ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 10, March 2016

ENERGY EFFICIENT AND DELAY AWARE ROUTING METHOD FOR WIRELESS SENSOR NETWORKS

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***ABSTRACT*-The Wireless Sensor Networks(WSNs) have emerged as a new category of networking systems with limited computing, communication, and storage resources. In many sensing applications source nodes deliver packets to sink nodes via multiple hops, leading to the problem on how to find routes that enable all packets to be delivered in required time frames, while simultaneously taking into account factors such as energy efficiency and load balancing. To solve this problem one datacollection protocol is developed called EDAL, which stands for Energy-efficientDelay-aware Lifetime-balancing data collection. Methods used arecentralized heuristic and ant colony gossiping to find best energy efficient path. CAS (Cooperation-Aware Scheme) is used to reduce the traffic in the network.**

Keywords: Energy efficiency, Ant colony gossiping, Centralized heuristic, Cooperation-Aware Scheme.

1. INTRODUCTION:

Wireless Sensor Network (WSN) refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location. A WSN consists of few hundreds to thousands of sensor nodes. The sensor node equipment includes a radio transceiver along with an antenna, a microcontroller, an interfacing electronic circuit, and an energy source, usually a battery. The size of the sensor nodes can also range from the size of a shoe box to as small as the size of a grain of dust.

The main constraint of sensor nodes is their very low finite battery energy, which limits the lifetime and the quality of the network . For that reason, the protocols running on sensor networks must consume the resources of the nodes efficiently in order to achieve a longer network lifetime.

This paper develops EDAL, an *E*nergy-efficient *D*elay-*A*ware *L*ifetime-balancing data collection protocol. Specifically, EDAL is formulated by treating energy cost in transmitting packets in WSNs in a similar way as delivery cost of goods in OVR and by treating packet latencies similar to delivery deadlines. So introduce both centralized heuristic based on tabu search and a distributed heuristic based on ant colony gossiping, to obtain approximate solutions. Our algorithm designs also take into account load balancing of individual nodes to maximize the system lifetime.

2. EXISTING SYSTEM

The vehicle routing problem (VRP) is a well-known NP-hard problem in operational research. VRP finds routes between a depot and customers with given demands so that the transportation cost is minimized with the involvement of the minimal number of vehicles, while satisfying capacity constraints. With additional constraints, VRP can be further extended to solve different problems, where one of the most important is the vehicle routing problem with time windows (VRPTW). This problem occurs frequently in the distribution of goods and services, where an unlimited number of identical vehicles with predefined capacity serve a set of customers with demands of different time intervals (time windows). VRPTW tries to minimize the total transportation cost through the minimum number of vehicles, without violating any timing constraints.

Once routes have been found using EDAL, further refine the data collection efficiency through an emerging technique calledCompressive Sensing. CS is a technique through which data are compressed during their transmission to a given destination by exploiting the fact that most sensors may not always have valid data to report when they sample the environment , especially for nodes deployed in stable environments with rare and infrequent events to be detected.

A new data aggregation technique derived from CS to minimize the total energy consumption through joint routing and compressed aggregation.

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Compressive sensing and particle swarm optimization algorithms to build up data aggregation trees and decrease communication rate. These two methods are different from EDAL in that they require all nodes to contribute sensing data during the data collection phase.

3. PROPOSED SYSTEM

Key motivation for this work stems from the insight that recent research efforts on open vehicle routing (OVR) problems are usually based on similar assumptions and constraints compared to sensor networks. Specifically, in OVR research on goods transportation, the objective is to spread the goods to customers in finite time with the minimal amount of transportation cost.

One may wonder, naturally, if treating packet delays as delivery time of goods, and energy cost as delivery cost of goods, it may be possible to exploit research results in one domain to stimulate the other.

Motivated by this observation EDAL, an Energy-efficient Delay-Aware Lifetime-balancing Protocol is developed. Specifically, EDAL is formulated by treating energy cost in transmitting packets in WSNs in a similar way as delivery cost of goods in OVR and by treating packet latencies similar to delivery deadlines.

To reduce its computational overhead, introduce both a centralized metaheuristic based on tabu search and a distributed heuristic based on ant colony gossiping, to obtain approximate solutions. This also takes into account load balancing of individual nodes to maximize the system lifetime.

