COMPARATIVE AND MODIFIED AODV ROUTING PROTOCOL IN WIRELESS BODY SENSOR NETWORK USING NS2.34

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Abstract :

Body sensor network (BSN) is a Wireless Network of Wearable Computing Devices.BSN in place on a patient can alert the hospital, even before they have a heart attack, through measuring changes in their vital signs.BSN on a diabetic patient could auto inject insulin through a pump, as soon their insulin level declines. The development of Body Sensor Network was motivated by healthcare application for supervision but today such networks are used in many industrial applications. In this paper, the concept of the Wireless Body Area Network we compared our proposed protocol MAODV with reactive routing protocols such as AODV, AOMDV using NS2. The performance of protocols are measured based on metrics such as packet delivery ratio, end to end delay, Throughput, Generated Packets, Received Packets and Energy Left.

***IndexTerms* – BSN, WSN, Routing protocols, CHNST and NS2.**

I. INTRODUCTION

Wireless Body Sensor Network (WBSN) is a special purpose Wireless Sensor Network (WSN) which can observe the physiological behavior of the patient or human being. Sensors can collect the data and then send them to the central unit through the Metropolitan Area Network (MAN) or Local Area Network (LAN). Wireless Sensor Network is a collection of several transducers spread across the environment to monitor the various parameters such as blood pressure, heart rate, blood sugar, skin temperature, blood oxygen. In this paper focused the cluster head node selection technique chooses the best node; the number of nodes is increased between the local nodes, Wireless Local Gateway (WLG) and the Hospital Gateway (HG) for the reliable and efficient communication. By implementing the automatic connection establishment, the time delay in the system can be improved. This method aims to provide immediate and remotely accessible monitoring system. The implementation is done using the Network Simulator 2 (NS2.34).

WIRELESS BODY SENSOR NETWORK

The sensor nodes collect the biomedical information and transmit it to the Cluster Head. The cluster head chooses the best node based on the detection technique. And the information is then transmitted to the WLG. From the local gateway the information is transmitted to the Hospital Gateway. The sensor nodes collect the information from the human body and the best node is selected from the group of nodes by the cluster head.

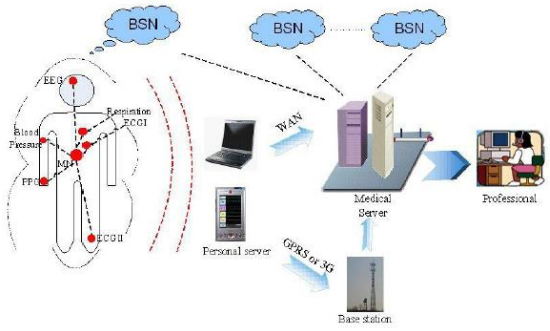

Fig:1 WBSN

And the information is sent to the hospital gateway by Wireless Application Protocol (WAP) for the diagnosis. In Fig: 1WBSN the local nodes are interconnected with the cluster head, the cluster heads are connected with each other. At the node level, CH is responsible for discovering faulty nodes. The faulty node is identified by the other neighboring CH`S in the network. All the Cluster Heads are connected to the main Wireless Local Gateway and this is connected to the Hospital Gateway (HG).

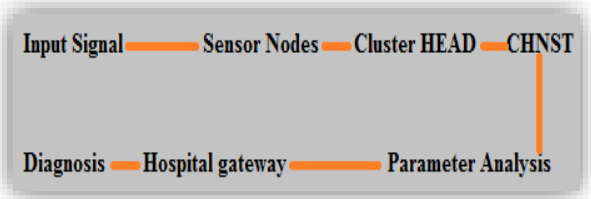

FIG:2 NETWORK ARCHITECTURE

ROUTING PROTOCOLS

Routing protocols are defined as a group of rules by which nodes or router sending the packet of information from source to intended node. Whenever a path is needed from source to destination, then routing protocols allows nodes or device of the network to find and maintain the routes up to intended nodes. Routing Protocols classified three types Reactive, Proactive and Hybrid. This paper focuses only Reactive Routing Protocols AODV and AOMDV.

