International Journal of Innovative Research in Technology & Science
ISSN: 2321-1156 Volume VIII Issue I, January 2020

Error Minimization, Analysis Based on Positioning Methods in Wireless Sensor Network: Review

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Abstract: *Wireless sensor networks and location are also an important aspect in the field of wireless sensor networks (WSN) that have developed important research interests between the academic world and research communities. The wireless sensor network is made up of a gigantic number of limited, low-energy and small processing capacities, and low-cost sensors that communicate with each other in ad-hoc mode, target tracking and, therefore, the task to determine the number of node positions or sensor nodes in. WSNs understood as location or position. This work aims to determine the situation of the sensor nodes with high accuracy and precision of position accuracy for various varied applications, different location methods used in different applications and there are several challenges in some special scenarios such as fire detection, The initial part in this work it is applied to the location of the nodes using node or device proposals in AWSN and obtaining device estimates when knowing a minimum of position values of the dye nodes that must be remembered in absolute position values in the network where the sensor nodes not fixed in WSN. The algorithm is known as Minimum RSSI Error. The analysis of the results obtained by simulation shows that the method of locating the proposed algorithm works better than the RSSI technique in terms of probability rate errors with a variable number of known sensors and the search for larger locations minimizing fault and thus obtain the optimal result. The basic challenge during a wireless sensor network is the location.*

Keywords: Wireless Sensor Network, localization, Global Positioning System, RSSI, Sensor Node, MAE , MRE.

I. Introduction

In the next generation of communications networks, they need real-time location and service based on precise positioning, low cost, energy-efficient and reliable. Today, wireless sensor networks (WSN) are often applied in many applications, such as investments in natural resources, monitoring objectives, where inaccessible monitoring originates. In these applications, the sensor nodes collect and transfer knowledge. Several applications request this information about the locations of the sensor nodes. In addition, situational information is additionally indispensable in geographical routing and grouping protocols [1]. In those mentioned above, location algorithms are one of the most important topics in WSN research. Therefore, the location of the capacitive nodes is important for the operation of the WSN. The location of WSN has been studied intensively in recent years, and most of these studies are based on the condition that only a small proportion of the sensor nodes, called anchor nodes, know the exact positions of the GPS devices or manual settings Other sensor nodes estimate the distances of the anchor nodes and calculate positions with multiple lateralization techniques. These methods provide satisfactory levels of accuracy and a small proportion of anchor nodes in WSN. Sensor nodes are randomly deployed on terrain accessible by car or aircraft robots to be used in many promising applications, such as health monitoring, battlefield monitoring, environmental monitoring, protection, routing, location services, objective tracking, and rescue [2].

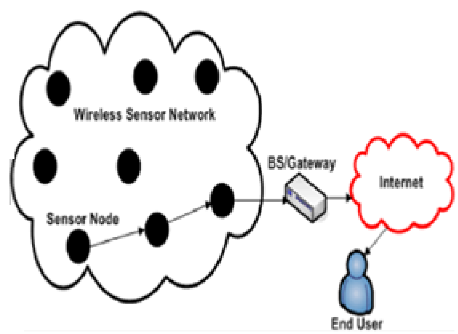

Figure 1 general wireless sensor network model

In the literature, numbers of location systems and algorithms for sensor networks are reported, which are broadly classified into row-based and short-range matrices according to the idea of estimating the location of the mechanism. Row-based schemes are defined by protocols that use absolute distance estimation to calculate the situation. Quick solutions do not make assumptions about the accessibility or legality of this information [5]. Due to the hardware constraints of the sensors, the solutions in the series of quick schemes have been considered cost-effective substitutes in mostly base-based arrays. Taxonomy location algorithms have admitted several different criteria, such as dependence on the measurement range, computer modeling link.

1.1 Location Process

The problem with the location of the sensor is to look for the status of all or over the sensor nodes. The localization process locates sensor nodes that support input files. If the link is available in the network, the common inputs are the location of the anchors, while the other inputs support measurement techniques. General description of the localization process [3].

