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A Review of Body Node Coordinator Placement Algorithms For Wireless Body Area Networks

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Abstract *– A Wireless body area network (WBAN) consists of communication technology, sensors technology like wearable and implantable biosensors, along with recent developments among the embedded computing area are enabling the design, improvement, and implementation of body area networks. 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, reviewed exhibit that a routing protocol together with an effective body node coordinator (BNC) deployment strategy can influence the network lifetime eminently.*

Keywords*: Body area network (BAN), body node coordinator (BNC) deployment, energy efficiency, human body,*

I. Introduction

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

Sensor nodes sense the physical stimuli and responds in the form of digital or analog signals. The purpose of using sensors is to collect and process signals based on different parameters like physiological condition, temperature, blood pressure etc. Different types of commercially available sensors are categorized in table 1 with their functionality.

Collected signals from the sensors are fed to the actuators. Role of actuator is to provide feedback as per the sensor's data. e.g. in automatic drug delivery system actuators automatically pump required dosage in the body after sensing the required level in the patient's body.

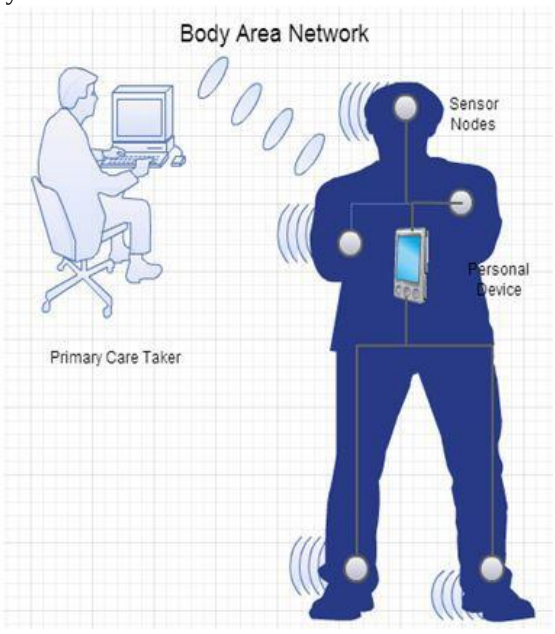

Figure 1 Body Area Networks

One approach toward this is often to enable a lot of efficient monitoring techniques that may give numerous advantages, including:

1) the examination of patients based on their criticality, that successively enhances doctor's time efficiency in examining patients, and lowers queues in emergency rooms, and

2) Correct monitoring of patients conditions and trends over a amount of time.

Wireless body area networks (WBAN) provides a chance to permit monitoring with such capability and high precision.[4]

II. Literature Survey

Md. Tanvir Ishtaique ul Huque et. al [1] illustrated the importance of effective BNC placement inside a WBAN to maximize the network longevity. Besides, to measure the life expectancy of a node, we have shown the lacking in measuring of available metrics and so projected a new metric to satisfy this demand. Supported our projected metric, we have planned 3 totally different algorithms, that are different in their necessities, formations, and lead to totally different level of energy efficient and computationally efficient performances. The simulation results show the consistency of PBP, over DBP-I and DBP-F, in term of energy efficient and computationally efficient performances. In our next step, we'll use specialized software system, Castalia [28], to evaluate the performance of our projected algorithms, in terms of dependability and control message overheads.

Md. Tanvir Ishtaique ul Huque et. al [2] projected a clustering based mostly routing protocol for WBANs, named as EAR-BAN, considering a particular situation wherever a group of sensor nodes are densely placed and maintain a particular distance from BNC. EAR-BAN protocol is an adaptive routing in WBAN that selects the most possible transmission technique for every BN, depending on its spatial info and offered energy. It additionally allows a BN to change from cluster based mostly transmission to either multi hop transmission or direct transmission. so as to evaluate the performance of EAR-BAN, we have thought of each cases once body nodes are uniformly and non-uniformly distributed on physical body. We have additionally shown the optimal position of BNC for the uniformly distributed body nodes and analyzed the effect of cluster size on network life.