CLASSIFICATION OF ROUTING PROTOCOLS

AODV

Ad-hoc on-Demand Distance Vector is capable of both unicast and multicast routing. It keeps these routes as long as they are desirable by the source. Additionally, AODV create trees which connect multicast group members. The trees are composed of the group members and the nodes need to connect the members. The sequence numbers are used by AODV to ensure the freshness of routes. It is loop-free, self-starting, and scales to large numbers of wireless sensor nodes. AODV defines three types of control message for route maintenance. [10] They are ROUTE REQ, ROUTE REP and ROUTE ERR.

ROUTE REQ: A route request message is transmitted by a node requiring a route to a node. ROUTE REP: A route reply message is unicast back to the originator of a route reply if the receiver is either the node using the requested address, or it has a valid route to the requested address. ROUTE ERR: nodes monitor the link status of next hops in active routes. When a link breakage in an active route is detected, a Route Error message is used to notify other nodes of the loss of the link.

AOMDV:

Ad-hoc On -Demand Multipath Distance Vector Employs the multiple loops free and link-disjoint path technique. In AOMDV only disjoint nodes are considered in all the paths, thereby achieving path disjointness. For route discovery, route request packets are propagated throughout the network thereby establishing multiple paths at destination node and at the intermediate nodes. [11]

II. LITERATURE SURVEY

Dam et al [02] presented paper, Body area network. The author this item has been first coined the lot of researchers has been by different experiments related to architecture, network lift time, Topology, Security, routing and other terms related body are networks. ***Otto et al [06]*** proposed a paper, "system architecture of a wireless body area sensor network for ubiquitous health monitoring". The author maximum numbers of nodes are declared 20 of wireless body area network but generally they also suggested that numbers of nodes are not limited. ***Tachtatizs et al [10]*** investigated the lifetime of body area network sensor with the help of various model proposed by IEEE and concluded the importance of either one hop or star topology for medical application of these low power devices with the network lifetime. ***Shahriyar et al [09]*** developed a paper ". Intelligent mobile health monitoring system (IMHMS)" that collects physiological sensed data, all these sensed data are sent to the mobile device responsible for transmitting the acquired data to the medical server to analyse data and give a feedback to the patients. ***Mohammad Abdur Razzaque et. Al. [15]*:** Here authors improve Quality of software in Body Sensor network using adaptive network coding technique. For simulation purpose author has takes MATLAB as a simulation tool. In their work author proposed a unique network coding that based on error recovery mechanism that improve Qos at very low energy, memory and hardware cost. In their contest it utilize application level and network level information to make it adaptive. After the simulation result they conclude that the proposed mechanism reduces retransmission and energy consumption and NC relay adaptive. ***Sidrah.et.al [04]*** Here authors analyses incremental. , Co-operative, communication for Wireless Body Area Network with different number of relays. In this propose scheme three stage relaying was used for compare single and two stage relaying schemes. This simulation result shows that the purpose three stage relaying gives high throughput an eliminate data redundancy problem.

III. PROPOSED METHODOLOGY [CHNST & MAODV]

The Cluster Head Node Selection Technique (CHNST) selects the best node from the group of nodes based on the packet drop. The information from the adjacent nodes is transmitted between the nodes for the analysis of the recent data transmission. Consider the situation node 0, 1 and 2 are connected to the cluster head node 3, the collected data is transmitted from the nodes to the head node. The best node is selected based on the node with minimum packet drop and reliable data transmission. Since the connection established is a wireless connection, there is a possibility of packet drop between the nodes. But the packet drop should be minimum for the health monitoring systems. The information from the best node is taken to the WLG for the diagnosis. The data base is predefined for the evaluation.

MAODV

In this solution, we adds information to control packets for all routes and after exploring all possible paths, one with the shortest path hop count is first selected that respect MAODV criterion required by user. In this solution control packet RREQ and RREP are routed in broadcast way. When the source wishes to transmit, it checks its routing table for any valid route to desired destination. If this is not the case, it starts Detection Phase (discovery route process) by broadcasting control packet RREQ. In this modification, propose to eliminate local repair phase to minimize modified protocol M-AODV tasks and the discovery phase is delegated in all scenarios to source node for a number of attempts RREQ_RETRIES.

