International Journal of Research in Engineering, Science and Management
Volume-3, Issue-7, July-2020
journals.resaim.com/ijresm | ISSN (Online): 2581-5792

An Efficient Neighbour Discovery Scheme for Mobile WSN

Eshwaramma Swapna Shree[1*], Anusha Gonchigar[2], Sakeena Khatoon Sana Khan[3], V. B. Apoorva[4], Sudhakar Avareddy[5]

[1,2,3,4]*Student, Department of Computer Science and Engineering, Ballari Institute of Technology and Management, Ballari, India*

[5]*Assistant Professor, Department of Computer Science and Engineering, Ballari Institute of Technology and Management, Ballari, India*

*Corresponding author: swapnadaddy123@gmail.com

***Abstract*: Mobile Low-Duty-Cycle Wireless Sensor Networks (MLDC-WSN) is a new type of WSN that has emerged in recent years. It can deploy nodes on moving objects, and use object mobility to capture a wide range of dynamic environmental information. It has diverse applications and have the ability of mobility and get into sleep for a long time. However, the mobility and sleeping features of MLDC-WSN nodes results in dynamic network topology changes, which restricts to quickly discover their neighbour nodes. Thus, the optimal distribution decision is not established by the nodes. To solve this problem, in this paper, a novel selectively proactive neighbour discovery (SPND) algorithm is proposed. The proposed algorithm enables the nodes when they wake up to search their neighbour nodes, which prevent the long-time waiting delay in the traditional passive neighbour discovery mechanism. Moreover, the proposed algorithm can further reduce the delay, and acquire accurate neighbour discovery results by quickly determining the next neighbour set at the next moment due to prediction of movement speed and distance of neighbours.**

***Keywords*: MLDC-WSM, Low-duty cycle, SPND.**

1. Introduction

The Mobile Low-Duty-Cycle Wireless Sensor Network (MLDC-WSN) is a new type of self-organizing network that has emerged in recent years. Like traditional WSNs, it consists of a large number of nodes with limited energy, communication range, storage capacity, and computing power. However, it is significantly different from WSN: the nodes in MLDC-WSN use a low duty cycle (LDC) protocol and go to sleep for a long-time to save energy and they have less active period compared with the sleeping period, whereas the traditional WSN nodes do not have LDC feature and therefore, its nodes awake for longer time causing more energy consumption and battery usage. Therefore, the topology changes of the MLDC-WSN will be more frequent, causing the neighbour nodes to change from time to time. Neighbour discovery is an important operation in the network. Nodes in the network need to quickly discover each other to form a network. Since nodes need to perform neighbour discovery in the network, a quick neighbor discovery with less energy consumption is an important scheme for the network to work normally and prolong its lifecycle. In MLDC-WSN, the node adopts a low-duty cycle mode of operation (i.e., the node has more sleep period than an active period) and neighbour discovery between nodes require the node to be simultaneously awakened. The state, which takes a long time for the node to wait for the discovered neighbour to wake up, causes a huge delay. In addition, the movement of the node when it wakes up will cause the network topology to change constantly so that the neighbours of the node will change from time to time. Therefore, it is very difficult to find neighbours with low-latency and power consumption. At present, the typical work is to use the node to actively wake up to discover neighbours, but this method requires the node to wake up many times, which consumes more energy. A new low energy selectively proactive neighbor discovery (SPND) algorithm, the node can combine the movement model of the nodes in the network, and according to the division of the set, selectively wake up at the moment when the neighbor wakes up, and confirm with the neighbor node. Moreover, this algorithm can further reduce the delay, and acquire accurate neighbor discovery results by quickly determining the next neighbour set at the next moment due to prediction of movement speed and distance of neighbours.

2. Literature Survey

In paper [1], A. Razaque and K. M. Elleithy [1] The need for an efficient medium access control (MAC) protocol is extremely important with the emergence of wireless sensor networks (WSNs). The MAC protocol has increasingly been significant in advancing the performance of WSNs. In this paper, a low duty cycle, energy-efficient and mobility-based Boarder Node Medium Access Control (BN-MAC) hybrid protocol introduced for WSNs that controls overhearing, idle listening and congestion issues by preserving energy over WSNs. BN-MAC leverages the features of contention and schedule-based MAC protocols. The contention encompasses the novel semi-synchronous approach that helps obtain faster access to the medium. The schedule-based part helps reduce the collision and overhearing problems.

In paper [2], S. Guo, Y. Yang [2] Data uploading time constitutes a large portion of mobile data gathering time in wireless sensor networks. By equipping multiple antennas on the mobile collector, data uploading time can be greatly shortened. However, previous works only treated wireless link capacity as a constant and ignored power control on sensors, which would significantly deviate from the real wireless environments. To overcome this problem, in this paper we propose a new data gathering cost minimization framework for mobile data gathering in wireless sensor networks by considering dynamic wireless link capacity and power control jointly. Our new framework not only allows concurrent data uploading from sensors to the mobile collector, but also determines transmission power under elastic link capacities. We study the problem under constraints of flow conservation, energy consumption, elastic link capacity, transmission compatibility, and Sojourn time. We employ the sub gradient iteration algorithm to solve the minimization problem. We first relax the problem with Lagrangian dualization, then decompose the original problem into several subproblems, and present distributed algorithms to derive data rate, link flow and routing, power control, and transmission compatibility. For the mobile collector, we also propose a sub-algorithm to determine sojourn time at different stopping locations. Finally, we provide extensive simulation results to demonstrate the robustness of proposed algorithm.

