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Underwater Sensore Network for GCORP

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Abstract --*The Underwater Sensor Network (UWSN) is attracting the attention of an increasing number of academics due to its unique features. However, the UWSN systems have significant design flaws that make them largely unsustainable due to the dynamic nature of water waves. The largest problem UWSNs confront is probably figuring out how to convey data in the most energy-efficient way possible at the destination. Relay nodes and geographic and opportunistic routing algorithms can be used to transfer data to surface sinks efficiently. We design a brand-new routing protocol called the GCORP. The GCORP packets are transmitted from the source point to the surface sinks through intermediary relay nodes. The initial network architecture of the GCORP protocol is based on a high number of sinks. The source node then selects a relay forwarding set using the depth fitness factor. The weight calculation method from the relay forwarding set is then used to determine which relay is the best.*

Keyword*: **UWSN, multiple sink, weighting scheme, congestion control, Energy consumption model***.

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I. INTRODUCTION

Underwater Acoustic Sensor Networks (UASNs) have seen a sharp rise in attention in recent years, both in terms of ocean exploration and exploitation. Research into UASNs is being driven by a variety of applications, such as marine information gathering, resource development, avoiding geological disasters, and military monitoring in many fields. It has been suggested to use underwater wireless sensor networks (UWSNs) to carry out activities like marine monitoring and resource identification in challenging underwater environments. It cannot be denied, however, that a number of unique characteristics of underwater sensor networks affect the gathering of sensory data and long-distance transmission. As a result, UWSN route design requirements should be straightforward and energy-efficient. One of the main issues with UWSNs is that dependable and effective data transfer to sink nodes is substantially more difficult. On the underwater node of UWSNs, a pressure sensor and a low bandwidth acoustic modem are typically observed. Each node may therefore transmit sensory information and determine its own depth from the water's surface. These problems can be resolved using opportunistic routing since it increases the efficiency of packet delivery. In this manner, a relay set made up of a partial neighbour of the source node forwards the data packet. The degree of trust between the nodes is used to establish the relay set. The trust level of the node determines how quickly a packet is sent. The amount of trust a node has varies with its energy. Nodes in a relay set will discard a packet if they notice it being relayed by a node with a higher priority. In the opportunistic routing paradigm, a packet's delivery is only deemed unsuccessful if no nodes in the relay set are able to successfully pass it. As a result, is the ratio of packets sent. Due to their distinctive characteristics, UWSNs are currently generating a lot of interest from researchers and application developers. Environmental monitoring, ocean sampling networks, assisted navigation, deep-sea mining, reconnaissance, undersea investigations, and disaster avoidance are some of the off-shore and on-shore industries that use UWSNs.

II.OBJECTIVES

Using the depth fitness factor and the relay forwarding set from neighbouring relay nodes, to propose an energy-efficient sink route. To increase node buffer congestion for dependable data transfer with minimal packet loss and high throughput.

III. PROBLEM STATEMENT

Our objective is to select the ideal next hop for the source node in a network of N linked sensors, each with the same transmission range and positioned in the water within given region borders. Our goal is to make sure that the connection between the source address and the destination nodes is reliable and energy efficient despite the fact that numerous sink nodes are uniformly distributed around the water's surface.

IV. PROPOSED SYSTEM

To enhance the network metrics, an unique GCORP routing technique is suggested. GCORP takes into account the nodes' position (reachability), depth, and current residual energy, but only the surface sinks' position data. Conventional beaconing is used to provide all of this node information to nearby nodes. The source node in GCORP selects its relay forwarding set by taking into account the depth fitness factor and nearby relay nodes. The best relay node, often referred to as the next-hop forwarder, is selected using a weighting method from the relay forwarding set to forward the packets from source to destination. The normalised energy, packet delivery probability, and normalised distance are distributed equally using the weighting mechanism.

Main advantages of the system are listed below;

1. Energy efficient routing which extends network lifetime.
2. Achieves higher packet delivery ratio.
3. Reliable data transfer across the network

V.TOPOLOGY DESIGN

The functionality of the scripts used to build topology is described in this section. This module involves creating a wireless network topology with moving nodes that can operate on several channels.

1.Setting up the Wireless Network Topology entails configuring the nodes, the environment and the topology itself.

