International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

Introduction to Wireless Sensor Network

Smridhi

Abstract: ***Currently underwater sensing community has attracted attention of the various researchers. Here most important task is positioning of sensing node. The gathered information might not be beneficial if sensing nodes aren't localized. The region unit uses numerous techniques for localization of sensing networks however the vicinity unit is completely specific just in case of terrestrial sensing community and underwater sensing network. This paper explores some of the localization schemes of underwater sensing community and their contrast is created so they'll be used on basis of their utility.***

Keywords: Underwater Sensor network, Localization, Architecture, range-based scheme, range-free scheme, architecture

1. Introduction

About 71 % of the Earth's surface is covered with water and additionally the ocean holds about 96.5% of all Earth's water. These oceans region gives an upscale to supply water to plants and fauna and many others. Over the time this area has attracted the attention of the various researchers. The sea environment is highly unconventional and quite unstable as major part of it is submerged under water and this space is typically out of vary for human beings. So human beings use another alternative to reach such areas and sensing network comes of pleasant use here. The low price, low electricity human operated devices can be deployed over a bodily area, which supply dense sensing. The devices have strong processing capability when combined together although not individually therefore wireless sensor network is built of ten to thousands of interconnected sensors that may be deployed randomly or deterministically deployed in field of interest to collect data about environment. This wireless sensing network related to seas are accurately referred to as Underwater wireless sensing networks (UWSN).

In the past three years there have been a lot of interest developed among researchers in underwater acoustic communications because of its features like simple easy deployment, easy-control, self-management and many more. There are many applications of underwater sensing network in several fields for instance in marine evaluation, earth technology, marine commercial operations, the offshore oil business, protection, armed provider police paintings, earthquake and transferring ridge caution, climate and ocean remark, and pollutants trailing and so on. For a proper exchange of information there is strong like for knowing the location of every and each node. For this reason, various localization algorithmic rules are projected.

Underwater sensing is very different than terrestrial sensing as UWSN has many diverse specifications like restrained data degree functionality, excessive propagation delay, excessive errors rate and temporary losses of assets resulting from multipath and attenuation phenomena, restricted switch pace as acoustic signals region unit used in place of radio frequency alerts. These factors must be considered when we defining the communication protocol.

Challenges of underwater wireless sensor network

The principal challenges faced with underwater sensing network are:

- Their records degree is limited.
- Underwater course is relatively weak due to multi-course and attenuation excessive bit mistakes rate and loss of property.
- Battery – constraints, generally they need constrained power and can't be charged after some limit.
- Propagation put off in underwater is critically excessive and variable

Underwater sensor network architecture

There are a number of methods in which **Underwater sensor network** is categorized. One category discriminates between static, semi- cell, and cellular architectures, any method is dividing UWSNs into two- dimensional and 3-dimensional, commonly known as single- hop, multi-hop, or hybrid (single-hop individual sensors, multi-hop clusters). Their Architecture may be classified into quick-run, time-vital applications, and lengthy, non- time-vital applications. The general layout is shown in fig one. The network uses sensing nodes, base station, autonomous underwater cars(AUV) and remotely operated automobiles(ROV). Base station area used for restraining ROV. Sensing node to begin with reveal entire readying space to collect records so uses acoustic sign to send records to opportunity nodes. presently radio indicators location unit used for causation the records to person station anyplace it is to be processed.

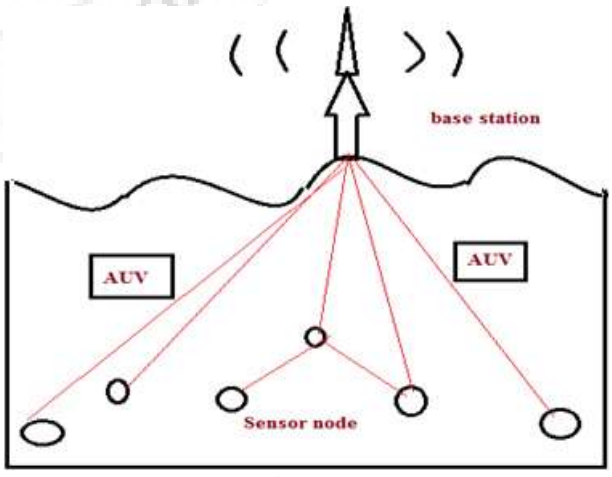

Figure 1

Rest of paper is as follows: in section 2, various localization schemes are discussed. In section 3, comparison of these schemes is done and then section 4 concludes the paper.

