

Localization in Wireless Sensor Networks

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Abstract— Wireless Sensor Network is very interesting research are for sensing the environment, temperature or humidity means any quantity that you can measure around the area. In this paper, we will discussed about localization, their classification, issues, methods, classification based on localization or etc. We will discuss about localization method, performance approaches in different condition, compare their efficiency or other related term about localization in sensor network.

Keywords—Sensor Node, Wireless Sensor Network, Time of flight, Technique of localization

I. INTRODUCTION

Wireless sensor network is very interesting area for limited sensing, computation or communication capabilities by consisting of set of sensor node but with in low cost. These sensor nodes are very small in size but perform different types of function according to the environmental condition. These sensor nodes are required more energy consumption to providing the services like for sensing the humidity, temperature or any other quantity. Two thing are main important which distinguish the sensor node from the traditional system.

a) Sensor node can be designed by using complex technique and can be placed at very large distant from the target.

b) A set of the sensor node perform the sensing so the arrangement of node with their topology can be engineered very carefully.

In this paper, we will discuss about the WSN localization. Localization in WSN means that to finding the location of node in environment. By find out the position of node you can detect or record or route your packet based on some routing protocol. Manual arrangement of node in large sensor network is not possible because it require a lots of energy and cost consumption.

II. LOCALIZATION

Localization in wireless sensor network means that to find out the physical position in a group of sensor node in wireless sensor network. For performing the localization, sensor require self organize a co-ordinate system. Localization concept used in wireless sensor network to provide the report about data which exist in geographical environment. Localization provide the services about routing and types of routing like geographical, context based and location based routing. But there are two problem exist with localization in wireless sensor network:

(1) We may not be sure about the right decision about co-coordinator which control whole sensor network as a single network.

(2) To find out the exact position of node in a network, we can not calculate the decision between sensor nodes. C- Coordinator can be place globally or relatively.

Globally coordinator can be place with external device like UPS. And if you are using the relative coordinator for performing the localization you will place arbitrary transformation which is place at very large distance from the global coordinate system.

Classification of localization in wireless sensor network

There are three classification of localization in wire- less sensor network:

- (1) Centralized verses Distributed
- (2) Anchor-free verses Anchor based
- (3) Range-free verses Range-based

In Centralized classification, all the computation means localization can be done by central server. In Distributed

localization, localization function can be performed by single node for different area.

In Anchor base localization all the sensor node are knows there exact position by using GPS or manual placement. But it require for 2D three and 3D four anchor nodes for localization. In Anchor free localization, all the node compute the distance based on some assumption these node can not determine exactly distance but compute some related coordinate.

In Range free localization, to computing the position of node in a network ,we will use simple local technique or hop count technique which require simple implementation process over any area. In Range based localization, this require receive signal strength indicator, time arrival time difference of arrival and angle of arrival for performing the localization in wireless sensor network. In mobile localization,

Resources constraint:- As we know very well that sensor node having limited resources or energy but it require more battery power to provide the services for sensing any node of area. But if sensor node have weak node means they can not perform their function in proper way then computation for node becomes infeasible. So all the function that perform sensor node means that communication, processing and sensing power will become very high. The main advantage of localization in this issue is that it reduce the cost by providing sufficient result.

Node density:- Sensor node are very sensitive for node density. It means that if you are using any technique for localization and require high density then your computation must be correct. But if you are required not high density based on beacon node then hop count approximation for distance will not correct and you cant find exact position of node in any area.

Non Convex topologies:- sometimes sensor node are used in convex shape in any area for covering problem. But this convex shape requires the arrangement of node in well manner. Sensor which is used outside the always lead to unlocalizable and error. So to solve this problem shape is require border nodes and few measurement of node from outside of this shape.

Environmental obstacles and terrain irregularities:- Environmental obstacle means to including large rocks, line of sight, interfere with radios and introducing error in to RSSI indicator. Due to all these obstacles they produce insufficient hop count distance to measure the position of node in network.

System organization:- To computing the position of node in wireless sensor network, we require the arrangement of system in centralized algorithm or distributed algorithm. Centralized system are run on central system with large amount of computation power. In this, node collect all the

data and transmit to the base station for analyzing the position of node in wireless sensor network by reducing the problem of computation limitation. In Distributed algorithm, all the machine will be run on different computer with own computation power. In this algorithm, all the data are collected at one node and then decide the position of all nodes in network by contribution of all participating node. Distributed algorithm use two main approaches:

(1) Bacon based distributed algorithm: this algorithm will be implement with in small number of beacon node and find out the own location based on measurement of previous phase.

