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A Study on Wireless Sensor Networks Localization

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ABSTRACT: Localization is one of the main issues in wireless sensor networks (WSNs), since the location of the sensor nodes are critical in network operation. Although there is lot of range based and range-free localization approaches were created to find the accurate location information of sensor nodes in wireless sensor networks, but not even a single approach to find the exact location information of the sensor nodes. In this paper, we present a comprehensive survey on sensor localization in WSNs covering both range-based and range-free approaches motivation, problem and performance.

KEYWORDS: sensor localization, wireless sensor networks, range-free, range-based.

I. INTRODUCTION

Wireless sensor and actuator network is a collection of small randomly dispersed devices that provide three essential functions; The ability to monitor physical and environmental conditions, often in real time, such as temperature, pressure, light and humidity, The ability to operate devices such as switches, motors or actuators that control those conditions and the ability to provide efficient, reliable communications via a wireless network. A wireless sensor networks are typically self-organizing and self-healing. Self-organizing networks allow a new node to automatically join the network without the need for manual intervention. Self-healing networks allow nodes to reconfigure their link associations and find alternative pathways around failed or powered-down nodes. Major issues in WSNs are authentication and privacy, denial-of-service, Localization and power consumption.

In this paper, we attempt to present a comprehensive survey on the state-of-the-art research concerning localization of nodes in WSNs from motivations to solutions. Our focus, therefore, is on WSNs that apply range-based and range-free approaches with the underlying assumption that node locations are known. We motivate the readers by identifying the basic problems in deployment, data gathering, and optimal resource usages; and thereby examine how localization becomes critical to the applications of WSNs.

An important problem in the deployment of WSNs is the coverage. A coverage model of sensor nodes would depend on the distance between the point of interest and the closest node. Therefore, locations of sensor nodes constitute the basic input for the algorithms that examine coverage of the network. The wireless sensor networks localization approach having a lot of problem on node deployment. The drawbacks are difficult to find the exact location of the sensor node, routing delay and power consumption. The more localization approach was created to overcome the problem of node localization. The figure 1 as mentioned as wireless sensor networks data transmission process.

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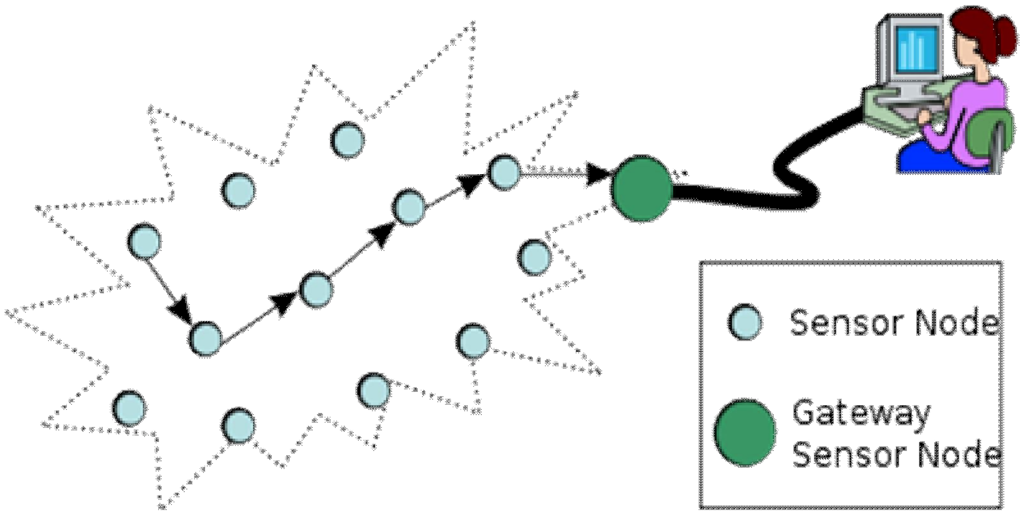

Fig.1 Wireless sensor networks

II. RELATED WORKS

The location of the sensor node is very important one because without knowing the node location we are not able to establish the routing to transfer the gathered information. There is lot of localization approaches were created to find the location of the sensor nodes. The paper has been organized into several sections. Section 2.1 gives them a component based localization scheme and better sharing information with the neighbor node. Section 2.2 deals with the localization from connectivity by using MDS. Section 2.3 gives a new range-based localization algorithm. Section 2.4 deals with the LHDV-HOP: An energy-effective range-free localization scheme to overcome the drawback of DV-HOP range-free localization scheme. Section 2.5 performs combined and differentiated localization approach to find the location of a node more accurately compared to previous SISR localization approach. Section2.6 deals with identifying the location information of sensor system in wireless sensor networks by using the TARF routing selection. It mainly used to solve the routing problem and also used to find good path to reach the base station.