On the other hand, the proposed CAS is a cooperative strong nodemechanism in which a threshold is preset in order to determine whether the node traffic is over or not. The privilege of corresponding sensor nodes is upgraded when the load exceeds the threshold. Therefore, the sensor node can command its child nodes to change the transmission path for distributing the traffic effectively. Moreover, once the traffic is over the overall network flow threshold, it is necessary to add the other new sensor nodes into the network for relieving the traffic.

4. SYSTEM MODEL

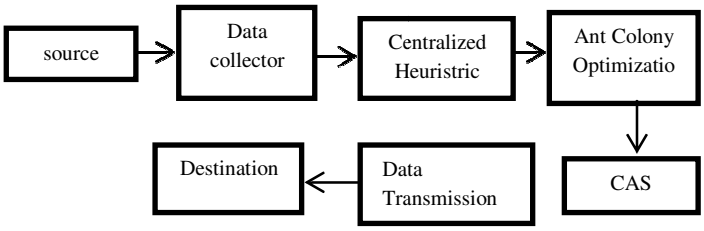

Figure 4.1 System Architecture

In Figure 4.1 the system architecture contains 4 main parts, i.e., Configuration Manager, Centralized Heuristic, Ant Colony Optimization andCooperative Aware Scheme. First create a Wireless Sensor Network .A Wireless Sensor Network consists of many number of sensor nodes. From the large number of sensor node, select a source node so as to transmit data to the destination node. Each node in the sensor network performs status gossiping. Based on centralized heuristic, route to reach the destination node will be constructed. The status gossip helps to store the details about nodes in the database. For example remaining energy level of nodes, path to reach the nodes are all stored. Sensor network depends on lifetime of the sensor node in the Wireless Sensor Networks. CAS is used when the network flow exceeds the capacity to reduce congestion.

Data Collector

This is used to collect the date from the network. This create the sensor nodes in the wireless sensor network. This data collector performs the process of monitoring and controlling the network devices to find where the nodes are located. This module organize and maintain the details about all components of the network. This component collects the packets from the networks, which are in-turn specified by the user and transfer it to the destination. This also identifies the source and destination to transfer the data.

Centralized Heuristic

The centralized heuristic algorithm consists of two phases one is route construction, which finds an initial feasible route solution, and route optimization,

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which improves the initial results using the tabu search optimization technique.In the route construction phase of this algorithm, we present a heuristic algorithm based on the Revised Push Forward Insertion Heuristic (RPFIH) method. RPFIH repeatedly selects the customer with the lowest additional insertion cost as the next node, until all customers are connected. Finally, RPFIH generates a set of found routes as the final output. Next optimize the initial solution using tabu search. Tabu search is a popular memory-based search strategy for guiding search beyond locally optimal points. Specifically, tabu search keeps the following data structures. One is tabu move list which is a queue with fixed size to keep the recent moves, so that problems such as repetition and cycling can be avoided. Other one is candidate list that stores the best solutions found so far by the search process, ranked by their total route cost.

Ant Colony Optimization

In Ant Colony Optimization, each node sends forward ants spreading its current status, including its remaining energy level, toward its neighbor nodes within H hops. Meanwhile, the status data of nearby nodes is collected by each source node with the received backward ants. The status Gossipis used to store the status information of various nodes.

In the status gossiping phase, each source node sends forward ants spreading its current status, including its remaining energy level, toward its neighbor source nodes within some hops. Meanwhile, the status data of nearby nodes is collected by each source node with the received backward ants. During the gossip phase, the ants are forwarded with a modified geographic forwarding routing protocol, which chooses the node with the maximum remaining energy while making geographical progress toward the destination as the next hop.

Once a node collects status information of all its nearby sources, it enters the route construction phase and runs RPFIH distributedly based on collected nearby neighbor status and the estimation of node status outside the immediate neighborhood.As all nodes start with a fixed amount of energy according to the node type, the source node can accurately estimate the status of nearby nodes. In that case, the minimal weight path from a source node to a nearby source node can be calculated with the currently held information.