1.2. Problems in WSN

The network location sensor is an active search area and has many problems, so it still has a lot of reaches Community research A number of issues have been received that must be addressed [4]. Cost-effective algorithms: during the planning of the location algorithm, the designer must close one yourself hardware cost and deployment. GPS is not adequate due to its cost and size hardware A robust algorithm for mobile capacity networks: mobile sensors are more useful in some environments Due to the mobility and coverage of the facilities. Therefore, the development of the latest algorithms is required to accommodate these mobile nodes. Algorithms for three-dimensional space: for multiple WSN applications, location information is accurate critical More of the proposed algorithms are applicable in 2D space. A device number you need a WSD 3D presentation.

1.3. WSN Features

A wireless capacity network consists of many different components, of which a sensor node is a critical but small part. The characteristics of an honest network of wireless sensors include energy efficiency, scalability, responsiveness, reliability, and mobility. A wireless capability network with these features can be very beneficial and, if not tracked or secured, can result during a network overload, which cancels your application [5]. The normal layer approach presents three main problems [6].

1. Traditional layer approaches cannot share different information between different layers since the results of each layer do not have complete information. The normal layer approach cannot guarantee the optimization of the entire network.
2. The normal layered approach does not have the power to adapt to environmental changes.
3. Due to interference between multiple users, access conflicts, fading and, therefore, changing the environment of wireless sensor networks, the traditional layered approach to wired networks is not applicable to wireless networks.

Low cost: in the wireless sensor network, practically hundreds or thousands of sensor nodes are implemented to live in any physical environment. As well as to reduce the total cost of the network, the total value of the sensor node should be kept as low as possible.

Computing power: Normally, the node has a limited computing capacity because the cost and energy had to be considered.

Communication Capabilities: the wireless sensor network generally communicates via radio waves through a wireless channel. It is the property for short-range communication, with broad and dynamic bandwidth. Communications between different channels are often bidirectional or unidirectional. With the hostile and operational environment alone, it is difficult to run wireless sensor networks without problems. The materials and software used for communication must refer to security.

Energy efficiency: WSN energy works for many purposes, such as computing, communication, and storage. A sensor node uses more energy compared to other nodes for communication. If they run out of installation, they often become invalid because we have no other option to recharge them. Therefore, different protocols and different development algorithms should consider the use of the installation in the design phase.

Security and privacy: each sensor node must have sufficient security mechanisms to stop unauthorized access, attack and involuntary damage to data within the sensor node. In addition, even more, privacy mechanisms should be included.

Distribute some: the numbers of the sensor node numbers are scattered exactly randomly. In the wireless sensor network, each node is able to collect, classify process, add and send the data to the flow. Then distribute given the strength of the plot. Multiple communication jumps a gigantic number of sensor nodes implemented in WSN. Therefore, the possible way to communicate with the dive station or base is to require the assistance of an intermediate node in the routing route. If one has to communicate with the opposite node or base station that is beyond its frequency, I must be on the route of multiple hops per intermediate node [3].

Dynamic network topology: in general, the wireless sensor network can be a dynamic network. The sensor node cannot succeed due to battery overload or other conditions; communication between different channels is often interrupted also because the additional sensor node could also be added in the network, which leads to frequent changes in the topology. Therefore, network sensitive network nodes must be integrated for the purpose of reconfiguration, self-tuning.

Self-organization: the sensor nodes in the network must have the potential to organize because the sensor nodes are implemented in an unknown way and in a hostile environment. The sensor nodes need to add collaborations to vary the algorithm and form the network automatically.