NETWORK SIMULATOR 2.34

Network Simulator is a Discrete Event Simulator, especially NS1, NS2 and NS3. NS2 are mostly used in research and teaching environment. Simulation environment offers great flexibility in investigating the characteristics of sensor network. In NS2 environment, a sensor network can be built with many of the same set of protocols and characteristics as those available in the real world. NS2 consists of two key languages: C++ and object oriented Tool Command Languages (OTCL) NS2 is the software package with the basic components like TCL/T K, OTCL, and TCLCL. TCL is open script language while TK is the development tool for graphical interface OTcl object oriented TCL while TCLCL provides Interfaces of NS2 and OTcl. NS2 provides X graph, GNU plots and selectable component NAM. The traffic classification, priority assignment, priority based back-off, sleeping and idle listening is simulated as different states in the simulator. [13]

IV. PERFORMANCE EVALUATION

In this section illustrates the experimental observation of the present research work. The performance analysis carried out with different parameters using network simulator 2.34. Our proposed algorithm is compared with Reactive AODV, AOMDV and Proposed Modified Reactive Protocol MAODV with throughput, different Pkt size, Packet Delivery Ratio, Latency. The following table show the parameters used in our Scenario.

Table 4.1: Parameters and Values

PARAMETERS	VALUES
Area of Simulation	(1000*1000)m
Number Of Nodes	180
Types of routing protocol	**MAODV**,AODV,AOMDV
Internet Protocol Type	TCP
Antenna Model	Omni directional
Type of the MAC	802.15.4
Number of Packets	50

PERFORMANCE METRICS

Performance of routing protocols is evaluated based on metrics such as Packet Delivery ratio, End to End delay, Throughput and Protocols Energy left.

A. Packet Delivery Ratio (PDR):

The Ratio of the data packets successfully received at the destination and total number of data packets generated at source. PDR = (Number of Packets Received / Number of Packets Sent) * 100

B. End to End Delay:

This Metric give delay from packet transmission from source agent to packet reception to destination.

End-to-End Delay = (Time packet received -time at packet sent)

C. Throughput

The Ratio of time taken to actually deliver the packet at its destination to the total number of packets actually sent. Throughput = ((total_pkt_recvd/1000)*512)/1024.

D. Energy

This total number of Protocol energy consumed for packets transmitted and packet receiving during the simulation. Total Energy = (total_energy_consumed/ (100*10000.000000))*100.000000)

Network Animator Window

NAM is a graphical interface in which Simulation controlling events are available during the active session of wireless simulation, such as to stop run, fast forward or slow motion available.

