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ENERGY ISSUES IN UNDERWATER WIRELESS SENSOR NETWORK: A SURVEY REPORT

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ABSTRACT

Energy efficient announcement is a significant requirement of energy-constrained in underwater wireless sensor networks. Acoustic communication dominates energy usage in underwater sensor network. Gaining of energy for sensor is the major challenge in underwater sensor network. Energy harvesting, renovating ambient energy towards electrical energy, which is alternative source for sensor, which are deployed in the ocean at numerous levels or at solitary level. The nodes in the structure are associated acoustically for transmission communication using as acoustic modem we industrialized. For complex point to point communication speed the nodes are interacted optically using convention built optically modem. In this paper we are analyzing the different ways of deployment of sensor network in underwater one is hop to hop communication and second technique is clustering.

Keywords – Underwater Wireless Sensor Network (UWSN), Energy Efficiency, Energy Regain, ADCs.

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Introduction

As we all discerns that computer science had magnificently deployed the sensor network on earth and on human body but still the underwater is unscathed area. In recent years, the study on underwater sensor network entices the researcher towards itself. Underwater wireless Sensor Network (UWSN), are emergent communication framework which has a wide range of potential application such as scientific ocean sampling, oceanographic data collection. Underwater sensor network can gently improve by employ cooperative diversity. An underwater sensor network aspect energy challenge indemnifying continual performance and the key trench on energy is communication [1].As the lifespan of any single sensor in the UWSN is limited; the numeral of sensor nodes that stop functioning due to the power loss increases with an extended disposition time, therefore the coverage zone of WSN will shrivel. It is obvious that the problem of limited battery assets is principally important and it is an encounter for researcher to obtain long functional time without surrendering system recital. Therefore new, energy efficient technique must be developed for all of the UWSN nodes functioning [2]. Now in this paper I will articulate that meticulous deployment of sensor in cooperative diversity which can diminish the energy constraint in the UWSN.

Literature Survey

Deployment Of Network

The deployment of nodes is a crucial factor in regulate the consumption of energy. The objective of the energy efficient topology pattern is to increase the network life by reduction of overall energy consumed by all the nodes. The architecture classifies two types: 1) Static UWSN means the sensors which are anchored. 2) Mobile UWSN means sensor with autonomous [3].

B. Static UWSN

The characteristics of static UWSN is the sensor would static after the deployment, means negligible movement and the architecture of network will be in 2Dimension.

2-Dimenisonal Architecture

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In the case of 2D there should be three topology which can be grid, cluster or line relay deployment;fig. 1shows that the sensors are arranged as cluster-based scheme in UWSN. Each Sensor is connected with another sensor within its range and out of these there is a cluster-head or Gateway. The sensors are using wireless acoustic links. The cluster-head relay the data form ocean bottom to surface of sea [4].

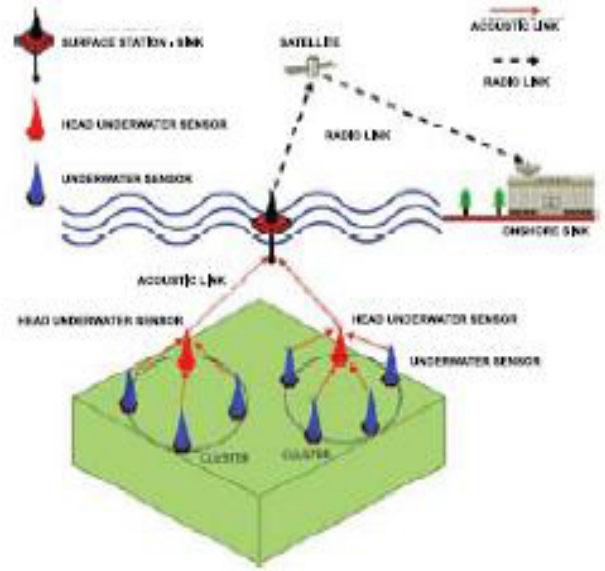

Fig. 1 2D Architecture of UWSN

To upturn energy proficiency and robustness a 2D multilayer topology anticipated by H.X.Tan and W.K.G. Seah [5]. This topology comprise various sensor nodes in practice of clusters and each cluster has its own one local aggregation point andthese aggregation points we will call virtual sink. Sensor will transmit their data to the local sink through virtual sink within their cluster. By the above approach, clustering is one of the best techniques that can be used for energy efficient and reliable network in UWSN.