II. Literature Review

Balasubramanian S. et al. [7].Localization is an essential and important research issue in wireless sensor networks (WSN). Most localization schemes focus on static sensor networks. However, Mobile sensors required in some applications to acquire all the relevant data. As such, a localization scheme defined for mobile sensor networks is necessary to track the moving nodes

In this paper, they propose a localization scheme, the normal nodes without location information can estimate their own locations by gathering the positions of location-aware nodes (anchor nodes) and the one-hop normal nodes whose locations are estimated from the anchor nodes. In addition, we propose a scheme that predicts the moving direction of sensor nodes to increase localization accuracy. Simulation results show that the localization error in our proposed scheme is lower than the previous schemes in various mobility models and moving speeds.

Zhang et al. [8] Localization in mobile sensor networks is more challenging than in static sensor networks because mobility increases the uncertainty of nodes' positions. Most existing localization algorithms in mobile sensor networks use Sequential Monte Carlo (SMC) methods due to their simplicity in implementation. However, SMC methods are very time-consuming because they need to keep sampling and filtering until enough samples are obtained for representing the posterior distribution of a moving node's position. In this paper, we propose a localization algorithm that can reduce the computation cost of obtaining the samples and improve location accuracy. A simple bounding-box method is used to reduce the scope of searching the candidate samples. Inaccurate position estimations of the common neighbor nodes are used to reduce the scope of finding the valid samples and thus improve the accuracy of the obtained location information. Our simulation results show that compared with existing algorithms; our algorithm can reduce the total computation cost and increase the location accuracy. In addition, our algorithm shows several other benefits: 1) it enables each determined node to know its maximum location error, 2) it achieves higher location accuracy under the higher density of common nodes, and 3) even when there are only a few anchor nodes, most nodes can still get position estimations.

S. Aggarwal et al. [9].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 the best solution with accurate results of sensor nodes, it mainly depends on the WSN node localization. This paper provides an overview of the different approaches 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.

J.P. Sheu et al. [10]. location estimation is a fundamental and essential issue for wireless sensor networks (WSNs). In this paper, we assume that only a few sensor nodes (named as beacon nodes) get their locations by Global Positioning System (GPS) and the remaining nodes without GPS (named as normal nodes) need to estimate their own locations by gathering the nearby neighboring information. Existing works are either too costly or not accurate enough. To improve previous works, we propose a distributed location estimation algorithm for WSNs. In our algorithm, each node without location information only needs to collect the location information of neighboring nodes and use simple computation to estimate its location. Besides, we improve the accuracy of the normal node's estimative region by discarding the communication area of the beacon node (named as the farther neighboring beacon node), which does not cover the normal node, from the original estimative region. We derive some rules to adjust the estimative region according to the relative location of the normal node and the farther neighboring beacon node. Simulation results show that the proposed algorithm achieves better accuracy of estimative locations.

C. Huang et al. [11].Location awareness is of great importance for several wireless sensor network applications. Precise and quick self-localization capability is highly desirable in the wireless sensor network. Localization algorithms have been developed with various approaches. A detailed survey of localization techniques is provided. 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 environmental interference. Though range-free methods cannot provide 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.

Sichitiu et al. [12] Wireless sensor networks have the potential to become the pervasive sensing (and actuating) technology of the future. For many applications, a large number of inexpensive sensors are preferable to a few expensive ones. A large number of sensors in a sensor network and most application scenarios preclude the hand placement of the sensors. Determining the physical location of the sensors after they have been deployed is known as the problem of localization. We present a localization technique based on a single mobile beacon aware of its position (e.g. by being equipped with a GPS receiver). Sensor nodes receiving beacon packets infer proximity constraints to the mobile beacon and use them to construct and maintain position estimates. The proposed scheme is radio-frequency based, and thus no extra hardware is necessary. The accuracy (on the order of a few meters in most cases) is sufficient for most applications. An implementation is used to evaluate the performance of the proposed approach

