

A priority adaptive routing to optimize WBAN

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Abstract: Body Area network is the complex and specialized form of sensor network in which nodes are defined on specialized positions. WBAN is defined for monitoring the patient disease status by placing the organ monitored sensors. According to the disease and patients, the nodes criticality is defined. To provide the effective communication, some improve routing approach is required. In this work, a priority adaptive approach is defined for route generation and optimization. The work has provided the communication on multiple WBANs located in limited areas. The work provided the optimization on inter WBAN and intra WBAN communication. The implementation result shows that the work model has improved the network life and throughput.

Keywords: WBAN, Inter WBAN, Routing, Optimization.

INTRODUCTION

WBAN is one of the most innovative and advanced form of wireless network that provide the application specific communication. These constraints include the specification of nodes in the network form and to provide the effective network communication under network strength specification and the adjustment of communication parameters. On the basis of coverage area the wireless network can be divided into following two types

a) Personal Area Network - PAN is the network type defined along with the specification of associated device with smart sensing capability [7]. There are a number of associated forms of these networks including Bluetooth, zigbee networks. The indoor propagation enable these networks provide the communication at smaller distance and also provide communication at high and medium speed. This network type also enables the integrated devices so that the reliable and accurate communication will be drawn over the network. This network provides high speed data communication under interference analysis.

b) Local Area Network – This network type is the most common network defined in restricted area with global constraints. A college campus or computer lab is the example of wireless local area network. The network form also provides the connective component analysis so that the reliable and high speed communication will be obtained over the network.

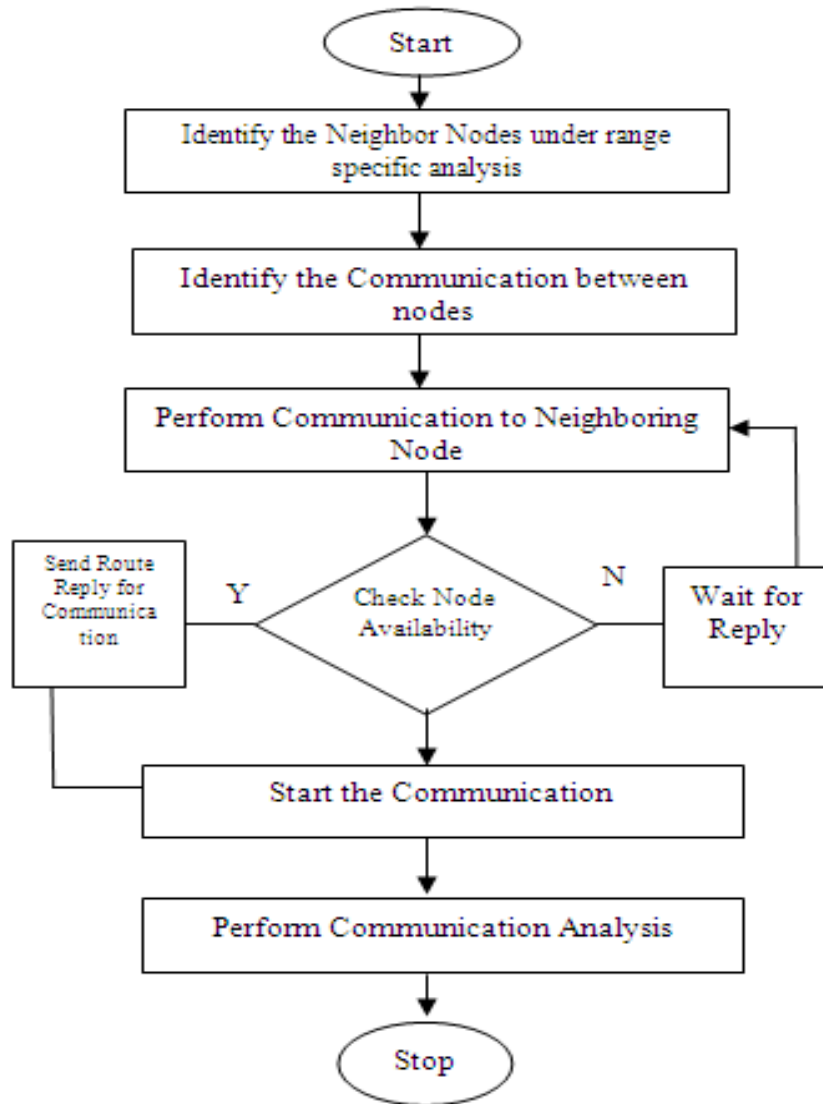


Figure 1 : Wireless Communication Model

IEEE has defined standardization to different communication levels and different communication architectures. These communication architectures are specific for different forms of network such as for wireless LAN available network standards are 802.11a, 801.11b and 801.11g. This network form defines the family specification so that protocol formation enable communication will be performed over the network. This network form will provide the effective information transfer at high speed. The standard controls the communication rate and network deployment under architectural specification. This network form also enables the data rate based transmission so that the information transmission to the network will be controlled. The basic architecture of the communication is defined here in figure 1.