Yuan Song et. al [3] studied the problem of energy-efficient even self-deployment in mobile sensor networks. So as to address the problem of energy-efficient deployment, that remains a challenge within the wide used Lloyd's technique, a new algorithmic rule, DEED algorithmic rule, is planned. Simulation results demonstrate that DEED performs well in several situations. Specifically, it results in up to 54 less traveling distance and 46th less energy consumption than Lloyd's technique. As future work, we'll explore even self-deployment of sensors in areas with obstacles.

Kihyun Kim et. al [4] proposes energy efficient location routing protocol in mobile wireless body area sensor networks. That produces limited routing area through the intersection of 2 circles that exist on the segment from node to sink. Intersection areas reduce routing participating nodes and find a route to the sink. Within the result, nodes transmit information to the sink while not flooding. Therefore, the energy consumption of network reduces.

Samaneh Movassaghi et. al [5] provides a unique routing algorithmic rule for Body area Networks supported the definition of a cost perform that considers the nodes energy, temperature and received signal power of adjacent nodes as metrics for calculation of the efficient route with minimum price. Simulations results have shown the planned protocol disperses the temperature rise among all nodes whereas ensuring longer time to energy depletion as opposed to different protocols that lead to temperature spikes at single nodes and short energy depletion times. Moreover, different parameters of the planned protocol in terms of Packet Delivery ratio and Packet Delay have shown to be quite like PRPLC. the average packet hop count of PRPLC is slightly less than ETPA that is suitable because of the main achievements of the projected protocol. The projected routing protocol has shown to possess significantly higher depletion time compared to PRPLC that results in longer lasting communication and efficient usage of scarce resources in BANs.

III. Method

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 2.

III.2 Intra-*BAN Communication Tier-1*

Intra – BAN communication is tier-1 of the generalized architecture which corresponds to a)

Communication between sensor nodes and b) communication between sensor nodes and personal device.

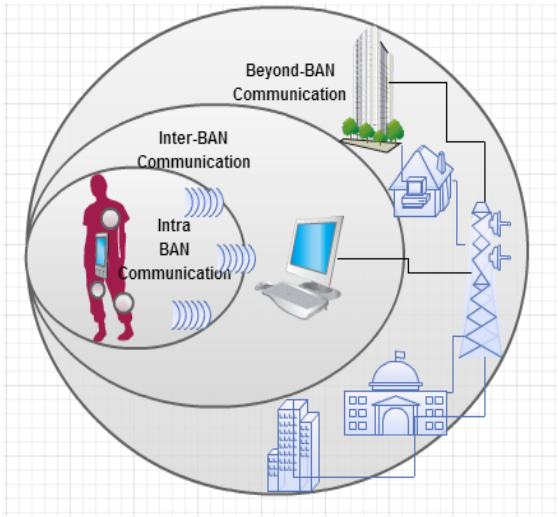

Figure 2 Architecture of Body Area Networks

Intra-BAN Communication is the communication within the tier-1.All the sensor nodes are implanted within the or on the body which collects data and sends it to the personal server within (~2 meters) transmission range. And then through some wireless technology via Wi-Fi, Bluetooth, ZigBee or other, the sampled data is passed to an access point in tier-2. Design of intra-BAN communication is little bit critical. To avoid number of energy and bit rate challenges , these low-battery sensors and PD can be directly connected to access point, wireless, wired or using different technique as per the application[2].

- Wired Connection between sensor and PD
- Direct Communication between sensors and AP(without PD)
- Wireless connection between sensor and PD(uses Star Topology)
- Wired or wireless connection between sensors and central processor:

Central processor further sends data to the personal device. By using central processor in between size of data to be transmitted to the PD is reduced by the central processor.

IV. Conclusion

In this paper review some work related to Body Node Coordinator Placement Algorithms for Wireless Body Area Networks and relevant work. In [1] illustrated the importance of effective BNC placement within a WBAN to maximize the network longevity. Authors proposed three different algorithms, which are different in their requirements, formations, and result in different level of energy efficient and computationally efficient performances. In [2] we have proposed a clustering based routing protocol for WBANs, named as EAR-BAN, considering a particular scenario where a group of sensor nodes are densely placed and maintain a certain distance from BNC.

References

[1] Lokesh Kumar Soni, Arati M. Dixit "Energy Efficient Data Broadcasting in a Body Area Network Middleware for Medical Applications", International Journal of Computer Applications (0975 – 8887) Volume 124 – No.4, August 2015.