Another approach to establish a network in UWSN is the traditional approach, **HOP TO HOP** shown in fig. 2. In this the sensor nodes will communicate. Through the neighbour nodes inside the range. Long range communication will takes place in the way; each sensor node will broadcast the signal to its nearby neighboring nodes within its range. There are three types of nodes: source node, intermediate node and destination node. Source node is that node which wants to send the data, intermediate node is the corresponding nodes which took the data from

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the source node and transfer the data to the destination node. In this network there are multiple intermediate nodes.

The major issue with this network is that if any intermediate node will dead than the whole data will lost and it can't be recover. So this approach is not reliable.

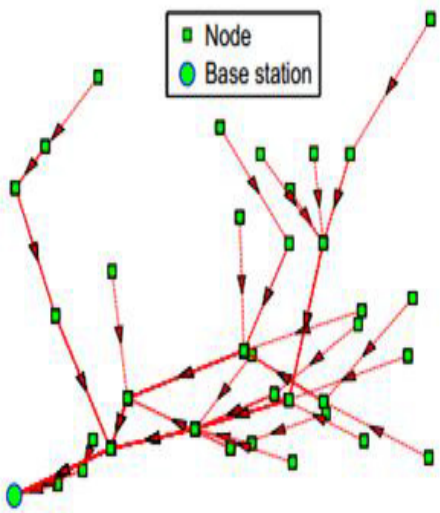

Fig.2Hop to Hop Communication Architecture

C. Mobile UWSN

Mobile UWSN is self-organized network. Underwater wireless sensor network nodes may be redistributed or moved by aqueous processes of dispersion or advection. After transportation by dispersion the sensor should reorganize as a network for the communication [6] as shown in fig. 3.

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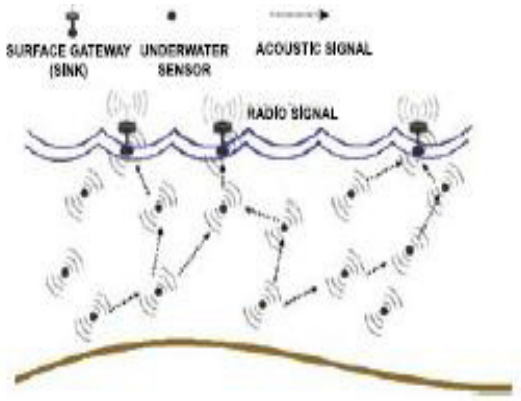

Fig. 3 Mobile Architecture of UWSN

In [7], author introduces two following classification in mobile underwater sensor networks:

A) Mobile UWSN for the long term but not the time critical aquatic monitoring: This include networks of local underwater sensors which collect the data and then relay them to intermediate underwater sensors; then these nodes forward the packets to the surface nodes, which transmit data, like radio on-shore command room. Typical applications are oceanography, deep-sea archaeology, marine biology and oil-gas field monitoring and seismic prediction [6]

B) Mobile UWSN for short term but for the time critical aquatic exploration: This includes the networks of underwater sensors that collect the data and after that forward them to surface control station via multi-hop acoustic routes. Typical applications may be anti-submarine military mission, discover the underwater natural resources, hurricane disaster recovery or loss treasure discovery.

