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Efficient Range-based Localization Algorithm for Fault Minimization in Mobile Wireless Sensor Networks: A Review

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ABSTRACT

A study in the field of mobile wireless sensor networks, The evolution of mobile wireless sensor networks, with advancements in hardware design, communication protocols, resource efficiency, and other aspects. Recently, there has been much focus on mobile sensor networks, and they have even seen the development of small-profile sensing devices that are able to control their own movement. Although it has been shown that mobility alleviates several issues relating to mobile sensor network coverage and connectivity, many challenges remain. Among these, the need for position estimation main problem and the most important feature. Not only is localization required to understand sensor node data in a spatial context, but also for navigation, a key feature of mobile sensors. In this paper, they present a survey on localization methods for mobile wireless sensor networks. Mobile wireless sensors and localization, including common architectures, measurement techniques, and localization algorithms. Proposed method is find best solution and fault minimization in mobile wireless sensor networks. Mobile wireless sensor network Algorithm using many mobile sensor applications that require position estimations.

KEYWORDS: - Mobile Wireless Sensor Networks, Localization Accuracy, RSSI, Position Estimation, Global Coordinate System, Localization.

I. INTRODUCTION

Mobile wireless sensor networks (MWSNs) are a particular class of WSN in which mobility plays a key role in the execution of the application. In recent years, mobility has become an important area of research for the WSN community. Wireless sensor networks (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to cooperatively monitor physical or environmental conditions. Similar too many technological developments, wireless sensor networks have emerged from military needs and found its way into civil applications. Today, wireless sensor networks has become a key technology for different types of"smart environments", and an intense research effort is currently. Underway to enable the application of wireless sensor networks for a wide range of industrial problems. Wireless networks are of particular importance when a large number of sensor nodes have to be deployed, and/or in hazardous situations. WSNs are composed of many limited energy sensor nodes, which are expected to be low-cost and self configurable. In most of WSNs applications, the localization information of nodes is necessary and important [1] and the global positioning system (GPS) or manual calibration can be used to collect the location data of sensor node. However, considering the cost, only a few nodes can get their positions by this way. Therefore, the localization algorithms are used to get the other nodes' localization information. In recent years, the localization techniques of static WSNs have been widely studies and these methods assume that nodes in WSNs are static. However, in many applications, the nodes are always in mobile conditions. Therefore, the localization algorithms for MWSNs [2], where the nodes have motion ability, are studied more and more. In addition, mobility enables sensor nodes to target and track moving phenomena such as chemical clouds, vehicles, and package [3].

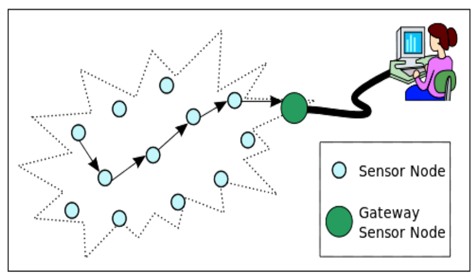

Figure 1 Mobile wireless sensor networks model

Range-Based Localization: The methodology of range-based localization depends on accurate ranging results among in-field sensor nodes. In other words, most of those designs are based on fine-grained point-to-point distance, angle, or relative velocity measurements to identify nodes' coordinates applied to compute the best-effort position estimations of sensor nodes in the network. In the following subsections, we explain range-based methods from the perspective of four types of elementary ranging modalities, including (i) signal strength, (ii) time (iii) angle of arrival [4].

(a) Received Signal Strength Indication (RSSI): In many ways, radio signal strength (RSS) is considered as an appealing modality for range estimation in wireless (sensor) networks, mostly because RSS information can be obtained at almost no additional cost with each radio message sent and received. The major challenge is that radio signal strength is so unpredictable, where reflecting and attenuating caused by objects in the environment can have much larger effects on RSS than distance, making it difficult to infer distance from RSS without a detailed model of the physical environment. To effectively utilize RSS for localization, two directions have been investigated: (i) directly infer distance from RSS measurement (ii) radio profiling and radio-frequency (RF) fingerprint matching[5]. In the following, we summarize basic ideas for typical examples of the above two types of methods.