In paper [3], Neighbour discovery is a fundamental service for initialization and managing network dynamics in wireless sensor networks and mobile sensing applications. In this paper, we present a novel design principle named Talk More Listen Less (TMLL) to reduce idle-listening in neighbour discovery protocols by learning the fact that more beacons lead to fewer wakeups. We propose an extended neighbour discovery model for analysing wakeup schedules in which beacons are not necessarily placed in the wakeup slots. Furthermore, we are the first to consider channel occupancy rate in discovery protocols by introducing a new metric to trade off among duty-cycle, latency and channel occupancy rate. Guided by the TMLL principle, we have designed Nihao, a family of energy-efficient asynchronous neighbour discovery protocols for symmetric and asymmetric cases.

3. Problem Statement

To enhance a selective proactive neighbour discovery which minimizes neighbour discovery delay and energy consumption.

A. Objectives

- To reduce energy consumption.
- To minimize neighbour discovery delay.

4. Methodology

In the SPND algorithm, for the sensor network just deployed, each node performs neighbour discovery in a distributive manner.

For the characteristics of the mobile sensor network, the neighbour discovery of the node is divided into 2 steps.

- Step 1: According to the group-based neighbour discovery algorithm, the initial neighbour nodes set is constructed according to the principle that the neighbour nodes in the newly joined group share their neighbour set information to other nodes in the group. Then the other nodes can quickly obtain the wakeup time of the potential neighbour node. After this, they actively wake up for neighbour discovery at that time.
- Step 2: It combines the movement model of the node to selectively specify the active wake-up time of the node. The node actively wakes up to discover the neighbour set at that moment. According to the principle that: after a period of movement of a node in the network, the node selects only those neighbour nodes that may be active in the communication range after the mobile to actively wake up the neighbour discovery. It is ensured that the nodes in the neighbouring range perform neighbour discovery according to the established sleep awake state. The node that is definitely moving out of the neighbour range is excluded from the neighbour set.

5. Implementation

Firstly, we build wireless network topology, topology consisting of mobile nodes each node working with multiple channels. Each and every node in the network topology will be assigned with certain bandwidth and topology in order to know the distance of neighbour for a particular node Euclidian distance concept is used. From which node the data has to be sent and which node must receive the data will be satisfied. Also, how much amount of data has to be sent along with time interval of sending data will be specified. The algorithm for placement of nodes in the network is given below.

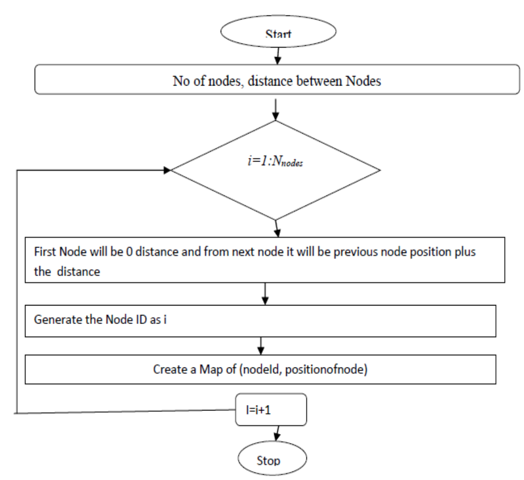

Fig. 1. Flowchart

After creating a network, it is important for each node to have energy to transmit the data packets. Energy mode1 as implemented in, is a node attribute the energy mode1 represents level of energy in the mobile host. The energy mode1 in a node has a initial value which is the level1 of energy the node has at the beginning of simulation. It also has given energy usage for every packet it transmits and receives these are called txPower_ and rxPower_. SPND algorithm finds the neighbour node quickly and reduce the delay. In SPND algorithm, the node can combine the movement model of the nodes. In the network, and according to the division of the set, selectively wake up, at the moment when the neighbour wakes up, and confirm with the neighbour node. Moreover, SPND algorithm can further reduce the delay, and acquire accurate neighbor discovery results by quickly determining the next neighbor set at the next neighbour set at the next moment due to prediction of movement speed and distance of neighbours. To prolong the life cycle of a node, we need to save energy i.e., battery consumption must be low, in order to achieve this, we will tune up parameters in Mac (Medium access control) layer.

6. Conclusion

SPND algorithm reduces the delay, and acquire accurate neighbour discovery results by quickly determining the next neighbour set at the next moment due to prediction of movement speed and distance of neighbours. To prolong the life cycle of a node, we need to save energy i.e., battery consumption must be low, in order to achieve this, we will tune up parameters in Mac (Medium access control) layer.

References

[1] V. C Giruka and M. Singhal, "Hello protocols for ad-hoc networks: Overload and accuracy trade-offs", In proceedings of sixth IEEE international symposium on a world of wireless mobile and multimedia networks (WoWMOM'05), 2005.
[2] R. Madan and S. Lall "An energy-optimal algorithm for neighbour discovery in wireless sensor networks," In proc. of mobile network and applications, ACM, pp. 317-326.2006.
[3] P. Dutta and D. Culler, "practical asynchronous neighbor discovery and rendezvous for mobile sensing applications," the 6th ACM conference on embedded network sensor systems, USA, pp. 71–84, 2008 IEEE.
[4] Valerie Galluzi and Ted Herman", Survey: Discovery in wireless sensor networks", International journal of distributed sensor networks, volume 2012, Article ID 27 1860.
[5] A. Razaque and K. M. Elleithy, "Low duty cycle, energy-efficient, and mobility-based boarder node-MAC hybrid protocol for wireless sensor networks," Journal of Signal Processing Systems, vol. 81, no. 2, pp. 265–284, 2015.
[6] J. Liang, X. Zhou, T. Li, "Energy saving proactive neighbour discovery algorithm in mobile low-duty-cycle wireless sensor network," Journal on Communications, vol. 39, pp.45-55, 2018.