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

MOBILE NODE SWAPPING BASED NETWORK LIFETIME EXTENDING IN WIRELESS SENSOR NETWORK

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ABSTRACT-Many energy enhancement techniques have been proposed for wireless sensor networks, the concentration of transmit a large amount of data to a sink remains a major threat to the network lifetime. The main reason is that the sensor nodes closer to the sink transmit more data and consume more power than sensor nodes farther from the sink and thus the high energy consuming sensor nodes near the sink depletes their energy very quickly. The solution proposed in this paper suggests the mobile node swapping; in this way the sensor nodes swaps the position of the mobile sensors to share the load of high energy consumption location. The analytical evaluation shows that mobile node swapping method improves network lifetime compared to the existing method.

***Keywords: Wireless sensor networks, sensor nodes, energy enhancement, swapping*.**

I. INTRODUCTION

A wireless sensor network consists of sensor nodes deployed over a geographical area to monitor physical or environmental conditions such as temperature, sound, pressure, etc. and to transfer their data through the network to a main location. The wireless sensor networks developed which was motivated by military applications such as battlefield surveillance; Nowadays such networks are used in many applications like habitat monitoring [1], environmental monitoring [2], [3], health monitoring, and so on. In addition, a power source supplies the energy needed by the device to perform the programmed task. This power source often consists of a battery with a limited energy budget. In addition, it could be impossible or inconvenient to recharge the battery, because nodes may be deployed in a hostile or unpractical environment.

On the contray, the sensor network should have a enough energy to satisfy the application requirements. In many cases a lifetime in the order of several months, or even years, may be required. Therefore, the crucial question is: "how to enhance the lifetime of the network for a long time?" In some cases it is possible to get energy from the external environment (e.g., by using solar cells as power source). However, power supply sources acts as a non-continuous behavior so that a battery power is needed as well. In any case, energy is a very critical resource and must be used very sparingly. For this reason, energy conversation is a key concern in the system design stationed on wireless sensor networks.

Recently, the concept of controlled mobility has been used to improve the energy efficiency of wireless sensor networks ie., relocating mobile sensors in the network topology can reduce the power consumption [4]. Three key requirements are identified which makes the controlled mobility concept infeasible. Three key requirements are,

1. The exact placement of sensor nodes may not be adjusted without compromising the monitoring coverage.
2. Nodes closer to the sink consumes more power than the node farther from the sink.
3. All nodes have same, limited, mobility capabilities. In that nodes have extra capabilities to perform complex motion planning.

To address these three requirements, a mobile node swapping approach is proposed, which is the inspiration of huddling and rotation behavior of the emperor penguin which helps to rotate the position to share their load. In mobile node swapping, it proposes to rotate the physical position of the mobile sensors to share the load of high power consumption location. Rotation is performed during scheduled node sleep times.

Mobile node rotation does not require powerful nodes to perform complex motion planning calculation, because all the movements are to the known position and there is no topology change except during the swapping of nodes.

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The rest of this paper is organized as follows: Related work on lifetime maximization based on controlled mobility in section 2. Detailed description of proposed work in Section 3. And the experiments and presents the preliminary analysis are demonstrated in section 4. Finally, conclusion of the paper and the future work is described in section 5.

II. RELATED WORK

To maximize the lifetime of a network, several approaches have been proposed are duty cycling, data reduction, topology control and controlled mobility.

To maximize network lifetime in duty cycling approach [12], [13], [14], it saves energy by turnoff radio signal when there is no need of communication and wakeup radio by providing some mechanism when communication is necessary.

To improve network lifetime in data reduction approach [15], [17], is by reducing the amount of data consumed and transmit.

The extension of network lifetime in topology control [18], [19], [20], is by reducing the initial topology of the network, transmission distance between sensors. Topology control approach minimize the average delay.

Controlled mobility approach include mobile base station, data mules and mobile relays. In mobile base station approach, base station has the mobility, ie., base station has the ability to move around the network and get the information from the other nodes through transmissions [4], [8], [9], [10], [11]. In data mules, [5], [6], [7], some mobile nodes called mules,visits all the nodes in the network to collect the data and transmit the data to the sink. In mobile relay approach [21], [22], [23], some nodes have more processing power, memory and energy than other nodes in the network can change their position to different location to reduce the communication distance between nodes.

In this paper mobile node swapping approach is proposed to overcome the disadvantages of the existing approaches.

