An Energy-Efficient Routing Protocol Analysis for Underwater Sensor Networks

K. Ranjeetha Priya[1] R. Sindhuja[2] R. R. Sowmiya[3] S. Swathi[4]
[1]Assistant Professor [2,3,4]Student
[1,2,3,4]Department of Information Technology
[1,2,3,4]Sri Krishna College Engineering and Technology, Coimbatore, Tamil Nadu, India

Abstract— The main concept the paper involves the improvement of the efficiency of data packet delivery underwater. Efficient and consistent routing protocols are very much essential and crucial to underwater sensor networks (UWSNs). Nowadays terrestrial communication proves to be much simpler and the problems faced by them are different from nodes faced underwater. Acoustic communication that prevails underwater still makes sensor communication a colossal task. An approach to improve the underwater communication is by learning more about the acoustic signals. In this paper we propose a Greedy Perimeter Stateless Routing (GPSR), a novel routing protocol for wireless networks that will make use of positions of the available routers and the respected packet's destination to make packet forwarding decisions. It makes use of greedy algorithm to forward packets using the information about the router's immediate neighbors in the topology. If the packet is forwarded to a region where greedy algorithm is impossible then it recovers by routing around the perimeter of the region. GPSR can make use of local topology information to find new routes to forward the data packets quickly.

Key words: Underwater Sensor Networks (UWSNS), Greedy Forwarding, Perimeters

I. Introduction

As most of the parts of our planet is covered by water bodies, underwater studies has become a need for successive generation of science and business. It is still a challenging phenomena to gather underwater information. The victorious readying of wireless device networks on the bottom result in their underwater readying. Communication between sensors and base station or between the nodes is totally different from the terrestrial situation. Communication exploitation of electromagnetic waves is not possible due to high attenuation and absorption impact of water. Optical communication suffers from scattering.

Under Water sensor Network (UWSNs) has picked up the thought of the fact-finding and mechanical teams due their potential to screen and investigate oceanic positions. UWSNs have an intensive sort of potential applications, for instance, to watch marine life, poisonous substance content, land forms on the ocean depths, oilfields, atmosphere ,waves and seaquakes to assemble oceanographic info, ocean and seaward testing, route facilitate and acknowledgment getting used for strategy observation applications.

Applications which are mission-oriented, like field of battle intelligence, fireplace detection in forests, and gas watching in coal mines, Wireless Sensor Networks (WSNs) square measure deployed in an exceedingly wide selection of areas, with an oversized variety of sensing element nodes detection and broadcasting some data of urgencies to the end-users. As there could also be no communication infrastructure, users most of the time are typically equipped with human action devices to associate with sensing element nodes. Once a vital event (e.g., gas leak or fire) happens within the watching space and is detected by a sensing element node, an alarm must be broadcasted to the opposite nodes as before long as attainable,. Then, sensing element nodes will warn users close to escape or take some response to the event.

Using tactful Routing paradigm, each packet is communicated to a causation set created out of neighbors. Greedy Perimeter Stateless Routing (GPSR), could be a responsive and economical routing protocol for wireless mobile networks. In contrast to established routing algorithms before it, that use graph-theoretic notions of shortest ways and transitive approaches to seek out routes, GPSR exploits the correspondence between geographic position and property in an exceedingly wireless network, by exploiting the positions of nodes to form packet forwarding choices. The routing uses greedy forwarding to forward packets to nodes that are increasingly nearer to the destination. In some regions of the network whenever a greedy path doesn't exist, GPSR recovers by forwarding in perimeter mode, within which a packet traverses nearer faces of a planate sub-graph of the total radio network property graph, till reaching a node nearer to the destination, at which point the greedy forwarding resumes its routing.

We schedule the use of geographical techniques to achieve extensibility in underwater wireless routing protocol which is called as Greedy Perimeter Stateless Routing (GPSR). The aim is to improve the measurability under increasing numbers of nodes in the network and increasing mobility rate. The measures of the protocol includes,

- Routing message cost
- Packet delivery rate

II. Related work

In literature review there are few routing protocols in acoustic networks which use the geographic and message-based routing to route the packets from source to their ultimate destination.

Rodolfo W.L. Coutinho, Azzedine Boukerche, et.al [1] has projected the GEDAR routing protocol for UWSNs. GEDAR is a network addressing and routing method, geographic and timeserving routing protocols that courses data packets from device nodes to completely different floats (sinks). At the purpose once the node is in an exceedingly correspondence void space, GEDAR changes to the recovery mode methodology that depends on topology management through the alteration of depth of the void nodes. Simulation comes concerning demonstrate that GEDAR basically enhances the network execution once contrasted and also the gauge arrangements, even in onerous and difficult mobile things of exceptionally distributed and very dense networks and for prime network traffic hundreds. the foremost imperative a part of the GEDAR is its novel void node recovery strategy. Instead of the customary message-based void node recovery network, GEDAR projected a void node recovery depth modification primarily based topology management formula. The thought is to maneuver void nodes to new depth to continue the geographic routing at no matter purpose it's obtainable. To the most effective of insight, this work is taken into account the depth amendment node capacities to rearrange the constellation of a mobile underwater device network to reinforce routing endeavor. Simulation comes concerning incontestable that GEDAR will ready to live the void nodes through the depth adjustment primarily based void node recovery network.