(2) localization: In this algorithm, we will try to obtaining global metric over the coverage area in distributed manner by using relaxation based distributed algorithm or Coordinate system switching.

Localization method:-

All the algorithm and technique are classified in to two main categories: (1) Range based method

(2) Range free method.

(1) *In range based method*, this method is very oldest method to computing the position of node. These methods are applicable to inter node distance. In this we will obtain the distance between pair of node firstly and then compute the individually position of node based on that distance. Example of this method is Triangulation which is very basic approach. And other is:

Receive signal strength: This signal appears as electromagnetic waves with energy of radio signal. But it decreases the energy of radio signal due to travelling in a space. To obtain the distance between nodes, we will compare originally emitted power or received signal power.

Time of flight:- . This method are applicable to radio signal. When a signal travel and we know their speed and measurement then we can easily obtain the distance based on estimation. If the propagating speed is fast then time accuracy[3,3] must be correct by the sensor node.

(2) *Range free method*, this method will never be used for obtaining the distance between node but it require for connectivity information or hearing to node, decide the range and calculate their position based on their assumption.

Do you hear me: In this method, all the node can communicate directly to the neighbor node and producing accurate result for distance by reducing the traffic but it require large number of node.

APIT: It divide beacon area in to triangular shape which keep record for every node and perform these activities:

(1)To checking node for every triangle, if inside then add it.

(2)Break the triangle, if accuracy is not producing by node and estimate their position.

APIT require signal strength which decrease as the distance is varying and then compute the distance for every node.

Approaches: manual configuration and GPS based localization.

In manual configuration, this approach is very difficult to understand and very costly for implementation. It is not a practical approach for implementation. In GPS based localization, each sensor contain own GPS receiver which perform function outside on earth. This approach is used for movement of node from one place to another but it is not feasible for cost

Indirect approach: This approach is recognized as a relative localization. In this, the entire node knows position of every neighbor node. This approach overcomes the drawback of GPS based localization by consisting the main advantage is accuracy of localization. In this approaches, all the beacon node send the signal [to compute the location] about their location to all the node they don't have GPS receiver. Indirect approach also consist range based or range free localization process.

Technique of localization

We can classify the technique of localization in wireless sensor network in two parts:

*Direct Approaches :*The technique is also recognized as absolute localization. It contain two parts for direct

Types of sensor networks based on localization

Available wireless sensor network are operate on land, underground and underwater. Due to support for every types of environment, sensor network has five types of wireless sensor network :

Terrestrial WSN made of several sensor nodes which is arrange in ad-hoc manner pre-planned manner. Sensor node is place randomly in case of ad-hoc manner or greed placement, optimal placement in case of pre-planned manner.

Underground sensor node contains several nodes in buried, cave, mine structure. These can locate the sensed information to the base station from sensor node by using additional sink node which is located above the ground. Theses sensor node are very expensive because they faces the many problem due to different environment.

Types of sensor network	Structure	Technique for placement	Reliable environment	Secondary source devices	Advantage	Disadvantage
Terrestrial sensor network	Ahhoc preplanned	Randomly Grid placement	Dense environment	Solar cells	No redundancy	Require multihop routing
Underground Sensor network	Buried ,cave, mone	Heap form like soil and water	Underground environment	Sensor node battery	Increase lifetime of a network	Expensive ,signal loss, high attenuation
Under water	Deployed node \$ vehicles under water	–	Sparse environment	–	Efficient under water communication	More expensive. require underwater vehicle
Multimedia data	Preplanned manner	Multimedia form like	Wireless connection	Network technique, camera, phone	High processing and delivery function	High bandwidth,energy consumption,QoS
Mobile wsn	Adhoc manner: static, dynamic	Fixed routing ,flooding	Real time environment	–	Sense. compute	Localization, self organization, navigation

Underwater sensor network contain number of node and vehicles operated in underwater. These sensor networks are very expensive and some node is used to sense the information. These networks require underwater vehicles for collect the data from sensor node. This node faces the problem of limited bandwidth, long propagation and signal fading issue. The WSN suitable for sparse environment to

developing efficient underwater communication and networking techniques. Multimedia sensor network are able to monitor and sensed information of multimedia like video, audio and imaging.

III. REFERENCES

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