Energy Aware Approach for Path Finding in Wireless Sensors Network

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ABSTRACT
Now a day's people make use of sensors in order to have a distant communication without any intervention and to avoid the use of wires so that our communication will be mobile, but these sensors suffers a problem of battery drainage. There are various Energy Efficient Protocols for WSN that are being created which aspire to successfully deliver the data packets from sensor node (source) to the Base Station. These protocols have certain parameters like distance to identify the route. These protocols have a considerable amount of energy to find the minimum distance. Our aim is to formulate a protocol which has a target to calculate an efficient path at the same time save the energy of sensors in order to enhance the lifetime of network.This paper proposed an Optimum Path and Energy Aware Sensor Routing Protocol (OPEASRP) which makes use of load as a parameter for calculation of optimal path and LEACH for conservation of energy of the nodes.

General Terms
Wireless Sensor Network, Path Finding, Load Balancing

1. INTRODUCTION
In this paper there is a description of an energy efficient approach.. As you know that a wireless sensor network (WSN) consisting of randomly distributed electronic devices make use of sensors to track local or environmental conditions. A WSN system has a gateway that offers non-wired connectivity reverted to the wired world and distributed nodes. A Wireless Sensor Network's nodes consists of various components includes the antenna, power battery, microcontroller, analog circuit, and sensor interface. While using Wireless Sensor Network's radio technology, one must take important trade-offs. In battery-powered devices, higher radio data transfer rates and continuous sensing of nearby radio channel may result in draining battery more often. To make the battery life better, a node after certain period of time wakes up and transmits data by powering on the antenna and then powering it back off to save energy. Microprocessor trends for WSNs include minimizing power consumption while retaining or enhancing. processor's speed. Much like your selected radio, the power usage and its transforming speed trade-off is a primary factor when selecting a processor for communication. Now days more work is evolving Based on LEACH protocol, this paper proposes an improved routing optimization algorithm, in order to extend the whole network lifetime.

DipakWajgi, Dr. Nileshsingh V. Thakur [3] has examined and proposed a load balancing algorithms for wireless sensor networks. Load balancing can be used to extend the lifetime of a sensor network by reducing energy consumption. Load balancing usingclustering can also increase network scalability. Wireless sensornetwork with the nodes with different energy levels can prolongthe network lifetime of the network and also its reliability.Clustering has numerous advantages like it reduces the size of the routing table , conserve communication bandwidth, to reduce the power consumption of WSN, but still the results are not that much proven.While keeping in mind the energy conservation, protocols suggested earlier should also be designed to attain robustness in routing structure. Many paths finding algorithms focus on endorsing the load-balancing technologies to attain the energy-saving effect by real time adjusting the distribution of flow traffic in networks only based on the current-status resources of link and nodes [9].This paper has a determination of an approach to save the energy of sensor nodes. This approach is a combination of two techniques called Load Balancing and LEACH Algorithm. This suggested approach will definitely gives a better output in terms of increasing the efficiency of WSN and save the energy of sensor nodes.LEACH methodology will form the clusters with the participation of sensor nodes and selects a Cluster Head to forward the communication on behalf of the cluster [2]. The criteria for selecting a cluster head is nothing but the load calculated in the load calculation process [2]. In a cluster the node with lowest load is selected as the Cluster Head (CH). This CH then transfer's the packets to base station (BS) [3].

