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RELAY NODE SELECTION USING OPPORTUNISTIC ROUTING ALGORITHM IN WIRELESS SENSOR NETWORK

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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 and multi-hop relay selection to enhance the network energy effectiveness is done 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 shows that proposed system ENS_OR considerably recuperates network performance by energy saving.**

Keywords: **One-dimension (1-D) queue network, OR, energy efficiency, relay nodes, WSN.**

1. 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 radionic 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 for choosing suitable heading nodes to decrease the power utilization, thereby enhancing scheme of an efficient-energy OR protocol for wireless network.

II. RELATED WORK

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 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. MOTIVATION

In order to obtain minimal energy utilization throughout packet broadcast in entire networks, introducing a theory of Equivalent Energy Nodes to direct energy optimum scheme based on optimal transmission distance dop. EEN is created by together considering an allocation of real nodes and its relay nodes.

a. Protocols and Relay Nodes

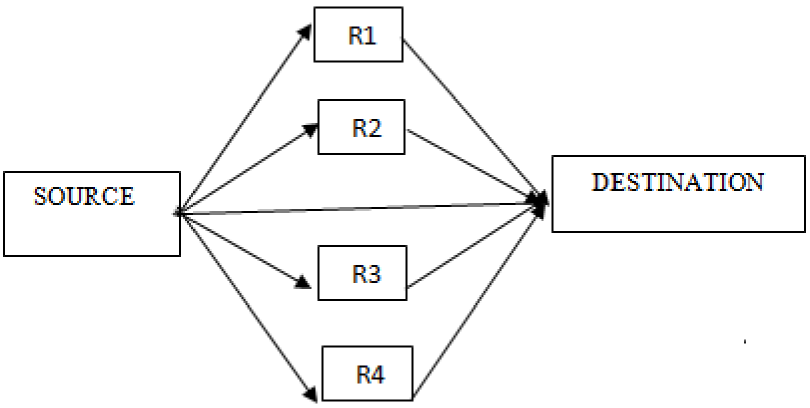
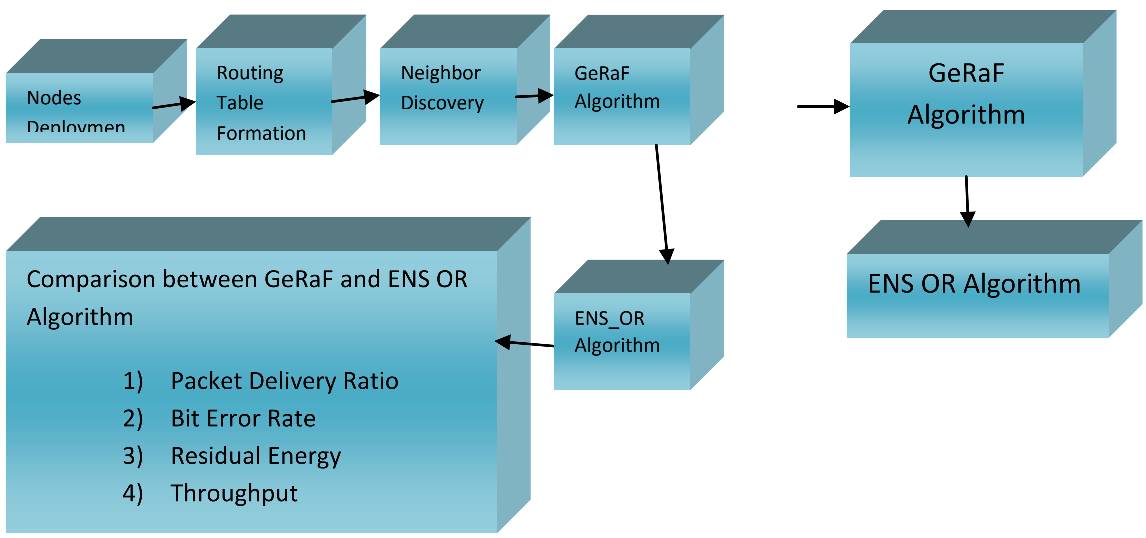


Fig 1: Relay Nodes in WSN

Relay Network is wide course of network technologies usually operated in wireless networks, here source node and destination node communicates by measure of intermediate nodes. In this type of networks there is no direct communication either from source node or from destination, hence the necessity for intermediate nodes to relay the information.