P. Roselin and G.Annalakshmi [2] has recommended a theme that includes any packet that cannot meet its scheduled date is discarded. The results of the execution demonstrate that the arrangement performs energy expenses and network output by heuristic formula. The relay priority is given a collection of forwarders that is decided at the beginning. Then a way for cluster based mostly forwarding set choice that develops an attainable forwarding set around every neighbor of the node is taken into the attention. This methodology involves maintaining the right internal priority order throughout the progressive development of the cluster. Finally, the forwarding set with the simplest one hop reliability is chosen from the given clusters as one of the node's actual forwarding set.

III. PROPOSED WORK

We describe the Greedy Perimeter Stateless Routing algorithm. The algorithm consists of two methods for forwarding packets: greedy forwarding that is used extensively and perimeter forwarding, which is used in the regions where greedy forwarding cannot be implemented.

A. Greedy-Perimeter Stateless Routing

A wireless routing protocol known as the Greedy Perimeter Stateless Routing (GPSR) proposes an aggressive use of earth science to realize measurability.

The GPSR permits nodes to work out who is its nearest neighbors are (with the help of beacons) that are nearer to the destination the data is meant to transmit. To calculate a path, GPSR uses a greedy forwarding algorithmic program that sends the data to the ultimate destination applying an economically potential path. If the greedy forwarding fails, perimeter forwarding is used to route the packets around the perimeter of the network region. GPSR uses Link State (LS), Distance Vectors (DV) and Path Vector routing algorithms. With DV, every node finds its destination node from its neighbors supported on a periodic beacon. The LS directly floods broadcast of changes in node standing to each node within the topology associated with the network. Consistent with the authors, each LS and DV will have minute inaccuracies within the state at a router [node] which may cause routing loops or disconnection. The speed of modification of the topology and therefore the variety of routers within the routing domain will have an effect on the message complexness of DV and LS routing algorithms.

B. Greedy Forwarding

We assume that the wireless routers [nodes] understand their own locations the Greedy forwarding algorithm can attempt to realize the nearest router that is the nearest to the ultimate destination as seen in the Fig 1.

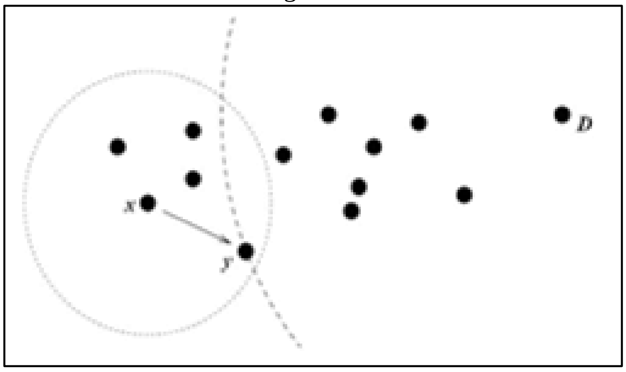

Fig. 1: Greedy Forwarding Example. Y is x's Closest Neighbor to D

Node x needs to send data to node D, utilizing the greedy forwarding program, x calculates that the nearest neighbor that's additionally the nearest to D which is in x's radio vary (the dotted circle encompassing x) is y. Even supposing there are different neighboring nodes with in x's range nearer to x than y, none are nearer to D as y is and so x can send its data to y, which can use the greedy forwarding algorithmic program to send it to consecutive node till the data reaches the ultimate destination D.

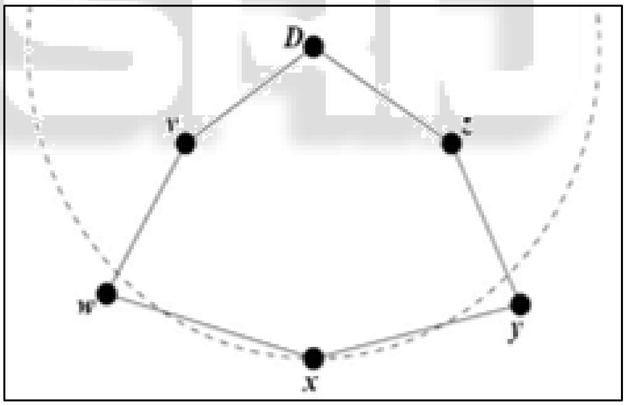

Fig. 2: Greedy Forwarding Failure. x is a local maximum is Its Geographic Proximity to D; w and y are Father From D

However, there's a disadvantage to this forwarding approach that happens once the configuration is just like the one in fig 2. During this category of topology there's just one route available and would cause x to send data to a neighbor that's distant from D than x is. Therefore during this case x is nearer to D than its neighbors w and y. Therefore, x would be forced to send its data to w or y that is farther away in geometric distance from the destination D than x is. The greedy forwarding approach won't permit this to happen. Therefore a distinct mechanism should be deployed to forward the knowledge in these positions which is a sort of a perimeter forwarding algorithmic approach.

