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A Survey of Different Localization Algorithm for Wireless Sensor Net works

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Abstract - In wireless networks there is no need for wires, we can connect our devices to the network. Since wireless network applications have been deployed widely, wireless sensor networks have become an important research area. The development of wireless technology enabled us to use cheap and small sized sensors in short range communications. A sensor network consists of several nodes that are low in cost and have a battery with low capacity. Localization in wireless sensor networks is a vital issue, i.e. determining the position of a given device in the network. Location information of mobile nodes is a demand in many wireless systems.

Key Words: Communication cost, DV-Hop algorithm, Localization, Ranging error, unconstrained optimization, Wireless sensor network.

1.INTRODUCTION

Wireless sensor network (WSN) is an integrated subject, which integrates the intelligent sensors, microprocessor and wireless communication technology. It is a comprehensive discipline which has great research and practical value. With the rapid development of integrated circuit technology and information technology, as well as the increasing attention of governments to smart city, smart planet, wireless sensor network has developed rapidly. It has been widely used in environmental monitoring, data acquisition, resource exploration, disaster prevention and other related fields [2].

Recently, many localization algorithms have been proposed for WSNs. These are generally divided into two categories: range-based and range-free. The range-based approaches require absolute point-to-point distance or orientation information between neighbor nodes for localization. These schemes have higher localization accuracy but require additional hardware for measurement of distance or orientation information and are thus expensive for large-scale sensor networks. On the other hand, range-free approaches do not require distance or orientation information between nodes for localization. They need only network connectivity information for localization of nodes. Although range-free algorithms provide cost-effective localization, their results are less precise than range-based algorithms. [1]

Wireless sensor networks (WSN) usually consist of a great number of randomly deployed nodes that communicate among themselves and gather information about the environment.

In many applications, it is required to know geographical location of the sensor which detected an event.[3] Distributed sensor networks have already been applied for years, but wireless sensor networks [1] have recently been focused on. The rapid development of wireless sensor networks opened the door to create low-cost, low-power and multifunctional sensor devices that are integrated with sensing, processing, and communication capabilities. Estimating the location of a sensor is a critical task in sensor networks. There exists several location estimation techniques used in sensor networks.

Localization can be classified in many aspects. Localization techniques can be divided into two categories based on the communication between nodes: - centralized localization techniques, and decentralized localization techniques.

2. LITERATURE SURVEY

Shrawan Kumar et al. “Novel DV-Hop localization algorithm for wireless sensor networks”, considering the drawbacks of DV-Hop algorithm and its improvements (IDV-Hop and RNLEDV-Hop) in terms of time and energy consumption, we proposed NDV-Hop localization algorithm in this paper. The proposed algorithm NDV-Hop provides efficient localization with lesser communicational cost and without requiring additional hardware. The NDV-Hop algorithm completely eliminates communication from one of the steps by calculating hop-size at unknown nodes. It significantly reduces time and energy consumption, which is an important improvement over DV-Hop–based algorithms. The performance of NDV-Hop (L) verifies that elimination of one communication step also improves localization accuracy over DV-Hop. Furthermore, localization accuracy is enhanced by minimizing error terms in the estimated distance between anchor nodes and unknown node by using unconstrained optimization. Log-normal shadowing path loss model is incorporated to simulate more realistic environment. Simulation results prove that the proposed algorithm, NDV-Hop (U) provides, on average 18% lower localization error than DV-Hop and 13% lesser localization error than IDV-Hop and RNLEDV-Hop. The computational time complexity of NDV-Hop algorithm is also comparable. This

verifies better performance obtained by proposed algorithm against DV-Hop, IDV-Hop, and RNLEDV-Hop, in all the scenarios considered.

Zhang Ying et al.[2] "A Novel DV-Hop method for localization of networks node", In this paper, authors proposed an improved DV-hop location algorithm to overcome the shortage of the traditional DV-hop location algorithm. Considering the shortage of the traditional DV hop localization algorithm, the calculation of average hop distance is improved, and improves the localization accuracy of the algorithm.