In wireless ad-hoc network Multipoint relays (MPR) are the nodes that perform relaying messages between nodes. The MPR also has role of routing beginning through source towards any of the coveted destination.

b. Methodology



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. **Construction of Routing Table:** Route table construction theory operated to prepare the path tables for all nodes in a network. As many as nodes will be equal to as many as routing table in a network. Each of the routing table will have N entries where each record will have a calculated nodes distance.

3. **Neighbor Discovery:** Neighbor discovery is a process of discovering the neighbor node, depending on the distance from the source to sink and its residual energy that falls within the broadcast range.

4. **ENS OR Algorithm:** This 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.

c. Queue Model for ENS_OR

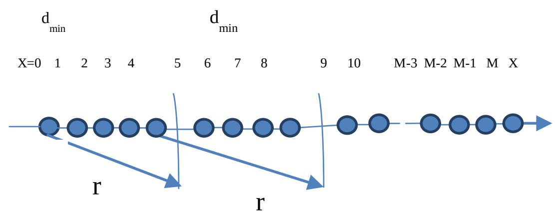


Fig 2: Queuing pattern of relay using maximum broadcast range R and minimum range d_{min}

In WSN consider a multi-hop One-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 broadcast range r and lowest broadcast range Dmin. 1-D queuing network built through an associated graph $g = (e, v)$, where (e) is a series of guided links among communicating nodes however (v) is series of guided bonds among communicating nodes. Setting pointers $[0, 1, 2, .. , H, N... .m\text{-}3\ m\text{-}2,\ m\ -1, m]$ through left towards right, and two identifiable node by means of index 0 and index m in addition with pointers such as the source node as well as sink node.

d. 1-Dimensional Queue Model for Existent and EEN

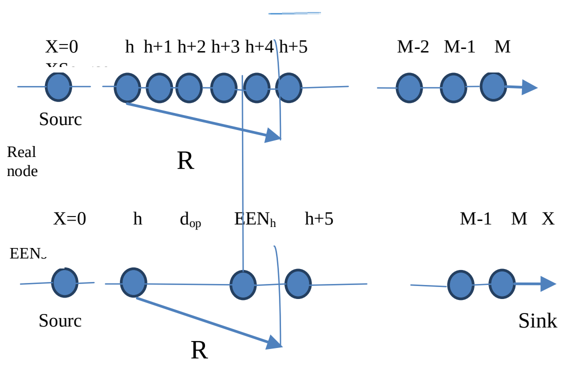


Fig 3: Existent nodes and EEN in One-D queuing pattern

A pattern intended for multi-hop One-D queuing network for existing and EEN is show in above fig. Conversely, the distance between source node to optimum succeeding relay nodes cannot essentially equivalent to Dop. Figure portrays a accurate situation, where ideal succeeding relay nodes of node H would probably fixed among two real relay node. For overcoming this difficulty, addressing theory of EEN for choosing the model succeeding relay node.

EEN defines effective relay nodes such that relaying task recognized through many real nodes and its energy depletion is parallel to amount of energy of real nodes. Related project focuses on bases of performance of source to relay data. Here replacing real node by EENs to achieve the low relay energy depletion to all nodes. In One-D queuing model, location of sensor node H is XH (XH -m), corresponding to

ET = (Eelec + εampdτ) B and

ER = EelecB.

An optimal broadcast distance Dop to node H is

Dop = m−XH/Nop

= {(2 Eelec)/ [(τ − 1) εamp]}1/τ .

e. Algorithm for ENS-OR

Requirement: Dh, Di, ei, Dop, C̍, however i belongs F (H)

Assure : location of next adjacent node Dn.

Proceeding : Node H is having packet to direct towards sink.

- Beginning with a transmission timer by selecting forwarder list F(H) from adjacent nodes N(H).
- Here every node i belongs to neighboring node N(H) if $((D(i, D_{op}) < D(H,D_{op})$ U (ei > C̍) thereby adding it forwarder node.
- Now prioritizing the forwarder list by use of optimum power design.
- Priority is based on $P(i) = (D_i\text{-}D_h)\ [(1/|D_i\text{-}D_{op}|) + (e_i\text{-}C̍)]$ now broadcasting the packets through the prioritized nodes.
- Each node (i) belongs to F(h) receives the data packet.
- When node (N) having a highest priority receives packets further a reply is received at the source using ACK sent by the sink after packets are received.

