ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

ENHANCING PERFORMANCE OF LOCALIZATION USING SJFR ALGORITHM

K. Rajkumar, P. Ganeshkumar, G. Nithya Prabha and V. Sakthivelmurugan
Department of Information Technology, PSNA College of Engineering and Technology, Dindigul, Tamilnadu India
E-Mail: krajkumarcse@gmail.com

ABSTRACT

In WSN the link failure is conquer by re-routing from the source node which is considered to be a time intense process that increases the overhead of the nodes. Also, in case of various link failures, there is probability for loss of data packets. The recital of the network during link failure has to be maintained vigorously in circumstances such as long data transfer and defend possible attacks during data transmission. Using SJFR algorithm we are going to recover the link failure.

Keywords: SJFR, TA, PST .PREQ, PREP, PERR.

1. INTRODUCTION

WSN is a variant of Ad hoc Networks consisting of a finite number of tiny, autonomous devices called wireless sensor nodes. A sensor network is designed to detect events or phenomena, collect and process data, and transmit the sensed information to sink node. Basic features of sensor networks are, dense deployment, self-organizing capabilities, short range broadcast communication, co-operative effort of sensor nodes, multi hop routing, frequently changing topology due to fading and node failures, limited energy, transmission power, memory, and computing power [2]. WSN consists of hundreds or thousands of tiny sensor nodes. These sensor nodes have the capability to communicate among themselves to make the information reach the sink node in a single hop or in multiple hops. Recent advances in WSN is the micro electro mechanical devices with low power, short range transceiver, processor with low capacity and a limited power unit contributed in designing sensor node.

However during link failure routing the sensed data to the sink node in a resource constrained environment is still a challenge [2]. Link failure between the nodes takes place due to reasons like channel interference and dynamic obstacles in mobile Ad Hoc networks, that give rise to severe performance dilapidation [3]. It is difficult to predict when and where a failure will occur and also perform local rerouting in a network. This paper describes a two tiered approach to solving these challenges: 1) by developing novel wireless-sensor-network (WSN)-based localization methods and 2) by using an enhanced novel Sectionary Junction Failure Recovery algorithm (SJFR) [1]. The goal is localizing the events (ie. link failure) without aid of global positioning information and an optimal path is selected based on the metrics such as the gradient of information, the minimum hop, minimum transmission cost, high residual energy, shortest path etc [2].

In conventional AODV, the link failure is overcome by re-routing from the source node which is considered to be a time consuming process that increases the overhead of the nodes. Also, in case of various link failures, there are chances for failure of data packets. The recital of the network during link failure has to be maintained dynamically in circumstances such as long data transfer such as a stream of voice data which is an underlying challenge. Another challenging problem is to possibly detect and defend possible attacks during data transmission [3]. The gradient broadcast routing protocol is one of the most promising routing solutions for a large scale wireless sensor network as it provides robust data delivery to error prone wireless channels. Sporadically, the broadcast nature of this protocol may incur high power consumption which is a critical issue of sensor nodes. In this thesis, several energy efficient forwarding algorithms are proposed and investigated. These algorithms aspire at finding an optimum trade-off between system resource consumption and system consistency. Also, when wireless links or sensor nodes are subject to failure, it is important to prevent the failure of messages. This paper proposes a route recovery protocol which allows the system to search for alternative route in order to ensure successful transmission from a sensor node to a sink [15]. In recent years, numerous applications have fueled research on WSNs. Most notable are those applications serving in harsh environments, such as coast and border defense, search-and-rescue and battlefield investigation. By getting miniaturized sensors to operate unattended in such hostile setup, it would be possible to decrease the cost of the application and avoid the risk to human life as well. Typically a sensor node is battery operated and consumes most of its energy in communication [15].

