Energy Saving for Opportunistic Routing Algorithm using Sleep/Awake Mode in WSN

Shivleela. T[1] Dr. Anuradha M.S[2]
[1]P.G. Student [2]Associate Professor
[1,2]Department of Electronics and Communication Engineering
[1,2]GNDEC college Bidar, Karnataka, India.

Abstract— In a mobile ad-hoc network routing optimization for saving energy has become one of notable aspect in the wireless sensor network (WSN) routing protocol conception, because more often sensor nodes provided with a bounded non rechargeable battery power. In order to lower energy absorption and increase network lifetime data relayed in one-dimensional queuing network. A theory of Opportunistic routing principle is further improved by implementing sleep/awake mode in 1-dimensional network and multi-hop relay selection to enhance the network energy effectiveness depending on deviation between sensor nodes, with respect to range towards sink and residual energy among all nodes. Particularly, an Energy saving Opportunistic Routing (ENS_OR) principle is constructed to guarantee lower power cost at the time of packet relay and safeguards nodes by moderately low residual energy. Simulation test details in NS-2 shows that proposed system ENS_OR with sleep/awake mode considerably recuperates network performance by energy saving.

Key words: 1-D queue network, sleep/awake, OR, energy efficiency, Relay nodes

I. INTRODUCTION

As field of technologies progressing in the world demand for wired and wireless networking has become necessitated. Both type of networking has its own benefits and demerits based on security. A rapid view of motivating and emergent technologies discloses an enormous heterogeneousness proposal. Protocol like Most Forward under Range (MFR) routing method is studied in one-D queue network, that choose the neighboring node that is far away and is selected as the another forwarder, that finally effects in few multi-hop delay, low power utilization.

Additional prospective system which is used to decrease sum of utilized energy is constructed on two effective objects, i.e., bit allocation and path selection. Geographic Random Forwarding (GeRaF) and Efficient QoS-aware Geographic Opportunistic Routing (EQGOR), procures benefits of the transmission characteristic of the wireless medium, grants many neighboring nodes that would eavesdrop a broadcast to take part for heading the data. On the other hand, all routing protocols have not made use of OR with sleep/awake mode for choosing suitable heading nodes to decrease the power utilization, thereby enhancing scheme of an efficient-energy OR protocol for wireless network.

II. INITIAL INFORMATION OF ROUTING PROTOCOLS

Since few years, numerous research on routing based specifications, such as connectivity-based specifications and density of the dispensed nodes, in a One-D queue network. The process of dissemination of data absorb more power than further function of sensor nodes, power savings design operation is accomplished by the result of minimal energy pathway from source to sink in WSNs. It has an adjustment among the use of more power and lengthy hop lengths as well as use of less power and short hop lengths. By this, minimal energy utilization can be reached, at the same time all sensor nodes identifies with the favorable broadcast range afar from alternative compact multi-hop wireless network. A most forward under range (MFR) routing scheme is also studied in One-D queue network, that selects the far away bystander node as its successor forwarder, that ultimately effects in few multi-hop delay, low energy absorption.

An OR routing algorithm adapts advanced approach termed as Energy Equivalent Node (EEN). It selects relay nodes, depending up on OR algorithm with sleep/awake mode to effectively deduce an optimum broadcast range to save power and maximize the lifespan of entire network. ENS-OR chooses a forwarder list and prioritizes the nodes based on their residual energy level and the optimum transmission distance. Nodes in the forwarder list which are near to EENs have much residual power. ENS-OR main objective is enhance the energy effectiveness to increase the network lifespan.

III. SYSTEM DESIGN

ENS-OR with sleep/awake mode algorithm positions the EEN nodes at veritable intervals (distances) towards the sink. The source node will detect neighbors if the neighbor nodes range is towards the sink, then it stops the process else it selects the forward neighbor which is near to relay node and has maximum residual energy. This process is iterated until a relay node is chosen to reach the destination. Relay nodes are made awake to transmit the data once data are transmitted, selected relay nodes are made to sleep thereby increasing the network lifetime.

