ISSN:2320-0790

COMPUSOFT
An International Journal of Advanced Computer Technology

Design of Protocol in Underwater Wireless Sensor Networks

S.Fathima, P.N.Kathiravan, Dr.S.Sharmila
Diploma In Information Technology, PSG Polytechnic College, Coimbatore.
Head, Department of Information Technology, PSG Polytechnic College, Coimbatore

Abstract: In this work we designed a routing protocol to overcome upcoming challenges in under water wireless sensor networks. The routing protocol designed for specific roles leads to issues in the network. The major issues for development of routing protocol for underwater sensor network are harsh deployment environment, low bandwidth, high propagation delay, low bandwidth, requires high bandwidth energy, temporary losses, fouling and corrosion and high bit error rates. In this project the certain issues to be rectified are low bandwidth, energy efficiency and data delivery. The limitations existing routing protocols are low data delivery, data delivery ratio, energy efficiency, bandwidth efficiency and reliability. Design of three new protocol is to overcome the limitations of existing protocols in underwater wireless sensor networks.

INTRODUCTION

Wireless sensor networks are increasing used in several applications such as wild habitat monitoring, forest fire detection, and military surveillance. After being deployed in the field of interest, sensor nodes organize themselves into a multihop network with the base station as the central point of control. Typically, a sensor node is severely constrained in terms of computation capability and energy reserves. A straightforward method to collect the sensed information from the network is to allow each sensornode's reading to be forwarded to the base station, possibly via other intermediate nodes, before the base station processes the received data. However, this method is prohibitively expensive in terms of communication overhead.

In this project, we focused on scenarios where perfect aggregation is used while gathering data, meaning that all forwarded messages are of the same size. An important problem studied here is finding an efficient routing scheme for gathering all data at the sink periodically so that the lifetime of the network is prolonged as much as possible. The lifetime can be expressed in terms of rounds where a round is the time period between two sensing activities of sensor nodes. There are several requirements for a routing scheme to be designed for this scenario. First, the algorithm should be distributed since it is extremely energy consuming to calculate the optimum paths in a dynamic network and inform others about the computed paths in a centralized manner. The algorithm must also be scalable. The message and time complexity of computing the routing paths must scale well with increasing number of nodes. Another desirable property is robustness, which means that the routing scheme should be resilient to node and link failures. The scheme should also support new node additions to the network, since not all nodes fail at the same time, and some nodes may need to be replaced. In other words, the routing scheme should be self-healing. The final and possibly the most important requirement for a routing scheme for underwater wireless sensor networks is successful packet delivery.

ROLE OF UNDERWATER WIRELESS SENSOR NETWORKS

Underwater sensor network able to perform operations in wide range of applications that application are perform different in underwater sensor network some applications likes mine reconnaissance, distributed tactical surveillance, seismic monitoring, ocean sampling networks, equipment monitoring, environmental monitoring, assisted Navigation, Disaster prevention and undersea explorations these all are the advantages of the underwater sensor networks. Since no system is perfect, therefore, even with all the above mentioned advantages of the system, a few disadvantages still exit like costly devices, more power requirement, Intermitted memory.

PROBLEMS IN UNDERWATER WIRELESS SENSOR NETWORKS

Underwater wireless sensor networks has certain problems such as More expensive devices, high power require for communication, Hardware protection requirement, intermitted data transfer, reading problems in space sensor, more sparse deployment, Propagation delay, Fouling and corrosion, Temporary loss, localization, High bit error rate, limited battery power, limited bandwidth size.

A. More Expensive Devices: underwater wireless sensor network's devices are more costly. Underwater wireless sensor devices are not easily available in the markets.

B. High power require for communication: The data is transmitted in underwater, so it need more power to communicate.

C. Hardware protection requirement: In underwater, lot of underwater devices are available not only for monitoring but also scientific work also there, that is why more security is require inside the water for safety of the underwater components.

D. Intermitted data transfer: In underwater sensor network data transferring could be create big interrupt at the time.

E. Reading problem in space sensors: Generally terrestrial sensors are related to each other. But In underwater sensor network it may not be possible in higher distance sensors but unlikely it could be co-related in higher distance among sensors.

F. More sparse deployment: In underwater sensor network the deployment is often sparser, but compared to terrestrial sensor networks, they are densely deployed.

G. Propagation delay: This is also a major problem which comes underwater sensor networks time. Propagation delay is orders of magnitude higher than in Radio Frequency variable and terrestrial channels.

H. Fouling and corrosion: Underwater sensors are prone to failures because of fouling and corrosion.

I. Localization: Localization is the challenging factor that is require for data labeling while some time critical applications require data without time delay.

J. High Maintenance: Underwater sensor's demands are increasing because for underwater sensor networks are very costly which are not easily available in the market and underwater sensor supplier and consultants are not available everywhere that is why cost is increasing. Underwater sensors are too costly because for underwater sensor networks high maintenance is required.

K. Temporary losses: For the connectivity time packet sending time it could be loss between the data transmission.

L. High bit error rates: In underwater sensor network high bit error rates mostly come at the time of duration.

M. Reliability: This is one of the major design issues for reliable delivery of sensed data to the surface sink is a challenging task compare to forwarding the collected data to the control center.