(b) Angle of Arrival (AOA): Another class of range-based localization is the use of angular estimates instead of distance estimates. The angle of arrival (AOA) data are typically gathered using radio or microphone arrays , which allows a receiver to determine the direction of a transmitter. At the concept level, AOA is not a new idea. Phased array radars and smart antennas, which function based on the AOA methodology, have been widely used in military and civil applications. However, the use of AOA for localization in wireless sensor networks is not a trivial "technology transfer" when considered from the perspective of a practical system. This is because angles are simply much harder and more expensive to measure than distance for sensor nodes with tremendous constraints in cost, form factor and energy. For example, the need of spatial separation between microphones or antennas is difficult to be accommodated in small sized nodes such as Berkley mote [6].

(c) Time Difference of Arrival (TDOA): Time-difference-of-arrival (TDOA) localization improves upon the TOA approach by eliminating the need to know when the signal was transmitted. Several time-synchronized nodes receive a signal, and look at the difference in arrival times (or difference in signal phase) at a specific time instant. Because the signal travels at a constant speed, the source position can easily be determined if there are a sufficient number of participating nodes [7]

(d) Time of Arrival (TOA): Many high-accuracy localization systems rely on time of fly measurements of acoustic or radio signals to achieve precise ranging. The methodology is simple: given the speed of signal propagation, the elapsed time from signal emitter to a receiver indicates the distance between them. Generally speaking, acoustic systems can achieve centimeter-level high accuracy, but require dense deployment of sensor nodes because of limited effective range at each node on the other hand, a RF-based design can have a wider coverage, and however it normally provides low accuracy from several feet to tens of meters [8].

Feature of Mobile Wireless Sensor Networks

A wireless sensor network consists of many different components of which a sensor node is an important yet small part. The characteristics of a good wireless sensor network include power efficiency, scalability, responsiveness, reliability and mobility. A wireless sensor network with these features can prove to be very beneficial and if not followed or ensured can result in a network that suffers from overhead thus negating its applicability

II. RELATED WORK

In the literature, there exist many solutions to locating moving objects based on different localization issues for wireless sensor networks (WSN). Sensor networks are expected to revolutionize information gathering, processing and dissemination in many diverse environments. Existing localization algorithms can be categorized as either range-based or range-free schemes. Range - based schemes are not suitable for WSN because of their irregularity of radio propagation and their cost of additional devices. In contrast, range-free schemes do not need to use received signal strength to estimate distances. They only need simple and cheap hardware and are more suitable for WSN. However, existing range-free schemes are too costly and not accurate enough or are not scalable. To improve previous works, a fully distributed range-free localization scheme for MWSN is presented, based the assumption that only a few sensor nodes, called anchors, know their locations, and the remaining (normal) nodes need to estimate their own locations by gathering nearby neighboring information. The improved grid-scan algorithm is used here to find the estimated locations of the normal nodes and a vector-based refinement scheme to improve the accuracy of the estimated locations [9].

Lirui Zhang et al. [10]. Localization is one of the crucial issues in current mobile wireless sensor networks (MWSNs). And localization algorithms for MWSNs can be classified as range-based and range-free. In this paper, we propose an efficient range-based localization (RBL) algorithm for MWSNs. And our method is based on the MCL method. The RBL algorithm is divided into three phases: prediction, filtering and computation. In our method, the range information is used, and the localization accuracy is improved by utilizing the measurement information between nodes and the characteristics of moving nodes. Simulation results verify that compared with other known localization methods, the localization accuracy of RBL algorithm is largely improved.

Alfaro et al. [11] provide three algorithms that enable the unknown nodes to determine their positions in presence of neighbor sensors that may lie about their locations. The first

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algorithm is called the Majority-Three Neighbor Signals. When an unknown node is localized, all the neighbor anchor nodes send their locations to it. For every three anchor nodes, the unknown node uses trilateration to calculate a position. Then, a majority decision rule is used to correct the final position of the unknown node. The second algorithm is the Majority- Two Neighbor Signals. The unknown node uses only two neighbor anchor nodes; therefore the correct location is one of the two points of intersection of the two circles centered at two neighbors. The third algorithm is called the Tabulated-Two Neighbor Signals. It is assumed the unknown node may trust one of the neighbor anchor nodes. Then, the unknown node implements the second algorithm for every neighbor anchor nodes except the trusted one. Finally, the unknown node calculates the occurrence frequency of each position and accepts the most frequently occurring one as the correct position. The three algorithms have been extended to localize unknown nodes.

