

A Brief Survey of Acoustic Wireless Sensor Network

Mansoor Ullah, Abbas Khan, Muhammad Adil

Department of Computer Science, Abdul Wali Khan University Mardan, Pakistan

ABSTRACT

In our earth 75% covered by water that could be rivers and ocean also. The underwater sensor network are enabling technology and become more and more popular for monitoring Large scale of Area in oceans. Underwater sensor Networks consist of a variable number of sensors that are deployed to perform Such as monitoring tasks over a given area in Which The UWSNs applications like pollution monitoring, disaster prevention, Submarine detection etc. In this paper, we discuss the internal architecture of underwater sensor. Here we Discuss architectures for two-dimensional and three-dimensional underwater sensor network, we also discussed the application and main problem or issue in underwater sensor network.

Keywords : Wireless Sensor Network, Acoustic, Underwater.

I. INTRODUCTION

As we Know earth Mostly covered by water. Which Is The Most concern area and recently humans are showing interest towards exploring it. Water is Hard to investigate and find How's the environment. in water we used the Acoustic Sensors Which use the mechanical waves. The UWSN consist of a variable number of sensors that are deployed to perform the monitoring tasks over a given Region. As in recent times Many disasters Happened in the past Due To which humans are need to greatly monitor the oceanic environments for Different needs i.e scientific, environmental, military, tsunamis, etc., in order to perform these monitoring task We need to deploy sensor nodes under water.

The UWSN Mostly operates on RF communication. Yet, RF communication is not an Best possible communication channel for underwater applications because of great degree of restricted RF wave's propagation underwater. The Water has great resistance propagation Power So It need HIGH Performance antennas, bandwidth for RF. Thus, links in underwater networks are based on *acoustic wireless communications* [1] Acoustic communications are the common physical layer technology in underwater networks. The acoustic communication is more

reliable and Fault tolerant and bandwidth is limited. underwater acoustic rates are between 5kb/s and 20kb/s, which is extremely slow compared to over air RF rate(in Gb/s)[1].

II. METHODS AND MATERIAL

A. Internal architecture of underwater sensor

The internal architecture of underwater sensor is shown in figure 1. In internal architecture the CPU-on board controller, sensor interface HW, acoustic modem, memory, power supply and sensor are the principle parts in an underwater or acoustic wireless sensor network. These parts are mostly found in each such application of an acoustic wireless sensor network and constitute the main body.

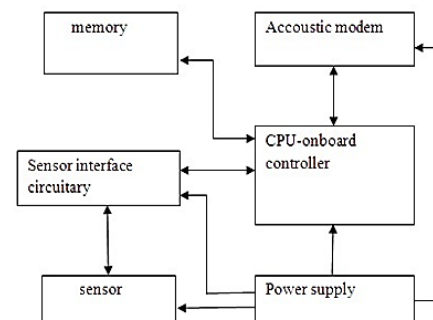


Figure 1. Internal architecture of underwater sensor

It consists of the main controller that is interfaced with sensor through a sensor interface circuitry. The CPU or controller get the information from the sensor and put it in the memory, process it and send to another sensor through the acoustic modem. Sometimes all the sensor component are protected by the Bottom-mounted instrument frames that are design to permit azimuthally omnidirectional communications, and protect the sensor and modem from potential impact of trawling gear[1].

In this paper, we discussed the literature survey of underwater sensor network.

B. Literature Survey

The terrestrial sensor network and underwater sensor network are different in many Perspectives. The difference between terrestrial sensor network and underwater sensor network is as follows:

- **Signal:** In the terrestrial sensor network there are radio signal used. But in underwater sensor network there are acoustic signal will be used.
- **Power:** In underwater sensor network High Energy power required is more compare to terrestrial sensor network because the signal will travelling in water medium which have lots of resistance to cover in that complex environment and high distance among sensors.
- **Memory:** In terrestrial sensor memory is limited but underwater sensor may need to do some data caching so, which require more memory.
- **Cost:** Underwater sensors are more costly On the other hand terrestrial sensors are not more costly.

The most important thing is use of some special routing protocol, which can work efficiently. In this research point of view UWSN use some special routing protocol, which is very efficient.

Flooding based routing protocols: In the flooding based routing protocols the node start sending too many packets to all other node within transmission range. There are many protocol in flooding based family like HH-VBF(hop-by-hop vector based forwarding protocol),DBR(depth based routing protocol),FBR(focus beam routing protocol),HH-DAB(hop-by hop dynamic address based routing Protocol).

Multipath based routing protocols: In multipath based there are more than one path are More paths available to transmit their packets. In multipath based routing include MPT etc.

Cluster based routing protocol: In this types of scheme there are group of nodes .In which one is cluster head node and cluster member node. These Protocols are also use Data Fusion For Removing redundancy. Cluster based include MCCP (minimum cost clustering protocol), DUCS (distributed underwater clustering scheme) PASCCC [2-24], etc.