G. K. A. et al. [13]. Wireless sensor network (WSN) is composed of low cost, a tiny sensor that communicates with each other and transmits sensory data to its base station/sink. The sensor network has been adopted by various industries and organizations for their ease of use and is considered to be the most sorted future paradigm. The sensor devices are remotely deployed and powered by batteries. Preserving the energy of sensor devices is most desired. To preserve the battery efficient routing technique is needed. Most routing techniques required prior knowledge of sensor nodes location in order to provide energy efficiency. Much existing technique has been proposed in recent times to determine the position of sensor nodes. The existing technique proposed so for suffers in estimating the likelihood of localization error. Reducing the error in localization is most desired. This work presents a (Time-of-Arrival) based localization technique and also presents an adaptive information estimation model to reduce/approximate the localization error in the wireless sensor network. The author compares our proposed localization model with the existing protocol and analyses its efficiency.

S. H. Thimmaiah et al. [14]. A wireless sensor-based communication system is an ever-growing sector in the industry of communication. Wireless infrastructure is a network that enables correspondence between various devices associated with an infrastructure protocol. Finding the position or location of the sensor node (Localization) is an important factor in a sensor network for proving efficient service to end-user. The existing technique proposed so for suffers in estimating the likelihood of localization error. The author proposes an RSS (Received signal strength) based localization technique and also proposes an adaptive information estimation to reduce or approximate the localization error in the wireless sensor network. The author compares our proposed localization model with the existing protocol and analyses its efficiency.

Singh et al. [15], the continuously widening range of Wireless Sensor Networks (WSNs) applications requires exact node location which needs efficient and error-free localization methods. Localization methods developed in the past are completely based on very fine numerical computation of various network parameters such as transmission range, propagation shape, transmitted or received power, sending or arrival time, connectivity information, etc. These parameters are prone to environmental situations and the presence of obstacles in the environment. Recently, research in localization is focused on the minimization of localization errors in the available techniques. In this paper, the cause and behavior of errors in AOA and RSSI localization techniques have been mathematically analyzed. Based on the error analysis of both the existing techniques, a hybrid localization algorithm is proposed. The hybrid localization algorithm is based on the existing Angle of Arrival (AOA) and Received signal strength indicator (RSSI). The algorithm is named as Minimum AOA Error with Minimum RSSI Error (MAE with MRE). Analysis of results obtained through simulation shows that the hybrid localization algorithm performs better than AOA and RSSI techniques in terms of error percentage probability with varying number of known sensors, unknown sensors and shadowing effect percentage.

Tomic et al. [16] This work revise existing solutions for a problem of target localization in wireless sensor networks (WSNs), utilizing integrated measurements, namely received signal strength (RSS) and angle of arrival (AoA). The problem of RSS/AoA-based target localization became very popular in the research community recently, owing to its great applicability potential and relatively low implementation cost. Therefore, here, a comprehensive study of the state-of-the-art (SOA) solutions and their detailed analysis is presented. The beginning of this work starts by considering the SoA approaches based on convex relaxation techniques (more computationally complex in general), and it goes through other (less computationally complex) approaches, as well, such as the ones based on the generalized trust region sub-problems framework and linear least squares. Furthermore, a detailed analysis of the computational complexity of each solution is reviewed. Furthermore, an extensive set of simulation results is presented. Finally, the main conclusions are summarized, and a set of future aspects and trends that might be interesting for future research in this area is identified

III. Expect Outcome

Research areas of wireless capacity networks and identify several challenges. Our goal is to reduce the error of the localization of wireless sensor networks. The overall result achieved shows the effectiveness of our proposed location model on existing RSS methods.

IV. Conclusion

The wireless network sensor may be a network that allows correspondence between several devices associated with smaller infrastructure. Finding the position/location of the sensor node (location) is a critical consideration network to demonstrate efficient service to the end-user. The dominant location is not effective in terms of accuracy and promotes location optimization itself. This paper presents a technique based on RSS localization and also proposes an estimate of adaptive information to reduce/approximate the error in the location of wireless sensor networks. The situation information is important and challenging. Finally, a discussion compares the previous method with the proposed method, such as reduced error and improved accuracy.

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