Vikas Gupta et al. [12].Localization has become one of the mandatory services in wireless sensor networks (WSNs) while dealing with critical operations such as coverage, deployment, routing, target tracking and rescue operations. Since the necessity of WSN has increased drastically to provide best solution with accurate results of sensor nodes, it mainly depends on the WSN node localization. This paper provides an overview of different approach of node localization discovery in wireless sensor networks. A survey on various aspects or techniques of localization like localization error, parameters of localization, accuracy, bit error probability, energy consumption has been studied. Various overviews of the schemes proposed by different authors for the improvement of localization in wireless sensor networks are also highlighted.

Du et al. [13] propose LAD (Localization Anomaly Detection) to detect abnormal anchor nodes in the localization process. When sensor nodes are deployed in groups, each node follows two-dimensional Gaussian distribution, which is centered at the deployment point of the node's group. It is assumed that the localization phase has already been ended, and each unknown node has already obtained a position. LAD uses the known deployment information and the group relationship between neighbor sensor nodes to check whether the computed positions of the unknown nodes are consistent with the known deployment knowledge.

E. Ekici et al. [14] Probabilistic Location Verification (PLV) algorithm is proposed. The main idea is to leverage the statistical relationships between the number of hops in a sensor network and the Euclidean distance that is covered. First, an unknown node broadcasts message in the network using flooding, which contains its location as well as the hop count. Each verifier receiving the message can compute the relative distance between it and the unknown node. Then, each verifier computes its probability slack and maximum probability values. Finally, a central node collects the two probability values from all verifiers and a common plausibility for the location advertisement is computed. The central node uses the plausibility to accept or reject the location**.**

S. Arisar et al. [15] .Location awareness is of great importance for several wireless sensor network applications. Precise and quick self localization capability is highly desirable in wireless sensor network. Localization algorithms have been developed with various approaches. A detailed survey of localization techniques is provided in. Localization techniques can be classified as range free or range based, depending on whether the range measurement methods are used or connectivity information is used. Range based methods require range measurement information, such as Received Signal Strength Indicator (RSSI) , Angle of Arrival (AOA) , Time of Arrival (TOA) and Time Difference of Arrival (TDOA) etc. However, the measurement accuracy of these methods can be affected by the environmental interference. Though, range free methods cannot pro-vide accurate location estimation, they are cost effective and robust to noise since range measurements are not involved in it. The range-based methods have connectivity or proximity information between neighbor nodes who can communicate with each other directly.

III. Problem Definition

Consider the case when we have deployed a sensor network consist of N sensors at locations S = {S1, S2… SN}. Let Sxi refer to the x-coordinate of the location of sensor i and let Syi and Szi refer to the y and z coordinates, respectively. Constraining Szi to be 0 suffices the 2D version of this problem. Determining these locations constitutes the localization problem. Some sensor nodes are aware of their own positions; these nodes are known as anchors or beacons. All the other nodes localize themselves with the help of location references received from the anchors. So, mathematically the localization problem can be formulated as follows: given a multihop network, represented by a graph, and a set of beacon nodes B, their positions {xb, yb} for all, they want to find the position {xu, yu} for all unknown nodes. Main problem fault in node position location estimated.

IV. EXPECT OUTCOME

In research in the field of mobile wireless sensor networks and identifies various face up to in the field MWSN. Our purpose

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and job in the field of minimizing fault in mobile wireless sensor networks.