2. LITERATURE SURVEY

Haibo Zhang and Hong Shen [1] has proposed a novel online routing scheme, called "Energy-Efficient Beaconless Geographic Routing in Wireless Sensor Networks" (EBGR), which can provide loop-free, fully stateless, energy-efficient sensor-to-sink routing at a low communication overhead without the help of prior neighborhood knowledge, wherein they have established the lower and upper bounds on hop count and the upper bound on energy consumption under EBGR for sensor-to-sink routing, assuming no packet loss and no failures in greedy forwarding.Yong-Zhen Li, Ai-Li Zhang, Yu-Zhu Liang [2] has proposed a hierarchical routing improved algorithm based on the LEACH algorithm (i.e., LEACH-R). The simulation results show that the improved algorithm makes the energy distribution more balanced, and LEACH-R outperforms LEACH-M nearly 20%. In this paper authors has compared and analyze the advantages and disadvantages of the existing technique. Cluster heads receive message and transmit it to the base station directly, the energy consumption is more than ordinary nodes, which leads to dead

prolong network lifetime, decrease the redundancy of data packets, reduces the rate of energy consumption etc. Triana Mugia Rahayu, Sang-Gon Lee*, Hoon-Jae Lee[4]has proposed to strengthen LEACH protocols. Thoseprotocols are SLEACH, SecLEACH, SC-LEACH, ArmorLEACH and MS-LEACH. They described the security analysis of SLEACH, SecLEACH, SC-LEACH, Armor LEACH and MS-LEACH. They had also provided some possible solution to some pointed drawbacks. The findings about previous drawbacks also directs them,that it is needed to devise efficient secure protocol for WSN that combines both secure routing protocol and secure data aggregation protocols together.Rachel Cardell-Oliver1, Keith Smettem2,

Mark Kranz1 and Kevin Mayer [5] has proposed the design and test of a sensor network that successfully meets the goal of reactivity, and that demonstrates satisfactory robustness and network lifetime. Improving the performance of the network is the subject of ongoing work. The long term aim of theirresearch is to develop components for sensor networks that can be simply combined to create reactive, long lived networks for a variety of environmental monitoring applications including irrigation in agriculture or urban settings, monitoring of water catchments and dry-land salinity management. They have described the design and implementation of a novel reactive sensor network for monitoring soil moisture and evaluated the reactivity, robustness and longevity of the network in the field. The Pinjar network meets the goal of providing useful data on dynamic responses of soil moisture to rainfall. Future work will focus on addressing the limitations of the current prototype in robustness of packet delivery and network longevity, and in guaranteeing network response to events of interest.

Thu Ngo Quynh*, Hieu Tran Trung*, Vinh Tran-Quangt [6] has proposed a new scheme (named OPEAS-Optimal Path and Energy Aware Sensor routing protocol) that uses different parameters and reduces the number of broadcasting messages during the relay node selection phase. These two main design features of OPEAS lead to the reduction of energy consumption of the entire network compared to ARPEES and other algorithms of the same category. Their simulation results shows that the new protocol OPEAS achieves better energy consumption, better lifetime, better packet loss rate than ARPEES and other similar routing protocols. They had proposed a new routing protocol for WSN that is based on the ARPEES algorithm but uses a new Relay_Node function and reduces the number of broadcasting messages. These two main design features of the new protocol help to improve the energy consumption thus prolong the lifetime of the entire network and achieves better packet loss rate. And disadvantage of the aPEAS algorithm is its load unbalance compared to the ARPEES

Luca Mottola [7] has proposed, MUSTER, a routing protocol expressly designed for many-to-many communication. First, they devised an analytical model to compute, in a centralized manner, the optimal solution to the problem of simultaneously routing from multiple sources to multiple sinks. Next, they have illustrated heuristics approximating the optimal solution in a distributed setting, and their implementation in MUSTER. To increase network lifetime, MUSTER minimizes the number of nodes involved in many-to-many routing and balances their forwarding load. They evaluate MUSTER in emulation and in a real WSN test-bed. Results indicate that our protocol builds near-optimal routing paths, doubles the WSN lifetime, and overall delivers to the user 2.5 times the amount of raw data w.r.t. mainstream protocols. Moreover, MUSTER is intrinsically amenable to in-network aggregation, pushing the improvements up to a 180 percent increase in lifetime and a four-time increase in data yield. We presented MUSTER, a protocol expressly conceived for many-to-many communication in WSNs. We studied the problem from an analytical standpoint, by devising a model inspired to the multi-commodity network design problem, used to compute the optimal routing topology in a centralized fashion. The distributed path merging and load balancing techniques implemented in MUSTER allow us to obtain routing paths whose cost is within 10 percent of the optimum, and evenly distribute the routing effort. By combining these techniques, MUSTER enjoys 2.5 times the data yield of mainstream protocols under the same settings.