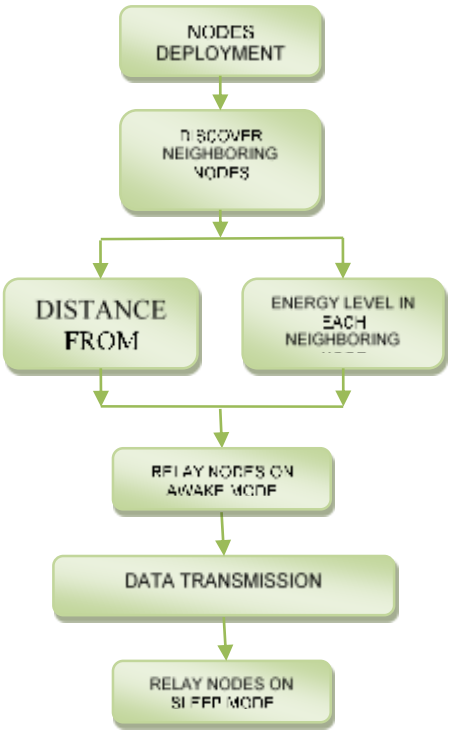

Fig. 1: system design of ENS-OR

1) Node deployment: The Node Deployment is an algorithm that is used to topographic the nodes in the network in the given area of x*y.
2) Neighbour discovery: Neighbour discovery is a process of discovering the neighbour node, depending on the distance from the source to sink and its residual energy that falls within the broadcast range.
3) Distance from Source to Sink: Distance from the source to sink is calculated based on the 1-dimensional network.
4) Energy of neighbouring node: Energy level at each neighbouring node is calculated depending on the threshold energy.
5) Relay node awake: once the distance and energy of neighbouring is calculated the node source node start to transmit data awakens the selected relay nodes.
6) Relay node sleep: after successful transmission of data packets from source to sink an acknowledgment is received at source by sink simultaneously all the relay nodes goes under sleep mode.

IV. SIMULATION RESULTS

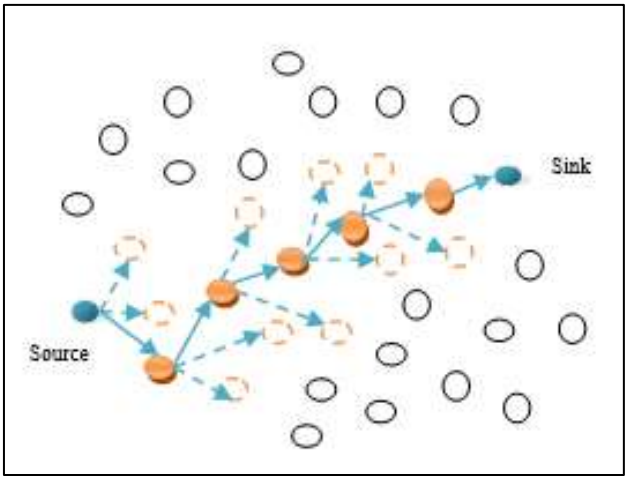

Fig. 2: selection of relay nodes in 1-dimensional.

In WSN consider a multi-hop 1-D queue pattern shown in Fig2. Assuming system is aimed at quite opaque networks, such as every relay nodes have loads of adjacent nodes. Each node has certain awareness of spot knowledge of its straightforward adjacent node and its location of the source node and sink node. All wireless sensor nodes have permanent highest transmission range r and lowest broadcast range Dmin.

As shown in fig. above source to sink path is constructed based on 1-dimensional queuing network, the relay nodes are selected depending on the distance to sink and the energy level in nodes. Source selects three neighboring nodes calculating

the nearest node among them one of the nodes is selected which has the highest energy, this process is proceeded selecting a definite path from source to sink. After transmitting data the selected nodes are activated to sleep mode thus increasing the network lifetime.

V. PERFORMANCE ANALYSIS

A. Average Residual Energy:

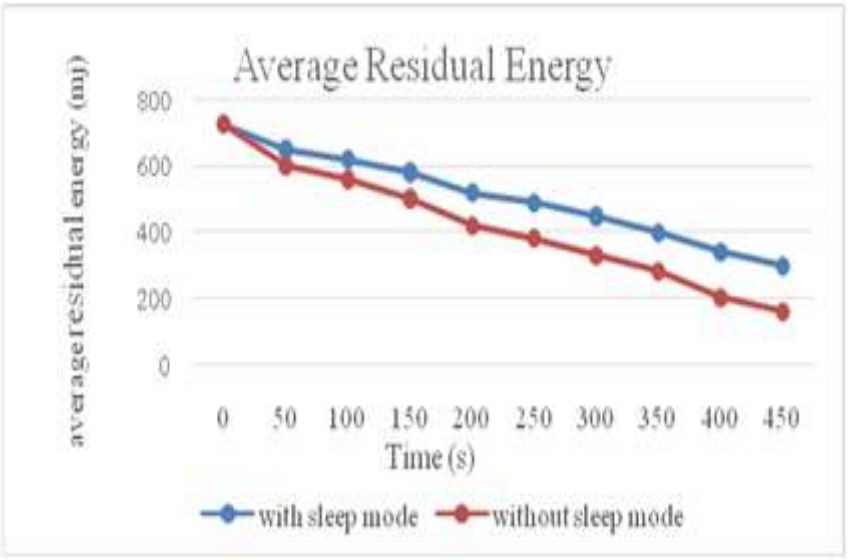

Fig. 3: Average residual energy

Fig shows average residual energy for ENS-OR selecting relay nodes using sleep mode left with more residual energy indicating that all the relay nodes are alive for longer time which helps to increase network lifespan as compared with the without sleep mode.

