Journal of Engineering and Applied Sciences 12 (Special Issue 11): 9189-9192, 2017
ISSN: 1816-949X

Sensor Communication Area Evaluation in under Water Sensor Network

D. Suganthy and G. Ranganathan
[1]Department of Information Technology, AMET University, Chennai, India
[2]Department of Information Technology, KCG College of Engineering and Technology, Chennai, India

Abstract: Under water sensor networks are planned to identify underground irregular situation. Many protocols use distance among the sensors as one of the parameter for transmission in the network. Sensor Communication Area (SCA) helps in predicting the position of the sensors and the distance among the sensors in many power optimization protocols. In this resaerch, sensor communication area evaluation in under water sensor network to identifying angles and distances of consecutive sensors hop by hop for the Base Station BS is introduced. Initially, the sensors are applied in under water region that is connected to receiver that is further linked to the BS. It is possible to locate all the nodes through GPS that can be used as a reference in the worst-case scenario by the BS.

Key words: Base station, localization, multi-hop communication, under water sensor, distances, identifying

INTRODUCTION

Wireless Sensor Networks (WSNs) have been used in a lot of areas right from private to manufacturing areas. Industrialized observation and management have found the applications of wireless sensors exceptionally gainful. The London underground explosion, the utilization of WSNs underground has been implemented and is still under present research. There is absolute require to localize and route information through the sensor present in subterranean areas. Therefore, the need to observe underground region has increased significantly. Mainly wireless communication is hardly probable owing to the complexity in the dissemination of wireless signals in underground areas. However, this challenge demands to be overcome by the co-operative procedure of the underground sensors operating together in a network.

Literature review: An in-building RF-based user position and tracking system (Bahl and Padmanabhan, 2000) proposed that each non-anchor node, uninformed of its position, utilized the Received Signal Strength (RSS) measurements and it collects stemming from the anchor nodes within its sensing region and creates its own RSS that is transmitted to the central station. However, it gives comparatively little position assessment errors. Several area-based localization algorithms (Elnahrawy *et al*., 2004) estimated the exact position of the non-anchor node they simply estimate a probable area. Indoor position sensing using active RFID, Ni *et al*. (2003) introduced weighted version of the RSS based localization technique that achieves a more accurate position estimate.

GPS-free positioning system (Capkun *et al*., 2001) explained the GPS disadvantages are expensive cannot used by the indoors, confused by tall buildings or other environmental obstacles. Distributed localization in cluttered underwater network (Hussain and Trigoni, 2010), proposed the use of localizers for enabling better localization accurateness in unlocalized nodes. Localizers help to localize more correctly in single-hop localization that contains distance with large non-line-of-sight) errors. Geo-position by time difference of arrival using hyperbolic asymptotes (Drake and Dogancay, 2004) proposed a solution for localization of distant transmitters based on triangulation of hyperbolic asymptotes.

Distance vector-hop localization technique (Ibrahim *et al*., 2013) introduced hyperbolic curves. It is estimated by linear asymptotes. Sensor keeps the shortest number of hops to each anchor node along with the anchor node position. The utility of Nonparametric Belief Propagation (NBP) (Ihler *et al*., 2005) introduced evaluating sensor locations and corresponding position doubts. NBP benefits are simple and it accepts a large selection of arithmetic methods and can signify multimodal ambiguity. Robust distributed localization measurement errors (Moore *et al*., 2004) approach was explained localization method against errors. Cramer-Rao

Corresponding Author: D. Suganthy, Department of Information Technology, AMET University, Chennai, India

bound (Savvides *et al*., 2005) investigated the error characteristics for a specific scenario in which anchors are located near the boundary of the region and non-anchor nodes are located inside the region. This approach requires to be validated with the evaluators utilized in different localization principle and it reduce the sum of the square of the distinction.

MATERIALS AND METHODS

Sensor communication area evaluation in underground sensor networks: In wireless under water sensor networks, the sensors required to inform their position at frequently to guarantee the transmission among the sensors in the network. Many protocols use distance between the nodes as one of the approach for transmission in the network. There is the required to identify the position of the sensors and the distance among sensors in many power optimization protocols. However, the query of how to obtain the distance or the position arises in the same.

Obviously, this approach is used to determining the position of nodes to catalyze transmission in the underwater sensor networks. Initially, the sensors are applied in the underground areas all of that join to a receiver that is more linked to the BS. It is possible to locate all the nodes via. GPS that is used in a worst-case situation by the BS. It is explained in Fig. 1. The receiver is able of offering the GPS message of every sensor n$\in$V that is randomly deployed that form the graph G (V, E) with V vertices and E Edges. Figure 2 explains that the sensors Q and R belong to the subset P(V_{SCA}, E_{SCA}). According to the proposed approach, the distances d_{PQ} and d_{PR} are obtained from the RSS values of the acknowledgments received from Q and R after the P sends an Add Signal using distance (Eq. 1). The sensor Q and R are received from the GPS values saved by the receiver are used to discover the angles Q builds with the line PR computed as using Eq. 2. Even small info cannot be processed after some decades (Manickasankari *et al*., 2014) is explained in the survey on query processing in mobile database:

$$d = \sqrt{(x-x_1)^2 + (y-y_1)^2} \quad (1)$$

The sensor P and Q are received using the GPS (Eq. 4). This builds an angle ∠OPQ with line PO. Likewise, ∠OPR is build by receiving the slope of the line PR created by the individual sensor P and R. By receiving these values, the involved angle ∠RPQ is received as a difference between the two angles as in Eq. 3. The sensor based water analysis is explained in the design of optical sensor for detection of brininess of water (Lavanya *et al*., 2014).