ARCHITECTURE OF SENSOR NODE

A sensor node consists of typically four basic components: a sensing unit, a processing unit, a communication unit and a power unit as shown in fig**.**4.The sensor unit consists of one or more sensors and analog to digital convertors (ADCs). The sensor observes the physical phenomenon. The ADCs convert the analog signal into digital signals, which will then send to the processing unit. The processing unit usually consist a microcontroller or microprocessor with memory, which provides the intelligent control to node. The communication unit consists of the short range radio for data transmission and also the reception over the radio channel. The power

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unit consists of battery to supply the power to drive all the components in the system. In addition, the sensor node equipped with some other units also, which will depending upon a specific applications. For example GPS tracker will require in some applications. These units should build into the small module with the low power consumption and also the low production cost [8].

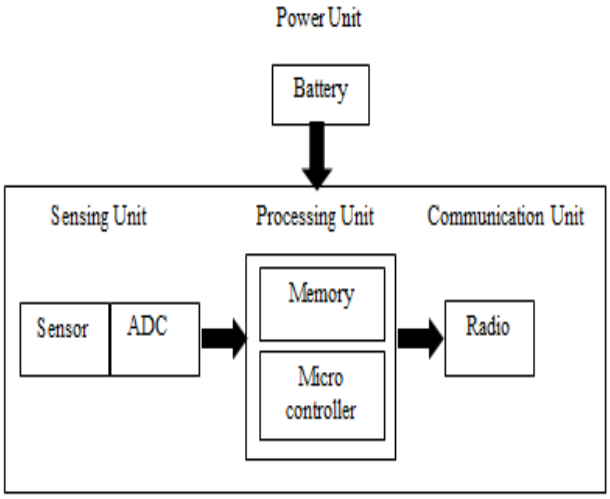

Fig. 4 Sensor Node Architecture

Sensor Node Used In UWSN

AquaNodes is a stretchy underwater sensing and communiqué system to proposal. The enlargement of the hardware, electronics, communications arrangements, and software for the AquaNode underwater sensor network organization is designatedbeforehand. Shown in fig. 5 is a winch-based segment that permitsevery sensor knob to energeticallyfine-tune its depth. Whereas as revealed in fig. 6 the AquaNode is a cylindrically molded sensor with a span of 8.9cm and a dimension of 25.4cm without the depth adjustment mechanism and 30.5 cm with depth adjustment. With the depth adjustment schemeinvolved, it deliberates 1.8kg and is 200g buoyant.y of the existing designations.

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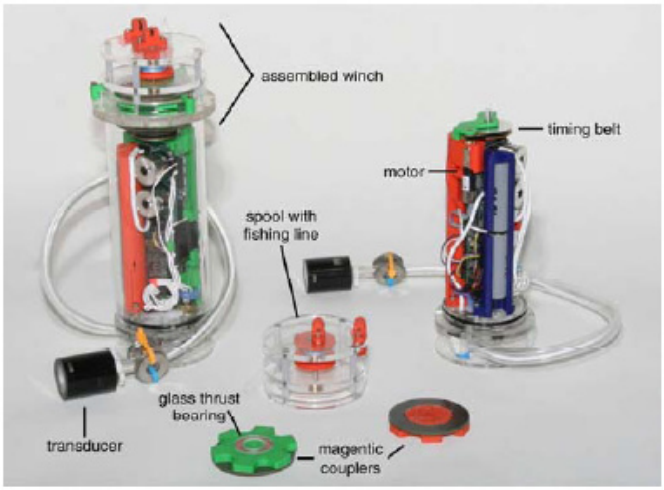

Fig. 5 Depth Adjustment system on AQUANODE [9]

Central to the AquaNode scheme is a 60MHz ARM7 processor. The structure has compression (for depth) and temperature sensors as well as the knack to associate other sensors. The AquaNode has an on-board 60WHr Li-Ion battery. This is adequate for two days of steady acoustic communiqué, two weeks of unremittingdetecting, or up to a year of stand-in time. The anticipateddisposition time can be succeeded by erratic the degrees of sensing andcommuniqué

Fig. 6 Depth Adjustment Mechanism Details.