Cooperative Aware Scheme

In CAS scheme, the buffer loading is applied to detect the outcome of congestion problems. When the bufferloading is higher than the preset threshold, there are impending congestion problems, thereby, the operating node mode is going to be switched into the strong node mode for reducing the network traffic. The transmission path and the node traffic of a child node is changing and observing, respectively, when in the strong node mode. Christo Ananth et al. [7] discussed about Reconstruction of Objects with VSN. By this object reconstruction with feature distribution scheme, efficient processing has to be done on the images received from nodes to reconstruct the image and respond to user query. Object matching methods form the foundation of many state- of-the-art algorithms. Therefore, this feature distribution scheme can be directly applied to several state-of- the-art matching methods with little or no adaptation. The future challenge lies in mapping state-of-the-art matching and reconstruction methods to such a distributed framework. The reconstructed scenes can be converted into a video file format to be displayed as a video, when the user submits the query. This work can be brought into real time by implementing the code on the server side/mobile phone and communicate with several nodes to collect images/objects. This work can be tested in real time with user query results. The algorithm of CAS mainly designed to avoid packets dropped by nodes due to high traffic loading. When a node is in danger of being overloading, part of the traffic is distributed to other nodes before the occurrence of the congestion problem.

5. CONCLUSION

An Energy efficient Delay Aware Lifetime balancing EDAL protocol was proposed in wireless sensor networks which is promoted by flourishing techniques developed for open vehicle routing problems with time deadlines. The proposed system EDAL solves the problem of high energy consumption in sensor networks by balancing the loads in nodes. The centralized heuristic algorithmgenerate routes that connect all nodes with minimal total path cost, under the constraints of packet delay requirements. Ant colony optimization is used to find the best path to transfer the data. The lifetime of the deployed sensor network is also balanced by assigning weights to links.Here high energy nodes are chosen to balance the load which in turn increases the lifetime of wireless sensor network.Thus traffic in the network also reduced by

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finding alternate route when congestion occurs which in turn reduces delay.

REFERENCES

[1] Anuba Merlyn "Energy Efficient Routing (EER) For Reducing Congestion and Time Delay in Wireless Sensor Network"International Journal of Computer Networks and Applications Volume 1, Issue 1, November - December (2014)

[2] Chen G, Guo T.D, Yang W.G. and Zhao T. (2006), „An improved ant based routing protocol in wireless sensor networks", Proc. CollaborateCom, pp. 17.

[3] Liu L, Zhang X. and Ma H. (2010), „Optimal node selection for target localization in wireless camera sensor networks", IEEE Trans. Veh.Technol., vol. 59, No. 7, pp. 3562–3576.

[4] Neelu Rajput , Dr. Dharm Singh & Dr. Naveen Choudhary "Longer Distance Hop Count based Priority Congestion Control Technique for Wireless Sensor Networks" Global Journal of Computer Science and Technology Network, Web & Security Volume 14 Issue 4 Version 1.0 Year 2014

[5] Manpreet Kour, Bhisham Sharma, Dr. Trilok C. Aseri"A Study of Traffic Redirection Based Congestion Control Protocols for Wireless Sensor Networks" IJCST Vol. 6, Issue 2, April - June 2015

[6] Ozyurt Z, Aksen D, and Aras N. (2006), „Open vehicle routing problem with time deadlines: Solution methods and an application", in OperOperations , vol. 5, pp. 73–78.

[7] Christo Ananth, M.Priscilla, B.Nandhini, S.Manju, S.Shafiqa Shalaysha, "Reconstruction of Objects with VSN", International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST), Vol. 1, Issue 1, April 2015, pp:17-20

[8] UrvashiHanda "Improved Hop-by-Hop Congestion Control Algorithm" International Journal of Computer Science and Information Technologies, Vol.5(3), 2014

[9]Vicaire P, He T, Cao Q, Yan T, Zhou G, Gu L, Luo L, Stoleru R, Stankovic R.A and Abdelzaher T.F. (2009), „Achieving long-term surveillance in VigilNet", ACM Trans. Sen. Netw., vol. 5, pp. 9:1–9:39

[10] Xu N, Rangwala S, Chintalapudi K.K, Ganesan D, Broad A, Govindan R. and Estrin D. (2004), „A wireless sensor network for structural monitoring", Proc. 2nd ACM SenSys, New York, pp. 13–24.

[11]Yanjun Yao, Qing Cao andAthanasios V. Vasilakos (2015),"EDAL: An Energy-Efficient, Delay-Aware, and Lifetime-Balancing Data Collection Protocol for Heterogeneous Wireless Sensor Networks", IEEE/ACM Transactions on Networking, Vol. 23, No. 3.

[12] Yu-HsingChien, Joy Iong-Zong Chen, Bo-HuiLee "A Cooperation-Aware Scheme for Overcoming the Traffic Congestion in the Deployment of WSNs" Engineering, 2014, 6, 185-192.