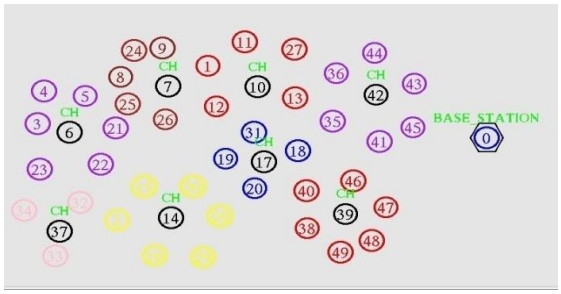
ElhamHajian, Kamal Jamshidi, Ali Bohlooli [8] has proposed a new method for selection of data transmission route that is able to solve this problem. This method is based on learning automata that selects the route with regard to energy parameters and the distance to sink. In this method energy of network nodes finishes rather simultaneously preventing break down of network into 2 separate parts. This will result in increased lifetime. Simulation results show that this method has been very effective in increasing network lifetime. As mentioned already, a main problem with wireless sensor networks is energy. In order to increase lifetime of these networks and to reduce energy use for nodes routing with automata has been used in this paper that is supported by local update. In this update process, in order not to reselect a node, selection probability of nodes with lower than threshold energy will decrease by relation 2 and for nodes upper than threshold energy award is conferred. Network lifetime and number of active nodes will increase with this algorithm.

RuHuanglZhihua Chen1 Guanghui Xu2 [9] has proposed a Predication mode based Routing Algorithm based on ACO (PRACO) to achieve the energy-aware data-gathering routing structure in wireless sensor networks (WSN). They adapt a series model ARMA to analyze dynamic tendency in data traffic and deduce the construction of load factor, which can help to reveal the future energy status of sensor in WSN. By checking the load factor in heuristic factor and guided by novel pheromone updating rule, artificial ants can foresee the local energy state of networks and the corresponding actions could be adaptively taken to enhance the energy efficiency in routing construction. For constructing optimal data-gathering routing structure in WSN, it is important to minimize the total energy cost of data transfer from the data-collecting region to a fixed sink for prolonging the lifetime of WSN, meanwhile, to improve the reliability of the tree structure in order to reduce the loss of efficient information and the probability of disconnected subnets, which are caused by unreasonable energy distribution of sensors in data-gathering routing structure. The paper presents an optimal routing algorithm based on ACO, i.e., PRACO to achieve the above two important objectives.