2. Localization Schemes in Underwater Sensor Network

Many localization schemes are projected for UWSNs thinking of different factors like constellation, tool abilities, sign propagation models, and power necessities. the position of sensing node is commonly taken into account for several localization schemes. Anchor nodes are the ones whose location is previously known. The localization schemes that uses anchor nodes region unit is categorized in 2 categories: vary primarily based schemes, and range free scheme. range based totally issues region unit those who use vary or bearing statistics and range free scheme location unit those who do not use range or bearing records.

2.1 Range based Schemes

Range based localization schemes utilize range information for role estimation. Time difference of arrival(TDOI), time of arrival(TOA), obtained signal energy indicator(RSSI) may also be used for distance estimation, attitude of arrival(AOA).

An anchor free localization algorithm(AFLA) is projected. Here no anchor nodes vicinity unit are deployed. It is self-localization algorithmic rule which uses adjoining node for estimation of accurate positions. Cables are used here to attach sensing node to fix anchors at the bottom of the sea so they cannot shift away from the moving area.

For huge scale 3D network, a hierarchical localization approach is projected. In this paper complete localization technique is broken up into 2 sub methods: anchor node localization and standard node localization. All present strategies can be applied for anchor node localization, besides for general node localization 3D Euclidian distance incorporated with algorithmic location estimation methodology is implemented.

A cooperative localization technique is also projected. It's anchor-free and powerful approach which uses centralized localization method where sensing node use buoyancy approach to move deeper in ocean. The sensing node journey begin to ocean floor as soon as desired depth is reached. Once these sensing nodes location unit starts moving, their intensity may be calculated with the help of victimization pressure sensors, but their position cannot be calculated as they are continuously revolving.

A node discovery and localization protocol (NDLP) is also projected. It is anchor-free localization technique. This system starts its node discovery section by a node that is alert to its self-position and selects alternative nodes again and again. Huge no of unknown nodes may be localized with the technique of selecting nodes unendingly. This technique consumes additional electricity as each node participates in message sharing.

In Dive and rise (DNR) technique, beacons area unit used for upward thrust learn their role victimization GPS once they on top surface and dive into ocean as much as desired depth and rise all over again. Sensing nodes ship and obtain DNR messages that uses unit time sealed and use TOA technique for conniving distance to DNR beacons. this technique includes a high electricity potency.

Underwater sensing positioning (USP) technique is also explained. It is a allotted bi lateration challenge based localization. Here 3-D localization downside is reborn to 2nd downside by means of utilizing intensity information of nodes via projection method as shown in fig. 1. This method has low garage and computation requirements.

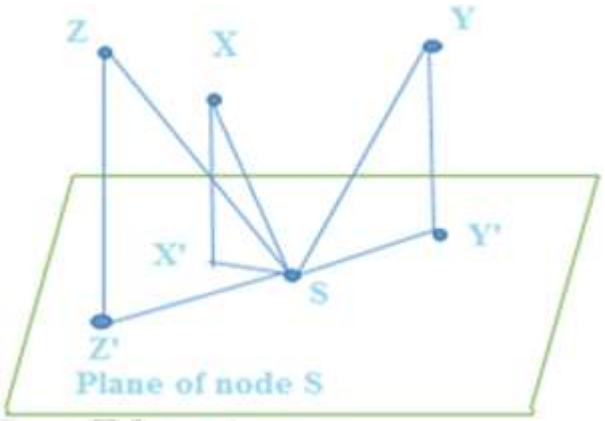

Figure 1: Projection of reference nodes X, Y and Z to the plane of node S as X', Y' and Z'

2.2 Range –free Scheme

Range Free schemes do not use any vary or bearing records. they do not use any of the strategies like TOA, TDOA, AOA. they're straightforward strategies which give giant localization estimate for underwater nodes. Common localization technique is also projected. Here the information of adjoining node connected to anchor node position is used. The anchor node sends signals at specified periods. These signals include placing data. Once the receiver receives these signals it estimates it closeness with anchor nodes. This region is then used for calculating Centre of mass of anchor nodes. Huge number of anchor nodes are needed for this system to be in use.