Stefan Tomic et al.[3] "Improvements of DV-Hop Localization Algorithm for Wireless Sensor Networks", In this article, three new algorithms are proposed, iDVHop1, iDV-Hop2 and Quad DV-Hop, as improvements of the original DV-Hop algorithm and simulation results are given for four different scenarios (uniform random, C shaped random, gridy and C shaped gridy topology). The iDV-Hop1 and iDV-Hop2 algorithms have additional steps added to the original DV-Hop in order to reduce the localization error. Quad DV-Hop algorithm improves the localization accuracy by solving the bounded least squares problem.

Zhihua Cui et al.[4] "A novel oriented cuckoo search algorithm to improve DV-Hop performance for cyber–physical systems" , DV-Hop is one general range-free algorithm to detect the positions for those unknown nodes. However, the estimated position errors may be large in some cases. In this paper, a new algorithm, oriented cuckoo search algorithm is designed to improve the precision performance of DV-Hop algorithm. In OCS, the local search capability is guided by the best position, as well as the global search capability is affected by different random distributions. To investigate the influence, five different distributions: standard Gaussian distribution, Cauchy distribution, exponential distribution, uniform distribution and Lévy distribution are selected. Total ten different combinations are used to compared, and tested in famous numerical un-constrained CEC2013 benchmark test suit. Simulation results show OCS with Lévy distribution and Cauchy distribution achieves the best performance. Then, OCS-LC is incorporated into the methodology of DV-Hop algorithm to improve the predicted precise.

Guangjie Han et al.[5] "A Survey on Mobile Anchor Node Assisted Localization in Wireless Sensor Networks", Localization algorithms provide fundamental support for many location-aware protocols and applications. Localization accuracy is closely related to the quality of service of WSNs. In this paper, we investigated mobile anchor node assisted localization algorithms in WSNs and presented a comprehensive review of the recent breakthroughs in this field. We classified MANAL algorithms into two categories: localization based on mobility model and localization based on path planning schemes, and gave a comprehensive survey for the most interesting and successful advances. In the future, we will further study the mobile anchor node assisted localization problem, including analyzing the impact of anchor mobility on localization, design an optimal path planning for anchor nodes to improve localization performance, etc.

3. BASIC LOCALIZATION METHODS

A sensor node (often called mote) is practically a device in the wireless network that is capable of data processing, information gathering and establishing communication with the other nodes in the network. Wireless localization techniques [6] are used to give the positions of the mobile nodes considering the known location information. Many applications of sensor networks require knowledge of physical sensor positions. Location information can be used not only to minimize the communication but also to improve the performance of wireless networks and provide new types of services.

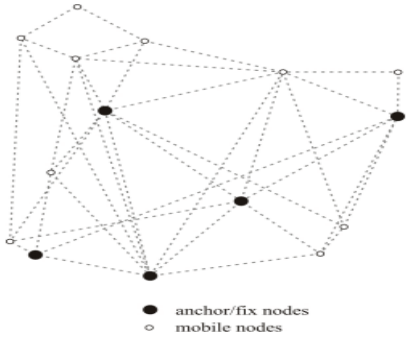

Fig-1: Nodes in a self-organizing wireless sensor network

There are several advanced localization algorithms based on machine learning and data fusion techniques.

3.1 Weighted centroid method

The idea of the centroid method (Fig. 2) is that the position of the target device is calculated by the known positions of the anchor nodes in the transmission range. Although this algorithm is very simple, efficient, easy to implement and needs low computational operations, it produces a lower level of precision. It is widely used in such dense sensor networks – there are fix nodes having known positions – that contains overlapping ranges. The known positions can be weighted, so the unknown position can be calculated.