Table 1.1 Summary

SR. No	TITLE	YEAR	AUTHOR(s)	FACTS	FINDINGS
1	Energy-Efficient Beaconless Geographic Routing in Wireless Sensor Networks	2010	Haibo Zhang and Hong Shen	Low communication overhead without the help of prior neighborhood knowledge	Energy-efficient sensor-to-sink routing at a low communication overhead without the help of prior neighborhood knowledge
2	Improvement of Leach Protocol for Wireless Sensor Networks	2013	Yong-Zhen Li, Ai-Li Zhang, Yu-Zhu Liang	Hierarchical routing improved algorithm based on the LEACH algorithm	Improved routing optimization algorithm, in order to extend the whole network lifetime
3	Load Balancing Algorithms in Wireless Sensor Network	2012	DipakWajgi, Dr. Nileshsingh V. Thakur	Proposed loadbalancing algorithms for wireless sensor networks	Load balancing usingclustering can also increase network scalability
4	Survey on LEACH-based Security Protocols	2014	TrianaMugiaRahayu, Sang-Gon Lee*, Hoon-Jae Lee	Strengthen LEACH protocols	Possible solution to some pointed drawbacks
5	Field Testing a Wireless Sensor Network for Reactive Environmental Monitoring Intelligent Sensors	2004	Rachel Cardell-Oliver1, Keith Smettem2, Mark Kranz1 and Kevin Mayer	To create reactive, long lived networks for a variety of environmental monitoring applications	Design and implementation of a novel reactive sensor network for monitoring soil moisture and evaluated the reactivity, robustness and longevity of the network in the field
6	Improving Energy Efficiency for ARPEES Routing Protocol	2012	Thu Ngo Quynh*, Hieu Tran Trung*, Vinh Tran-Quangt	Reduces the number of broadcasting messages during the relay node selection phase	New protocol OPEAS achieves better energy consumption, better lifetime, better packet loss rate
7	MUSTER: Adaptive Energy-Aware MultisinkRouting in WSN	2011	Luca Mottola	Routing protocol expressly designed for many-to-many communication	Distributed path merging and load balancing techniquesobtain routing paths whose cost is within 10 percent of the optimum, and evenly distribute the routing effort
8	Increasing WSN Lifetime by Using Learning Automata for Optimal Route Selection	2010	ElhamHajian, Kamal Jamshidi, Ali Bohlooli	Method for selection of data transmission route	Selection probability of nodes with lower than threshold energy will decrease by relation 2 and for nodes upper than threshold energy award is conferred
9	Energy-aware Routing Algorithm in WSN using Predication-mode Communications, Circuits and Systems	2010	RuHuanglZhihua Chen1 Guanghui Xu2	Achieve the energy-aware data-gathering routing structure in wireless sensor networks	Minimize the total energy cost of data transfer and improve the reliability of the tree structure

3. PROPOSED METHODOLOGY



3.1 Creating Network

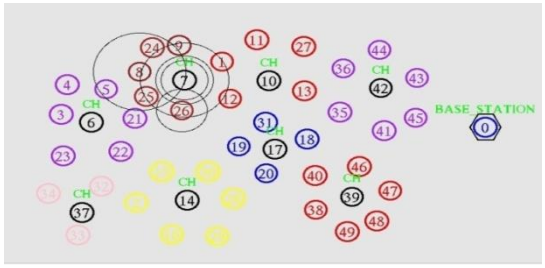
Initially the approach will form a network by dropping several nodes regardless of their positions.

3.2 Selection of Random Nodes

Here the approach will select random nodes as a source and to act as a cluster head in order to begin the communication.

3.3 Forming Clusters

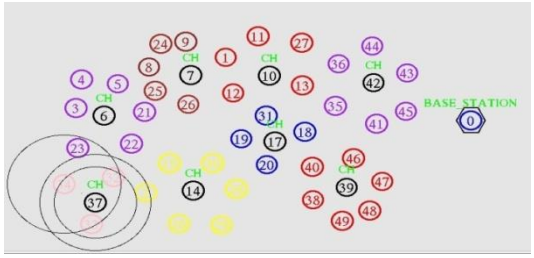
The OPEASRP methodology incorporates calculation of load on each node in the network and forming clusters of the nodes using LEACH algorithms [2][6].



3.4 Selecting Head

Load on every sensor node is calculated first, then cluster head is selected based on load [3]. The energy efficient method of LEACH is applied for cluster formation [2]. The packets are then transferred from Cluster Heads to Base Station selecting the optimal path based on load [3]. The Cluster heads having lesser load are selected to be in the path to BS [2].