C. Perimeter Forwarding

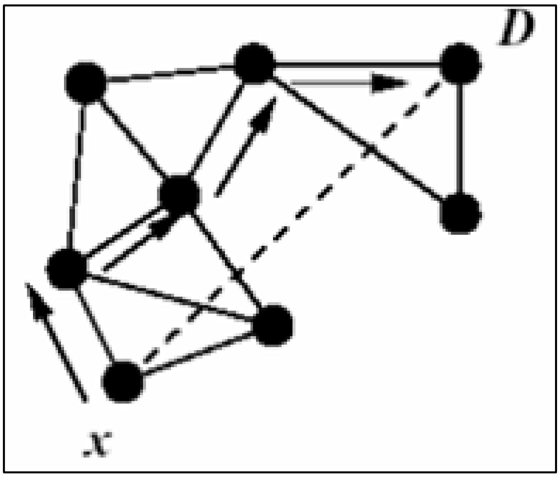

Fig 3. Perimeter Forwarding: x is the node where Greedy forwarding failed. Algorithm uses right hand rule to forward packets.

D. Right-Hand Forward Algorithm

By deploying the right-hand rule to search the perimeters and associate that data with the no-crossing heuristic to compel the right-hand rule. It's potential to search out perimeters that encircle voids in regions wherever edges of the graph cross. However, this rule doesn't realize routes once they exist. The no-crossing heuristic removes whichever edge it encounters second during a combination of crossing edges and by doing it will partition the network. If it does, the rule won't realize routes that cross the partition.

While the no-crossing heuristic analytically notices majority of the n (n-1) routes among n nodes, in arbitrarily generated networks, it is unacceptable for a routing formula to sometimes fail to seek out a route to a approachable node in a very static, unchanging topology. There are certain ways that to unravel this downside of crossing links from the network, one such technique being Planarized Graphs where no edges cross.

Finally, combining the Greedy and planar Perimeters offers the complete GPSR algorithm which includes the greedy forwarding algorithm on the complete network graph with perimeter forwarding on the networks with planerized graph once greedy forwarding isn't available to find routes. All the algorithms deliver over majority of the data given to a node to deliver to their respective destination.

IV. Conclusion

When it comes to acoustic communication the scarce distribution of nodes causes the reduction within the network performance. The protocol is reliable with data delivery at the Base Station (BS). The projected protocol is primarily cluster based. Every cluster consists of a cluster head (CH) node, a pair of deputy CH nodes, and a few standard detector nodes. Considering the dependability facet of the protocol, it puts best effort to make sure a nominative output level at the BS. GPSR makes use of integrated models to reckon trust in the native neighbor. This trust is then related to the routing method to create routes that bypass malicious nodes with a high possibility of success.

References

[1] A. Ranjan and A. Ranjan, Underwater Wireless Communication Network, Adv. Electronic and Electric Engg., ISSN 2231-1297, 3(1), 41-46 (2013).
[2] D. Chen and P. Varshney, “A survey of void handling techniques for geographic routing in wireless networks,” IEEE Commun. Surveys and Tuts., pp. 50–67, 2007.
[3] H. Yan, Z. J. Shi, and J.-H. Cui, “DBR: depth-based routing for underwater sensor networks,” in Proc. 7th Int’l IFIP-TC6 NETWORKING, 2008, pp. 72–86.
[4] I. F. Akyildiz, D. Pompili, and T. Melodia, “Underwater acoustic sensor networks: research challenges,” Ad Hoc Networks, vol. 3, no. 3, pp. 257–279, 2005.
[5] Karp, B., Geographic Routing for Wireless Networks, Ph.D. Dissertation, Harvard University, Cambridge, MA, October, 2000.
[6] P.Roselin and G.Annalakshmi,” Active Opportunistic Routing In Underwater Sensor Networks”, Volume 21 Issue 3 – APRIL 2016.
[7] Rodolfo W.L. Coutinho, Azzedine Boukerche, Luiz F.M. Vieira, and Antonio A.F. Loureiro,” Geographic and Opportunistic Routing for Underwater Sensor Networks”, 2016.