Figure 3 shows the technique to evaluate the angle from sensor. Angle among two lines P and Q with related co-ordinates x_p, y_p and x_q, y_q can be given by replacing Eq. 2 in 3:

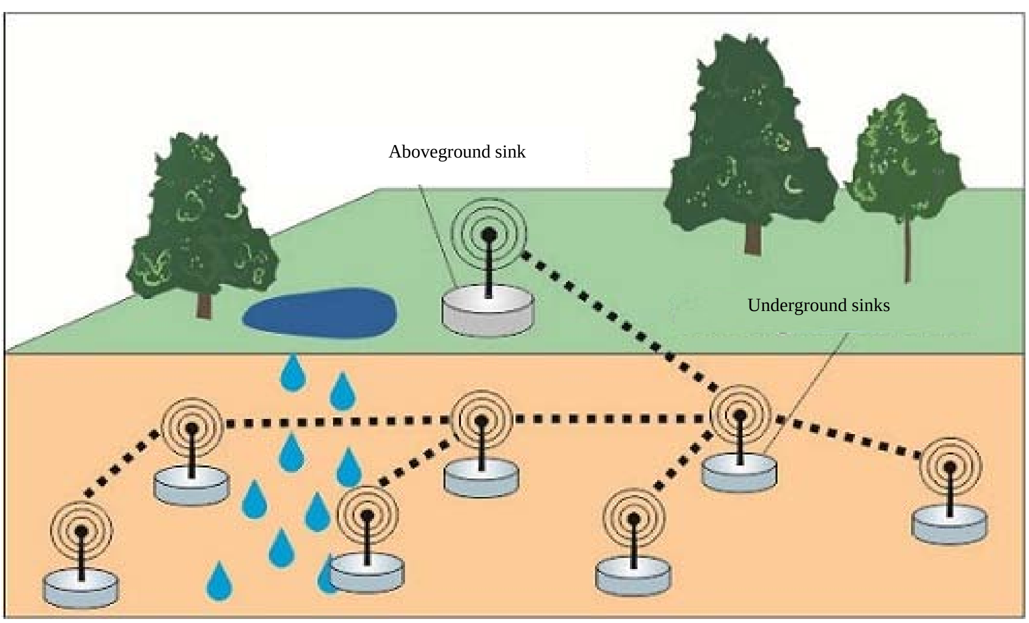

Fig. 1: Example architecture of underwater sensor network

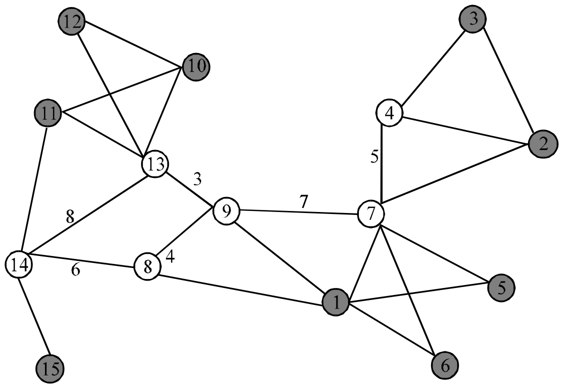

Fig. 2: Triangle formation

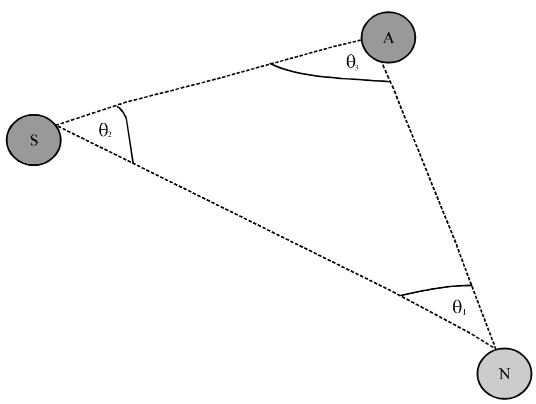

Fig. 3: Evaluating angle from sensor

$$dx = x_p - x_q \quad dy = y_q - y_q \tag{2}$$

$$\theta = \text{Atan}\,2(dy, dx) \times \frac{180}{\pi} \tag{3}$$

$$\angle RPP = \angle OPQ - \angle OPR \tag{4}$$

Being identified the angle ∠RPQ and the distances d_{PQ} and d_{PR} it is possible to attain the third side using the law of cosines that is an expansion of the Pythagoras theorem as in Eq. 5:

$$r^2 = p^2 + q^2 - 2pq\cos\theta \tag{5}$$

$$d_{QR}^{\ 2} = d_{PQ}^{\ 2} + d_{PR}^{\ 2} - 2d_{PQ}d_{PR}\cos\angle RPQ \tag{6}$$

