Recent Trends In Wireless Sensor Networks

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Abstract-*In recent years, Wireless sensor network is one of the rapidly growing areas. It consists of thousands of tiny sensor nodes distributed in application area.WSN (Wireless Sensor Network) is a collection of battery powered tiny sensor nodes which has ability of collecting, processing, storing and transferring the sensed data from one node to another. These sensors work with every other to sense some physical phenomenon after which the information gathered is processed to get relevant outcomes. These sensor nodes can calculate, sense, and assemble particulars from the atmospheres and based on some neighborhood decision process, they are able to transmit the sensed records to the person. These capabilities make sensor network to be used for many applications like environmental monitoring, intruder detection, object tracking and many more. Due to several resources constraint design tracking algorithm in terms of tracking quality and energy efficiency is a challenging issue in WSN and has gained worldwide attention in recent years.*

Keywords-wireless sensor network, object tracking, intruder detection, prediction, design tracking.

I. INTRODUCTION

Wireless Sensor Networks (WSN) is group of small sensor nodes connected by wireless media. They are low cost, battery powered, placed randomly to form a sensor field. [1]The sensors are distributed to monitor physical or environmental conditions, such as temperature, sound, vibration, motion, pressure or pollutants. It has an ability to work cooperatively and pass their data through the network to the Base Station (BS) or a sink node. WSN has the ability to dynamically adapt to changing environments.

Object tracking is one of the challenging applications for Wireless Sensor Network in which group of wireless sensors nodes are involved in the task of tracking a moving object. It consists of mainly two phase: 1) Detection of object 2) Monitoring and 3) tracking of object. Object Tracking is widely used in many applications like military application, commercial applications, field of surveillance, intruder application and traffic applications. There are various metrics for analyzing object tracking such as cluster formation, tracking accuracy, cluster head life time, miss rate, total energy consumed, distance between the source and object, varying speed of the object, etc. The open issues in object tracking are detecting the moving object's change in direction, varying speed of the object, object precision, prediction accuracy, fault tolerance and missing object recovery.

In all tracking process, more energy is consumed for messages or data transmission between the sensor nodes or between the sensor and sink. In traditional object tracking, the entire sensor node pass their sensed data to the one node (base station or a sink node) therefore computation burden increases at that node, results in less accuracy and reduction in energy efficiency. In WSN, each node has very limited power and consequently traditional tracking methods based on complex signal processing algorithm are not applicable.

In an object tracking application, the sensor nodes which can sense the object at a particular time are kept in active mode, while the remaining nodes are to be retained in inactive mode so as to conserve energy until the object approaches them. To continuously monitor mobile object, a group of sensors must be turned in active mode just before object reaches to them. The group of active sensor nodes varies depending on the speed of moving object. Those groups of active sensors are scheduled by cluster head.

The sensor nodes detect the moving object and transmit the information to the sink or the base station. The object tracking algorithm should be designed in such a way that it results in good quality tracking with low energy consumption. The good quality tracking extends the network lifetime and achieves a high accuracy.

II. NAÏVE ARCHITECTURE

[1]Naive architecture (or centralized) based tracking method is the simplest approach, in which all nodes are in tracking mode all the time. In this case all the network nodes are at the same level in terms of work responsibility. All the sensor nodes always try to intercept and monitor object which comes within their sensing range and pass monitored information to centralized sink node or base station.

A. Tree based architecture

Tree-based methods organize the network into a hierarchy tree. H. T. Kung et al. Have proposed STUN [2] where construction of the tree is based on the costs. Cost is computed from the Euclidean distance between the two nodes and assigned to each link of network graph Some algorithms are Scalable Tracking Using Networked Sensors, Dynamic Convoy Tree-based Collaboration and Optimized Communication and Organization. Wensheng Zhang has proposed DCTC [3] algorithm, dynamically constructs a tree for mobile object tracking.

B. Cluster based architecture

[1]Cluster based architecture is used to facilitate collaborative data processing, in which large network is divided into small regions called cluster. Each cluster has a cluster head (CH) and slave nodes (members). Clustering is particularly useful for applications that require scalability to hundreds or thousands of nodes.

1. Static clustering

In static clustering, clusters are formed manually at the time of network deployment. The attributes of each cluster, such as the size of a cluster, the area it covers, and the members it possesses are fixed throughout the network lifetime.

2. Dynamic clustering

Examples of dynamic cluster-based tracking are but not limited to RARE, Dynamic Clustering Tracking Algorithm DCTA and Adaptive Dynamic Cluster-based Tracking (ADCT). Wei-Peng Chen et al. have proposed, Dynamic clustering algorithm [4] for acoustic object tracking in WSNs, constructs a voronoi diagram for CHs and nearest CH to object in each interval time is selected as active CH.

C. Hybrid architecture

Hybrid architecture generally combines one of the previously mentioned architectures with some prediction mechanism. Examples are PES (Prediction-based Energy Saving), DPR (Dual Prediction-based Reporting) and DPT (Distributed Predicted Tracking). These methods focus on increasing energy efficiency by keeping most of nodes in sleeping mode. Yingqi Xu et al. have proposed, DPR [5], where the next location of object is calculated at both sensor nodes and sink.

An auction based adaptive sensor activation algorithm for target tracking in WSNs is presented in (Zhenga et al., 2014) [6] where the authors used an auction mechanism for selecting the cluster head. When the difference between real location and predicted location is acceptable, no update message sends to sink and therefore less packets are transmitted to the sink which results in less utilization of communication bandwidth.DPR reduces the energy consumption of radio components by minimizing the number of long distance transmissions between sensor nodes and the sink node with a minimal overhead.

III. TYPE OF SENSORS

The tracking methods are widely different depending on the type of sensors used:

A. Ordinary sensors.
B. Binary sensors.

A. Ordinary Sensors

The ordinary sensor network consists of the type of sensor nodes that operate on original values of signals. Thus the distance, speed and direction of target have to be calculated on the basis of signal strength measured by the sensor nodes.

B. Binary Sensors

The binary sensors detect only two binary values. They can detect the presence or absence of the target in their sensing range by signaling either by 1 or 0. Thus the tracking mechanism in this case is more complicated than ordinary sensor networks [4,12].

IV. CONCLUSION

WSN avoid obstacles in the network by its decentralized forwarding technique, there by networks which are comprised of sensors that are distributed in an ad hoc way. WSNs are becoming a cost effective, practical way to go about deploying sensor networks. WSN uses different technology to avoid the reducing packet drop due to network load, as against the compared approach. The redundant nodes are identified and scheduled alternatively in the atmosphere with random obstacles. All this makes the technique reliable scheme which improves the overall network quality of service for WSN. Based on the survey, all the object tracking methods aim to minimize number of active sensor nodes to minimize energy consumption. There is always tradeoff between energy efficiency and accuracy.

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