ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 5, May 2015

Steadfast Energy Efficient Clustering Protocol in Wireless Sensor Networks

SelvaKani P[1], Krishna Ganesh S.M.[2]

PG Student, Department of CSE, Raja College of Engineering and Technology, Madurai, India [1]

Assistant Professor, Department of CSE, Raja College of Engineering and Technology, Madurai, India [2]

Abstract: Wireless sensor networks sense data and implements wide range of practical applications development. Although WSNs have the capability to be applied to some applications but there is some limitations associated with it in some environments. Energy efficiency is the primary factor in WSN and energy level maintenance is the important problem in distributed sensor networks. Cluster based communications protocols implements the energy efficiency mechanisms in WSN. Cluster head (CH) selection is the important factor of those protocols. Existing protocols (SEECH) select CH and relays separately based on nodes eligibilities. But the energy problem retains in these protocols when aggregate data is transmitted from CH to sink. The CRDD protocol is used and implements a new concept which creates a region and connects the Base Station (BS) to the canter point of the region. This will reduces the unnecessary packet flow from CH to sink and increase the energy level through reliability. Experimental results produce the effective solution and achieve a good performance.

Keywords: SEECH, CH, CRDD, BS.

I. INTRODUCTION

There is a tremendous growth in the applications of Wireless Sensor Networks (WSNs) in the recent years. The rapid convergence of advantages in digital circuitry, wireless transceiver, and micro electro-mechanical systems, has made it possible to integrate sensing, data processing, wireless communication and power supply into a low-cost inch scale device. Consequently, the potential of an easily deployed and inexpensive WSN consisting of.thousands of these nodes has attracted a great deal of attention. Inch scale sensor devices have been designed to work unattended with limited powerrequirements, for long periods of time. One of the looming challenges that threaten successful employment of WSNs is their energy efficiency with an increase of the network scalability. A number of sensor nodes can join or leave the network at any time while the workload of the network can be extremely high during some time frames. For instance, in monitoring applications and event tracking, when an event occurs the workload can increase dramatically. Moreover, many of the WSNs operate in unlicensed spectrum bands while theworldwide available and commonly used 2.4GHz band is shared by other applications such as Bluetooth and WiFi. Hence, it is important for WSNs to explore additional capabilities in energy consumption and spectrum access.

Opportunistic routing with cognitive networking can alleviate the problem. In opportunistic routing, the path towards the destination changes dynamically following certain next relay node selection criterion. The selection criterion is crucial in every opportunistic routing protocol and it has high effect on the network performance. The distance from the destination, the node or the link availability are some of the common selection criterion while location information probabilistic forwarding and coding strategies always affect the performance of any opportunistic protocol

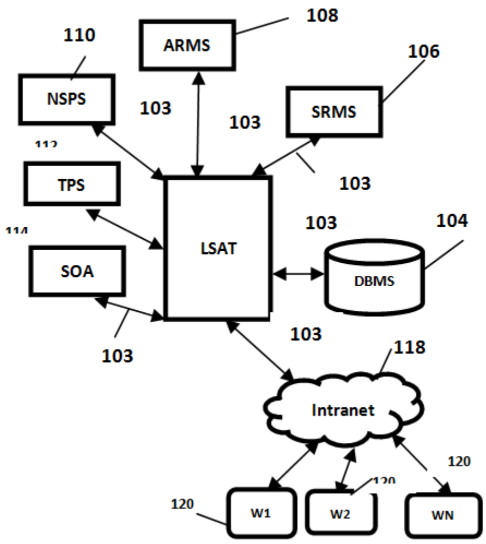


Fig 1 Architecture of CRDD

Another promising solution is the use of CognitiveRadio (CR) technology along with the wireless sensor nodes. It is possible to apply Dynamic Spectrum Access (DSA) models in WSNs to provide them with access to less congested spectrum. In general, a Cognitive Radio Sensor Network (CRSN) can be defined as a distributed network of wireless cognitive radio sensor nodes, which sense event signals and collaboratively communicate their readings dynamically over available spectrum bands in a multi hop manner to ultimately satisfy the application-specific requirements.

The combination of these two solutions can deliver promising results. Opportunistic routing principles are

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 5, May 2015

easy to be implemented in WSNs while the low-cost of inch scale device design with CR technology makes it a leading technology in the area. In this work, we investigate the efficiency of an opportunistic routing protocol with cognitive wireless sensor nodes under a CRSN. Cognitive Networking with Opportunistic Routing (CNOR) [3], is presented in further details. The system model and the routing principles such as the neighbour discovery process, the packet transmission process and the route maintenance are also described. By the integration of opportunistic routing and DSA, we show how the cognitive networking approach can improve the quality of wireless communications, as compared to simple opportunistic spectrum access protocol, and geographic opportunistic routing protocol. A channel model was built and calibrated for this work. Simulation results are presented with performance evaluations and simulation analysis.