Area localization subject is presented. the placement of unknown node is calculable. This subject matter doesn't want any synchronization. Anchor node send signal with different power stages. The unknown nodes must pay attention to these alerts and save the desired information like nodes identity and so on. This abruptly region unit transfers to vital node that calculates the location anywhere these nodes are positioned.

Underwater localization supported directional beacons (UDB) is put forwarded in this paper. AUV with an antenna moves continuously and sends signals at various angles.

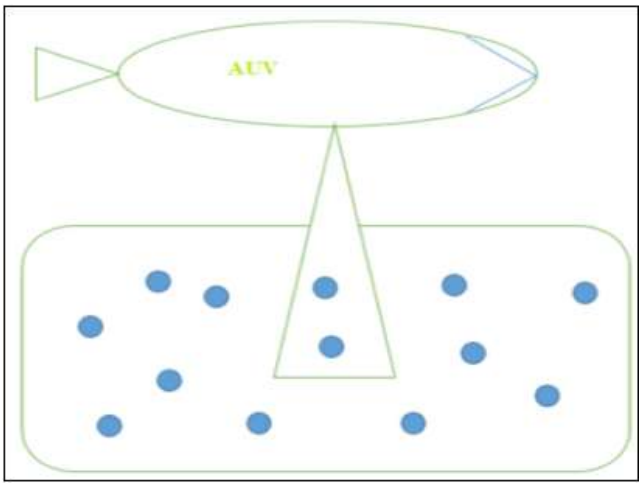

Figure 2: AUV sending Directional beacons

Sensing nodes receives these signals and localize themselves. This is energy cost effective approach as nodes solely obtain transferring beacons. this is however not usually applicable on giant scale UWSNs.

Localization with directional beacons (LDB) is proposed. It is extended 3d network of UDB scheme. AUV send beacons at specified intervals. Nearby nodes will share first-heard beacon point and also the last-heard beacon point. Nodes are deployed at different depth to extend it to 3d network. It is silent positioning and energy efficient scheme.

Table 1: Comparison of localization schemes

Scheme	Range Based/Range Free	Range measurement using	Time Synchronization required	Node Mobility considered
AFLA	Range based	TOA	yes	Yes
HLS	Range based	TDOA	yes	no
CLS	Range based	TOA	Yes	Yes
NDLP	Range based	Not specified	Not specified	No
DNR	Range based	TOA	Yes	Yes
USP	Range based	TOA	yes	No
Centroid	Range free	n/a	No	No
ALS	Range free	n/a	No	No
UDB	Range free	n/a	No	No
LDB	Range free	n/a	No	no

3. Comparison of localization Schemes

Comparison of numerous schemes referred in this paper is completed in table one. The schemes are compared on basis of their time synchronization, node quality, range measurement and various other parameters. If TOA is used, then nodes synchronization is very essential. Receiving consumes much less power than transmission. with a purpose to make bigger insurance unvaried localization is beneficial. Localization scheme and process need to be selected according to the need and requirement of the application.

4. Conclusion

Localization of nodes is very important but a highly challenging project. Localization finds its importance in several applications. This paper conferred a survey of varied localization schemes utilized in underwater seas, oceans and so on. Few localization schemes of primarily based and range free region unit are mentioned. Then these schemes are compared. Vary free schemes supply a much less correct estimate in comparison to differ based totally schemes. Localization scheme must be chosen according to requirement of application like range free schemes are more useful in areas where sensor nodes may not be able to send signals for range estimation. Whereas range based schemes are generally preferred in areas where various factors like TOA, TDOA etc. can be taken in account.