2. Setting the threshold and bandwidth, every node in the network topology will have a certain bandwidth and topology assigned to it.

3. Finding the neighbours to locate the neighbours for a specific node. It uses the Euclidian distance concept.

4. Specifying single-hop and multi-hop data transmission: It will be defined from which node the data must be sent and which node must receive the data. Additionally, the amount of data that must be delivered and the frequency of the data transmission will be set.

5. Setting the start and finish times for the simulation: In NS 2, the entire transaction is finished in a matter of seconds. Anytime the NAM window is open, the transaction can be seen. For this, the start and finish times of the simulation will be given.

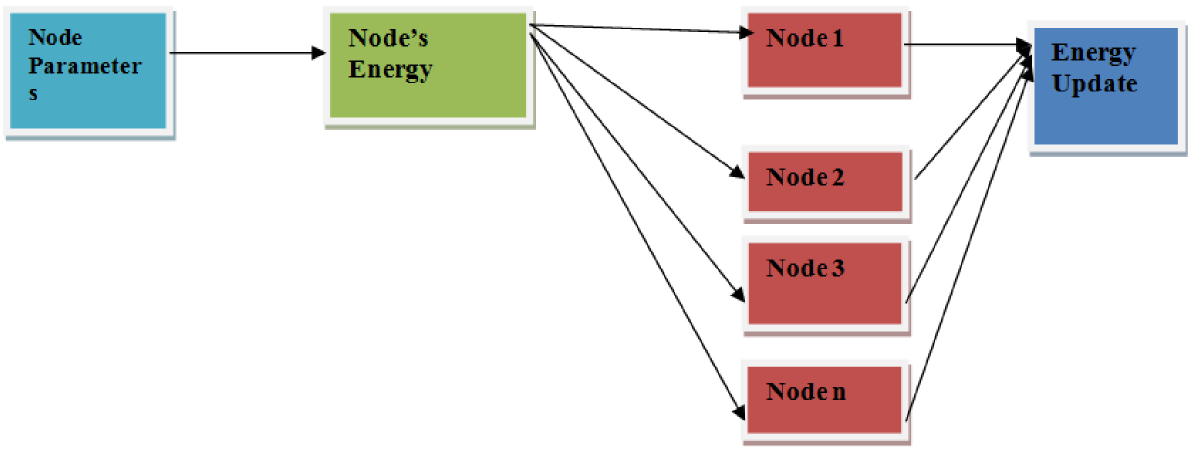

Figure1: Level 0 Node Deployment Level Diagram

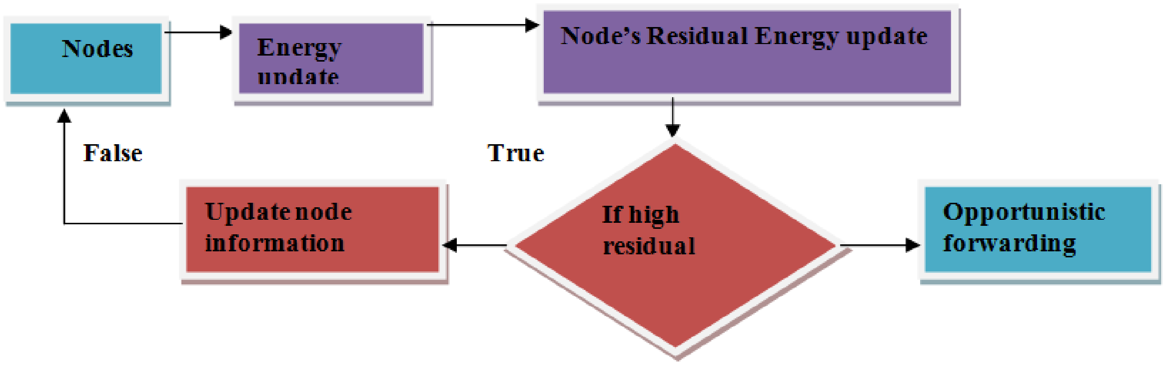

Figure 2 Energy Calculation Level1 Diagram

In the schematic above, as depicted in Figure 1 and 2, respectively. The placement of nodes with regard to network parameters and node functionalities. To determine the nodes' residual energy, the energy levels in the energy module are updated often and the nodes' energy is calculated for each iteration

