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UNDERWATER WIRELESS SENSOR NETWORK WITH E2R2 ALGORITHM

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ABSTRACT

Underwater wireless sensor networks (UWSNs) contain several components such as vehicles and sensors that are deployed in a specific to perform collaborative monitoring and data collection tasks. These networks are used interactively between different nodes and ground based stations. Reliable Underwater Wireless Sensor Networks (UWSNs) can supply good services for deep-water engineering applications operating in the volatile underwater environment. UWSNs are getting growing interest because of wide- range applications, such as deep-sea ecology, military operation, predicting earthquake, and so on UWSNs are different from terrestrial radio networks and it is full of challenges. However, the underwater acoustic communication technology is constrained by the nodes' continuous movement, limited communication bandwidth and node energy, which bring great challenges to UWSNs. To propose a communication scheme called AA-RP (AUV-Aided Routing Method Integrated Path Planning). In AA- RP, AUV collects data from sensor nodes following a dynamic path, which is planned by itself at the same time. When sensor nodes send data to next hop, apart of them send data packet directly, which can reduce the energy consumption. Relying on the dynamic path of AUVs, the network topology can be rebuild and these sensor nodes, While in critical flooding issues it sensed from the moored sensor for predicting the threshold level and will give alert.

Keywords: Wireless sensor network; E2R2 Algorithm; AARP aided Localization; Throughput; Energy

1. INTRODUCTION

Radio signals cannot properly propagate in water and there is a need for acoustic communication. Nevertheless, acoustic communication has to bear some cost with a lower propagation speed, longer delay, lower delivery rate, less bandwidth and higher bit error rate. Packet collision by hidden terminal problem is easy to happen because propagation delay of acoustic signal is 2.0×105 times larger than radio signal. The routing protocols , which

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require higher bandwidths or result in large End-to-End delays, are not suitable for UWSNs. Secondly, most of the times, sensor nodes in UWSNs tend to passively move with the water currents. Sensor nodes can move up to 1–3 m/sec because of different there is a dynamic topology in UWSN, and routing protocol should make sure that the routing path is variable and available. Thirdly, underwater sensor nodes consume more power as well as the replacement of the nodes or batteries is not so easy.

So deep sea applications are often constrained by theoperation power and limited battery. Most problems of the underwater communication can be addressed at the physical layer by designing receivers. Conversely, characteristics, such as the long delays, limited bandwidth and node energy, must be addressed at higher layers . In order to reduce energy consumption and prolong network lifetime, considerations of energy saving must be incorporated into the communication protocol design, and flooding packets should be avoided in low bandwidth environment, which can decrease p For these circumstances, many routing schemes have been proposed for UWSNs.

Among these, a kind of potential solution is that it employs the autonomous underwater vehicle (AARP) as the sink node or relay node to gather data from the sensor nodes.

In this paper, we propose a communication scheme called E2R2(AARP- Aided Routing Method Integrated Path Planning).

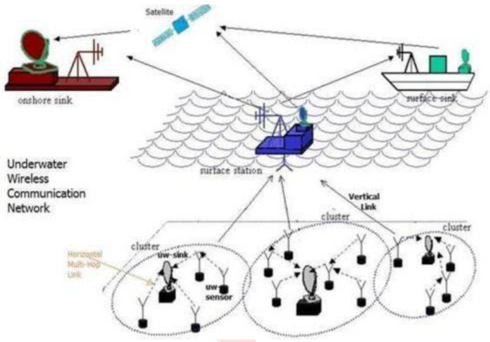

Fig 1: System Architecture

In AA-RP, AARP collects data from sensor nodes following a dynamic path, which is planned by itself at the same time. When sensor nodes send data to next hop, apart of them send data packet directly, which can reduce the energy consumption. Relying on the dynamic path of AARPs, the network topology can be rebuild and these sensor nodes, which is near to sink nodes, can overcome the energy hole problem.

In summary, the E2R2has following advantages: routing process needn't location information it can equalize energy consumption and avoid hot point and hot zone problem; it can save energy by combining multitasks and reducing forwarding packets. In this part, we discuss the feasibility of our assumptions by pointing out various studies carried out in recent years in UWSNs. According to cross-layer level of communication method, there are two categories: no cross-layer routing and cross-layer routing.

First, there are several works, such as [3, 6, 8, 9], which only consider routing without cooperations between different layers. the sensor nodes transmit data to AARPs or surface sinks by multi-layer and the relay node can be any node in the upper layer . In the authors propose the location-aware source routing (LASR) protocol which modifies the dynamic source routing (DSR) protocol, and it adds a link quality as the route metric in UWSNs where link quality can be highly variable. It aims to adapting the dynamic topology that is coursed by employed multiple AARPs, but the quality metric may choose a data forwarding route with more hops other than a less one. This leads to a longer latency that is not what we want.