V. CONCLUSION

They have analyzed the various traditional and latest techniques that have been either proposed or implemented for localization techniques in MWSN. Selection of the best technique for a particular application is always a challenging task owing to varying parameters of localization, localization error, accuracy, bit error probability, energy consumption etc. Hence a good judgment is required to select a suitable method depending on the project in hand. This paper can prove handy for aiding in proper selection of technique to be used as per the specifications of problem in hand. The proposed scheme is suitable to be implemented on the resource-limited sensor nodes and reduce error. Different localization techniques have been explained to reduce the localization error. Localization can be used to localize the sensor node .Wireless Sensor Network, the localization is an essential issue as many applications require sensor nodes to know their locations. Many algorithms are used for localization of sensor nodes.

REFERENCES

[1]. C. Y. Chong, and S. Kumar, "Sensor networks: evolution, opportunities, and challenges," Proceedings of the IEEE 91(8), 2003, pp: 1247–1256.

[2]. J. Mei, D. Chen, J. Gao, Y. S Gao, and L. K. Yang, "Range-free monte carlo localization for mobile wireless sensor networks," Computer Science & Service System (CSSS), 2012 International Conference on 2012, 2012, pp:1066–1069.

[3]. Tilak, S., Kolar, V., Abu-Ghazaleh, N.B., Kang, K.D.: Dynamic localization control for mobile sensor networks. In: Proceedings of the IEEE International Workshop on Strategies for Energy Efficiency in Ad Hoc and Sensor Networks, 2005.

[4]. Savvides, A., Han, C., and Strivastava, M. B. “Dynamic fine-grained localization in Ad-Hoc networks of sensors”. In Proceedings of the 7th Annual international Conference on Mobile Computing and Networking, Rome, Italy, Jul. 16-21, 2001, pp. 166-179.

[5]. Liu, J., Zhang, Y., and Zhao, F. “Robust distributed node localization with error management”. In Proceedings of the 7th ACM international Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc ’06), Florence, Italy, May 22-25, 2006, pp. 250-261.

[6]. Winters, J. H. “Smart antenna techniques and their application to wireless ad hoc networks”. IEEE Wireless Communications, vol. 13, no. 4, Aug. 2006, pp. 77-83.

[7]. McCrady, D. D., Doyle, L., Forstrom, H., Dempsey, T., and Martorana, M. “Mobile ranging using low-accuracy clocks”. IEEE Transactions on Microwave Theory and Techniques, vol. 48, no. 6, Jun. 2000, pp. 951-958.

[8]. Priyantha, N. B., Chakraborty, A., and Balakrishnan, H. “The Cricket location support system”. In Proceedings of the 6th Annual international Conference on Mobile Computing and Networking, Boston, Massachusetts, USA, Aug. 06-11, 2000, pp.32-43.

[9]. Sheu J.P, Chen P.C, and Hs u C.S, “A Distributed Localization Scheme for Wireless Sensor Networks with Improved Grid-Scan and Vector-Based Refinement,” IEEE Trans . Mobile Computing, 2008, Vol. 7, No. 9, pp. 1110 - 1123.

[10]. Lirui Zhang, Beijing Division, “An Efficient Range-based Localization Algorithm for Mobile Wireless Sensor Networks”, International Conference on Intelligent Human-Machine Systems and Cybernetics, IEEE,2016.

[11]. J. Alfaro, M. Barbeau, and E. Kranakis, “Secure localization of nodes in wireless sensor networks with limited number of truth tellers,” in Proceedings of the 7th Annual Communications Networks and Services Research Conference, 2009, pp. 86–93.

[12]. Vikas Gupta, Sakshi Aggarwal, “Localization in Wireless Sensor Networks”, International Journal of Advanced Research in Electronics and Communication Engineering, Volume 5, Issue 5, May 2016.

[13]. W. Du, L. Fang, and P. Ning, “LAD: Localization anomaly detection for wireless sensor networks,” in The Journal of Parallel and Distributed Computing, vol. 66, no. 7, 2006, pp. 874–886.

[14]. E. Ekici, J. Mcnair, and D. Al-Abri, “A probabilistic approach to location verification in wireless sensor networks,” in IEEE International Conference on Communications, vol. 8, June 2006, pp. 3485–3490.

[15]. S. Arisar and A. Kemp, “Secure location estimation in large scale wireless sensor networks,” in Proceedings of the 3rd International Conference on Next Generation Mobile Applications, Services and Technologies, 2009, pp. 472– 476.