EERDC: Energy Efficient Routing using Dynamic Cluster approach

Praveen Kumar K V\textsuperscript{a}, Shwetha K\textsuperscript{b}, B M Thippeswamy\textsuperscript{b}, Reshma\textsuperscript{b}, M K Banga\textsuperscript{c}, Udaya Rani V\textsuperscript{a}, Venugopal K R\textsuperscript{d}

\textsuperscript{a}Department of Computer Science and Engineering, REVA University Bangalore 560 064, India, Contact: praveenkv_mtech@yahoo.com
\textsuperscript{b}Department of Computer Science and Engineering, Sambhram Institute of Technology, Bangalore
\textsuperscript{c}Department of Computer Science and Engineering, Dayananda Sagar University, Bangalore
\textsuperscript{d}University Visvesvaraya College of Engineering, Bangalore University, Bangalore 560 001.

Density of nodes deployed in Wireless Sensor Network (WSN) is based on application requirements. The redundant data collection in dense network results in more energy consumption. The Data Routing In-Network Aggregation (DRINA) is one of the recent algorithms proposed to shrink the energy consumption in dense network environment by minimizing the number of communications from source to sink. Here the data transmission is carried out by using data aggregation in cluster based environment using shortest path method. But due to inefficient cluster head selection technique, it is unable to manage cluster head failures and avoids the energy drain in sensor nodes along the common static path that leads network partition. In order to overcome these problems we proposed an algorithm known as Energy Efficient Routing using Dynamic Cluster approach (EERDC), that includes efficient cluster head selection technique and dynamic route selection for the reliable data transmission. In our approach the cluster head selection technique involves an efficient method of cluster head selection. Our algorithm minimizes the overhead in communication, consumption of energy and increases the network lifetime when compared to earlier state of art works.

Keywords: Clustering, Data Aggregation, Dynamic Routing, Energy Efficiency, Wireless Sensor Network.

1. Introduction

A wireless sensor network is a special category of AdHoc network with huge number of tiny nodes, which have the capabilities of self organization, physical parameters sensing and one to one communication. These nodes have limited energy, processing capability which collaboratively sense physical and environmental parameters like temperature, sound, pressure, vibration, pollutants etc [1][2]. WSNs are used in various applications like habitat monitoring, health monitoring, target tracking, military and in many other applications.

In dense sensor networks the communication overhead and energy consumption is high due to large redundant data collection and transmission towards the sink. Energy conservation is one of the critical challenges in WSN to increase lifetime of the network. Most of the previous works used Data aggregation technique that is used to increase energy conservation by reducing communication overhead [3,4].

Low Energy Adaptive Clustering Hierarchy (LEACH) [5] is a prevalent energy conservation mechanism that dynamically forms the cluster and assigns the cluster head that directly sends the aggregated data to sink. This technique avoids energy consumption of individual nodes in a cluster. But it leads the energy drain at the cluster head soon and requires frequent replacement of cluster heads. The LEACH replaces the cluster head randomly without taking the account of energy status of the nodes.
transmission. Thus the packet delivery rate is comparatively higher and increasing linearly throughout the simulation (2000ms to 14000ms). It is observed that the Packet Delivery Rate increased by 18% in comparison with DRINA and InFRA. Figure 7 illustrates the network throughput of the EERDC, DRINA and InFRA. It is clearly observed that the EERDC exhibits the higher network throughput when compared to earlier protocols. This is mainly due to an efficient optimal path mechanism that includes fewer number of nodes that greatly reduces the transmission time. Hence EERDC results 20% high throughput when compared to the protocols DRINA and InFRA. Table 4 shows the comparison values of network overhead. The EERDC network overhead is shown in Figure 8. The optimum number of messages is used to construct dynamic shortest path in EERDC, this results 10% minimum overhead compared to DRINA and InFRA protocols.