The contribution of this work is summarized in the introduction of a novel opportunistic routing protocolfor CRSN. Moreover a realistic channel model was built with the use of information from measurement campaigns with wireless nodes. Real data were collected with the use of a prototype of a wireless sensor node and used for experiments. The complexity of the proposed protocol is acceptable enough for a WSN network, however the cognitive aspects of the protocol may increase the cost per unit

II. SYSTEM MODEL

In this section the basic functionality of the system model is presented. The network address mechanism is described, followed by the radio implementation of the wireless sensor nodes. The link model is also discussed.

A. Network Address Mechanism

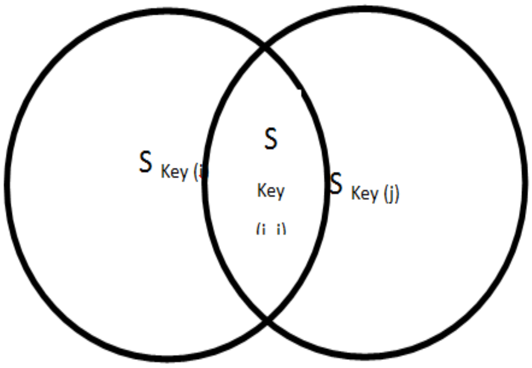
The network address of each sensor node in the network is subjected to a delivery criterion and is related to the distance from the destination node. Given the address of a node i , and the address of the destination node dst, the delivery criterion c should be locally obtained. Usually, in WSNs this delivery criterion is correlated with the distance between two nodes i,dst. In the proposed protocol, the destination node broadcasts identity advertisement packets toward every sensor node in the network. This packet has the delivery criterion field c equals to zero.

On the reception of this packet, every sensor node i , updates the delivery criterion field according to its distance from the destination c .When all the nodes have broadcasted all the packets, every node in the network knows its delivery criterion. As the network scalability changes, the nodes can update their delivery criterion locally. When a new node joins the network, it can estimate its logic address by acquiring the logic address of its neighbor nodes. When a node leaves the network or there is a different source node, the network addresses of all the nodes remain the same.

Only if the destination node changes this network address mechanism should take place again. After this, each node will advertise identity packetsperiodically, depending on the application. For instance, in a monitoring application, the time the identity packets are sent is related with the event occur probability. If a node is no longer available in the network, this node will not participate in any future transmission. In order to have a unique network address this address is also related to a hardware product number. Hence, any node that joins the network cannot use any network address from a previous node.

B. Link Model

There are three major factors that can affect the successful transmission of a packet between any two nodes: channel availability, channel access priority and packet reception ratio. 1) Channel Availability: In a link between two neighbor nodes there is a number of available channels$_N$.



$S_{\text{Key }(i,j)} \neq 0$

Fig 2 Representation of the closer region nodes

When a node has a packet to transmit, it will search for the available channel between all these N channels. If all the channels are occupied, the node has to wait for the next available channel. The number of the channels N ch should be carefully selected. A large number of channels may not be useful while it can lead the nodes to spend time and energy on sensing all the channels.

On the other hand, a small value in N ch will not take full advantage of the cognitive radio concept. , is free, a number of nodes that have packets to transmit will compete for this channel.

When a node is transmitting over a channel, none of the nodes in its transmission range can use this channel. As a consequence, the priority criterion is crucial. In this work, the distance from the destination was used as a priority criterion.
The node which is closer to the destination, according to its network address, will have the highest priority to access the next available channel. 2) Channel Access Priority:

When a channel Ch 3) Packet Reception Ratio: When a node sends a packet to a neighbor node over a channel Ch , there is a Packet Reception Ratio (PRR) for this channel.

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 5, May 2015

To simulate a realistic channel model for lossy WSNs with Binary Phase-Shift I ch Keying (BPSK) without channel coding, the log-normal shadowing path loss model derived.

III. CLUSTER MODEL

Energy efficiency is the important factor in wireless sensor networks to transfer data in sensor networks, create a cluster from the network based oncertain constraint. The constraint may be some times distance and energy level. An head is selected from the cluster head and head may be high level energy nodes according to fitness functions, some of them would play the role of relay node. The data sink is located in maximum distance from the sensing filed. Sensed data is gathered and sent to the data sink after aggregation.

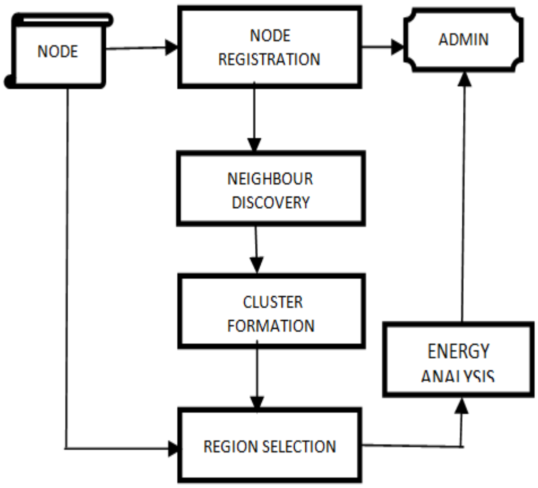


Figure 4 Architecture diagram

Architecture diagram starts with node registration with unique ID and the secret key. After registering a node, its neighbors are discovered and form a cluster. In each cluster, a cluster head is elected by using SEECH protocol and collects data from its advisory nodes.