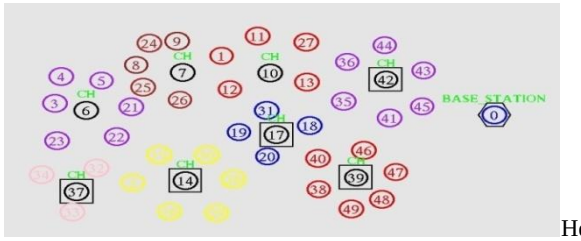
3.5 Load Calculation



A load on each node in the context of WSN can be defined as the number of store forward requests it has to serve or are in queue [3]. The requests are counted in terms of number of packets. So for a node to calculate load on it, the number of packets it has forwarded are counted with respect to total number of packets submitted to it during a period of time [3].Load = no of packets released / total number of packetsLoad is defined as exceed number of packets present in the node with respect to total number of packets.

In OPEASRP, load calculation is a onetime task which is performed when the network is started or when any new node is added or any node is restarted [6]. The task is performed for all the nodes in the network.

3.6 Finding Path

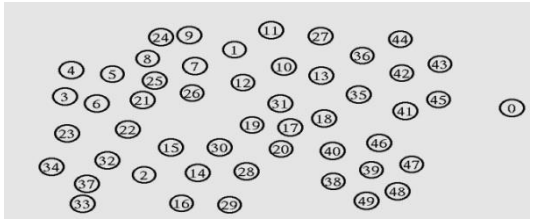


Here on the basis of Load calculation the describe approach will find a Path which will be effective and more efficient.

4. IMPLEMENTATION

1. *4.1.1 Deployment of Nodes*

Here the assumption is that sensor's are placed into a plane and linear surface.



2. *Forming Clusters and Cluster's Head*

Here two things are applied i.e. OPEASRP Methodology in order to form Clusters and LEACH algorithm for selecting Cluster Heads.

3. *4.1.2 Communication*

Here the Non CH nodes are sending data to CH nodes.

4. *4.1.3 Optimal Path Selection:*

Calculating the load balance using the below approach:

Load = no of packets released / total number of packets

5. *Graphs*

The below graphs show the output result and the comparison between the existing approach.

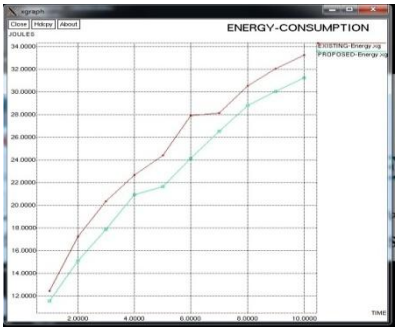


Fig. 4.5.1. Energy Consumption graph (red= existing:: green = our)

The above graph depicts that using energy efficient approach, the packet delivery ratio is also increased if you compare it with the previous models.

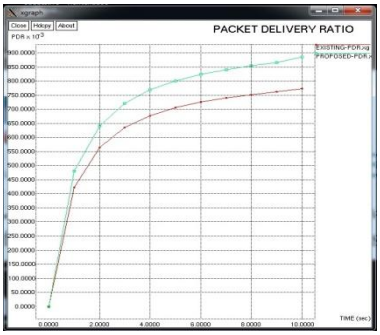


Fig. 4.5.2. Packet Delivery Ratio (red= existing:: green = our)

Fig. 4.5.3. Throughput (red= existing:: green = our)

The above graph shows that the approach is consuming less a energy than the previous approaches.The above graph shows the throughput of the system after applying energy efficient approach (described in this paper).

5. CONCLUSION

In this paper you'll find the description of a survey with an Implementation of new approach over various Path Finding approaches and also a proposed solution in order to find a path by saving the energy of wireless sensor nodes. The idea behind finding this approach is to make the wireless communication more prominent and seamless. Also saving the time require to place new sensors with more battery power by improving the hardware or attaching bigger batteries.This approach will not only make the communication better but it will remove the drawback of changing battery by reducing the power consumption of the sensor nodes.The future work will include the placing of Sensor's on a non-planar surface, also with a solution to find a shortest path for transmission.

6. REFERENCES

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