III. PROPOSED WORK

The discussion of proposed work is as follows:

Mobile node swapping is proposed to improve the lifetime of the wireless sensor network, which is more successful than the existing methods. Generally, nodes which is near to the sink consumes much energy than the nodes which is far away from the sink. In this situation, if any one of the nodes closer to the sink loses its energy then there will be a failure of network suddenly. Therefore swapping of nodes helps to enhance the network lifetime. Here the nodes having low energy finds the availability of high energy nodes to swap. If there is a availability of node having enough energy, then the nodes swap their position. Swapping is done at sleeping time of scheduled nodes. By doing so, the location of the sensor nodes in the network is never changed. No complex processes are taken for lifetime stabilizing. Thus the issues of an existing system are overcome.

ARCHITECTURE

The proposed mobile node swapping is explained by using phases of wireless sensor node generation, data acquisition, lifetime improvement using MNSLTM algorithm and server storage. The figure 1 shows the system architecture of the proposed method. The phases of system architecture is describes as follows.

A.WSN GENERATION

WSN nodes are configured. For each node same energy level is given. Server nodes are configured. After configuring the entire nodeit builds topology of network and according to that we can build directed routing tree.

B. DATA ACQUISITION

WSN deployment process is performed. WSN node senses the information from the environment and send the information to the base station.

C. LIFETIME IMPROVEMENT USING MNSLTM ALGORITHM

Self energy levels of each and every node are measured. If the energy level is reduced to the dangerous level (below threshold), then the corresponding node searches about the availability of rotational position. Corresponding node send signal to the rotational position to perform the node swapping operation. Rotational position node move towards the corresponding node. Corresponding node move towards the rotational position. Then the corresponding node distributes the swap information to all the nodes. All nodes update the nodes position status. The

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network tree structure is updated.

D. SERVER STORAGE

The sensed information of nodes is send to the server through the WSN network. The server node receives the information in the nodes position.

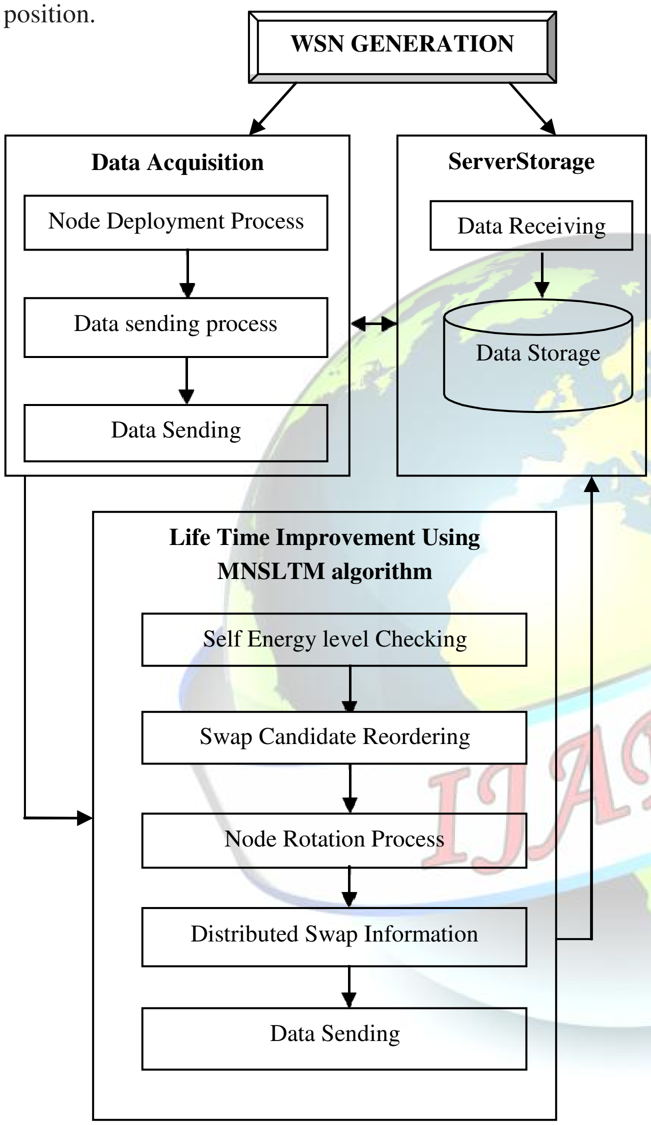

Figure 1 System Architecture

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IV.EXPERIMENTAL RESULTS AND ANALYSIS

A. SIMULATION SETUP

Participating simulations with sensing area of size 300 m X 300 m and with random deployment of 30

threshold value is considered as critical node. Then the critical nodes finds if any nodes are available for swapping. If there is an availability of nodes having more energy to tolerate, then the swapping will be performed. The figure 2 depicts that after transmission, self energy level is done by each node, and nodes having below threshold energy levels are identified.

