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***Research Article***

# Efficient Load Balancing and Optimized Routing Protocol for Wireless Network

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## Abstract

One of the primary objectives of wireless sensor networks is to provide full coverage of a sensing field as-long-as possible. With the limited energy of sensor nodes, organizing these nodes into a maximal number of subgroups capable of monitoring all discrete points of interest and then alternately activating them is a prevalent way to provide better quality of surveillance. In addition to maximizing the number of subgroups, the connectivity of sensor nodes is also important while achieving full coverage. Thus, we develop a novel maximum connected load-balancing cover tree (MCLCT) algorithm to achieve full coverage as well as BS-connectivity of each sensing node by dynamically forming load-balanced routing cover trees. Through MCLCT, the burden of nodes in sensing and transmitting can be shared, so energy consumption among nodes becomes more evenly. Extensive simulation results show that our solution outperforms the existing ones in terms of energy efficiency.

**Keywords:** Load balancing; Routing protocol; Wireless Network; Maximum connected load-balancing cover tree algorithm.

## 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 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 [1-4].

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. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth [5-9].

## Materials

### *Hardware*

One major challenge in a WSN is to produce low cost and tiny sensor nodes. There are an increasing number of small companies producing WSN hardware and the commercial situation can be compared to home computing in the 1970s. Many of the nodes are still in the research and development stage, particularly their software. Also inherent to sensor network adoption is the use of very low power methods for data acquisition [10].

### *Software*

Energy is the scarcest resource of WSN nodes, and it determines the lifetime of WSNs. WSNs are meant to be deployed in large numbers in various environments, including remote and hostile regions, where ad hoc communications are a key component. For this reason, algorithms and protocols need to address the following issues such as lifetime maximization, robustness and fault tolerance and self-configuration.

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### *Operating systems*

Operating systems for wireless sensor network nodes are typically less complex than general-purpose operating systems. They more strongly resemble embedded systems, for two reasons. First, wireless sensor networks are typically deployed with application in mind, rather than as a general platform. Second, a need for low costs and low power leads most wireless sensor nodes to have low-power microcontrollers ensuring that mechanisms such as virtual memory are either unnecessary or too expensive to implement [2,6,10].

### *System specifications*

Wireless sensor networks (WSNs) consist of tiny devices which are equipped with processing, transceivers, storage resources and batteries. Wireless sensor networks are deployed in open and in discreet environment. The collected information is sent through wireless links using multiple hops to a sink which can use it locally, transmit to other networks through a gateway. A node in sensor network consists of memory, battery and transceiver. The memory stores data, battery provides energy, and the transceiver receives and sends data [9].

## Methods

In the present work, we planned the relay node that is responsible for deliver packets for all the nodes among the cover set as shown in figure 1. The relay node can at first be closer to center. Once routing it'll chosen supported probability of maximum coverage and energy levels. Within the planned MCLCT algorithmic rule the multiple routes are discovered for delivering the packets and the routes can have highest residual energy [7,8].

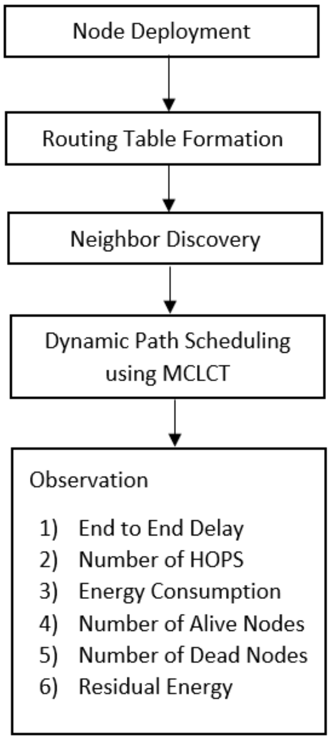


Figure 1. Dynamic path scheduling algorithm

## Results and discussions

The results are obtained using the Network Simulator software tool as shown figure 1 and 2.