Table 4

<table>
<thead>
<tr>
<th>Network Size</th>
<th>Time Overhead EERDC</th>
<th>Time Overhead DRINA</th>
<th>Time Overhead InFRA</th>
</tr>
</thead>
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<tr>
<td>50</td>
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7. Conclusions

In this work, we devised an Energy efficient routing mechanism using dynamic cluster head
approach. Efficient cluster head and Dynamic shortest path is introduced to improve energy conservation and network lifetime. The EE-DRC algorithm utilizes minimum number of messages to build optimal Dynamic Shortest path that supports reliable information transmission. The obtained results shows that EE-DRC outperforms the DRINA and InFRA regarding Network Lifetime, Throughput, packet delivery rate and latency. Further this work can be extended to very large and mobile wireless sensor networks.

REFERENCES

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**Praveen Kumar K V** is an Associate Professor in the Department of Computer Science and Engineering at Sambhram Institute of Technology, Bangalore, India. He received his Bachelors degree in Computer Science and Engineering from Bangalore University, Bangalore. Master of Technology in Computer Science and Engineering at Visvesvaraya Technological University India. He is presently pursuing his Ph.D programme in the area of Wireless Sensor Networks in REVA university, Bangalore India. His research interest is in the area of Wireless Sensor Networks.

**B M Thippeswamy** is currently the Professor and Head in the Department of Computer Science and Engineering at Sambhram Institute of Technology, Bangalore, India. He obtained his BE in Computer Science and Engineering from Mysore University and ME degree in Computer Science and Engineering from Bangalore University, Bangalore. He was awarded Ph.D in Computer Science and Engineering from JNTU Anantpur,India. His research interest is in the area of Wireless Sensor Networks and IoT.

**Reshma S** is a Assistant Professor in the Department of Computer Science and Engineering at Sambhram Institute of Technology, Bangalore, India. She received her Bachelor’s degree in Computer Science and Engineering from Visvesvaraya Technological University and Master of Technology from Visvesvaraya Technological University, -Regional Center, Bangalore. Her research interest is in the area of Wireless Sensor Networks.

**Swetha K** received her Bachelor’s degree in Computer Science and Engineering from Visvesvaraya Technological University Belguam, in 2013 and Master of Technology in computer science and Engineering at Sambhram Institute of Technology affiliated to Visvesvaraya Technological University. Her research interest is in the area of Wireless Sensor Networks.
**M K Banga** is currently the Professor in Dayananda sagar University. He obtain Ph.D in Computer Science from Indian Institute of Technology, Kharagpur. He has around 32 years of experience in Teaching/industries. He has nearly 16 years of teaching experience in various esteemed Engineering colleges and Universities and served at Wipro Technologies for 16 years in various capacities including General Manager and Head of the Architect Academy. He has published many research papers in national and international journals. His research interests includes Data Networks, Wireless Ad-hoc Network, Machine Learning and Analytics.

**Udayarani V** is an Associate Professor in the Department of Computer Science at REVA University Bangalore, India. She obtained her B.E and M.Tech degrees in Computer Science and Engineering Ph.D degree from Mother Teresa University. Her research interests are in the area of Sensor Networks, Adhoc Networks and Image Processing.

**Venugopal K R** is currently the Principal, University Visvesvaraya College of Engineering, Bangalore University, Bangalore. He obtained his Bachelor of Engineering from University Visvesvaraya College of Engineering. He received his Masters degree in Computer Science and Automation from Indian Institute of Science Bangalore. He was awarded Ph.D in Economics from Bangalore University and Ph.D in Computer Science from Indian Institute of Technology, Madras. He has a distinguished academic career and has degrees in Electronics, Economics, Law, Business Finance, Public Relations, Communications, Industrial Relations, Computer Science and Journalism. He has authored and edited 57 books on Computer Science and Economics, which include Petrodollar and the World Economy, C Aptitude, Mastering C, Microprocessor Programming, Mastering C++ and Digital Circuits and Systems etc., He has filed 101 patents. During his three decades of service at UVCE he has over 550 research papers to his credit. His research interests include Computer Networks, Wireless Sensor Networks, Parallel and Distributed Systems, Digital Signal Processing and Data Mining. He is a Fellow of IEEE.