A.Model for Energy Consumption

The distance between the transmitter node and the receiver node determines how much energy each node consumes. The radio energy consumed by node to transmit message of l bits through distance d, either using free space (d^2) or multipath fading (d^4) is computed as:

$$E_{t_x}(l,d) = \begin{cases} l * E_{elec} + l * \epsilon_{fs} * d^2 & d \le d_0, \\ l * E_{elec} + l * \epsilon_{amp} * d^4 & d > d_0, \end{cases}$$

E_{elec} Is the energy consumed by electronic circuit by transmitter or receiver which depends on the modulation, digital coding and propagation factors. ϵ_{fs} represents the energy coefficient per bit for free space model when $d < d_0$ otherwise multipath fading ϵ_{amp} is used when $d > d_0$ where d_0 is the threshold value. Energy required at receiver to receive data of l bits is given as

$$E_{r_x} = l * E_{elec}$$

B.GCORP Model

In the GCORP protocol, the source node selects a relay forwarding set initially from its neighbourhood nodes using the depth fitness factor. The optimal relay node is then chosen using a weighted technique. When a packet is broadcast by the source address for the best intermediate nodes, the other nodes in the relay forwarding set a holding time to stop it from interfering with previously delivered packets. After receiving the packet from the source and destination, the best relay must send it to the prospective next-hop. The packet must be sent to the prospective next-hop after being received by the best relay from the source node. Other relay nodes will reject the packet if they discover it. If the top relay node is unable to broadcast the packet, the second-best relay is chosen based on weight value and a new holding time. As a result, packet forwarding continues until each packet is properly delivered to a surfaces sink.

C.Congestion Control

The CSMA/CA Carrier Sense Multiple Access method pits nodes against one another for the chance to access a channel. The proposed method modifies CSMA/CA to lessen collisions when they take place. The carrier-sensing features are specified by the IEEE 802.11 standard. The physical carrier sense, also known as clear channel evaluation (CCA), which is based on energy thresholds from the radio interface, assesses whether or not the medium is idle.

VI. RESULT

In overhead graph the proposed system has lower overhead since it finds the efficient relay nodes which has high residual routes to surface sink which consume less overhead to compute route to sink. However the existing scheme has high overhead since the routes are found based on the shortest hop which does not consider energy level

In throughput graph, the proposed system has higher throughput since it delivers high packets through evaluating congestion status of the channel. The integration of congestion control scheme achieves higher throughput, however existing system has lower throughput because it considers optimal path to delivery data.

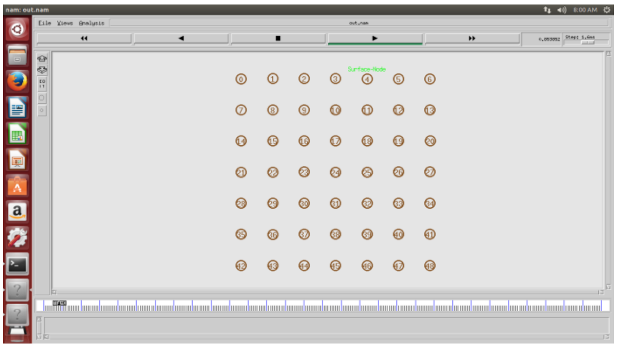

Figure 3.Initially nodes are deployed in layered and top level is surface sink and ground levels are nodes

Figure 4. Actual data transmission through energy efficient relay nodes

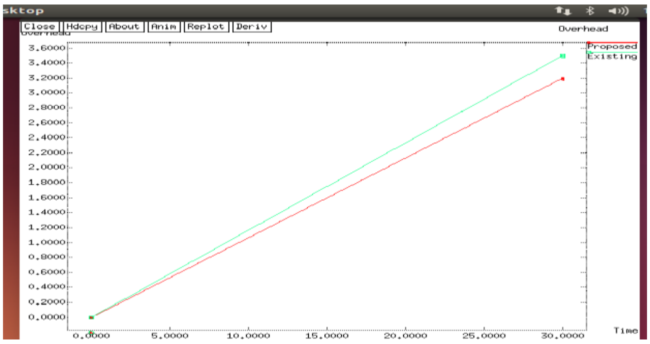

Figure: Overhead and delay values of proposed system should be less than existing

In delay graph, the proposed system has lower delay, this is because the retransmission are avoided by finding the energy efficient relay nodes, but in existing system the nodes with low energy is also selected for forwarding data which may drop packets due to insufficient energy and retransmission takes place frequently which results in high delay.