References

[1] I. F. Akyildiz, D. Pompili, and T. Melodia, "Underwater acoustic sensor networks: research challenges," *Ad Hoc Netw.*, vol. 3, no. 3, pp. 257–279, May 2005.
[2] E. M. Sozer, M. Stojanovic, and J. G. Proakis, "Underwater acoustic networks," *IEEE J. Ocean. Eng.*, vol. 25, no. 1, pp. 72–83, Jan. 2000.
[3] J. G. Proakis, E. M. Sozer, J. A. Rice, and M. Stojanovic, "Shallow water acoustic networks," *IEEE Commun. Mag.*, vol. 39, no. 11, pp. 114–119, Nov. 2001.
[4] M. Stojanovic, "Acoustic (Underwater) Communications," in *Wiley Encyclopedia of Telecommunications*, John Wiley & Sons, Inc., 2003.
[5] W. K. G. Seah and H. X. Tan, "Multipath Virtual Sink Architecture for Underwater Sensor Networks," in *OCEANS 2006 - Asia Pacific*, 2006, pp. 1–6.
[6] Y. Guo and Y. Liu, "Localization for anchor-free underwater sensor networks," *Comput. Electr. Eng.*, vol. 39, no. 6, pp. 1812–1821, Aug. 2013.
[7] Z. Zhou, J.-H. Cui, and S. Zhou, "Efficient localization for large-scale underwater sensor networks," *Ad Hoc Netw.*, vol. 8, no. 3, pp. 267–279, May 2010.
[8] D. Mirza and C. Schurgers, "Collaborative Localization for Fleets of Underwater Drifters," in *OCEANS 2007*, 2007, pp. 1–6.
[9] A. K. Othman, A. E. Adams, and C. C. Tsimenidis, "Node Discovery Protocol and Localization for Distributed Underwater Acoustic Networks," in *Advanced Int'l Conference on Telecommunications and Int'l Conference on Internet and Web Applications and Services (AICT-ICIW'06)*, 2006, pp. 93–93.
[10] A. K. Othman, "GPS-less localization protocol for underwater acoustic networks," in *2008 5th IFIP International Conference on Wireless and Optical Communications Networks (WOCN '08)*, 2008, pp. 1–6.
[11] M. Erol, L. F. M. Vieira, and M. Gerla, "Localization with Dive'N'Rise (DNR) Beacons for Underwater Acoustic Sensor Networks," in *Proceedings of the Second Workshop on Underwater Networks*, New York, NY, USA, 2007, pp. 97–100.
[12] A. Y. Teymorian, W. Cheng, L. Ma, X. Cheng, X. Lu, and Z. Lu, "3D Underwater Sensor Network Localization," *IEEE Trans. Mob. Comput.*, vol. 8, no. 12, pp. 1610–1621, Dec. 2009.
[13] W. Cheng, A. Thaeler, X. Cheng, F. Liu, X. Lu, and Z. Lu, "Time-Synchronization Free Localization in Large Scale Underwater Acoustic Sensor Networks," in *29th IEEE International Conference on Distributed*

Computing Systems Workshops, 2009. ICDCS Workshops '09, 2009, pp. 80–87.
[14] M. Sugeno, "An introductory survey of fuzzy control," *Inf. Sci.*, vol. 36, no. 1, pp. 59–83, Jul. 1985.
[15] V. Chandrasekhar and W. Seah, "An Area Localization Scheme for Underwater Sensor Networks," in *OCEANS 2006 - Asia Pacific*, 2006, pp. 1–8.
[16] H. Luo, Y. Zhao, Z. Guo, S. Liu, P. Chen, and L. M. Ni, "UDB: Using Directional Beacons for Localization in Underwater Sensor Networks," in *14th IEEE International Conference on Parallel and Distributed Systems, 2008. ICPADS '08*, 2008, pp. 551–558.
[17] H. Luo, Z. Guo, W. Dong, F. Hong, and Y. Zhao, "LDB: Localization with Directional Beacons for Sparse 3D Underwater Acoustic Sensor Networks," *J. Netw.*, vol. 5, no. 1, Jan. 2010.
[18] G. Han, J. Jiang, L. Shu, Y. Xu, and F. Wang, "Localization Algorithms of Underwater Wireless Sensor Networks: A Survey," *Sensors*, vol. 12, no. 2, pp. 2026–2061, Feb. 2012.