In this study, we introduce an enhanced novel sectionary junction Failure Recovery algorithm (SJFR) for recovering from link failures locally in Ad hoc networks. When a link failure occurs due to faint signal between nodes, the route has to be configured and repaired spontaneously so that there is no data loss and the data stream is fully transferred. When a link failure is detected by a sensor node, the sectionary junction Failure Recovery (SJFR) mechanism deployed in each node arrives on an alternate path from that intermediate node which did not receive the PREP i.e. the failed node. The SJFR then updates the alternate path to source and sends the data packets to the destination much faster, instead of dropping the whole route and discovering a new route to the destination. The over head among nodes are significantly reduced as the failure recovery is done locally. The packet delivery ratio also increases, as defensive measures for safe landing of data packets to the destination are taken in the new route, by keeping a constant tab on the signal strength of neighboring nodes. Using stimulation we found that this mechanism exhibits better efficiency by overcoming the overhead issues during link failures [4].

2. RELATED WORKS

Location aware event driven multipath routing (LEDMPR) in WSN uses a set of static and portable agents. Two types of software agencies are used in the scheme to find and setup the multipath in WSNs. They are node agency (NA) at each sensor node and sink agency (SA) at sink/base station. The proposed scheme works as follows: (1) Event node computes the arbitrary midpoint between the event node and the sink node by using the position information. (2) Affair node establishes a shortest path from itself to the sink node through the reference axis connecting both the nodes by using a mobile agent with the help of location information; the mo-bile agent collects the path information and nodes parameters on the way and provides to the sink node. (3) Finds the arbitrary position of the special (middle) intermediate node (above/below reference axis) by using the midpoint location information [8].The motivation for this article is the design of an effective geographic routing algorithm for lossy WSNs. The algorithm should consider energy efficiency and load balance simultaneously. Two key features of the proposed algorithm include: 1) a link estimation scheme of the packet reception rate (PRR) designed to increase the network energy efficiency; 2) a network load balance learning method which maintains a local network load balance. These features simultaneously improve network lifetime and delivery performance [13].

In this paper, we propose link stability based multicast routing scheme that establishes a route from a source to multicast destinations in WSN. A multicast mesh is formed with stable links when a source node needs to send data to receiver nodes. The scheme consists of the following phases. (1) Mesh creation through the route request (RR) and route reply (RP) packets. (2) Finding constant routes between source and destination pair of nodes by selecting stable forwarding nodes (SFNs) using link stability metric. (3) Mesh maintenance to handle link failures. LSMRM detects two types of link failures: (1) link failure between SFN nodes and (2) link failure between a multicast source/receiver and a SFN. In the case of linkage failure between two SFN's, the node detecting failure condition will try to find the next stable link in the mesh and route the packet through such a link. In case, if the entire forwarding node's connection fails, RE packet is sent to the source to rediscover the routes [9]. In this paper, we propose an analytical model for route maintenance in an Energy Efficient Node Disjoint Multipath Routing Protocol (EENDMRP). It focuses on route redundancy in a particular node level redundancy over a single path, particular node level redundancy through multi node over single path, and particular node level redundancy through multiple level multiple nodes in a single path [10].

In B-AODV, first through reverse request by sending BRREQ replace of PREP, it reduces the time of routing result. Second, two hops IP trace in control messages and route table can improve the rate of routing repair and reduces the times of routing findings. And it improves the utility of Ad Hoc network For the shortage of AODV protocol, a better protocol is needed to avoid route breaking, reduce message lose rate and decrease network interruption. An improved approach B-AODV based on AODV was designed, assuming that the network link was bidirectional, that was the source node and the destination node could reach each other through one route. [11]. In this paper we use heuristic algorithms to generate the plans, with two different heuristics: prioritizing the number of new nodes, and prioritizing the pathway length. However, while executing the plan, the agent will encounter infertile paths and broken radio links, but also surviving components of the mature network, and as it discovers new knowledge, it must revise its plans to complete the repair. We consider two approaches for revising the plans. The first conducts full replanning whenever it discovers new knowledge that changes the cost of the plan, or which renders the plan infeasible. The second attempts to restore the plan, by searching for a new motion plan to reach its current location object, and reverting to full replanning only after large changes.