N. Limited battery power: Battery power is the major issues which mainly comes underwater sensor network because many underwater devices working throw the battery suppose if a underwater sensor device is not working so underwater charging is not possible or it may not be charged.

O. Limited bandwidth size: In underwater sensor another problem is issue is related to bandwidth because bandwidth size is limited.

RELATED WORKS

There are ten different routing protocols available for underwater sensor network. They are Vector-Based Forwarding Protocol or location-based routing protocol, Robustness Improved Location protocol, Depth-Based Routing protocol, Hop-by-Hop Dynamic Addressing Based protocol, Focused Beam Routing Protocol, Path Unaware Layered Routing Protocol, Adaptive Routing protocol, GPS-free Routing Protocol, A Low Propagation Delay Multi-Path Routing Protocol, Pressure Routing Protocol.

PROPOSED ALGORITHM

A.**CALCULATIONS**

In propose algorithm, Validity time is calculated. Validity time indicates a time limit, which states and specifies the time for packet to be transferred and delivered at the destination end. The destination node always specified with the certain time limit for receiving data,

VT = C * (1 + a/16) * 2^b

Where, C is the scaling factor for the "validity time"calculation. A is the higher order bit. B is the lower order bit. As validity time decreases, sender needs to process the packet very quickly with the help of priority, so that the performance can be increased. The MPFR protocol does the job here.

The packet Deliver Ratio (PDR) states number of packets delivered successfully at the receiver which is transmitted from the sender

$$\text{PDF} = \frac{\text{Number of received packets}}{\text{Number of sent packets}}$$

The above formula is used to find the packet drop in the network. A high value of Packet Delivery Fraction indicates that most of the packets are being delivered to the higher layers and is a good indicator of the algorithm performance. This is defined as the average time taken by the data packets to reach the intended destinations. This include delay occurred due to different reasons like queuing delay, propagation delay, processing delay etc.

$$\text{AED} = \frac{\Sigma\ (\text{time received} - \text{time sent})}{\text{Total data packets received}}$$

The link stability metric rather than path stability metric is considered. This is due to the protocol scalability properties that we tried to offer to the routing scheme. A node with the best tradeoff between link stability and energy consumption is adopted through a local forwarding criterion. Before explaining the method adopted to estimate the link stability grade, the definition of link stability is provided

By following the strategy outlined in the proposed mathematical model, the expected residual lifetime Ri;j(ai;j) of a link (I; j) of age aij is determined from the collected statistical data as follows:

$$R_{i,j}(a_{i,j}) = \frac{\sum_{a=a_{ij}}^{A_{\max}} a \cdot d[a]}{\sum_{a=a_{ij}}^{A_{\max}} d[a]} - a_{i,\,j}\ \forall (i,j) \in A,$$

It is assumed that each wireless node has the capability of forwarding an incoming packet to one of its neighboring nodes and to receive information from a transmitting node. In addition, each node is able to identify all its neighbors through protocol messages. It is assumed that each node does not enter in standby mode and each node can overhear the packet inside its transmission range and it is not addressed to itself. The energy needed to transmit a packet p from node I is: (p,i) = I.v. Joules, where I is the current (in Ampere), v the voltage (in Volt), and tb the time taken to transmit the packet p (in seconds).n The energy E(p, i) spent to transmit a packet from node into node j is given by

E (p,i) = (p,i)+(p,j)

Where Etx and Erx denote, respectively, the amount of energy spent to transmit the packet from node I to node j and to receive the packet at node j; to the energy spent to overhear the packet has been avoided.

B.GREEDY FORWARDING

Under Greedy Forwarding protocol there are so many protocols are there. Among those protocols, Signal Stability Based Adaptive Routing Protocol is implemented in underwater wireless sensor networks. Signal stability protocols contain two protocols. They are Dynamic routing protocol (DRP) and Static Routing Protocol (SRP). The Dynamic Routing Protocol (DRP) contains two tables. They are, Routing Table (RT) and Signal Stability Table (SST).

In Signal Stability Based Adaptive Routing Protocols, nodes are transmitted via the strongest signal. If sender sends the data, it will move to DRP, then the DRP will send the data to SRP, SRP checks for the paths in the Routing Table and the strongest Signal in the SST and sends the data via that path.

If there is no path in the routing table, Route Request Packet will be sent by the Request Sender in all direction. Once Route Request Packet reached the destination, the destination node will send reply to the packet which reached first. If the Route Request Packet is dropped while sending, the node which sends the data will inform the sender. The sender will send erase message to all the nodes and the process will happen once again.

After the destination node sends a reply, the RT will be updated and the sender will send the data through that route.

C.NETWORK SIMULATOR

The results for the above algorithm is simulated using Network Simulator.