The suggested system delivers more packets than the current system in the PDF graph because relay nodes with high energy and reliable paths were chosen. In the energy graph, the average consumption of the proposed system is lower than that of the present system. This is because data transmissions involving nodes with high residual and low hop are chosen to use less energy.

VII.CONCLUSION

GCORP routing protocol to the specified system with numerous sinks. The source node in this protocol initially chooses a relay forwarding set from its neighbouring relay node using depth data to calculate the fitness factor. The several sinks positioned at the water's surface sent out a distributed beacon message that was used to acquire depth information. The best relay node was then selected from the source node's list of relays by applying a weight calculation scheme. Every relay node in the relay forwarding set has its normalised energy and normalised distance taken into account when the weighting technique is applied. In order to avoid packet collisions and retransmissions, a holding time model is also created for each relay node. The suggested solution uses a contention-based multi-hop congestion control method that gauges the lengths of queues at sender and receiver nodes throughout hop-by-hop transmission. Requests to Send (RTS) and Clear to Send (CTS) control messages are exchanged along with flag command indication to accomplish this. The method controls the next hop node's congestion process, allowing the present node to map the available channel, and alters the contention window of the node dynamically when it becomes crowded.

VIII. FUTURE WORK

In future, cluster based routing can be implemented for energy saving and to harvest energy for extending network lifetime of nodes. Clustering techniques offers better solution than flat routing.

REFERENCES

[1]. D. Chen and P. Varshney, ''A survey of void handling techniques for geographic routing in wireless networks,'' IEEE Commun. Surveys Tuts., vol. 9, no. 1, pp. 50–67, 1st Quart., 2007.

[2]. S. M. Ghoreyshi, A. Shahrabi, and T. Boutaleb, ''A stateless opportunistic routing protocol for underwater sensor networks,'' Wireless Commun. Mobile Comput., vol. 2018, pp. 1–18, Nov. 2018.

[3]. F. Al Salti, N. Alzeidi, and B. R. Arafeh, ''EMGGR: An energy-efficient multipath grid-based geographic routing protocol for underwater wireless sensor networks,'' Wireless Netw., vol. 23, no. 4, pp. 1301–1314, May 2017

[4]. C.-J. Huang, Y.-W. Wang, H.-H. Liao, C.-F. Lin, K.-W. Hu, and T.-Y. Chang, ''A power-efficient routing protocol for underwater

wireless sensor networks,'' Appl. Soft Comput., vol. 11, no. 2, pp. 2348–2355, Mar. 2011.

[5]. Y. Noh, U. Lee, P. Wang, B. S. C. Choi, and M. Gerla, ''VAPR: Void-aware pressure routing for underwater sensor networks,'' IEEE Trans. Mobile Comput., vol. 12, no. 5, pp. 895–908, May 2013

[6]. Y.-S. Chen and Y.-W. Lin, ''Mobicast routing protocol for underwater sensor networks,'' IEEE Sensors J., vol. 13, no. 2, pp. 737–749, Feb. 2013

[7]. H. Yu, N. Yao, and J. Liu, ''An adaptive routing protocol in underwater sparse acoustic sensor networks,'' Ad Hoc Netw., vol. 34, pp. 121–143, Nov. 2015.

[8]. K. Zeng, W. Lou, J. Yang, and D. R. I. Brown, ''On geographic collaborative forwarding in wireless ad hoc and sensor networks,'' in Proc. Int. Conf. Wireless Algorithms, Syst. Appl. (WASA), Aug. 2007, pp. 11–18.

[9]. G. Han, J. Jiang, L. Shu, Y. Xu, and F. Wang, ''Localization algorithms of underwater wireless sensor networks: A survey,'' Sensors, vol. 12, no. 2, pp. 2026–2061, Feb. 2012

[10]. M. Jouhari, K. Ibrahimi, H. Tembine, and J. Ben-Othman, "Underwater wireless sensor networks: A survey on enabling technologies, localization protocols, and internet of underwater things," IEEE Access, vol.7, pp. 96,879–96, 899, 2019