We evaluate the approaches in simulation on randomly generated problems, where we vary the density of the connectivity problem and the level of damage sustained. We demonstrate that the full replanning approach produces better quality solutions, but has significantly higher runtime as damage and density increase. However, when we factor in the predictable total time to execute the plan, full replanning becomes competitive. For slower moving agents, the reduction in path length with the path heuristic outweighs the increased runtime, while for faster agents, the repair actions are more significant, and the node heuristic with full replanning becomes more efficient at higher damage levels. The results illustrate the trade-offs between minimizing node cost and minimizing the speed of the repair, where the choice of approach will be dependent on the application [12].

A new QoS routing protocol (Ramadoss *et al*., 2014) is proposed which provides spanning tree based path selection by avoiding congestion, balancing the load and energy paving way to avoid data loss simultaneously minimizing the communication overhead without reducing the network performance. The work in (Babbitt *et al*., 2009) is a good example of self route selecting scheme for the sake of reliability. When a data packet is sent from a source to a destination, each node competes for self selection based on back-off delay in this scheme. Although there are several mechanisms to overcome link breakage and link failure recovery, each has its own limitations. We

VOL. 10, NO. 7, APRIL 2015 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

propose that localization of link failure recovery will reduce the overhead of route discovery and is essential for ad-hoc routing protocols to improve its QoS parameters [14].

3. PROPOSED WORK LOCALIZATION

Wireless sensors are arbitrarily deployed to envelop an indeterminate environmental region, such that they will form a linked network. While any wireless sensor detects a object, every sensor node obtain a gradient assigned to it. This gradient is a function of the node's announcement distance from a recognized object location. As a result, the sensor node nearest to the object (object node) has the peak gradient assigned to it. A "Target Algorithm" (TA) is formed in the region. Autonomous Robots positioned into this environment will track to reach the object from any place inside the region. Because global positioning data is not available. It has only the wireless received signal strength (RSTH) which is used to produce the TA. Using RSTH to assign the node gradient have been proved to be profitable in such indeterminate environments, since this approach is a low-complexity approach; RSTH will give a good sign of noise and obstruction available in the environment [1].

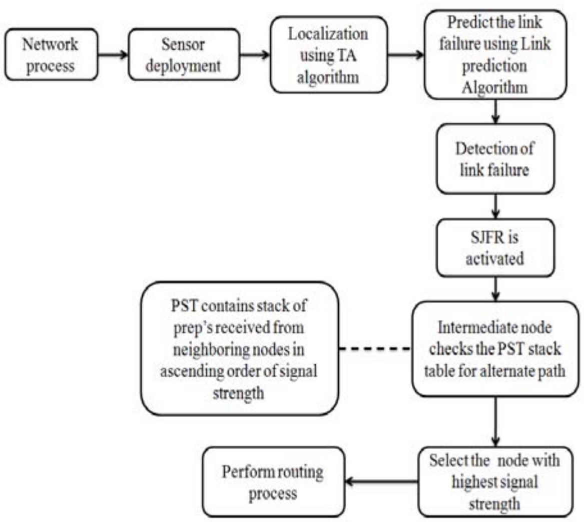

Figure-1. Proposed architecture overview.