C. Applications of Underwater Sensor Network

- Fastest way for finding underwater information:** Underwater sensor is Now the most recent and speediest method for discovering data in light of its need and significance in a few circumstances i.e catastrophes, marines and so on which is useful for both the people additionally for scientists [1].
- Disaster Prevention :** The Most important is disaster prevention characteristics of UWSN system able to perform seismic activity which produce tsunami warnings [1].
- Ocean Sampling Networks:** it brings refined new automated vehicles i.e robots with advanced ocean sea models to enhance our capacity to watch and predict the ocean future conditions. We can organized the sensor in various depth in ocean.so we can sense the sea region at various depths [1]
- Environmental Monitoring :** Environment Monitoring is a standout amongst the most essential use of UWSN. They sense the characteristics and properties of any object which include pollution monitoring, Water quality and habitant monitoring also.
- Mine Reconnaissance :** The simultaneous operation of multiple AUVs (Autonomous underwater vehicle) a robot with acoustic sensor can be used to perform rapid environmental and detect mine like object [1].

D. Underwater WSN Architecture

UWSN have diverse characterization i.e. One order separates between static, semi-Mobile, and Mobile. Another Type of UWSN strategy is to Divide UWSNs into One-dimensional two-dimensional (spread sea depths) and three-dimensional (includes depth as a

measurement). UWSN can likewise be single-jump, multi-hop, or Both i.e Mixed (single-jump individual sensors, multi-hop clusters). Structures can be assembled into short-term, time-critical applications, and long haul, non-time-critical applications. RF, optical, and acoustic wave based models are another approach to look at the accessible UWSNs [1].

Fig. 2 demonstrates the most widely recognized UWSN design. Each and every Device is moored at the sea depths. They are small in size, battery worked, and acoustic modems for transmission. . So having acoustic modems, The Cluster heads utilize two acoustic handsets, i.e vertical and an even Trancievers. The group head or uw-sink to speak with the sensor nodes [1] utilizes the flat (horizontol) tranciever:

- i. Send Queries and setup information to the sensors. This correspondence will happening between underwater sink and Cluster head to sensors.
- ii. Collect checked information, which monitored. This correspondence will happening between sensors to group head or sink. The information exchange from Node to group head can be single-Jump (every Node imparted to the Cluster head specifically) or multi-jump. The vertical Transceiver is utilized by the uw-sinks to transfer information to a surface station. Vertical antenna must be long range antenna for profound water applications as the sea can be as deep as 10 km. The surface station is furnished with an acoustic Transceiver that can deal with numerous parallel interchanges with the conveyed uw-sinks. At long last base or surface station will send the detected information to on-shore base station through RF signal [1].

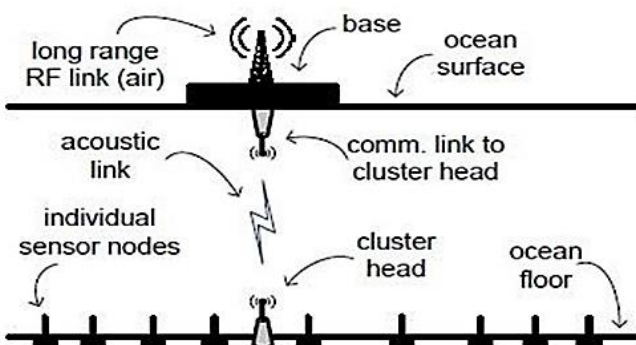


Figure 2. 2D architecture of underwater sensor network

Not at all like TWSNs, direct communication with sea surface separate the cluster head from others. There it

increases the overall network lifetime and which became energy efficient as well. Also, the group head is possibly the most security-helpless part in UWSNs military applications, since it is an only point of failure node.

3D UWSN Architecture. Three dimensional underwater systems are utilized to use to detect and observe phenomena that cannot be easily observed by means of sea base sensor Device, i.e, to perform agreeable inspecting of 3D sea environment.

In 3D Architecture ,sensors In this type of Network, the sensors are sent in the form of clusters, and are anchored at various depths because of which correspondence is far superior than 2D. The depth of sensor can be managed by changing the length of wire that interface the sensor to the anchor, by means of an electronically controlled engine that live on sensor. [1] 3D Architecture all nodes can be straightforwardly convey to the surface group heads sent packets to the base. In the previous case, all nodes are of the same type, yet correspondence may be more vitality Energy serious than that of the cluster head approach. The grouped methodology is to single point of failure. Military applications are to a great degree of sensitive due to single point failure.

E. Problem in Underwater Sensor Network

- *More costly devices:* Underwater sensor devices are more costly.
- *Hardware Protection requirement:* The uAs the devices are expensive so its require to protect against water damage
- *Need High Energy for communication:* In underwater sensor communication require more power because the data transfer will done in water medium. It is hard to propagate the signals easily which needs lots of energy and bandwidth [25-36].
- *Propagation delay:* The propagation delay is major problem in UWSN Because of water resistance
- *Limited battery power:* UWSNs suffer from a sensor's fouling and corrosion. Electronics component the battery, tend to degrade faster under extremely low temperatures such as the one found in deep underwater.

- *Bandwidth size limitation:* In the underwater sensor network bandwidth is another big problem. Because bandwidth size is limited.

III. CONCLUSION

In this paper, we presented the underwater sensor system. We Show the primary applications, the importance of underwater sensor networks in recent times, the design of UWSN sensor system, routing protocols and principle challenges issues UWSN system. We plan to continue our UWSN study. Also we expect the time on to make efficient routing in underwater sensor network.

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