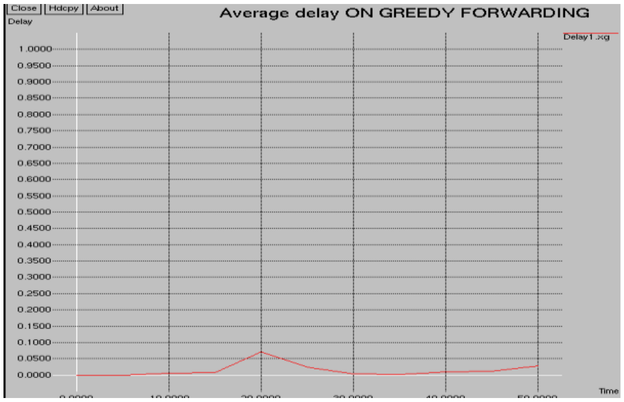

Fig 1.The graph is simulated in Network Simulator which describes about the Average Delay on the Proposed algorithm

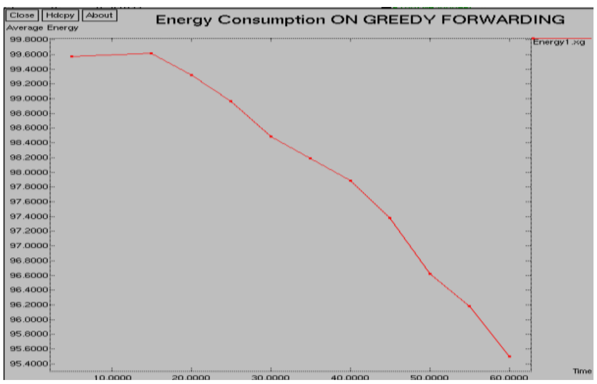

Fig 2.The graph is simulated in Network Simulator which describes about the Energy Consumption of the Proposed algorithm

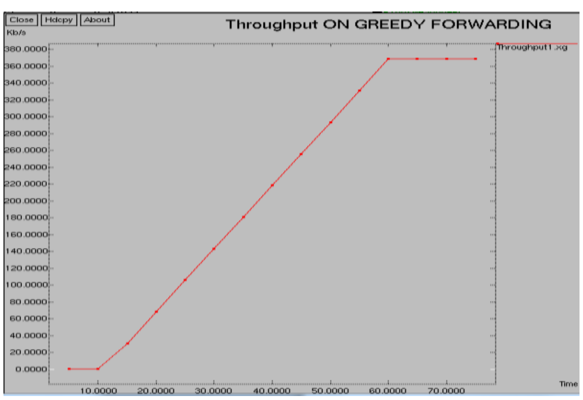

Fig 3.The graph is simulated in Network Simulator which describes about the Throughput of Proposed algorithm

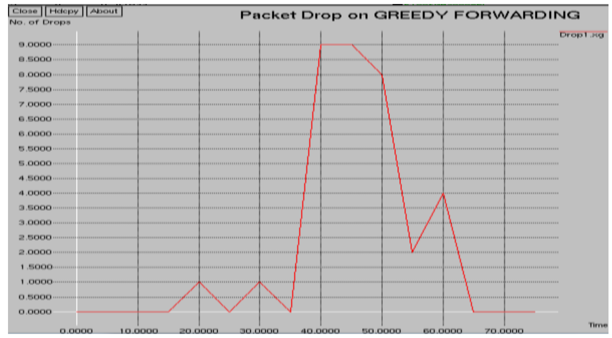

Fig 4.The graph is simulated in Network Simulator which describes about the Packet Drop in the Proposed algorithm

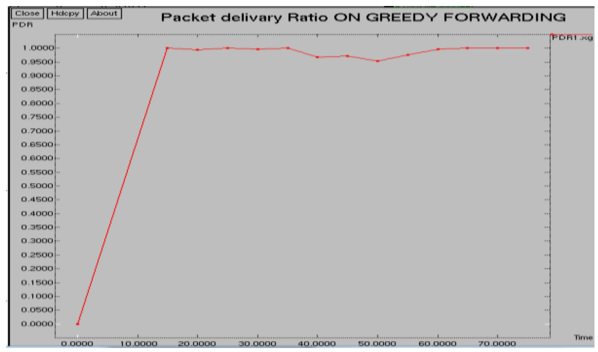

Fig 5.The graph is simulated in Network Simulator which describes about the Packet Delivery Ratio of Proposed algorithm

D.CONCLUSION

A new protocol for UWSN is proposed and simulated based on an existing protocol named Signal Stability Based Adaptive Routing protocol. By implementing it in underwater wireless sensor, the no of Packet Drop can be reduced

REFERENCES

[1] Aman Sharma and AbdhulGaffar, "A Survey on routing protocols for Underwater Wireless Sensor Networks"

[2] Hai Yan, Zhijie Shi and Jun-Hong Cui, "DBR-Depth Based Routing Protocol for Underwater Sensor Networks"

[3] PengXie, Jun-Hong Cui and Li Lao, "VBR-Vector-Based Forwarding Protocol for Underwater Sesor networks"

[4] RohitDube, Cynthia D. Rias, Kuang-Yeh Wang, and SathishK.Tripathi, "Signal-Stabily Based Adaptive Routing Protocol for Ad-Hoc Mobile Networks".