Target algorithm

Initialize grade value=Maximum grade; Hop Total=Maximum hop;
If object=class to **then** node=object
Hop Total=0;
Grade value=Maximum grade;
BC (grade value,Hop total);
Else
Obtain $RSTH_a$, Hop $Total_a$, Grade $value_a$ from neighbor a;
Compute grade $value_a^{comp}$ =grade $value_a$.$RSTH_a$;
Compute Hop $Total_a^{comp}$ =Hop $Total_a$ +1;
If (Hop $Total_a^{comp}$<= Hop Total) **&&** (grade value ^{comp} $^{>}$grade value) **then**
Assign Hop total=Hop $total_a$;
Assign grade $value_a^{comp}$ =grade value;
BC (grade value, Hop total);
end if
end if

Link prediction

The Local algorithms depend on increasing the refresh gap. While the mobility of sensor nodes are low, then raising the refresh gap can reduce the broadcast of control packets periodically over the entire network uselessly. As a result, the Control Overhead is reduced significantly. For example, ODMRP-LM uses the prediction algorithm to predict the imminently link breakages. The sensor nodes that predict that imminent breakage must try within the region to find another route keeps it linked to the sender node to keep on getting multicast data. Consequently, routes and Forwarding set are maintained among Join Queries gaps in case of topology changes because of sensor node mobility [5].

Implementation of the link failure prediction algorithm (LFPA)

To implement the link failure prediction algorithm, we considered the following points:

Sensor Node A requires 3 successive packets obtained from its nearest node B can able to predict the instance while the link A to B will be wrecked.

The LFPA algorithm is deployed solitary on multicast receivers and forwarding set sensor nodes.

Every sensor node watches only information packets obtained from sender or forwarding set sensor nodes.

The local scheme requires a particular interval of time (the dangerous Period) to discover another route as a replacement of the one that is predicted to be almost immediately wrecked. This dangerous Period will be enough for sensor node A to discover a new route prior to the old one is wrecked. If the breakage time for the link between A to B is less than or equal to the existing time +dangerous Period, that means, the link is fall on the Critical State. As a consequence, sensor Node A will instantly notifies the sender node about the forthcoming breakage of the present route in Global Maintenance scheme. Sender will take necessary action to find the alternate path. But we use local scheme SJFR to minimize the overhead and time.

Link failure recovery

The routing protocols are classified into 3 types, namely pro-active, reactive and hybrid routing protocols. In proactive routing protocols, every node in the network maintains the routing table that is updated regularly. The nodes exchange the topology information to keep the routing table with latest notifications leading to high overhead, as they are flooded with information pertaining to unknown links. Ad hoc On-demand Distance Vector, (AODV) is a reactive routing protocol used in wireless networks that discovers a route to destination on demand. AODV requires each node to maintain a routing table containing the discovered path information. AODV is capable of creating fresh routes whenever a route error occurs. The advantages of AODV is that, it uses sequence numbers to determine the freshness of the route thereby preventing loop formation and doesn't create overhead unnecessarily during communication.

WSN's have become highly adaptable to all the groups, as human society relies on portability of devices which enhances the importance of wireless connectivity in work spaces, offices, colleges, hotels etc. Routing in WSN is always a distinctive task and it becomes a challenge to have an appropriate routing scheme when the network size grows more sizeable. Owing to the mobility of nodes in a wireless network, the network topology changes and the route length between the source to destination increases. When the link between the nodes in a network suffers due to failures, the reactive protocols like DSR and AODV generally drops the original route and triggers a new route discovery process causing overhead in local route discovery. The re-routing is an energy consuming process that heaps the overheads on the nodes. The motivation of this study is to overcome link breakages, by recovering link failures locally and spontaneously thereby establishing routes without losing the data packets.