RESULTS AND DISCUSSION

The simulation result is analyzed by analyzing the area of the network in which the node communicates

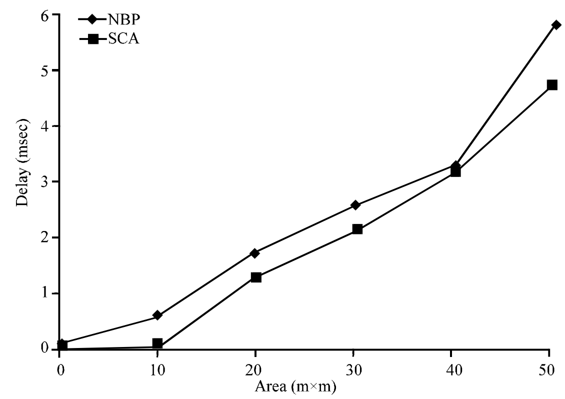

Fig. 4: Delay vs. area

according to their and their communication distance. If the distance increases the delay, also, increases however the proposed scheme SCA has better delay rate compared to the conventional NBP method. Figure 4 shows the packet delivery delay taken by the nodes for transferring the information.

CONCLUSION

It can be observed from proposed method that the sensor position can be achieved by using the angles and the distance technique to achieve accurateness in identifying the sensor transmission. This method can so facilitate in position of a sensor, transmission of sensed data back to the BS with superior throughput by taking minimum time. This technique considers least time in to transaction delay in treating the data.

REFERENCES

Bahl, P. and V.N. Padmanabhan, 2000. RADAR: An in-building RF-based user location and tracking system. Proceedings of the 19th Annual Joint Conference of the IEEE Computer and Communications Societies, March 26-30, 2000, Tel Aviv, Israel, pp: 775-784.

Capkun, S., M. Hamdi and J.P. Hubaux, 2001. GPS-free positioning in mobile ad-hoc networks. Proceedings of the 34th IEEE Hawaii International Conference on System Sciences (HICSS'01), January 6, 2001, IEEE, Maui, Hawaii, ISBN:0-7695-0981-9, pp: 56-62.

Drake, S.R. and K. Dogancay, 2004. Geolocation by time difference of arrival using hyperbolic asymptotes. Proceedings of the 2004 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP'04) Vol. 2, May 17-21, 2004, IEEE, Montreal, Quebec, Canada, ISBN:0-7803-8484-9, pp: ii-361-ii-364.

Elnahrawy, E., X. Li and R.P. Martin, 2004. The limits of localization using signal strength: A comparative study. Proceedings of the 1st Annual Communication Society Conference Sensor and Ad Hoc Communication and Networks, October 4-7, 2004, Santa Clara, California.

Hussain, M. and N. Trigoni, 2010. Distributed localization in cluttered underwater environments. Proceedings of the 5th ACM International Workshop on Under-Water Networks, September 30-October 01, 2010, ACM, Woods Hole, Massachusetts, ISBN: 978-1-4503-0402-3, pp: 1-8.

Ibrahim, W.M., H.S. Hassanein and A.E.M. Taha, 2013. Does multi-hop communication enhance localization accuracy?. Proceedings of the 2013 IEEE Conference on Global Communications (GLOBECOM'13), December 9-13, 2013, IEEE, Atlanta, Georgia, USA., ISBN:978-1-4799-1353-4, pp: 121-126.

Ihler, A.T., J.W. Fisher, R.L. Moses and A.S. Willsky, 2005. Nonparametric belief propagation for self-localization of sensor networks. IEEE. J. Sel. Areas Commun., 23: 809-819.

Lavanya, J., S.K. Roy and P. Sharan, 2014. Design of optical sensor for detection of brininess of water. Proceedings of the Conference on Global Humanitarian Technology South Asia Satellite (GHTC-SAS), September 26-27, 2014, IEEE, Trivandrum, India, ISBN:978-1-4799-4097-4, pp: 99-104.

Manickasankari, N., D. Arivazhagan and G. Vennila, 2014. A survey on query processing in mobile database. Indian J. Sci. Technol., 7: 32-34.

Moore, D., J. Leonard, D. Rus and S. Teller, 2004. Robust distributed network localization with noisy range measurements. Proceedings of the 2nd International Conference on Embedded Networked Sensor Systems, November 03-05, 2004, ACM, Baltimore, Maryland, USA., ISBN:1-58113-879-2, pp: 50-61.

Ni, L.M., Y. Liu, Y.C. Lao and A.P. Patil, 2003. LANDMARC: Indoor location sensing using active RFID. Proceedings of the 1st IEEE International Conference on Pervasive Computing and Communications, March 23-26, 2003, Fort Worth, Texas, USA., pp: 407-415.

Savvides, A., W.L. Garber, R.L. Moses and M.B. Srivastava, 2005. An analysis of error inducing parameters in multihop sensor node localization. IEEE. Trans. Mobile Comput., 4: 567-577.