A) Body Area Network

Body Area Network is one of the latest communication networks defined as the network of nodes attached on the human body. These nodes can be placed in or on the human body to provide significant services for specialized application. The main objective of this network is to monitor the human body using specialized sensor devices. Each sensor is defined here for specific human body to monitor the impact of environment or the application area. This communication network is having the significance in medical field, defense, space etc. The sensor devices used in the body area network are called smart sensor devices which are defined along with the specification of intelligent node and the memory. The network is having various challenges in terms of node localization, routing, energy restrictions, sensing range, heterogeneous data communication, event specific analysis etc. These criticalities are different from other network type so that the design of such kind of network as well as its optimization is always a challenge. This network form is defined under dynamic topological reformation, time effective communication analysis, effective resource utilization etc. The presented work is defined in the network, the section has explored the network under different issues. These issues are same here specified respective to the relative layer.

B) WBAN Issues

Wireless Body Area network is defined as the layered architecture to specify the activities associated with the network in an effective way. Each of the layer of this network is defined with specification of associated responsibility, restrictions and the challenges. In this section, these challenges specific to each layer are defined.

I. RELATED WORK

Lots of work is already done by researchers for body area network to optimize the capabilities under different aspects. These aspects include the architectural improvement, localization improvement, routing approaches etc. Some of such work is defined specific to the application area. Most of the work done by the researchers is on health monitoring system for the patients. Author [1] has defined an optimal routing algorithm for a health monitoring system using multi factor analysis. The opportunistic analysis on health care system is defined and provides the integration to it under different scenarios. The author provided the sensing under different aspects and provided the communication interference analysis under multi mode routing in distributed environment. The routing under mobility analysis and multipath communication for healthcare systems was performed. Here the energy effective communication to the node was defined along with node level analysis, node selection, analytical process of formation and the decision making for route selection. The simulation under different parameters was done which lead to the reduced loss rate and failure rate over the system. Here analysis was done under mobility and buffer capacity parameters. Author [2] has defined a work on reliability improvement for multi hop communication in body area network. This work provides solution for health care system and improved network life.

Here architectural specification was provided under probabilistic connectivity analysis along with the multi-hop communication in a distributed environment. The circular coverage based analysis over the health care system and the path loss generation of the human body was provided. An improvement was done to the existing systems with the multi hop protocol specified in medium access and routing layer. Here the effective slot allocation under randomize scheme for parent node specification was done. The author provided the positive throughput based estimation to improve the network life and reduce the network communication so that effectiveness will be improved. Author [3] has defined a work on reliability improvement for multi hop communication in body area network. This work provides solution for health care system and improved network life. Here architectural specification was provided under probabilistic connectivity analysis along with the multi-hop communication in a distributed environment. The circular coverage based analysis over the health care system and the path loss generation of the human body was provided. An improvement was done to the existing systems with the multi hop protocol specified in medium access and routing layer. Here the effective slot allocation under randomize scheme for parent node specification was done.

The author provided the positive throughput based estimation to improve the network life and reduce the network communication so that effectiveness will be improved. Author [4] has defined an architectural work in telehealth system. The interdisciplinary area based work done to achieve the health and medical information processing under large network with specification for small distance analysis and electronic communication analysis. The specifications of health management and health care based system for real time environment were analyzed. The author provided the vigilant and pervasive monitoring to the system under capability analysis for system architecture and lower layer protocol specification for body area networks. The work on architectural standard specification, network generation and protocol specification was defined. The cooperative communication was performed over the network. Author [5] has defined a work on effective routing in postural analysis in a body area network. The effective communication achieved in stationary sensor network for human body network. The safer deployment of nodes was done under coverage hole identification. The coverage perspective analysis was defined under body movement analysis so that the effective communication with network nodes can be performed. The perfect coverage was obtained under different vectors so that improvement in network performance can be achieved. Solution to the network problem, including the mobility analysis, fault tolerance and scalability of network was provided.