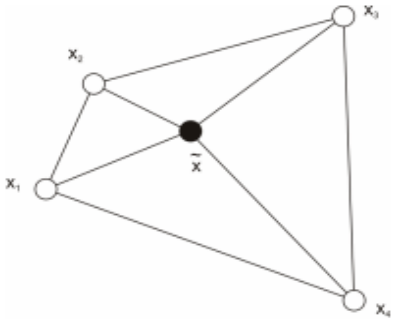

Fig-2: Centroid method

3.2 Bounding box method

The bounding box method (Fig. 3) is a simple and low computational localization technique. The accuracy of this technique is limited, but it is simple, fast to implement and to run on sensor nodes.

The main concept is that boxes are created around the transmission range of the nodes, and the target device is located in the intersection of these boxes. The distance between the target device and the i-th fix node can be estimated by the side length of the i-th bounding box. The result of the position estimation is the intersecting box or its centre.

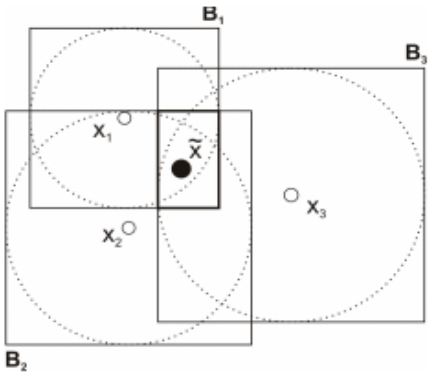

Fig-3: Bounding box method

3.3 Point in Triangle method

The Point in Triangle method (Fig. 4) is a range-free localization scheme. In this approach the target device sends a beacon message that is received by the fix nodes.

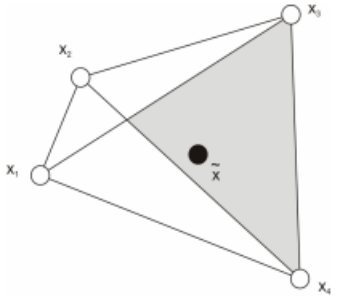

Fig-4: Point in Triangle based localization

4. CONCLUSIONS

In wireless communication the localization of mobile devices is a major problem. Location-based applications are very close to our daily life; it is a process to compute the locations of wireless devices and relies on the geometric relationship of network nodes. Discovering accurate locations of sensor nodes in WSNs is decisive to both network functions and most application level tasks. In this survey, we presented several advanced localization algorithms based on machine learning and data fusion techniques.

REFERENCES

[1] Kumar, Shrawan, and D. K. Lobiyal. "Novel DV-Hop localization algorithm for wireless sensor networks." Telecommunication Systems 64.3 (2017): 509-524.

[2] Zhang, Ying, and Zhuling Zhu. "A novel DV-Hop method for localization of network nodes." Control Conference (CCC), 2016 35th Chinese. IEEE, 2016.

[3] Tomic, Stefan, and Ivan Mezei. "Improvements of DV-Hop localization algorithm for wireless sensor networks." Telecommunication Systems 61.1 (2016): 93-106.

[4] Cui, Zhihua, et al. "A novel oriented cuckoo search algorithm to improve DV-Hop performance for cyber–physical systems." Journal of Parallel and Distributed Computing 103 (2017): 42-52.

[5] Han, Guangjie, et al. "A survey on mobile anchor node assisted localization in wireless sensor networks." IEEE Communications Surveys & Tutorials 18.3 (2016): 2220-2243.

[6] El Assaf, Ahmad, et al. "Low-cost localization for multihop heterogeneous wireless sensor networks." IEEE Transactions on Wireless Communications 15.1 (2016): 472-484.

[7] Halder, Subir, and Amrita Ghosal. "A survey on mobile anchor assisted localization techniques in wireless sensor networks." Wireless Networks 22.7 (2016): 2317-2336.

[8] VARGA, ATTILA K. "LOCALIZATION TECHNIQUES IN WIRELESS SENSOR NETWORKS." University of Miskolc, Hungary Department of Automation and Communication Technology 6 (2013).