In the paper proposes a protocol in UWSN to wake up nodes before AARP arrives. But sometimes it needs many relay-nodes to wake up one node separated from others by a hole and this leads to extra energy consumption. It proposes a depth based routing protocol which doesn't require full-dimensional location information of sensor nodes. This protocol can handle dynamic network efficiently, but it can't avoid hot spot problem, which leads to nodes with smaller depth die out early. Second, there are several cross-layer routing schemes.

2. RELATED WORK:

Reliable Underwater Wireless Sensor Networks (UWSNs) can supply good services for deep-water engineering applications operating in the volatiledepth die out early. Second, there are several cross-layer routing schemes. In an integrated method of localization and routing is proposed by simply extending control packets exchanged for localization, which is usually discussed separately. It's a good idea for the efficient setup of the network, but it doesn't show a reliable routing method. In this paper proposes an AARP-aided underwater routing protocol, namely, which uses not only heterogeneous acoustic communication channels but also controlled mobility of multiple autonomous underwater vehicles (AARPs).

In, the total data transmission hop count are minimized by using AARPs as relay nodes, which carried sensed data from gateway nodes to the sink, and the protocol utilizes the mobility of AARPs to apply a underwater channel with short range and high data-transfer rate for large data transfer. It also mentions the effects of AARPs' movement on the performance of the routing protocol, but it dose not give a further description. What's more, it uses pre-determined gateway nodes, so it can't meet the requirement dynamic topology. In the authors propose a paradigm-changing geographic routing protocol and all nodes of the

UWSN are gliders, which relies on a statistical approach to estimate a model position zone. In this routing protocol, it combines routing protocol with practical cross-layer to minimize energy consumption.

But the algorithm is not easy to constrained ordinary sensor nodes. cuts down speed. In another data collecting cycle, AARP will send HGP (Hello GN Packet) to recycle data and revoke the power of GN when it passes by GNs. 2) Ordinary Node (ON): ON collects data using equipped sensors in the water and trys to send the sensing data to AARPs. When ON receives Hello Packets, they can establishe a routing table depending on the Hello Packets and forward the Hello Packets.

During this process, ON can store multiple data forwarding routes to AARPs. If a ON is not the first hop node of AARP, it chooses the optimal node from the routing table as the next hop and send data directly. When the optimal nodes is unavailable, ON will choose a suboptimal node as the next hop. If a ON is the first hop node of AARP, it sends a Data Request Packet and waits for the reply. After it receives the DRPR, this ON sends data to one replying node.

When this ON receives both AARP's and GN's reply, it will choose AARP firstly. 3) Gateway Node (GN): GN is selected by AARP from first-hop nodes and it is an agent of AARP when AARP leaves. Similar to ON, GN establishes a routing table and stores mutilple data forwarding route to AARPs. While, GN can reply DRPRs to first hop nodes when the first hop node send DRPs. If AARP is not here, GN can accept data from first hop node and store the data in a queue until it receives another HP or HGP from AARP. If GN receives a HGP from AARP, the GN sends the stored data to the AARP directly and turn into ON.

3. PROBLEM DEFINITION

The system is designed such that different scenarios of routing within a WSN can be analyzed in such a way that their energy efficiency can be increased. The different effects of changes in parameters of the scenario where nodes are moving within and in between clusters are observed to increase their life.

3.1. SYSTEM MODEL

Underwater networks consist of a variable number of sensors and vehicles that are deployed to perform collaborative monitoring tasks over a given area. Traditional approach for ocean bottom monitoring is to deploy underwater sensors that record data and then recover the instruments .By this method real time monitoring is not possible, failures occur .This can be overcome by connecting underwater instruments by means of wireless links. Combination of acoustic and optical

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channel model must be developed so as to improve the performance. Additionally,pollution control, climate recording, ocean monitoring(for prediction of natural disturbances)and detection of objects on the ocean floor are the other areas that could benefit from enhanced underwater communications. UW is a rapidly growing area of research, Compared to acoustics, optics can provide orders of magnitude more bandwidth (megabits per second to gigabits per second) for high speed data transfer over short ranges. Optical wireless communication is possible in water, especially in the blue/green light wavelengths because it suffers less attenuation in water compared to other colors.

To propose a communication scheme called E2R2 (AARP-Aided Routing Method Integrated Path Planning). In AA-RP, AARP collects data from sensor nodes following a dynamic path, which is planned by itself at the same time. When sensor nodes send data to next hop, apart of them send data packet directly, which can reduce the energy consumption. Relying on the dynamic path of AARPs, the network topology can be rebuild and these sensor nodes, which is near to sink nodes, can overcome the energy hole problem. While in critical flooding issues it sensed from the moored sensor for predicting the threshold level and will give alert. The advantages of the proposed systems are critical situation is flooding is predicted. Routing process didn't need location.