IV. SIMULATION RESULTS

Simulation results involve the study for traffic network topology for 100 nodes as shown in fig. and the proposed system is implemented with NS2. Data packets are transmitted with same size through source towards sink node. Proposed system is implemented depending on the range to sink through source and residual energy of each node in one-dimension. Simulation time is considered as the network lifetime. Results shows that packet delivery ratio, throughput, bit error rate occurred during data transmission and residual energy of each node. Comparison of ENS_OR with GeRaF routing.

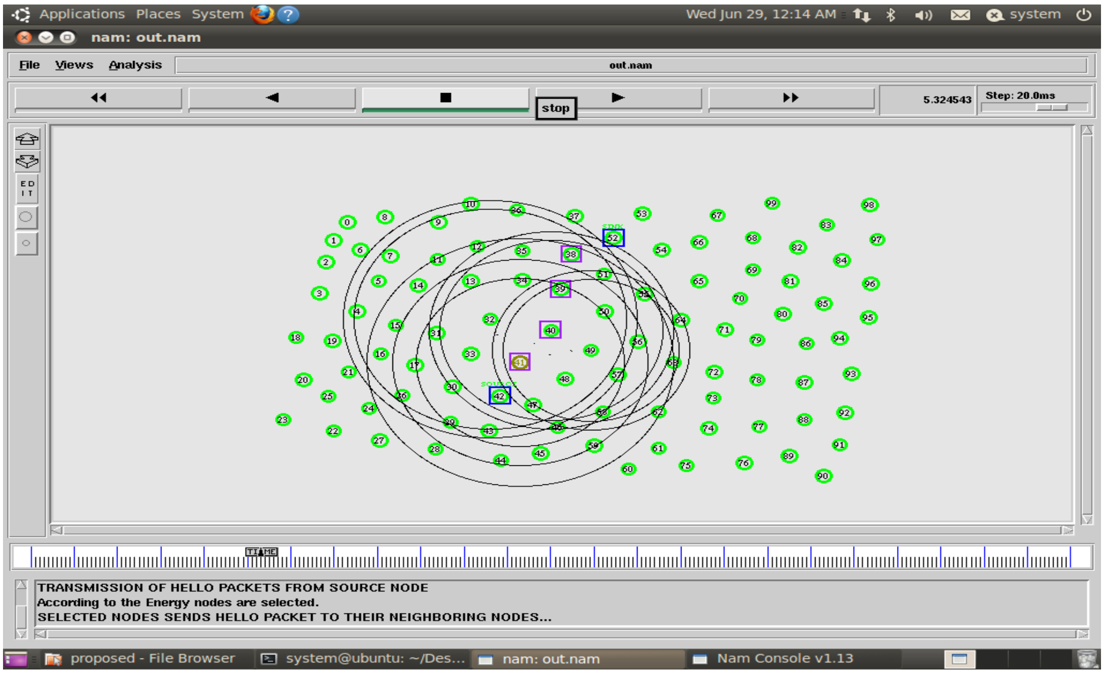


Fig 4: Ad-hoc Network of 100 Nodes deployment

Network topology is showed in Fig 4 that shows the traffic model. Nodes are deployed with relay nodes monitoring the traffic. It senses the ehicular movement and transmits an information from source to sink using one-dimensional path.

V. PERFORMANCE ANALYSIS

a. Packet Delivery Ratio

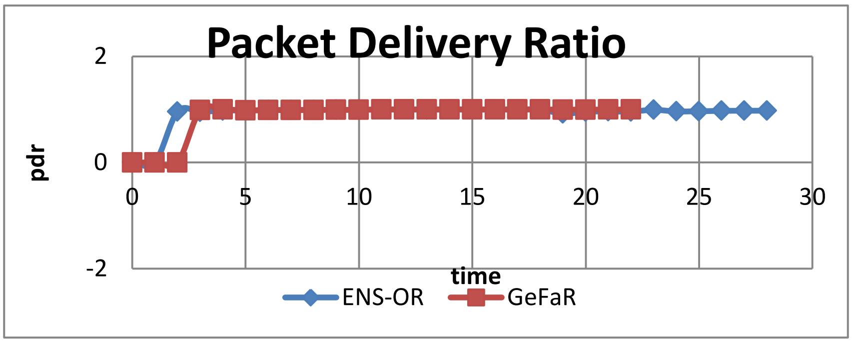


Fig 5: PDR ENS_OR verses GeRaF

Fig.5 describes the PDR as event of time, packets received at end i.e., sink node using ENS-OR is more compared to GeRaF. Therefore ENS-OR receives more number of packets transmitted through source than that of GeRaF, and successfully avoids the network detachment so that it will have good connectivity of the network. Performance of ENSO_OR is better than GeRaF.