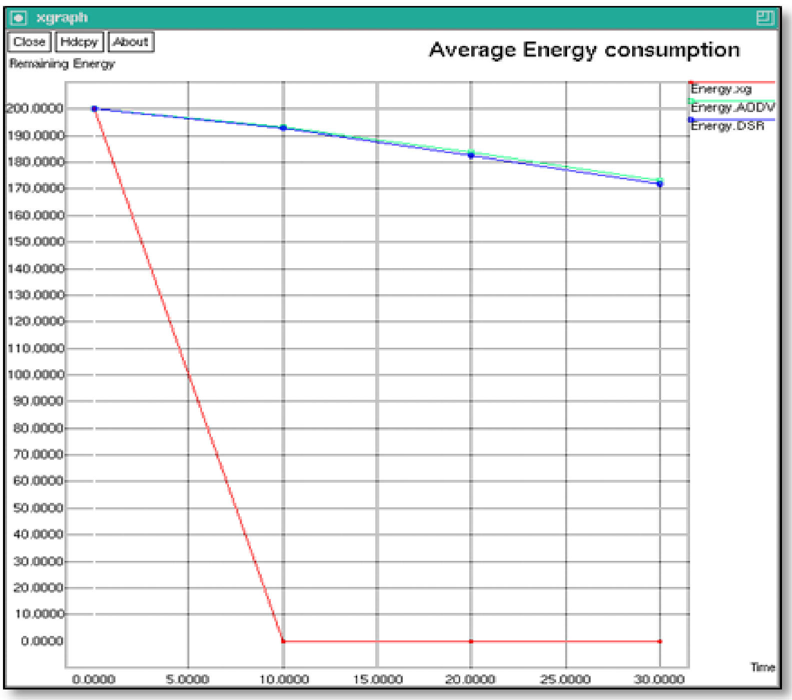


Figure 2. Average energy consumption

 

Based on the outputs, the proposed system outperforms in terms of energy consumption, throughput and Packet Delivery ratio. Network simulators like OPNET, NetSim and OMNeT can also be used to simulate a wireless sensor network.

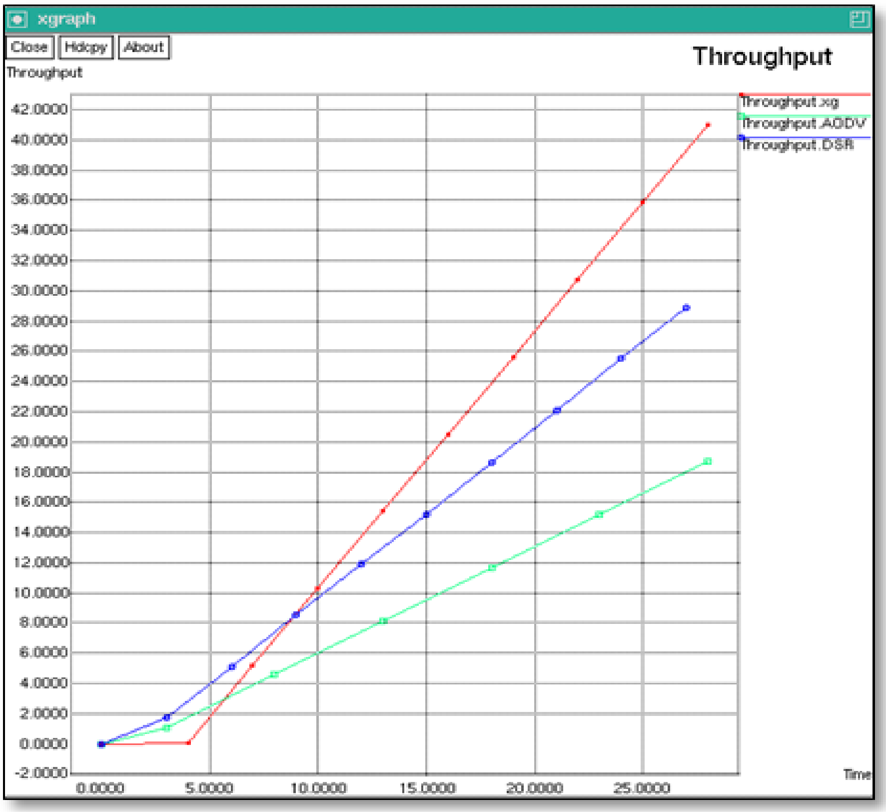


Figure 3. Throughput

## Conclusions

An approach for load balancing in the wireless sensor network is proposed. Algorithms for cluster formation, intra cluster communication and inter cluster communication in wireless sensor network are proposed. Maximum connected load-balancing cover tree (MCLCT) algorithm to attain full coverage. Ad hoc On-Demand Distance Vector (AODV) protocol is used to find the shortest path to obtain the optimized routing for the communication. Measured the performance of the proposed system using the Throughput, Average energy consumption and packet delivery ratio for the network and observed the better results.

## Conflicts of interest

No conflicts of interest.

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