2.1 COMPONENT BASED LOCALIZATION SCHME:

This technique mainly used to combine the node as a component. The low power node has not able to forward the message to longer node, on that critical situation the node choose intermediate node to forward the message to the target node. The advantages of this approach are better sharing between two nodes and it locates the entire node with in the region at 90% accurately. The disadvantages of this one are distance criteria. This Component Based Localization approach was implemented in [9].

2.2 MULTIDIMENTIONAL SACLING LOCALIZATION APPROACH:

The MDS approach measure the nodes distance with their neighbor, and also it collect more data related to those neighbor nodes like direction of the node, angle of the node and so on to find the location of the node. The advantages of this approach are each node known their neighbor node accurate location. The disadvantages of this approach are it not fully utilize the information between the two nodes and it take O (n^3) time to complete the process so the sensor nodes life time is reduced automatically. The MDS localization approach was measure the node location through sending the beacon signal to new entry node on the particular region. The new node can measure location by receiving three beacon signals, after that it collects neighbor node location information for establishing routing at WSNs data transmission. The MDS localization approach measure the signal reached time and beacon signals direction. Fig.2 as mentioned as to how to measure the beacon signal arrival time and the direction of beacon signal to estimate node location. The MDS approach was implemented in [8].

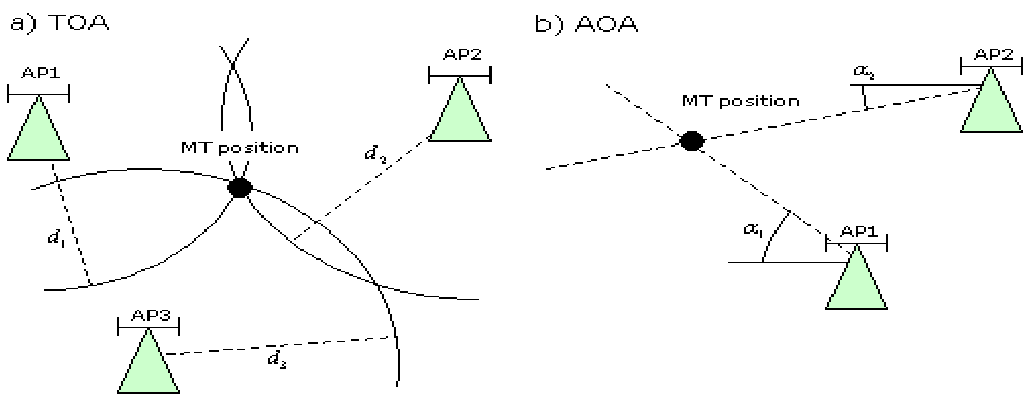

Fig.2 Measure the node location.

2.3 SNAP INDUCING SHAPED RESIDUAL (SISR) LOCALIZATION APPROACH:

Traditional range-based localization methods for wireless sensor networks usually cannot achieve high localization accuracy, when the number of labor anchor is less than three. This paper used the SISR error tolerant localization method .SISR automatically find the bad link and bad node. The SISR localization approach finds the good node from the particular region and gives more important to their good node location accuracy. The drawback of this one is fail to achieve the location accuracy because of malicious node. The disadvantages of this one is could not provide the accurate location of the node. It couldn't be adaptable for another real time application of wireless sensor networks. This Snap Inducing Shaped Residual localization approach was implemented in [4].

2.4 LHDV-HOP LOCALIZATION SCHME:

The widely used localization technique is range-free algorithm, especially DV-HOP (Distance Vector Hop) algorithm. The DV-HOP of Limited Hops scheme mainly used to overcome the drawback of Distance Vector Hop approach. The drawback of DV-HOP is it utilizes more power from the nodes for large communication, so the nodes life time reduced automatically. The LHDV-HOP N is set to limit the flooding range, and furthermore, three anchor nodes with the best precision for localization are chosen among all anchors within the N hops, as reference points. The advantages of this one are decrease the energy consumption and improve the location accuracy. The disadvantages of this one is it provide more accurate location of the node when compare to other approaches, but it doesn't provide the exact location of the node. This Distance Vector for limited hop localization approach was implemented in [10].