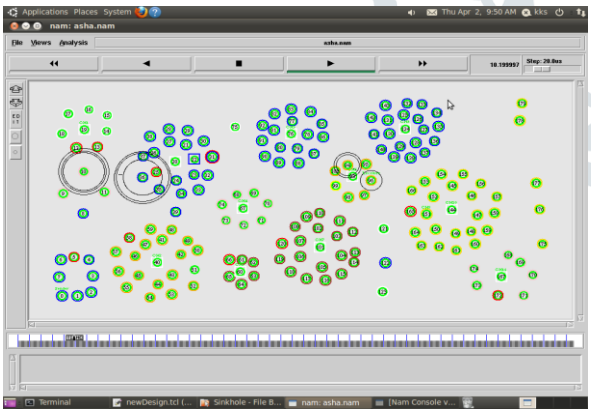

Fig: 4.1 Radio Propagation

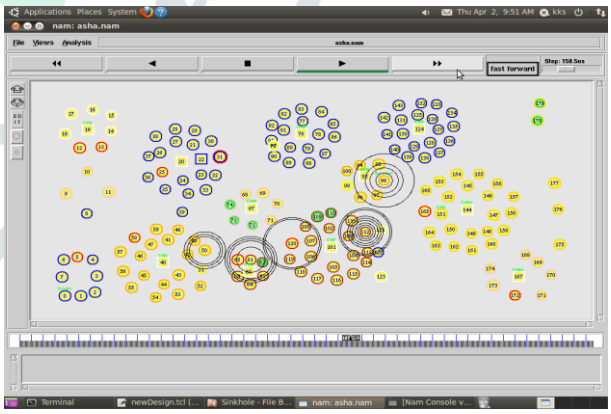

Fig: 4.2 Msg Transfer one cluster to Another Cluster

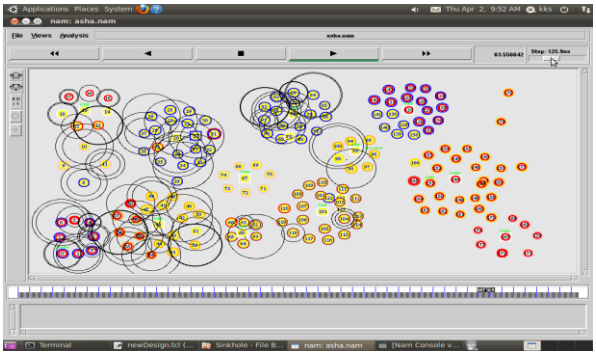

Fig:4.3 Energy Left

Parameters and Values

Table 4.2: Simulation Results

Routing Protocols / Parameters		AODV	AOMDV	Proposed MAODV
180 Nodes	PDR	90.228	91.187	**98.812**
	Delay	0.201986 ms	0.173589 ms	**0.06519 ms**
	Throughput	389.45	459.75	**697.91**
	Generated Packets	2763	3359	**8895**
	Received Packets	2573	3209	**8784**

EXPERIMENTAL RESULT

Packet Delivery Ratio

It could be seen from Table 4.2 that the performance of Packet Delivery Ratio shows its performance clearly for the three routing protocols namely AODV, AOMDV and Proposed MAODV. The experiment was conducted for a maximum of 180 nodes. The performance of PDR at 180 nodes was 90.228 in AODV, 91.187 in AOMDV and 98.812 in Proposed MAODV. It is observed that the third proposed MAODV protocol had performed with an excellent output of 98.812. From the comparative analysis, it is proved that the proposed MAODV progress in ensuring the efficiency of PDR is excellent than in other Reactive Routing Protocols.

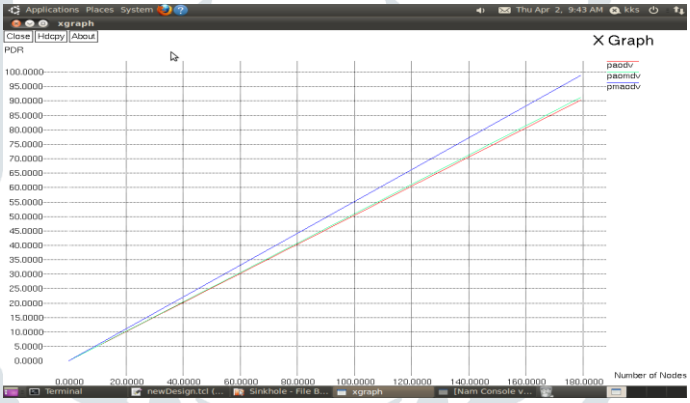

Fig:4.4 PDR – Packet Delivery Ratio

Delay

The following fig 4.5 shows the end to end delay for three protocols. It is observed from the experiment that among the three protocols, the MAODV is shows minimum delay compared to the existing protocols such as AODV and AOMDV. From the analysis, it is concluded that MAODV is the best protocol among the three protocols.

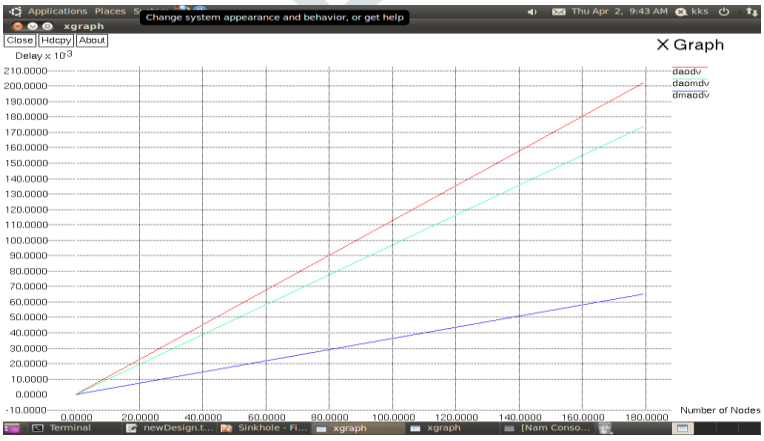

Fig: 4.5 Delay

Compute the Throughput for MAODV Protocol.

Figure 4.6 represents the throughput comparison of the proposed protocol MAODV with existing protocols AOMDV and AODV. The Throughput of the proposed method MAODV for 180 nodes is 697.91 KBps which is better than the throughput of reactive protocols AOMDV and AODV whose throughput are 459.75 and 389.45 respectively.