After selecting head, its region is considered and it may be in the center position from the head, based on the region distance values, energy is calculated. Sensors control its power level to adjust transmission power according to the distance from the region distance. A node calculate the distance from center of the region to the corresponding node based on the signal power. Then energy is calculated the following

$E_{ix} = \{ tE_{e.head} + nE_{fd}$ if $d<=0$ ……..(1)

Depending on the distance between the node and cluster head, an empty space (d) or multi path fading yx channel model are employed.

IV. SIMULATON AND RESULTS

The performance of CRDD architecture is implemented in NS2. The requirement of the CRDD, are designed a sensor network simulation incorporating ECDG – essentially a multi-hop hierarchical sensor network as the foundational environment.

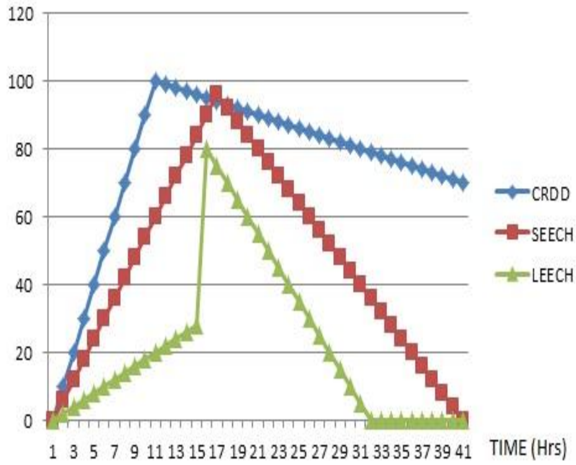


Fig 5 Energy level of CRDD protocol, SEECH protocol and LEECH protocol

In order to explain the relations among CRDD, SEECH and LEACH, we run each kind of simulation in these three different scenes. For increasing the comparability and feasibility, the parameters are the same as SEECH, LEACH and ECDG

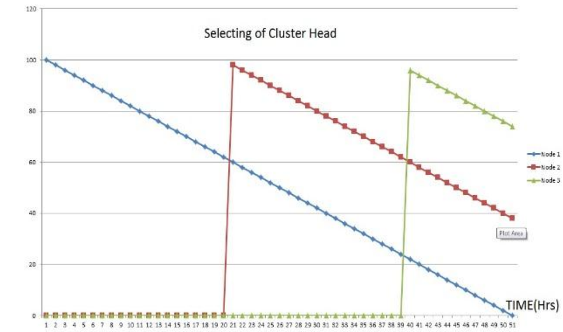


Fig 6 Selecting CH of the maximum Energy Nodes

As shown in our CRDD architecture performs better than ECDG and LEACH under the same environment. Having sent the same amount of messages, CRDD generates the least amount of error messages. The error message amount generated by CRDD is about 3 times less than LEACH's and about 5 times less than ECDG's.

IV. CONCLUSION

In this paper, we present a novel, scalable andintelligent architecture, a compensation-based reliableagent architecture (CRDD) for wireless sensor network. The CRDD protocol is used and implements a new concept which creates a region and connects the Base Station (BS) to the center point of the region. This will reduces the unnecessary packet flow from CH to sink and increase the energy level through reliability. Experimental results produce the effective solution and achieve a good performance.in our CRDD architecture performs better than ECDG and LEACH under the same environment. Having sent the same amount of messages, CRDD generates the least amount of error messages. The error message amount generated by CRDD is about 3 times less than LEACH's and about 5 times less than ECDG'sAs a result, in thenear future we are going to work on

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 4, Issue 5, May 2015

improving theability of message processing in base station and makeoverall sensor network reflect faster.

REFERENCES

[1]. S. Buchegger and J. Boudec, "A robust reputation system for P2P and mobile ad-hoc networks," in Proc. 2nd Workshop Econ. Peer-to-Peer Syst., 2004, pp. 403–410.
[2]. F. Li and J. Wu, "Mobility reduces uncertainty in MANETs," in Proc. IEEE INFOCOM, 2007, pp. 1946–1954.
[3]. A. Josang, R. Ismail, and C. Boyd, "A survey of trust and reputation systems for online service provision," Decis. Support Syst., vol. 43, no. 2, pp. 618–644, Mar. 2007.
[4]. F. Li, A. Srinivasan, M. Lu, and J. Wu, "Uncertainty mitigation for utility-oriented routing in MANETs," in Proc. IEEE GLOBECOM, 2007, pp. 427–431.
[5]. F. Li and J. Wu, "Hit and run: A Bayesian game between malicious and regular nodes in mobile networks," in Proc. IEEE SECON, 2008, pp. 432–440.
[6]. P. Liu, W. Zang, and M. Yu, "Incentive-based modeling and inference of attacker intent, objectives and strategies," ACM Trans. Inf. Syst. Secur., vol. 8, no. 1, pp. 78–118, Feb. 2005.