

Enhancement of Localization Algorithm in Wireless Sensor Networks

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Abstract: Localization is that the main sensible issue in wireless sensor networks as a result of several applications need the sensing element to understand their actual position with a high degree of exactitude. In WSN, due to limitations of nodes energy, energy potency is a vital factor which should be considered when protocols are designing. In wireless sensor network due to Varied localization methods supported mobile anchor nodes are projected for helping the sensing element in node to see their location. Consequently, this paper presents a path designing theme, which ensures that the flight of the mobile anchor node minimizes the localization error and guarantees that everyone of the sensing element node will verify their location further as LEACH protocol plays a vital role in response to the uneven energy distribution that's caused by the randomness of cluster heads forming. The performance of the projected theme is evaluated through a series of simulations with the .NET. The result shows that, shortest path finds by using Dijkstra's algorithm.

Keywords: Localization, mobile anchor nodes, obstacles, path designing, wireless sensor networks, routing protocol.

1. Introduction

A wireless Sensor Network (WSN) consists of hundreds or thousands of sensor nodes and a small number of data collection devices. The sensor nodes have the form of low-cost, low-power, small-size devices, and are designed to carry out a range of sensing applications, including environmental monitoring, military surveillance, fire detection, animal tracking, and so on. The sensor nodes gather the information of interest locally and then forward the sensed information over a wireless medium to a remote data collection device (sink), where it is fused and analyzed in order to determine the global status of the sensed area. In wireless Sensor Network (WSN), sensed data with location information is valuable. Several schemes, broadly classified into two categories, have been proposed for dealing with the localization. First, the range-based schemes need either node-to-node distances or angles for estimating locations. The range based schemes typically have higher location accuracy. Although these schemes cannot accomplish as high accuracy as the range-based ones, they provide economic approach. However, the accuracy of current algorithms is mostly environmentally sensitive which lead to low reliability and low success rate about the location results. Most localization mechanisms use fixed anchors. However, if all of the nodes within the network have the ability to determine their locations, a large number of fixed anchors are required. Thus, several methods have been proposed for reducing the anchor deployment cost by utilizing Global positioning system GPS-enabled mobile anchors, which navigate the sensing field and issue periodic beacon messages advertising their current coordinates.

As a new information acquisition and processing technology, wireless sensor network (WSN) has a wide range of applications in military, environmental monitoring, smart furniture and space exploration. Wireless Sensor Network can be described as an autonomy system consisting of lots of sensor nodes designed to intercommunicate by wireless radio and it can collaborate in real time monitoring,

perceiving and collecting information of various environmental or monitoring objects and transfer this information to the base station. It does not need a fixed network support and it has rapid employment, survivability and other characteristic, so it has a good application prospect. Until now the research on sensor network generally has gone through two stages, the first stage is primarily intended for node, the second one is for network-level issues, the main research works in this stage involve the network layer and MAC (media access layer) layer protocol based on energy optimization, node localization technology, clock synchronization technology and data fusion technology. Study of routing protocols in wireless sensor networks is one of the hot topics at this stage. LEACH (low energy adaptive clustering hierarchy) protocol is the first protocol of hierarchical routings which proposed data fusion; it is of milestone significance in clustering routing protocols. Many hierarchical routing protocols are improved ones based on LEACH protocol. So, when wireless sensor networks gradually go into our lives, it is of great significance to research on LEACH protocol. In LEACH protocol, due to the randomness of clusters forming, the energy of cluster head is very different, so do the distances between cluster heads and base station. Cluster heads are responsible not only for sending data to the base station but also for collecting and fusing the data from common nodes in their own clusters.

2. Background

Following method plays an important role in our project to find exact location of node by using following algorithm and routing protocol.

i. Localization Algorithm

In the localization scheme, a mobile anchor node moves randomly through the sensing field broadcasting periodic beacon messages containing its current coordinates. The locations of the individual sensor nodes are determined by

exploiting the fact that the perpendicular bisector of a chord of a circle passes through the center of the circle. As the anchor node moves through the sensing field, it broadcasts its coordinates periodically, and each sensor node chooses appropriate locations of the anchor node (called *beacon points*) to form chords of its communication circle. We propose a technique and protocol to finding the exact location of the node by using Path planning algorithm but with different topology means by using star topology to find the location of node.

ii. LEACH Protocol

LEACH (Low energy adaptive clustering hierarchy:-In LEACH the network are divided in to the number cluster and the each cluster are divided in to the two parts that is cluster head and non-cluster head. We calculating cluster head by, a node carry much energy is set as a cluster head. And all communication is done via the cluster head only. LEACH Protocol is a typical representative of hierarchical routing protocols. It is self adaptive and self-organized. LEACH protocol uses round as unit, each round is made up of cluster set-up stage and steady-state stage, for the purpose of reducing unnecessary energy costs, the steady state stage must be much longer than the set-up stage.