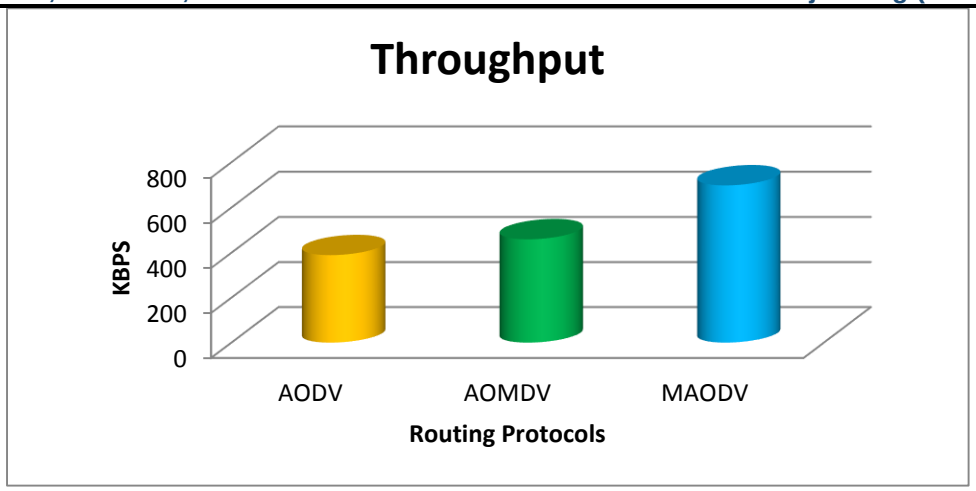

Fig: 4.6 Throughput

EnergyLeft Vs Routing Protocols

To evaluate the energy consumption, an experiment was conducted with maximum nodes 180 using NS2.34 simulator. The experiment was conducted with the proposed MAODV, existing reactive AOMDV, AODV. The result obtained by the experiment is given in Table 4.2.

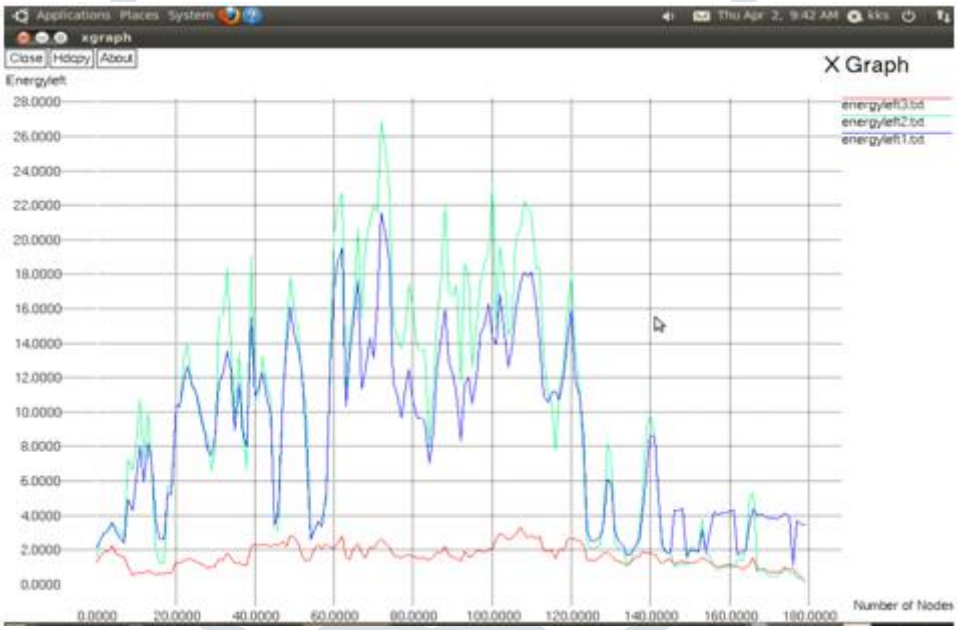

Fig:4.7 EnergyLeft

V.CONCLUSION

In this paper compared the performance of AODV, AOMDV and proposed MAODV routing protocols for Wireless Body Sensor Networks using NS2 Simulation. Reactive protocols performed well in high sensor scenarios than sensor networks. The Experimental result shows that the proposed protocol MAODV gives low level of delay ratio, Protocol Node Left Energy and high level of packet delivery Ratio, than the existing protocols.