Wireless networks are highly liable to suffer from route breaks due to several reasons such as signal intrusion, data crash, faint environment, node mobility etc., The Sectionary Junction Failure Recovery Algorithm (SJFR) deployed in each nodes present in the network (i) performs local route recovery minimizing data packet loss during link failures in ad hoc network (ii) overcomes issues pertaining to overhead caused to nodes during link failures (iii) Improves QoS parameters like the packet delivery ratio, average end to end delay and throughput compared to its predecessors The session inducted by the SJFR consists of spontaneous initiation of the SJFR and checking the PST for alternate path without disturbing the network setup. The neighboring node with highest signal strength is chosen to forward the data. When a link failure is detected by a node, it immediately triggers the SJFR to explore an alternate route to the destination simultaneously having a vigil on the signal strength of successive links. The SJFR algorithm comprises a PREP Buffer Table which stores the PREP's received from the neighboring downstream nodes in ascending order of signal strength. The received signal strength is the MAC layer information used by the routing layer of the nodes through cross layer interaction. The RSTHI is the received signal strength indication, which is used to determine the amount of radio energy in the channel. RSTHI is possible to estimate the relative stability of the link based on recent and current received signal strength. The overhead on each node is drastically reduced due to non transmission of PERR packet to source node [4].

SJFR algorithm

The SJFR deployed in every node updates the PST with PREP packet in ascending sequence of highest signal strength from relevant downstream nodes. So when a link failure is detected, the foremost PREP stored in the PST will be chosen as the next downstream node and this process continues until reaching the destination. The alternate path is updated with the source node and the routing table of all relevant nodes. The Local Link Failure Recovery Algorithm with AODV routing protocol is implemented and evaluated using the Network Simulator.

In AODV node doesn't have any information about other nodes until a communication is required. By spreading HELLO packets in a standard interval, local connectivity information is maintained by every node. Local connectivity maintains information about all the neighbors. In ensuring QoS provisioning, a network is expected to guarantee a set of measurable pre-specified service attributes to the users in terms of end-to-end performance, such as demanding task to ensure QoS provisioning including routing in ad-hoc networks due to the mobile and dynamic nature of the nodes. Recent Qos solutions are designed to operate on trusted environments and totally assume the participating nodes to be cooperative and well behaved [6, 7]. The major drawback of conventional AODV protocol is the absence of the Quality of Service (QoS) provision that make routing protocols which requiring applications of QoS lower efficiency. WSN's usually consist of mobile battery operated devices that communicate over the wireless medium. These devices are battery operated and therefore need to be energy conserving so that the battery life of each individual node can be extended. To make the most of the lifetime of an ad hoc network, it is necessary to lengthen each individual node life through minimizing the total transmission energy consumption for each communication request. Therefore, a proficient routing protocol must satisfy that the energy consumption rate an each node is evenly distributed and at the same time the total transmission energy for each request is minimized. Therefore, energy for nodes needs to be considered while routing since nodes may drain out of energy levels. Though a node is providing its complete support for routing it can perform well only if it has sufficient energy. Conventional AODV does consider the energy levels of nodes before routing. Energy is announced by the proposed AODV protocol that checks for energy levels of nodes before taking part in routing in order to make the efficient and effective routing and also ensure Qos.

The SJFR algorithm implemented with AODV routing protocol is described below:

i) If association failure detected then
ii) Go to step iv
iii) Else transmit data packet
iv) SJFR is activated
v) The middle sensor node receives PERR. It will act as the sender node
vi) Choose the first entry in the PST stack as the middle node
vii) Form another path using PST information in each sensor node

ARPN Journal of Engineering and Applied Sciences

viii) Perform data packets transmission through alternate path to destination node
ix) Update about the fresh route to the sender node

4. RESULTS

The simulation results of Sectionary Junction Failure Recovery Algorithm (SJFR) incorporated in AODV routing protocol is given below.

A. Throughput

Throughput is the number of bits transmitted per unit second over a communication channel. The results of SJFR compared to the conventional AODV routing protocol which is given below.