3. Literature Survey

Previously, various authors have proposed different techniques to find location of node, in the existing scenarios path planning scheme, which ensures that the trajectory of the mobile anchor node minimizes the localization error and guarantees that all of the sensor nodes can determine their locations[1] and the other one is finding the location of node by using two cord method. By doing this they able to find the x,y co-ordinates of the node. But drawback of this paper is not all node be reach by this topology[2]. Wireless sensor network (WSN) technology has been successfully applied to energy saving applications in many places, and plays a significant role in achieving power conservation. However, previous studies do not discuss WSN costs and cost-recovery. But drawback is data is transmitted to the all node[3].In [4], we have studied the problem of path planning for mobile landmarks to reduce localization error as well as the time spent on localizing the sensor network and study three different trajectories for the mobile landmark, namely SCAN, DOUBLE SCAN, and HILBERT. We show that any deterministic trajectory that covers the whole area offers significant benefits compared to a random movement of the landmark[4].Localization technique based on a single mobile beacon aware of its position [5].However, previous studies do not discuss WSN costs and cost-recovery. But drawback is data is transmitted to the all node. In propose scenario we are using multiple anchor node, by doing this we get exact and every time the location of node and here we are using a protocol whose work is transmit the data and getting a nearest path.

Chia-Ho and all [1] "Path Planning Algorithm for Mobile Anchor-Based Localization in Wireless Sensor Networks" Localization is an essential issue in wireless sensor networks because many applications require the sensor nodes to know their locations with a high degree of precision. Various localization methods based on mobile anchor nodes have

been proposed for assisting the sensor nodes to determine their locations. However, none of these methods attempt to optimize the trajectory of the mobile anchor node. Accordingly, this paper presents a path planning scheme, which ensures that the trajectory of the mobile anchor node minimizes the localization error and guarantees that all of the sensor nodes can determine their locations. The obstacle-resistant trajectory is also proposed to handle the obstacles in the sensing field. The performance of the proposed scheme is evaluated through a series of simulations with the NS-2 network simulator. The results show that the proposed path planning algorithm yields both a lower localization error and a higher percentage of localized sensor nodes than existing path planning schemes. Index Terms—Localization, mobile anchor nodes, obstacles, path planning, wireless sensor networks. [1]

Chunyao FU and all [2] "An Energy Balanced Algorithm of LEACH Protocol in WSN" author in this paper deals with In wireless sensor networks (WSNs), due to the limitation of nodes' energy, energy efficiency is an important factor should be considered when the protocols are designing. As a typical representative of hierarchical routing protocols, LEACH Protocol plays an important role. In response to the uneven energy distribution that is caused by the randomness of cluster heads forming , this paper proposes a new improved algorithm of LEACH protocol (LEACH-TLCH) which is intended to balance the energy consumption of the entire network and extend the life of the network. The new algorithm is emulated by Matlab simulation platform, the simulation results indicate that both energy efficiency and the lifetime of the network are better than that of LEACH Protocol[2].

Kuo-Feng Ssu and all [4] "Localization With Mobile Anchor Points in Wireless Sensor Networks" proposed Localization is one of the substantial issues in wireless sensor networks. Several approaches, including range-based and range-free, have been proposed to calculate positions for randomly deployed sensor nodes. With specific hardware, the range-based schemes typically achieve high accuracy based on either node-to-node distances or angles. On the other hand, the range-free mechanisms support coarse positioning accuracy with the less expense. This paper describes a range-free localization scheme using mobile anchor points. Each anchor point equipped with the GPS moves in the sensing field and broadcasts its current position periodically. The sensor nodes obtaining the information are able to compute their locations. With the scheme, no extra hardware or data communication is needed for the sensor nodes. Moreover, obstacles in the sensing fields can be tolerated. The localization mechanism has been implemented in the network simulator NS-2. The simulation results show that our scheme performed better than other range-free mechanisms. [4]