2.5 CDL LOCALIZATION APPROACH:

The sensor networks system deployed in a forest may affected by interfering factor such as rain, animals and low power. The existing SISR(snap-inducing shape residual)approaches created to find the location of the sensor system, but the error rate is 4.6m(it find 60% location of the sensor system).In localization of wireless sensor networks in the wild:pursuit of ranging quality they developed Combined and Differentiated Localization approach to overcome the existing problem. It reduce error rate as 2.9m (it find 80% location of the sensor system).The CDL approach combine virtual-hop localization, local filtration and ranging quality aware calibration to provide better ranging quality. The CDL implemented in Green Orbs. The drawback of CDL approach could not find exact location of the sensor system. Because the error rate is 2.9m i.e. it could find only 30% of the location. Solution is the error rate to be reduced as much as possible by finding accurate position and distance of the node form regular node. Assumption of this may find almost 50% location of the sensor system. This CDL approach was implemented in [5].

Virtual-Hop Localization

For the first phase of CDL, Virtual-hop localization initially computes node locations. This is an enhanced version of hop-count based localization. Compared to the DV-hop scheme, virtual-hop particularly addresses the issue of nonuniform deployment and improves the localization accuracy in such contexts. Based on the output of virtual-hop localization, the subsequent localization processes in CDL (filtration and calibration) are expected to achieve higher accuracy and efficiency of iteration.

Local Filtration - Infeasibility of Model-Based Filtration

Filtration is very important in CDL. In order to illustrate its significance, it carry out an experiment to examine the efficacy of location calibration without differentiating good nodes and bad nodes before calibration. They call this straightforward model-based calibration indiscriminate calibration. Using such calibration, every node's location is adjusted directly based on the distances to its neighbors converted from RSSI, using the log-normal shadowing model. Figure 9 compares the localization errors of nodes before and after indiscriminate calibration. Surprisingly, they find the output of indiscriminate calibration to be even worse than before. Model-based filtration is infeasible, considering the estimated localization error and irregularity of RSSI.

Neighborhood Hop-Count Matching

Every node takes neighborhood hop-count matching as the first step to identify whether it is a bad node. This mainly utilizes local connectivity information. Note that hop-count is indeed a rough estimation of the distance between two nodes. If a node's hop-counts to its neighbors greatly mismatches the distances calculated using the nodes' estimated coordinates, w.h.p. the local node's coordinates will have a large error. It use node vi as an example to illustrate the matching procedure. First, every node exchanges its estimated coordinates with its 2-hop neighborhood. Second, when vi receives the estimated coordinates of vj, it estimates the distance between them, denoted by d0 i j. Third, for each node vj within its 2-hop neighborhood, vi estimates the hop-count to v j as h0 i j = dd0 i j=d˜ke, where d˜k is the per-hop distance obtained from the nearest landmark Rk during virtual-hop localization. Fourth, vi computes its ratio of matched hop-counts within its 2-hop neighborhood vj where hi j denotes the hop count from vi to vj and n is the number of its 2-hop neighbors of vi. ri denotes the mean matched ratio in the neighborhood of vi. If ri < ri, vi regards itself as a bad node, which has an apparent error in its estimated coordinates. Otherwise, the role of node vi is left undetermined for further filtration. Hop-counts actually offer relatively limited information to filtration. As a result, neighborhood hop-count matching only identifies a small portion of bad nodes with apparently wrong coordinates. In order to ensure that all the sifted good nodes do have satisfactory location accuracy, they need to further filter bad nodes. As mentioned as figure.3 explain the non-uniform deployment in wild area.

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Fig.3 GreenOrbs

2.6 IDENTIFYING LOCATION INFORMATION OF SENSOR SYSTEM IN WSNs BY USING TRAF ROUTING SELECTION AT WILD AREA

The location information to be identified by the Combined and differentiated localization approach, they found the location information almost 80% more than the existing SISR approach. But the CDL approach having some major drawbacks first one is power consumption because of using more transmission range for each node. the second one is all the sender node who want to transfer the gathered information through the good node means routing traffic were occurred because more than one sender node select the same good node at the time. Then the routing delay occurred behind the routing traffic. The proposed localization approach mainly focusing the routing traffic, delay and power consumption, the routing traffic and delay to be overcome by using Trust Aware Routing Framework. TARF were find the good node simply in normal environment but when this concept will applied on the wild area is difficult to find the good node, because node deployment to be high with in the small range at wild area. Ant colony optimization algorithms were used to find the good node and their transmission effectiveness. The good node to be selected based on time taken to transfer the data and their power efficiency.

III. CONCLUSION

This paper dealt with the localization problems in WSNs. In the WSN literature, localization methods are normally referred to either as range-based or range-free. Still the localization is very difficult one in the wireless sensor networks. In this paper we discussed more localization scheme based on both range-free and Range-based and their advantages and disadvantages. Subsequently, a summary of qualitative evaluation of important localization schemes is presented on basis of node density, power consumption routing delay and the time taken for each data transmission.

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