The protocol level work was defined to achieve the communication under energy effective scenario and routing scheme under the global positioning system. The author improved the energy level formation of nodes over the network. Author [6] has defined a work on packet routing algorithm in the body area network. The location specific packet forwarding routing was performed for body area networks under postural partitioning approach. The experimentation under critical situations to the work was done under topological specification and network generation. The author provided the parametric analysis for system evaluation and experimentation. The probabilistic routing on specialized body packet flooding was performed so that routing delay over the network will be reduced. Author [7] has defined a work on decentralized system for adaptive routing to improve the reliability of work under broken network. The quality of service based analysis was defined on event delivery for recognized system. The experimentation was done on routing events and provided the investigation on reliability needs of network and path quality analysis. The work on reliability analysis of decentralized system to perform reliability estimation was carried out. Message complexity

analyzed to generate the network aspects and to perform the route generation. Author [8] has defined a work on body area network under mobility specification for soccer players. A novel approach for interactivity analysis and to analyze the distance measures between the players in mobility patterns was proposed. A model was defined to analyze the complexity solution under mobility pattern and resemblance to the expected tracer to the system so that the high accuracy to the system can be obtained. This model analyzes the system in real time scenario and provides the analysis on the spectrum so that the effective routing to the sink can be done. The work was experimented in mobility model and the work was analyzed in different networks. Here analysis obtained in terms of performance and accuracy vectors. Author [9] has defined a work on topology selection to the body area network. The topological selection for the work and the development of entire network protocol stack was done. The topological improvement was done to improve the communication in mesh network. The need of topological improvement in BAN selection was identified. The selection to the network was defined to provide the comparison on different parameters. The work was generated in environmental conditions, device parameter specification, traffic specification etc. The work was done to achieve the suitability under different Author [10] has defined a work on opportunistic routing for body area network. The interaction of network with outer world is defined along with energy preserving communication over the network. The link estimation performed to provide the significant network improvement. The author analyzed the quality of network and the links under frequently changing network so that effective WBAN communication can occur. The analysis on problem domain was done to generate the opportunistic scheme based on body movement analysis. To optimize routing, the life time based comparison was done for route generation in effective time.

II. WORK MODEL

In this paper, an optimize network formation architecture is defined to present the WBAN network with multiple body networks. These body networks are here presented in an integrated way so that the individual as well aggregative communication will be formed. The presented work includes the coverage of inter-BAN and intra-BAN communication over the network. This network model is defined to perform the effective node selection in individual WBAN network and later on the node selection method is applied to perform the effective communication. The consideration is here given to the multiple node selection parameters. The basic model considered in this work for route formation and communication generation is given in figure 2.

