Analyze for Geographic Routing in Clustered Wireless Sensor Networks among Obstacles

Jay Prakash Singh[1] Raj Kumar[2]
[1,2]Department of Computer science engineering
[1,2]RITM, Palwal, YMCA University of Science & Technology, Faridabad, Haryana, India

Abstract— An important issue of research in wireless sensor networks (WSNs) is to dynamically organize the sensors into a wireless network and route the sensory data from sensors to a sink. Clustering in WSNs is an effective technique for prolonging the network lifetime. In most of the traditional routing in clustered WSNs assumes that there is no obstacle in a field of interest. Although it is not a realistic assumption, it eliminates the effects of obstacles in routing the sensory data. In this paper, we first propose a clustering technique in WSNs named energy-efficient homogeneous clustering that periodically selects the cluster heads according to a hybrid of their residual energy and a secondary parameter, such as the utility of the sensor to its neighbors. In this way, the selected cluster heads have equal number of neighbors and residual energy. We then present a route optimization technique in clustered WSNs among obstacles using Dijkstra's shortest path algorithm. We demonstrate that our work reduces the average hop count, packet delay, and energy-consumption of WSNs.

Key words: Geographic Routing, Clustered Wireless Sensor Networks, Obstacles

I. Introduction

A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.

II. Existing System

1) Most of the existing solutions for the local minimum problem use perimeter routing technique (PRT). By the PRT, when greedy forwarding fails at a local minimum, *i.e.*, no neighbors closer to the sink, packets tend to be routed along the whole boundaries. In SPAN, a sensor associates with a CH in a step.
2) A cluster with a higher CH degree may become highly loaded. Another drawback of existing clustering techniques is that they require more than one transmission power levels for routing the data. Such techniques are not suitable for low-cost sensors which have usually single power level. GPSR does not achieve shorter routing paths.
3) Similarly, GFVD does not construct a shorter routing path and may burden the energy consumption of sensors.

A. Disadvantages of Existing System:

1) In existing, CHs to perform direct transmissions to the sink, thus it suffers from the cost of long-distance transmissions.
2) More energy consumption
3) They may not use shorter routing path

III. Proposed System

1) I propose an EHC technique in WSNs that periodically selects CHs according to their residual energy and the utility of the sensor to its neighbors. The main difference between existing clustering techniques and EHC technique is the utility of the CHs in WSNs. In the EHC technique, a sensor becomes a CH if the utility of the sensor is higher than its neighbors.
2) Different from the existing work, a CH in EHC technique has maximum eleven neighboring CHs and does not make any assumptions about the density of sensors. The worst case processing time and space complexities of EHC technique is $O(1)$ per sensor.
3) I present a route optimization technique in clustered WSNs among obstacles using Dijkstra's shortest path algorithm.

A. Advantages of proposed system:

1) Reduce the energy consumption
2) Decrease the hop count
3) Decrease the delay time
4) Increase the throughput

IV. SYSTEM ARCHITECTURE

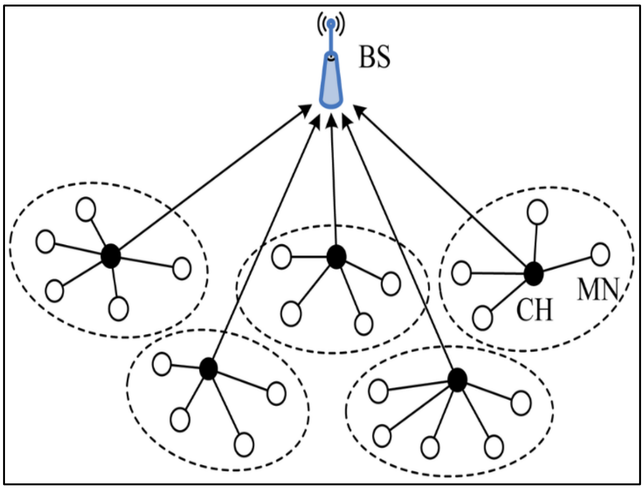

Fig. 1: System Architecture

V. DESIGN

A. *Input design*

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialogue to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

B. *Objectives*

- Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.
- It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.
- When the data is entered it will check for its validity. Data can be entered with the help of screens.
- Appropriate messages are provided as when needed so that the user will not be in maize of instant.