Dimitrios Koutsonikolas and all "Path planning of mobile landmarks for localization in wireless sensor networks" focus on Many applications of wireless sensor networks require the sensor nodes to obtain their locations. The main idea in most localization methods has been that some statically deployed nodes (landmarks) with known coordinates (e.g., GPS-equipped nodes) transmit beacons

with their coordinates in order to help other nodes to localize themselves. A promising method that significantly reduces the cost is to replace the set of statically deployed GPS-enhanced sensors with one mobile landmark equipped with a GPS unit that moves to cover the entire network. In this case, a fundamental research issue is the planning of the path that the mobile landmark should travel along in order to minimize the localization error as well as the time required to localize the whole network. We show that any deterministic trajectory that covers the whole area offers significant benefits compared to a random movement of the landmark. When the mobile landmark traverses the network area at a fine resolution, SCAN has the lowest localization error among the three trajectories, followed closely by HILBERT. But when the resolution of the trajectory is larger than the communication range, the HILBERT space-filling curve offers significantly better accuracy than the other two trajectories. We further study the tradeoffs between the trajectory resolution and the localization accuracy in the presence of 2-hop localization, in which sensors that have already obtained an estimate of their positions help to localize other sensors. We show that under moderate sensor mobility, 2-hop localization along with a good trajectory reduces the average localization error over time by about 40% [5].

4. Problem Definition

Localization of mobile node is the main issue in mobile networks because many applications require the mobile nodes to know their locations with a high degree of precision. In many mobile network applications, the nodes are required to know their locations with a high degree of precision, broad speaking these methods can be categorized as either rang-based or rang-free. In rang-based schemes, the node location is calculated from the node-to-node distances or inters node angles. Conversely, in range free schemes, the node location is determined by radio connectivity constraint.

Range based schemes are typically more accurate than range free schemes. However, they require the use of infrared, X-ray or ultrasound techniques to calculate the inter-node distances and/or angle; and are therefore both more complex and more expensive than range-free schemes. As a result, range-free localization schemes tend to be preferred for large-scale Mobile network applications.

5. Propose Methodology

Localization is the main issue in mobile network, if the location of node is unknown then there may be the chances of packet delay and packet failure. To overcome this problem a new technique and a protocol is proposed which is used to find exact location of the node by using Path planning algorithm but with different topology i.e. by using star topology we can find the location of node. In previous work only one mobile anchor node is used to find location of node but in this proposed methodology multiple mobile anchor nodes are used to find the exact position of node. Due to this, Every time we get exact location of the node. One of the challenging thing is that LEACH protocol is also implemented is this proposed methodology.

i) LEACH (Low energy adaptive clustering hierarchy) protocol) : To route the path it is assumed that the WSN consists of stationary sensor nodes randomly deployed in an $L \times L$ field and a single mobile anchor node. It is assumed that the mobile anchor node obtains its position coordinates via a x, y co-ordinate. If three beacon points are obtained on the communication circle of a sensor node, it follows that the mobile anchor node must pass through the circle on at least two occasions. LEACH (Low energy adaptive clustering hierarchy) the networks are divided in to the number cluster and the each cluster are divided in to the two parts that is cluster head and non-cluster head. We calculating cluster head by, a node carry much energy is set as a cluster head.



Figure 1: Snapshot for finding shortest Path

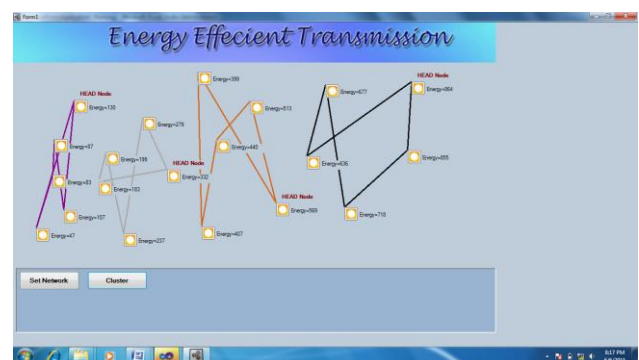


Figure 2: Snapshot to create the group of clusters

The snapshot first shows that, there are maximum 20 nodes . Each and every nodes add the distances then communication is done in between source and destination to find the shortest path by using Dijkstra's algorithm. Same like that, second snapshot shows that, these all nodes gets the energy to create the group of cluster and We calculating cluster head by, a node carry much energy is set as a cluster head.

6. Conclusion

In this paper, a new technique with mobile anchor node is used to find the exact location of nodes by using path planning algorithm. Similarly, to gain the better performance LEACH i.e. Low Energy adaptive clustering hierarchy protocol with basis of co-ordinate of the node is used. Due to this protocol, energy as well as time is consumed as the data is transmitted from cluster head to cluster head. In this way by using anchor nodes and LEACH protocol we will achieve

enhanced path planning algorithm and energy efficient data transmission in wireless sensor network.

7. Future Scope

In the future scope, head node will be trace the location by using mobile anchor node and we will see the position of head node in (x,y) directions.

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