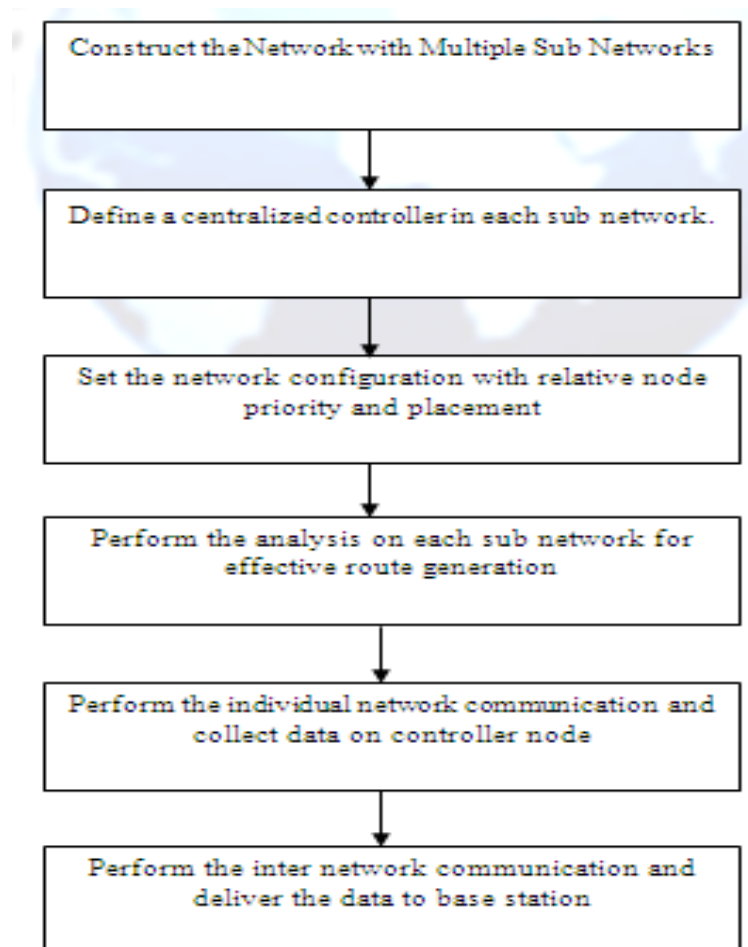


Figure 2: Flow of Work

Here figure 2 has presented a broader view of network communication applied for the network. The network is here designed with M sub networks. Each of the sub networks is designed with N nodes and one controller node. The nodes are placed with the organ specification and the relative communication parameters. The communication is performed in each sub network from each node to the controller node. As the controller accepts the data, the aggregative communication between the sub networks is performed to deliver the communication information to the base station.

III. RESULTS

The presented work is simulated in MATLAB environment. Here figure 4.15 is showing the comparative analysis on remaining energy. The figure shows that the proposed work model has improved the network life. The figure shows that the communication is here performed for 2000 rounds. Both the existing and proposed model has the same initial energy level. But as the communication performed, the energy consumption in the existing approach is high whereas in this work, a criticality analysis based communication model is presented. The presented work model reduced the energy consumption over the network so that network effectiveness is improved.

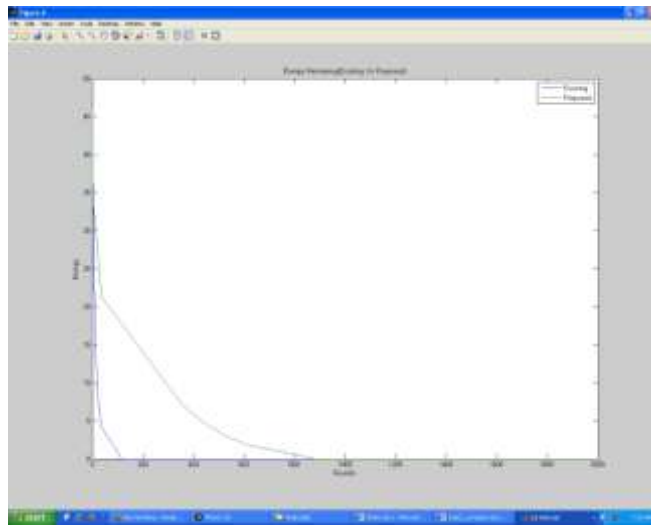


Figure 3: Remaining Energy Analysis (Existing Vs. Proposed)

Here figure 3 is showing the comparative analysis in terms of network energy. The figure shows that the energy consumption in case of existing approach is higher whereas in case of proposed approach is lesser. It shows that the presented work model has reduced the network consumption and improved the network life.

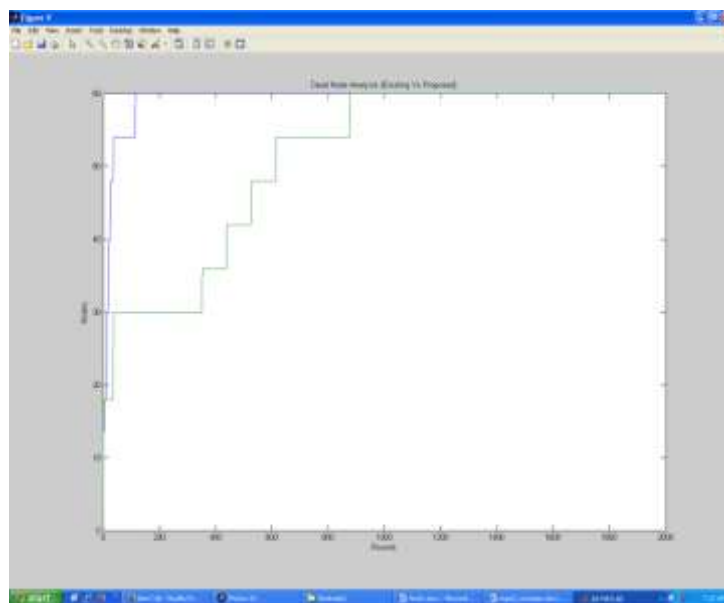


Figure 4: Dead Node Analysis (Existing Vs. Proposed)

Figure 4 is showing the comparative analysis on existing and proposed work in terms of dead nodes. The figure shows that both models does not have any dead node initially. But as the communication performed and energy getting loss over the network, nodes are getting dead. In the existing approach all network nodes are dead after 150 rounds whereas in case of proposed work, the network resides for 900 rounds which shows that the network effectiveness is improved.