b. Bit Error Rate

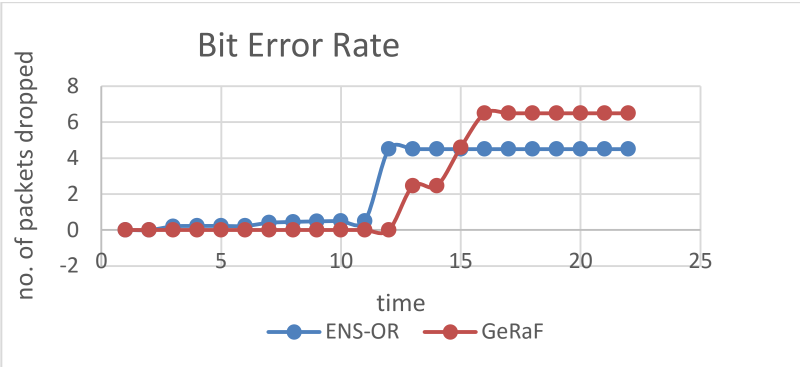


Fig 6: BER ENS_OR verses GeRaF

From Fig 6 it is shown that Bit Error Rate as a function of time, the number of bit errors received in ENS-OR is less compared with the GeRaF. Bit error rate for the ENS-OR evaluates better end to end packets delivery by source towards sink. There by increases the throughput.

d. Throughput

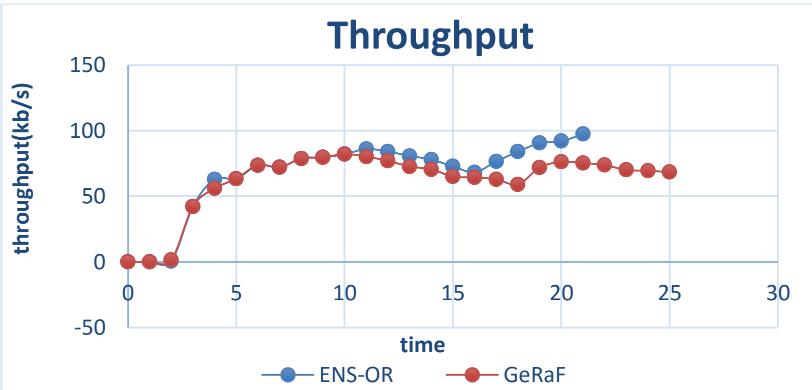


Fig 7: Throughput ENS-OR versus GeRaF

As shown in above fig. throughput is described as a function of time, the data sent by source is equal to the data received at the particular period of time. The throughput of ENS-OR is more than the GeRaF algorithm, variation in the throughput graph indicates delay in selection of relay nodes.

e. Residual Energy

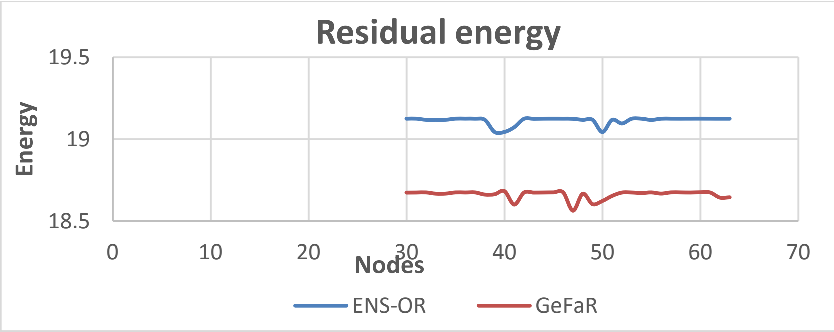


Fig 8: Residual Energy ENS-OR versus GeRaF

Fig. illustrates the residual energy as event of time, ENS-OR achieves higher residual energy compared with GeRaF, due to its energy optimum scheme and opportunistic routing strategy. ENS-OR maintains the energy absorption at lower state because of its low energy absorption so that longer lifespan can be attained.

VI. CONCLUSION

In this project the design of routing and broadcasting of packets are being studied, using the1- dimension queue network for minimizing energy consumption, thereby increasing network lifetime. An Opportunistic Routing theory is used for virtually enhancing network energy effectiveness considering both range to sink and residual energy of every node. Opportunistic Routing theory 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 strategy guarantees minimum power cost. Simulation results and test bed results demonstrates ENS-OR significantly improves energy conserving and network detachment matched with existent routing algorithm.

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