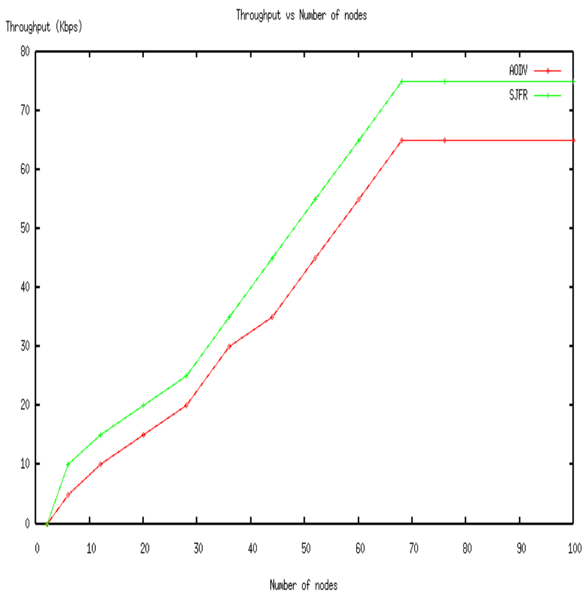

Figure-2. Throughput Vs Number of nodes.

B. Control overhead

Control overhead is the number of routing messages requested while a data packet is successfully given to the destination.

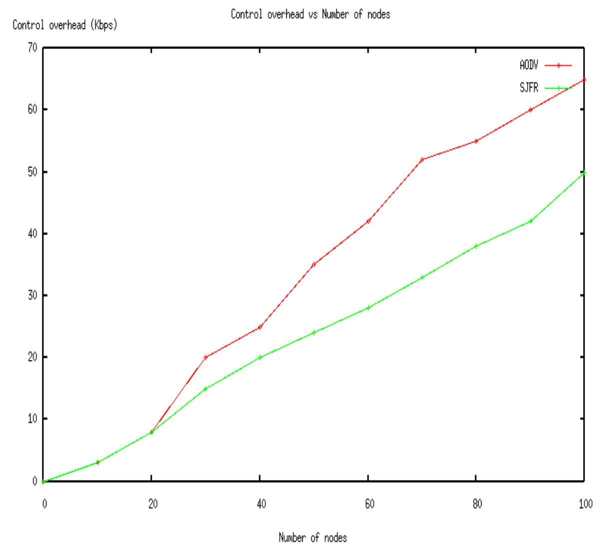

Figure-3. Control overhead Vs Number of nodes.

5. PERFORMANCE EVALUATION

The performance of the SJFR with AODV is compared with conventional AODV routing protocol for throughput, overhead. The simulation outcomes in Figure-2 confirm that the throughput of AODV with SJFR is considerably improved compared to AODV in the occurrence of link failure. The SJFR gets better throughput when compared to the conventional, as the alternate path chosen by the SJFR is consistent leading to improved throughput. There is negligible chance of data packet loss in case of stream of data such as voice or video as the middle node in no time triggers the SJFR algorithm and begins routing the data through a reliable alternate path. The SJFR has sensibly has lesser overhead when compared to conventional AODV as given in Figure-3. In conventional AODV, sensor nodes reply to link failures with several messages which are flooded in the network to maintain an active route in AODV. As a result, the overheads are increased. The routing Protocol with SJFR has the finest overhead performance since its individuality in suddenly responding to link failures. Though the overhead of SJFR is sensibly significant, the overhead of the SJFR incorporated Ad hoc network with multiple link failures is far better.

6. CONCLUTION AND FUTURE WORK

In this paper, a new approach for localizing objects in unidentified environments by means of a fixed WSN has demonstrated. The significant feature of this approach is that it does not depend on global positioning information and uses only RSTH and hop count. This allows the "TA" algorithm to function inside buildings or forested areas, exclusive of having any sophisticated hardware. The usefulness of the TA algorithm is successfully verified through simulation. A novel scheme for wireless sensor networks to recover from link failure called the Sectionary Junction Failure Recovery algorithm

(SJFR) with AODV routing protocol is implemented in this paper. Performance of SJFR algorithm included with AODV routing protocol is compared with conventional AODV in terms of routing overhead, throughput and found appreciably improved in all aspects. This is attained since the SJFR is activated suddenly during link failure thereby decreasing the chance of packet loss. The routing overhead of AODV with SJFR is considerably low compared to conventional AODV, as the functionality is need-based, overcoming the unnecessary overheads caused by the routing nodes. The overhead is even less in case of more than one link failures as the conventional AODV needs more time to improve from multiple link failures. The simulation results show that the AODV routing protocol included with SJFR successfully improves the throughput and reduces routing overhead when compared to conventional AODV routing protocol. Still we have not taken effort for packet delivery ratio, delay and also node failure is the another phenomena in WSN. It will be addresses in the future research.