B. Network Lifetime:

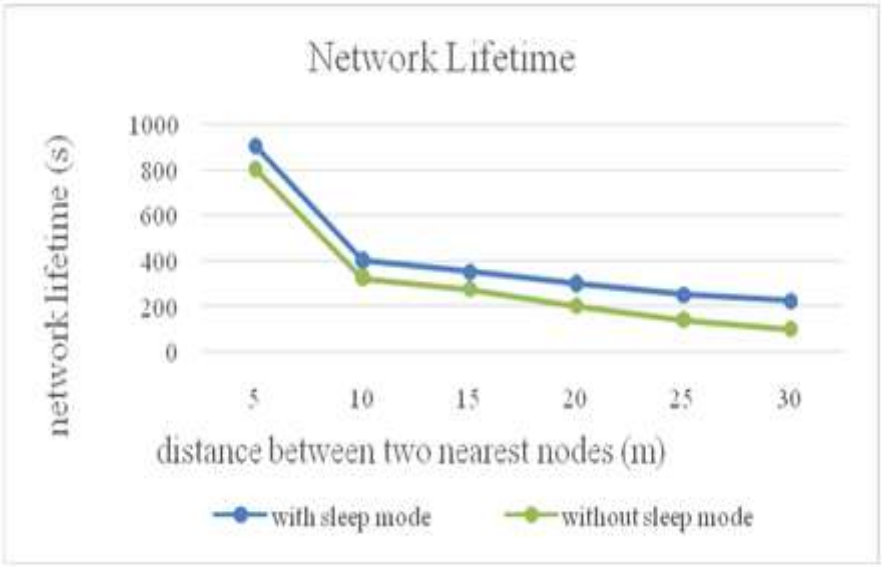

Fig. 4: Network lifetime

Network lifetime is defined as the time when the first dead node occurs, this is because when a node dies a network partition may occur quickly. Fig depicts Network lifetime over distance between the nodes and it is clear that ENS-OR with sleep mode gives better system lifetime than without sleep mode. This is because after selecting the forwarder set relay nodes are activated and are immediately goes to sleep mode once it transmit the data to its next nearest node.

C. Times of FDN & NL:

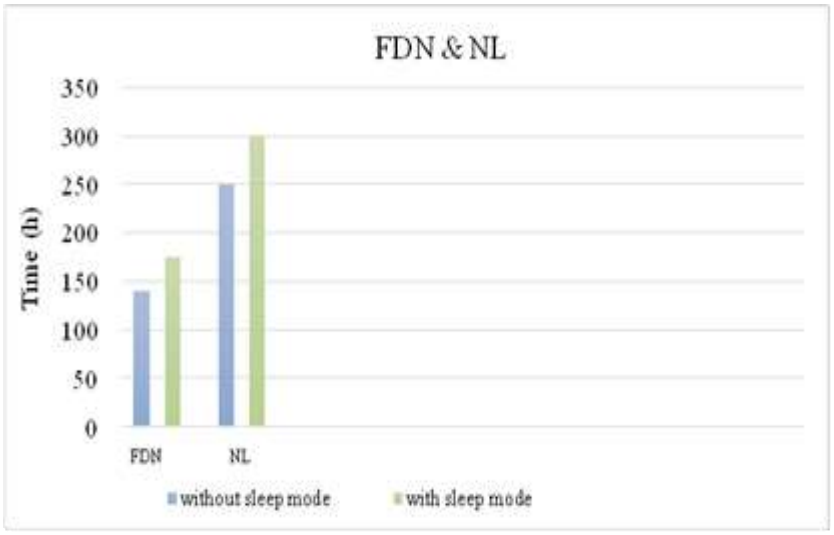

Fig. 5: Times of FDN & NL

There is strong correlation between FDN and NL, longer the network life time more slowly the first dead will appear as shown in fig the time that first dead node appears in ENS-OR with sleep mode is much better than that of without sleep mode. Hence ENS-OR with sleep mode guarantees both the extensive lifetime and the largest conservation of energy.

VI. CONCLUSION

A numerous routing algorithms for saving energy during the packet transmission are designed, however using sleep/awake mode in 1-dimension queue network for minimizing energy consumption, thus maximizes the network lifetime. An Opportunistic Routing theory with sleep/awake mode is used for virtually enhancing network energy efficiently considering both distance to sink and residual energy of each node as the relay node transmits the packets it immediately turns the node in to sleep mode thereby saving an energy . OR with sleep/awake mode is implemented for effectively realizing the relay node as real relay nodes are fore determined, in turn prolongs the network lifetime. Therefore the main objective for energy –efficient OR with sleep/awake mode strategy guarantees minimum power cost. Simulation results and test bed results demonstrates ENS-0R with sleep/awake mode significantly improves energy conserving and network partition compared with existing ENS-OR algorithm.

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