A Review on Localization Techniques for WSN

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ABSTRACT: The sensor nodes that are present in the wireless sensor network are used for the transmitting the data from source to the destination. As the data send or receive by the node is important in same way the location of the nodes is essential. Localization is the technique for obtaining the information about the location of the nodes present in the network. Various localization methods have been proposed for localization of sensor. The localization mechanism for the wireless sensor network should have low cost designing, scalable and efficient. So in this paper we will discuss about the related work and methodology for localization in WSN.

KEYWORDS: Wireless Sensor Networks, node, localization.

I.INTRODUCTION

WSN stands for Wireless Sensor Network.WSN consist of number of nodes. These nodes made clusters collectively. A cluster is a combination of relative nodes. Then from these clusters a cluster head is selected which is used to transfer the data to sink node. [2]The nodes in the WSN consumes a amount of energy.This enrgy makes the cluster nodes to behave activily at the time of communication with the sink node.The lifetime of the network depends upon the amount of energy consumed by the cluster nodes,less energy comsume will helps to increase the lifetime of the network.WSN faces the problem of limited lifespan due to lack of energy available in the network[1].

WSN also faces the problem of localization. Localization is process which defined the position of node in network. Localization is a problem which is relatd to the deployment of nodes or location of the nodes.nodes deployment can[7] be of two types i.e. static node deployment and dynamic node deployment. In case of static node deployment the best location of the nodes are choosen and then this location doesn't through out the existance of the network[8].In case of dynamic node deployment first of all maximum performance of the sensor network is obtained and then sensor nodes automatically move in the network to proper location and then starts working.

Localization is a kind of technique or tool which is used for deploying the nodes in case of low-cost sensor network. The example of localization is GPS system but it is not a kind of low-cost sensor network [9].

The following diagram shows the layout of the network in which there are 25 nodes and the nodes which communicate directly are linked with the edges. The way in which the nodes are linked plays an important role for the accuracy of localization algorithms[1].
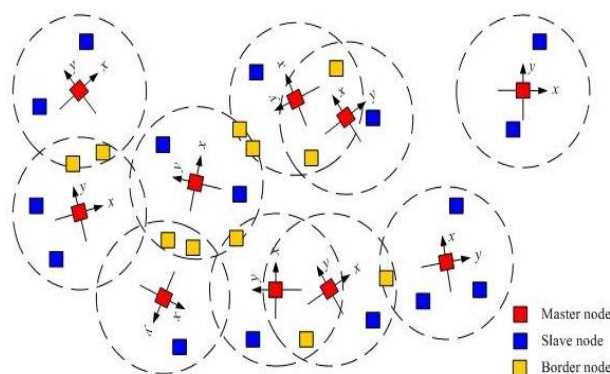

Fig.1: Network Topology

II. LOCALIZATION METHODOLOGY

Localization [3] is a technique used for deployment of nodes. In localization methodology various techniques or algorithms are defined. The algorithms are as follows [10]:

- The signal propagation theorem
- K-Nearest Neighbors Fingerprinting Estimation
- Probabilistic Estimation.

All above algorithm is explained in the coming section:

Signal Propagation Theorem: According to this theorem, in case of controlled environment signal interference is not allowed. Wi-Fi RSS is used to track the object, [8] whereas in some algorithms visible light and sound is used as a tool to track the object. [9]Radio frequency signals follow the rules of propagation theorem.

$r_j(d_{j,k}) = r_k(d_k) - 10\alpha \log_{10}(d_{j,k}) - wallLoss$

r_k defines the initial RSS with the reference distance $d_0 = 1m$,

α is used to define the path loss exponent. In some other cases the parameter of α may vary from 1 to 6,

Wall Loss is used for denoting the total number of losses exists in the system environment corresponding to line segments.

$d_{j,k\ is}$ used to define Euclidean distance[11].

K-Nearest Neighbors Fingerprinting Estimation: It is an algorithm which is used to find out the position of sensors.[12] By using this algorithm the approximate position of the sensors can be estimated only. To apply algorithm two sets of data are required. First data set is a sample of RSS which relates to N APs. A sampling vector R is used which defines [r1, r2, r3……rN]. The elements of the vector are independent of RSS measured in dBm. The elements of the vectors are collected from APs in the location.[6]Other data set consists of average RSS which relates to the N APs at specific location. [13] A database is created by the data named as LF database. In this data set vector is denoted by F. The elements of the vector F is [f1, f2, f3,…..fN]. The position of elements of the vector are denoted by a vector D =[d1,d2, d3………dN].