REFERENCES

ALEK06 Aleksandar Milenkovic, Chris Otto, Emil Jovanov, Wireless sensor networks for personal health monitoring: Issues and an implementation Computer Communications

ARIF 11 Arif Onder ISIKMAN, Loris Cazalon, Feiquan Chen and Peng Li, `Body Area Networks', Sweden, 2011

PITC 01 Dam, pitchers, Body area network, towards a wearable future, proc.wwrf kick of meeting munich, germany, pp- 6-7, 2001.

OTTO 06 Otto,milenkovic, system architecture of a wireless body area sensor network for ubiquitous health monitoring, jopurnal of multimedia, vol.1, no.4., pp.307-326, 2006.

HONG06 Hongliang Ren , Understanding the Mobility Model of Wireless Body Sensor

Networks , IEEE Explorer, Digital Library, Information Acquisition, 2006

JOHN 11 Johansson A, Wei Shen ; Youzhi XuAn ANT Based Wireless Body Sensor Biofeedback Network for Medical E-Health Care, Wireless Communications, Networking and Mobile Computing (WiCOM), 2011

MANO 15 Mano And Dr.S.Sathappan, "Performance Evaluation Of Wireless Routing Protocols based on RTP" IEEE Doi:10.1109/ICATCCT.2015.7456986.

MARY 13 Maryam Elazhari, Ahmed Toumanari, Rachid Latif and Nadya El Moussaid. Article: Enhanced Low Energy Communication Protocol for Implantable Wireless Body Sensor Networks. International Journal of Computer Applications 75(11):26-29, August 2013.

MOHA15 Mohammad Abdur Razzaque , Saeideh S. Javadi ,Yahaya Coulibaly and Muta Tah Hira,'' QoS-Aware Error Recovery in Wireless Body Sensor Networks Using Adaptive Network Coding'',MDPI, 2015,pp. 440-464

NS2 Network Simulator Wiki. [Online]. Available: http://nsnam.isi.edu/nsnam/index.php/ The Network Simulator Wiki–NS-2Trace Formats. [Online]. Available: http://nsnam.isi.edu/ Nsnam //index.php/NS-2 Trace Formats #Old Wireless Trace Formats

SHAH09 Shahriyar R, Bari MF, Kundu G, et al. Intelligent mobile health monitoring system (IMHMS). In: International Conference on Electronic Healthcare. Springer; 2009. pp. 5–12.

SHIO 10 Shio Kumar Singh 1, M P Singh 2, and D K Singh 3, Routing Protocols in Wireless Sensor Networks, A Survey, International Journal of Computer Science and Engineering Survey (IJCSES) Vol.1, No.2, November 2010

SUNI 10 Sunil Taneja, Ashwani Kush, Performance Evaluation of DSR and AODV Over UDP And TCP Connections International Journal of Computing and Business Research (IJCBR), Vol.1, No. 1, December 2010

SEOS 10 Seo, S.H.; Gopalan, S.A.; Chun, S.M., Seok, K.J.; Nah, J.W.; Park, J.T. An Energy-Efficient Configuration Management for Multi-Hop Wireless Body Area Networks. In Proceedings of 3rd IEEE International Conference on Broadband Network and Multimedia Technology, Beijing, China, 26–28 October 2010; pp. 1235–1239

SHIW 14 L. Shiwei, D. Gude, P. Prakash, and S. Warren. "A paraeducator glove for counting disabled-child behaviors that incorporates a Bluetooth Low Energy wireless link to a smart phone," Proc. IEEE Symp. Eng Med Biol Soc, 2014, pp. 57-64.

TACH15 Tachratzis, Di, An Energy analysis of IEEE 802.15.6 scheduled access modes, IEEE GLOBRCOM workshop, pp.1270-1275, 2010.

TEER Teerawat Issariyakul Ekram Hossain :Introduction to Network Simulator NS2 Second Edition,Springer.Romana Rahman Ema, Ashrafi Akram, Md. Alam Hossain and Subrata Kumar Das.Performance Analysis of DSDV, AODV and 150 AOMDV Routing Protocols based on fixed and mobile Network Model in Wireless sensor Network.

THIE 06 Thiemjarus, S.; Lo, B.; Yang, G.Z. A Spatio-Temporal Architecture for Context Aware Sensing. In Proceedings of the International Workshop on Wearable and Implantable Body Sensor Networks, Cambridge, MA, USA, 3–5 April 2006; doi:10.1109/BSN.2006.5.

Bibliography
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