The first component of the structure is a motor-powered that initiatives the winch. The motor-powered is a 1.3W output power 1224-12V Faulhaber by way of a spur

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gear head having a 20.6:1 reduction. The motor-powered and gearbox assemblage is 51.6mm long and 12mm wide. The gearbox output is associated to a timing belt drive that auxiliary reduces the output by 6:1, provided theentire reduction of 123.6:1. The timing belt drive connects to a custom designed magnetic coupler. The magnetic coupler transmits drive power from the inside of the housing to the outside without needing to penetrate the housing with a shaft. This has a number of advantages. First, there is no chance of leaking. Second, this allows the external components of the winch to be easily removed. Finally, the magnetic coupler is compliant to misalignments of the two sides of the coupler.

The internal and external magnetic couplers are identical and consist of four parts. A holder is been designed that contains places for six magnets. The magnets are oriented in the holder with poles alternating so that the magnetic field forms a closed loop when connected to the other coupler. In order to concentrate the magnetic field, a steel ring sits on top of the magnets. On the bottom of the holder a custom built glass thrust bearing is placed. This gives the couplers very low friction, ensuring efficiency.

The external magnetic coupler is submersed in salt water so resistance to corrosion is important. Both of the couplers use corrosion-resistant nickel plated neodymium magnets. The external magnetic coupler attaches directly to the spool on which the anchor line is wound via an aluminum shaft. Bronze bushings support the shaft in order to allow it to spin with the low-friction. Since the anchor line winds perpendicular to the shaft, three delrin pulley wheels guide and redirect the anchor line. These provide a low-friction method for properly aligning the anchor line on the spool. 30lb test fishing line as the anchor line on the spool is used. The spool holds over 50 meters of line [10].

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ENERGY RESOURCE FOR AQUANODE

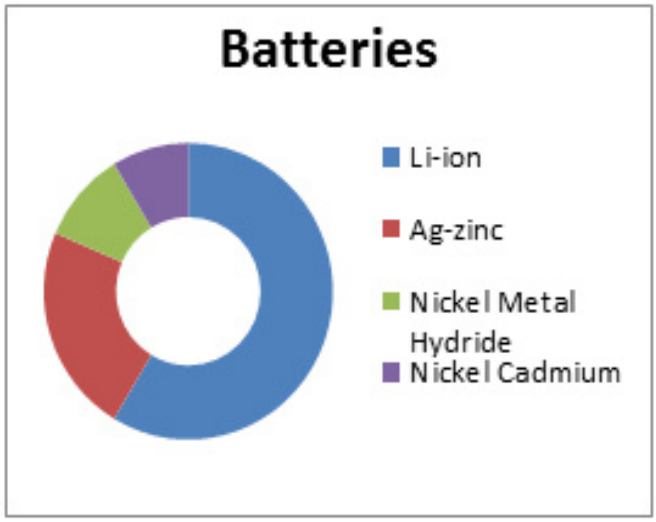

Fig. 7 Comparison of Batteries

To increase the network lifetime, energy should be saved in the every hardware. Software solution composes the network architecture. One way to solve the energy problem for UWSN sensor to generate the energy by itself and it can be solved by the mechanical method like conversion of tidal energy or solar energy into electrical energy.

Presently Li-ion batteries are mostly used. Li-ion batteries power is 300mwh/cm3 (3 – 4 V) whereas Zinc-Air battery is just give 1.4V and there are some other batteries which are shown in fig. 7 [3].

CONCLUSION

In this paper we conclude about the network hierarchy of AQUANODE in UWSN. We deliberated two sorts of network disposition schemes; one is cluster based and second is the hop to hop communication. So we achieve that in clustering based scheme, network life proliferations rather than hop to hop communication due to inadequate energy resource.

Second thing we discuss about the sensor node (AQUANODE) which is used in UWSN.Third thing we also compare the various battery technology which provide us the power, after compare we find Li-Ion battery is much reliable.

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