Probabilistic Estimation : This is an algorithm in which probabilistic estimation is used to define the probability that used to choose the correct fingerprint. To measure the probability Euclidean distance is used[14], For example if both vectors i.e. sample vector and location fingerprint vector have same values then the correct location can be find. Whereas it not possible that the sampling vector and location both poses the same values.[15] The equation for measuring the Euclidean error distance is as follows:

$|r-f_{correct}|$

It may also generate false or wrong neighbor location.

III. RELATED WORK

[1] Koen Langendoen [1], in this paper, author describes the problem of localization in ad-hoc networks. In this comparison is done between three localization algorithms. The algorithms used in this are N-hop multilateration, Ad-hoc Positioning and Robust Positioning. The algorithm used by the author follows the three phase structure as follows:

      Phase 1**:** calculate the distance corresponding to anchor node.

      Phase 2**:** calculate the position of the node.

      Phase 3**:** It follows an iterative procedure to define the positions of nodes.

After simulation it is proved that no algorithm individually is best to use. Each and every algorithm generate different result corresponding to various parameters like anchor fraction, range errors etc. Each and every algorithm has advantages corresponding to various phases.

[2] Eddie C.L. Chan [2], in this author defines that WSN has wide range of applications. WSN can be used in Localization and real time tracking system. Traditional system commonly generates the problem of LOS. Los stands for line of sight. Traditional system also depends upon the light intensity of the background. Location fingerprinting uses the data sets for localization. The disadvantage is that it is must to have datasets for localization and output gets affected by changing the internal structure. In this author presents a sensor based LF method. After simulation it is observed that the sensor based LF technique is much reliable as compare to traditional LF technique.

[3] Mihail L. Sichitiu [3], in this author explains that WSN is best candidate for becoming pervasive sensing technology. In some applications expensive sensors are used instead of few expensive sensors. The sensors in the network prevent the hand placements of the sensors. Localization is a method which is used to calculate the physical location of the nodes after the deployment of the nodes. In this author presents radio frequency based technique for localization. After simulation it is observed that this technique is suitable for many applications.

[4] Ramesh, Maneesha V [4], WSN stands for Wireless Sensor Network**.** It includes large number of sensors. It is applicable in those areas where human intervention is not possible or difficult. It is used to measuring the parameters of the surroundings in which it is deployed. Thus it is workable in the case where the location is unknown. Many localization algorithms are used to enhance the reliability and efficiency of the system. In this paper author presents the technique of localization named as fuzzy based localization algorithm.

[5] **Bhavana Adiga H. P [5],** WSN is sensor network which is quite popular in real world application. Nodes deployed in WSN system senses the surrounding environment and its parameters. Various routing protocols are developed for increasing the accuracy of the system. In this a technique for clustering is defined as BFOA. BFOA stands for Bacterial Foraging Algorithm. The basic idea behind this technique is LEACH protocol. After applying BFOA it is proved that it is much helpful to increase the performance accuracy of the system as compare to traditional technique.

[6] **Er. Nisha Devi [6],** with the advancement in the technology of VLSI and semi-conductors, the popularity of WSN is also increased. WSN is a collection of sensors which combines the real world with virtual world. The working of the sensor nodes depends upon the battery consumed by the nodes. This leads to the problem of energy saving. WSN is also known as MANET i.e. Mobile Ad-hoc Network. In this sensors are deployed randomly which leads the problem of covering all nodes or few nodes. Hence, this problem can lead to the decrease in the overall performance of network. The main focus of the author is to calculate the location of the sensors and finding the shortest route between nodes.

IV. CONCLUSION

Localization is one of the major challenges in the wireless sensor network. Localization is the method of determining the position of the node in the network. All the techniques that are studied some of them are advancement in traditional techniques. All the techniques are efficient and have many advantages but on other side there are some disadvantages also. There are many types of Localization techniques is available. Many techniques are reviewed in this paper corresponding to the problem of localization. The algorithms studied in this paper are signal propagation theorem, K-Nearest Neighbors Fingerprinting Estimation, Probabilistic Estimation.

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