorithms. In this work, to provide an efficient energy to the node and also to improve the network lifetime, various techniques have been discussed. The various techniques such as HEED,BNC placement algorithms includes Distance Aware BNC Placement Algorithm-Iterative, Distance Aware BNC Placement Algorithm-Fixed and Position Aware BNC Placement Algorithm has improved the network lifetime efficiently with less computational processing rather than the node placement algorithms of Wireless sensor network.

References

[1] ul Huque, Md Tanvir Ishtaique, Kumudu S. Munasinghe, and Abbas Jamalipour. "Body node coordinator placement algorithms for wireless body area networks." IEEE Internet of Things Journal 2.1 (2015): 94-102.

[2] Movassaghi, Samaneh, et al. "Wireless body area networks: A survey." IEEE Communications Surveys & Tutorials 16.3 (2014): 1658-1686.

[3] Wan, Jiafu, et al. "Cloud-enabled wireless body area networks for pervasive healthcare." IEEE Network 27.5 (2013): 56-61.

[4] Ivanov, Stepan, et al. "Virtual groups for patient WBAN monitoring in medical environments." IEEE Transactions on Biomedical Engineering 59.11 (2012): 3238-3246.

[5] Omeni, Okundu, et al. "Energy efficient medium access protocol for wireless medical body area sensor networks." IEEE Transactions on biomedical circuits and systems 2.4 (2008): 251-259.

[6] ul Huque, Md Tanvir Ishtaique, et al. "EAR-BAN: energy efficient adaptive routing in wireless body area networks." Signal Processing and Communication Systems (ICSPCS), 2013 7th International Conference on. IEEE, 2013.

[7] Yoon, Yourim, and Yong-Hyuk Kim. "An efficient genetic algorithm for maximum coverage deployment in wireless sensor networks." IEEE Transactions on Cybernetics 43.5 (2013): 1473-1483.

[8] Song, Yuan, et al. "Distributed algorithms for energy-efficient even self-deployment in mobile sensor networks." IEEE Transactions on Mobile Computing 13.5 (2014): 1035-1047.

[9] Kim, Kihyun, et al. "An efficient routing protocol based on position information in mobile wireless body area sensor networks." Networks and Communications, 2009. NETCOM'09. First International Conference on. IEEE, 2009.

[10] Movassaghi, Samaneh, Mehran Abolhasan, and Justin Lipman. "Energy efficient thermal and power aware (ETPA) routing in body area networks." Personal Indoor and Mobile Radio Communications (PIMRC), 2012 IEEE 23rd International Symposium on. IEEE, 2012.

[11] Khan, Jamil Y., and Mehmet R. Yuce. "Wireless body area network (WBAN) for medical applications." New Developments in Biomedical Engineering. INTECH (2010).

[12] Somasundaram, M., and R. Sivakumar. "Security in wireless body area networks: A survey." 2011 International Conference on Advancements in Information Technology With workshop of ICBMG. Vol. 20. 2011.