[2] Hanson, Mark A., Harry C. Powell Jr, Adam T. Barth, Kyle Ringgenberg, Benton H. Calhoun, James H. Aylor, and John Lach. "Body area sensor networks: Challenges and opportunities." Computer 1 (2009).

[3] Boonma, Pruet, Paskorn Champrasert, and Junichi Suzuki. "Bisnet: A biologically-inspired architecture forwireless sensor networks." In Autonomic and Autonomous Systems, 2006. ICAS'06. 2006 International Conference on, pp. 54-54. IEEE, 2006.

[4] Heinzelman, Wendi B., Amy L. Murphy, Hervaldo S. Carvalho, and Mark Perillo. "Middleware to support sensor network applications." Network, IEEE 18, no. 1 (2004):

[5] Keoh, Sye Loong, Naranker Dulay, Emil Lupu, Kevin Twidle, Alberto E. Schaeffer-Filho, Morris Sloman, Steven Heeps, Stephen Strowes, and Joe Sventek. "Self-managed cell: A middleware for managing body-sensor networks." In Mobile and Ubiquitous Systems: Networking & Services, 2007. MobiQuitous 2007. Fourth Annual International Conference on, pp. 1-5. IEEE, 2007.

[6] Koutsoukos, Xenofon, Manish Kushwaha, Isaac Amundson, Sandeep Neema, and Janos Sztipanovits. "Oasis: A service-oriented architecture for ambient-aware sensor networks." In Composition of Embedded Systems. Scientific and Industrial Issues, pp. 125-149. Springer Berlin Heidelberg, 2008.

[7] Seeger, Christian, Kristof Van Laerhoven, And Alejandro Buchmann. "Myheal thassistant: An Event-Driven Middleware For Multiple Medical Applications On A Smartphone-Mediated Body Sensor Network." Biomedical And Health Informatics, Ieee Journal Of 19, No. 2 (2015).

[8] Kim, Yung Bok, Marie Kim, And Yong Joon Lee. "Cosmos: A Middleware Platform For Sensor Networks And A U-Healthcare Service." In Proceedings Of The 2008 Acm Symposium On Applied Computing, Pp. 512-513. Acm, 2008.

[9] Liu, Ting, and Margaret Martonosi. "Impala: A middleware system for managing autonomic, parallel sensor systems." In ACM SIGPLAN Notices, vol. 38, no. 10, pp. 107-118. ACM, 2003.

[10] Wolf, Peter, Andreas Schmidt, Javier Parada Otte, Michael Klein, Sebastian Rollwage, Birgitta König-Ries, Torsten Dettborn, And Aygul Gabdulkhakova. "Openaal-The Open Source Middleware For Ambient-Assisted Living (Aal)." In Aaliance Conference, Malaga, Spain, Pp. 1-5. 2010.

[11] Munasinghe, Kumudu S., and Abbas Jamalipour. "Body Node Coordinator Placement Algorithms for Wireless Body Area Networks." Internet of Things Journal, IEEE 2, no. 1 (2015): 94-102.

[12] Souto, Eduardo, Germano Guimarães, Glauco Vasconcelos, Mardoqueu Vieira, Nelson Rosa, and Carlos Ferraz. "A message-oriented middleware for sensor networks." In Proceedings of the 2nd workshop on Middleware for pervasive and ad-hoc computing, pp. 127-134. ACM, 2004.

[13] Chen, Min, Sergio Gonzalez, Athanasios Vasilakos, Huasong Cao, and Victor C. Leung. "Body area networks: A survey." Mobile networks and applications 16, no. 2 (2011)

[14] Wolf, Peter, Andreas Schmidt, Javier Parada Otte, Michael Klein, Sebastian Rollwage, Birgitta König-Ries, Torsten Dettborn, and Aygul Gabdulkhakova. "openAAL-the open source middleware for ambient-assisted living (AAL)." In AALIANCE conference, Malaga, Spain, pp. 1-5. 2010.

[15] Shen, Chien-Chung, Chavalit Srisathapornphat, and Chaiporn Jaikaeo. "Sensor information networking architecture and applications." Personal communications, IEEE 8, no. 4 (2001).