Thus the objective of input design is to create an input layout that is easy to follow

C. *Output design*

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1) Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2) Select methods for presenting information.
3) Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the Future.
- Signal important events, opportunities, problems, or warnings.
- Trigger an action.
- Confirm an action.

VI. CONCLUSION

In this paper, we proposed a distributed approach to determine if a sensor in WSNs is a CH to meet the desired connectivity requirements. We mainly focused on energy-efficient clustered WSNs to prolong the lifetime of WSNs. We also proposed a technique to optimize the routing path among obstacles in clustered WSNs. We simulated the performance of the proposed EHC and ROT for different network scenarios and demonstrated that the energy consumption and average hop count in WSNs are reduced due to the clustering of sensors and optimization of routing path, hence the lifetime of WSNs is increased. The results demonstrated that the geometry and location of the obstacles should be considered to compute an optimized routing path.

REFERENCES

[1] Hari Prabhat Gupta, S. V. Rao, Amit Kumar Yadav, and Tanima Dutta, "Geographic Routing in Clustered Wireless Sensor Networks Among Obstacles", IEEE Sensors journal, vol. 15, no. 5, May 2015.
[2] J. H. Lee, T. Kwon, and J. Song, "Group connectivity model for industrial wireless sensor networks," *IEEE Trans. Ind. Electron.*, vol. 57,no. 5, pp. 1835–1844, May 2010.
[3] J.-S. Lee and W.-L. Cheng, "Fuzzy-logic-based clustering approach for wireless sensor networks using energy predication," *IEEE Sensors J.*,vol. 12, no. 9, pp. 2891–2897, Sep. 2012.

[4] Z. Ha, J. Wu, J. Zhang, L. Liu, and K. Tian, "A general self-organized tree-based energy-balance routing protocol for wireless sensor network,"*IEEE Trans. Nucl. Sci.*, vol. 61, no. 2, pp. 732–740, Apr. 2014.
[5] D. C. Hoang, P. Yadav, R. Kumar, and S. Panda, "Real-time implementation of a harmony search algorithm-based clustering protocol for energy-efficient wireless sensor networks," *IEEE Trans. Ind. Informat.*,vol. 10, no. 1, pp. 774–783, Feb. 2014.
[6] M. Tarhani, Y. S. Kavian, and S. Siavoshi, "SEECH: Scalable energy efficient clustering hierarchy protocol in wireless sensor networks," *IEEESensors J.*, vol. 14, no. 11, pp. 3944–3954, Nov. 2014.
[7] P. T. A. Quang and D.-S. Kim, "Enhancing real-time delivery of gradient routing for industrial wireless sensor networks," *IEEE Trans.Ind. Informat.*, vol. 8, no. 1, pp. 61–68, Feb. 2012.
[8] J. Niu, L. Cheng, Y. Gu, L. Shu, and S. K. Das, "R3E: Reliable reactive routing enhancement for wireless sensor networks," *IEEE Trans. Ind.Informat.*, vol. 10, no. 1, pp. 784–794, Feb. 2014.
[9] R. Xie and X. Jia, "Transmission-efficient clustering method for wireless sensor networks using compressive sensing," *IEEE Trans. ParallelDistrib. Syst.*, vol. 25, no. 3, pp. 806–815, Mar. 2014.
[10] H. Lu, J. Li, and M. Guizani, "Secure and efficient data transmission for cluster-based wireless sensor networks," *IEEE Trans. Parallel Distrib.Syst.*, vol. 25, no. 3, pp. 750–761, Mar. 2014.b