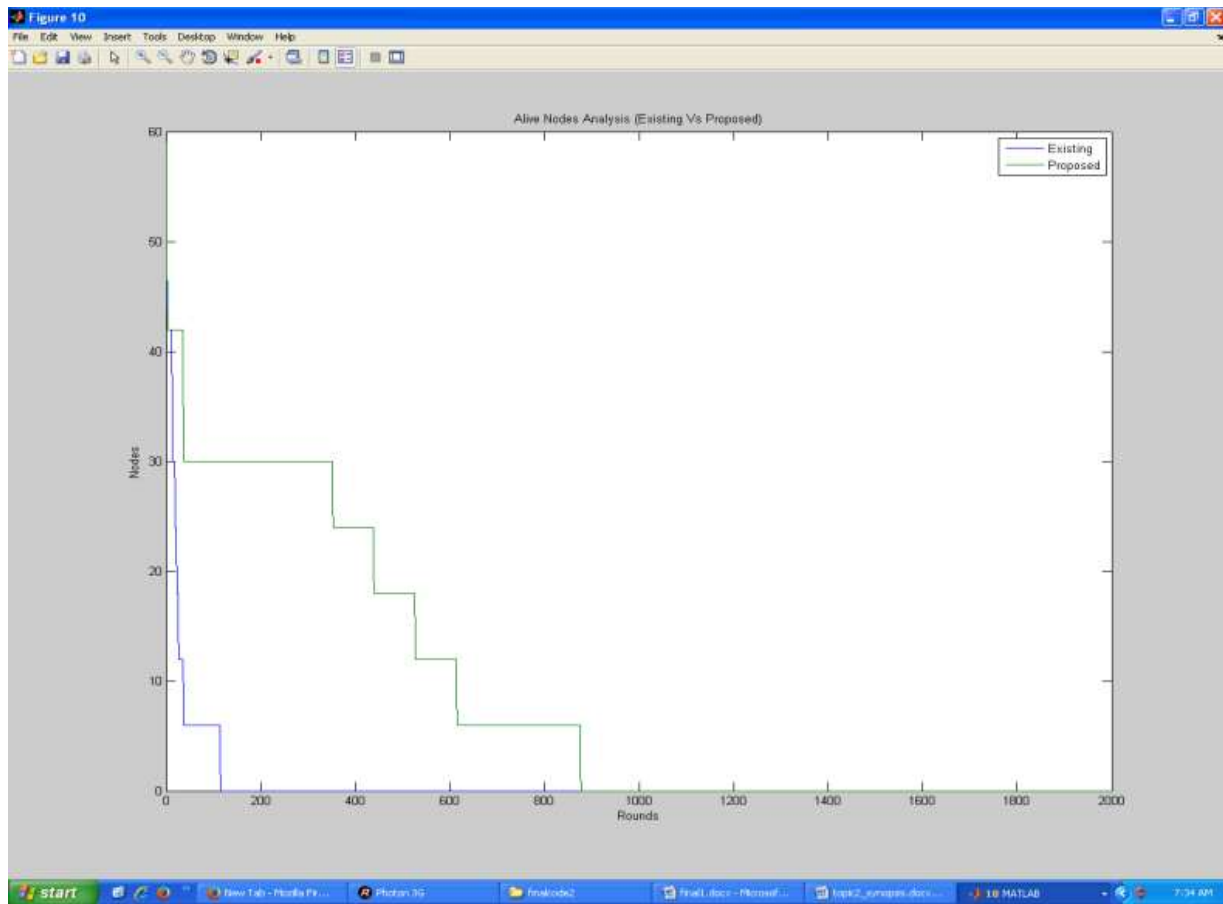


Figure 5: Alive Node Analysis (Existing Vs. Proposed)

Figure 5 is showing the comparative analysis on existing and proposed work in terms of alive nodes. The figure shows that both models have all the network nodes alive. But as the communication performed and energy getting loss over the network, nodes are getting dead. In the existing approach all network nodes are alive till 150 rounds whereas in case of proposed work, the network resides for 900 rounds, which shows that that the network effectiveness is improved.

CONCLUSION AND FUTURE SCOPE

WBAN is the critical network form defined to optimize the communication in terms of data and node type. In this work, a criticality analysis model is presented for optimized communication in WBAN network. The work is here implemented in real time multi BAN network. The proposed priority driven algorithm has optimized the communication over the network. The results shows that the work model has improved the communication and network life. The work does not included any optimization algorithm, in future some optimization algorithm can be applied to improve the network strength.

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