REFERENCES

[1] Nikhil Deshpande, Student Member, IEEE, Edward Grant, Senior Member, IEEE, and Thomas C. Henderson, Fellow, IEEE "Object Localization and Autonomous Navigation Using Wireless Sensor Networks- A Pseudogradient Algorithm Approach". IEEE systems journal. vol. 8, no. 1, march 2014.

[2] Shiva MurthyGa, R.J.D' Souzab, Varaprasad GcReliability "Analysis of Route Redundancy Model for Energy Efficient Node Disjoint Multipath Routing in Wireless Sensor Networks" Procedia Engineering. 38(2012): 1487-1494.

[3] P. R. Jasmine Jeni, A. Vimala Juliet, A. Messiah Bose "A Secured and Reliable Route Maintenance Mechanism for AODV Routing Protocol" Inte (IJCSES). Vol.3, No.1, February 2012.

[4] P.R. Jasmine Jeni, A. Vimala Julie and A. Messiah Bose "An enhanced route failure recovery model for mobile ad hoc networks" Journal of Computer Science. 10(8): 1561-1568, 2014 ISSN: 1549-3636.

[5] Fayez Khazalah, Ismail Ababneh, Zaki Malik" Forwarding Group Maintenance of ODMRP in MANETs" Procedia Computer Science. 19(2013) 289-296.

[6] C. Perkins, E. Royer and S. Das, "Ad hoc on-demand Distance Vector Routing", RFC-3651.

[7] Hu, Y.," Enabling Secure High-Performance Wireless Ad Hoc Networking", PhD Thesis, Carnegie Mellon University (CMU).

[8] A.V. Sutagundar, S.S. Manvi "Location aware event driven multipath routing in Wireless Sensor Networks: Agent based approach "Egyptian Informatics Journal. (2013): 14, 55-65.

[9] Abedalmotaleb Zadin and Thomas Fevens "Maintaining Path Stability with Node Failure in Mobile Ad Hoc Networks" Procedia Computer Science. 19(2013) 1068-1073.

[10] Sheng Liu, Yang Yang, Weixing Wang"Research of AODV Routing Protocol for Ad Hoc Networks".

[11] Thuy T. Truong, Kenneth N. Brown and Cormac J. Sreenan "Autonomous Discovery and Repair of Damage in Wireless Sensor Networks".

[12] Wang Guodong, Wang Gang and Zhang Jun "ELGR: An Energy-efficiency and Load-balanced Geographic Routing Algorithm for Lossy Mobile Ad Hoc Networks Chinese Journal of Aeronautics 23(2010): 334-340.

[13] Ramadoss, P., S.M. Yakub and S. Annaji, 2014. "A preemptive link state spanning tree source routing protocol for mobile ad hoc networks". J. Comput. Sci. 10: 85-90. DOI: 10.3844/jcssp.2014.85.90.

[14] F. Ye, G. Zhong, S. Lu, L. Zhang, and F. Y. G. Zhong, "Energy Efficient Optimization and Route Recovery for Gradient Broadcast Routing Protocol for Wireless Sensor Networks" ISSN: 2157-4952 7-10 May 2012.

[15] Sookyoung Lee, Mohamed Younis "Recovery from multiple simultaneous failures in wireless sensor networks using minimum Steiner tree. Vol. 70, Issue 5, May 2010, pp. 525-536.