4. RESULTS AND DISCUSSION

Accurate sensor localization is a crucial requirement for the deployment of underwater acoustic sensor networks (UASNs) in a large variety of applications. However, the asynchronous clock, stratification effect and mobility characteristics of underwater environment make it challenging to realize accurate node localization for UASNs. This paper develops an autonomous underwater vehicle (AUV) aided localization solution for UASNs, subjected to asynchronous clock, stratification effect and mobility constraints in cyber channels. A hybrid architecture including surface buoys, AUVs, active and passive sensor nodes, is first presented to construct a cooperative location- aware network

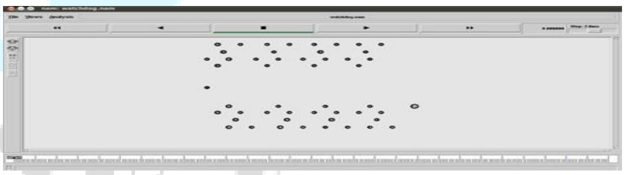

Fig 2 : Nodes Created

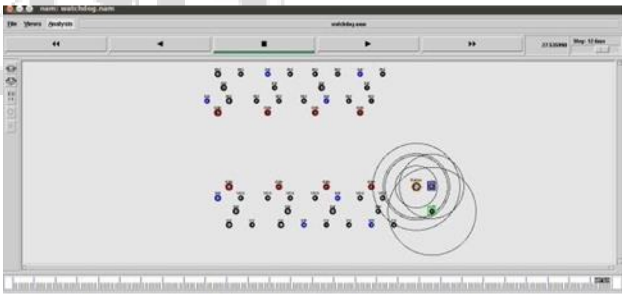

Fig 3: Nodes reach the base station

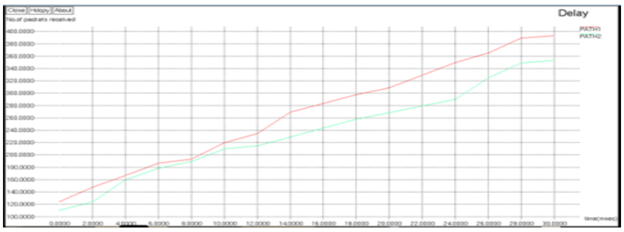

Fig 4: Delay in transmission graph

The simulation of the wireless sensor network (WSN) is depicted in a clustered environment and the nodes are addressed hierarchically and are placed in a flat topography. Being a flat topography, the coordinates of the nodes are in the form (x,y,0) boundaries and if a node lies within these boundaries then it is enlisted in that respective cluster. Graphical clusters are differentiated by their respective colors.

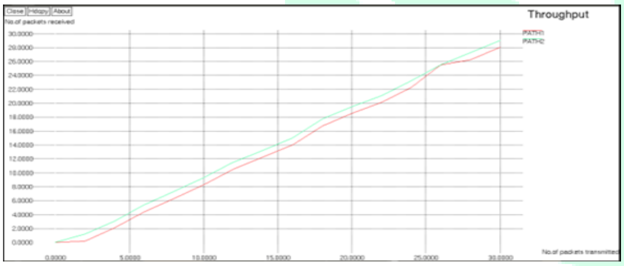

Fig 5 : Throughput Graph

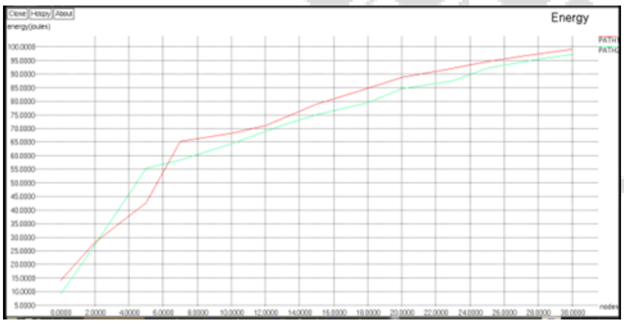

Fig 6: Energy Consumption

Figure 6 represents the variation in the time of survival nodes in the network.The results show that our proposed E2R2 performs better than AARP which saves enegy consumption and extends the lifetime of the network.

5. CONCLUSION

We proposed an AARP-aided localization system that enables localization ofsensor nodes in a UWSN. The method exploits the mobility of the AARP to overcome the lack of GPS and to communicate with sensor nodes in disconnected parts of the network. We observed atrade-off between the time to finish the localization process and the number of successfully localized nodes. We showed that the ratio of the localized nodesim proves as the duration of the localization process increases.This is mainly due to slower AARP movement yielding more successful message delivery.

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