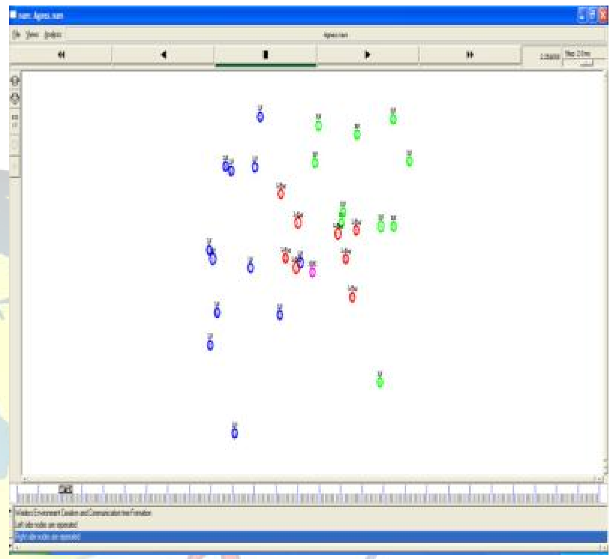
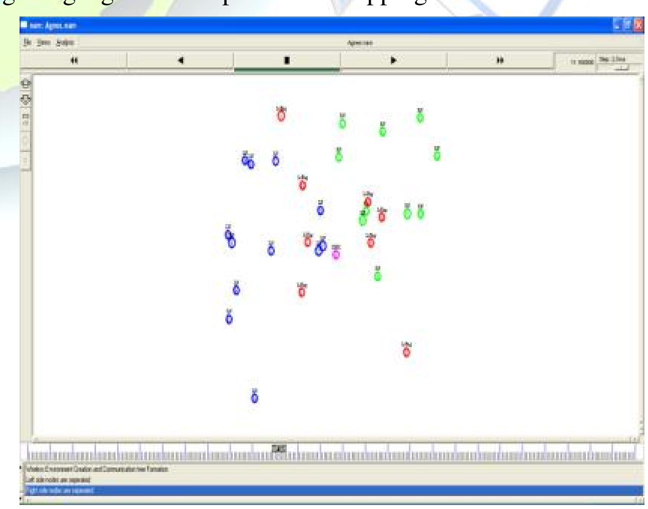


Figure 2 Before swapping

The figure 3 shows that, the critical node checks the availability of swapping. If there is a node available for swapping, critical node sends the signal to the non critical node which is available to swapping. After getting signals node performs swapping.



sensors and placing sink at the center. Random deployment of the sensor nodes can be achieved by choosing the (x, y)

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Thus the lifetime of the network is maximized by using the concept of mobile node swapping Christo Ananth et al. [16] 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.

B. TIME TAKEN ANALYSIS

Simulations are evaluated and results are obtained. Based on the results obtained by the simulation, existing and proposed method are compared.

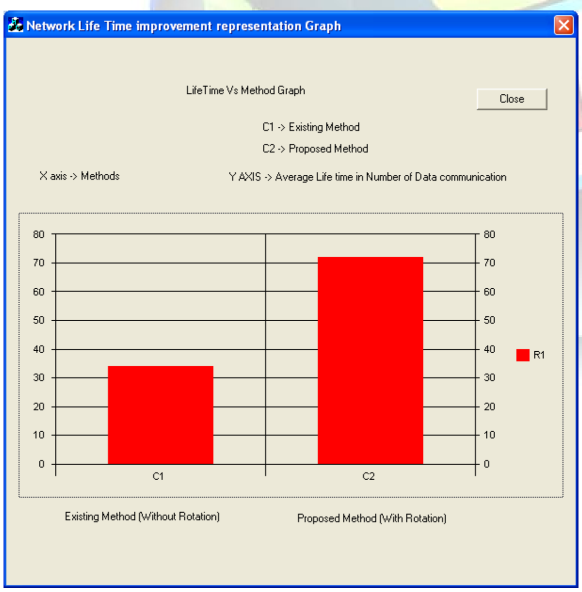

Figure 4 Comparison between methods

By comparing existing method (without rotation) and proposed method (with rotation), the proposed method achieves the maximization of lifetime by significant level as compared to the existing method.

V. CONCLUSION

To save the energy of the sensors is main goal in the designing of wireless sensor networks. This paper presents a mobile node swapping approach for extending the lifetime of mobile WSNs. Sensors having high energy consumption location swap their position with sensors having low energy consumption location. By performing swapping, the nodes having low energy level will have less communication in the network, because the swapped node having high energy will take the responsibility of high communication. In this way it balances the differential power consumption without modifying the existing topology. The simulation shows that the mobile node swapping approach is the effective method can improve average lifetime by a significant level.

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