

Mobile Object Tracking in Area of Wireless Sensors Network

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Abstract— In this project of the mobile object detection in the environment of the wireless sensor network is a challenging task. Clustering is there to save energy of the nodes in the network. In network, localization is very important part of sensors to know the position of the sensor which is detecting target at that point. Range free localization technique is we are going to use in this project. Range free localization is of very less cost and minimum hardware require for this type of localization. Here as the target is an moving object we are using LEACH algorithm. This project can be useful in the area where GPS is not able to respond appropriately like in Coal mine, Forest, Indoor Applications, Battle field etc.

Keywords- WSN; Tracking; NS2; LEACH; Prediction.

I. INTRODUCTION

Mobile And Static Sensor Network is an intelligent technique for the target tracking. There are many applications for both static and mobile sensors in health care, surveillance, human computer interaction[13] like Green building communication [12], Flu virus tracking, Air quality monitoring[15], Tracking in hard to reach areas like Nuclear Power Plant[4], Disaster recovery, intelligent traffic system, Instruction Detection in facility management, precision agriculture[5] etc. Localization is very essential part in the target tracking. There are two types of localization range based and range free[12][2]. Where both technique has its own advantages and disadvantages. Range based method measures different phenomenon in and between the nodes like[12] Time of arrival, Time difference of arrival, received signal strength indicator for localization of the node. In this range based techniques GPS like localization system are used. And inter node communication is the technique use in range free localization. In range free localization heavy computation required but cost is low compare to range based technique. For range based an interference and additional hardware requirement are problems in this technique. Here we are using Range free technique it is based on the centriod method where we are using hopping for communication with the sink node.

The algorithm used in this project is Low Energy Adaptive Clustering Hierarchy protocol (LEACH) which is proposed by the authors in [16]. Based on the probability model algorithm elects cluster heads, adjusting to topology modifies. In this cluster head directly send data to base station that is in single hop. Also data fusion technique is there for maximizing lifetime of the network. The cluster head position is changes periodically. Extra node is not require to decide which node is become cluster head. Minimum energy is calculated by each node to send the data to cluster node, only that minimum energy is used to send the data. There is a good chance that a node with a very low energy is elected as the cluster head, as the probability is used for selection of cluster head[16]. Other nodes

than a cluster head will select its cluster's head by comparing RSSI of multiple cluster heads, from where the nodes received advertisements. Elected cluster heads broadcasts their status using CSMA MAC protocol. A TDMA schedule is created by a cluster head for its related group members in the cluster. When data from all the nodes in the cluster is received by cluster head, the cluster head aggregates, compress and transmits to the base station.

II. TRACKING IN WSN

There are different types of nodes static sensor nodes and mobile sensor nodes[15], according to application requirement one can use that nodes. We are using mobile sensor node which is a target node in this scenario. This mobile sensor node is a wearable sensor node which we are going to put on the target (eg. an animal) if hardware implementation will be there. High end sink node sequentially send broadcast message to nearby nodes and that nodes also further send the broadcast message to their nearby nodes. The cluster head is then chosen according to the highest energy in each node. Each cluster head sends neighbor discovery message to all nodes in the cluster. All cluster head using adaptive scheme for enable and disable prediction operations. Each cluster head sends their location information message to nodes in that cluster. Node which sense the data about target moving object to its cluster head and immediately that cluster head forward that message to the sink node in the network. That node continuously sends the data about target moving object periodically if that moving object is the tracking area of that node. High end sink node is going to collect all the data from the nodes by using hopping approach. Here cluster head sends data which is collected from the nodes in their cluster to the sink node. Probabilistic approach is use to select the cluster head if one cluster is active because of target in that cluster for most of the time. The cluster head changes time to time without considering power available in that node.

III. RESULTS

In this project of target tracking in wireless sensor network we are using NS2 software in the windows 7 and for environmental setting, 2D plane is considered. Number of nodes we are taking are 37 in that one node is a randomly moving target. X*Y co-ordinate value is 1250*900. For the wireless communication in node we are taking Omni directional antenna. Power requirements of the sensor nodes is idle Power is 0.9, Receiving Power is 0.005, Transmitting Power is 0.05, sleep Power is 0.0000015, and initial Energy is 200. We are using prediction operation here for target tracking. Prediction about the target is made by the network by accessing previous results about the target.

A. Average Energy Consumptions

Below result in Figure 1 shows the energy consumption of the whole wireless sensor network by taking the average of the energy consumption of each sensor node in the network for processing. Which will be useful to know the life of the network established.

B. Packet Delivery Ratio

$$\text{Packet Delivery Ratio} = \frac{\sum \text{Number of packet receive}}{\sum \text{Number of packet send}} \quad (1)$$

This result is shown in Figure 2, packet delivery ratio with time is constant after the required pick time for the network. Packet delivery ratio is responsible for the delay in the network operations.

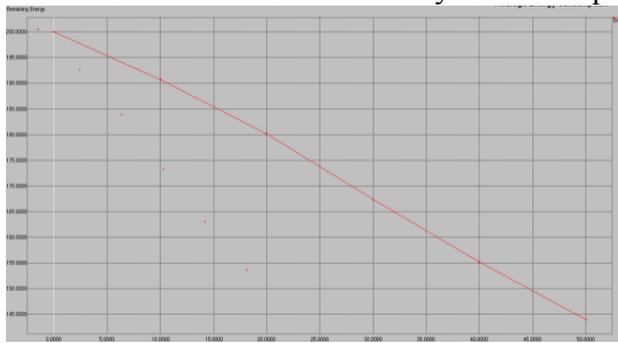


Figure 1. Average Energy consumption

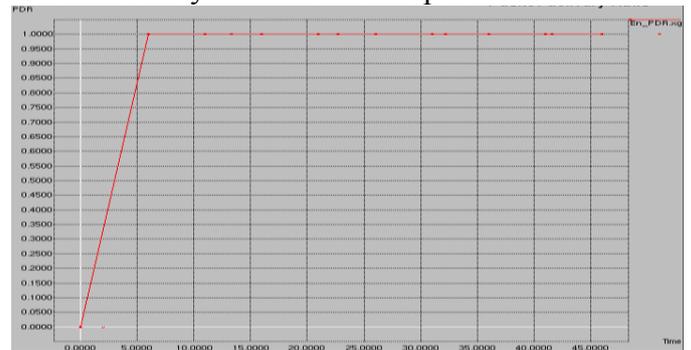


Figure 2. Packet Delivery Ratio

C. Packet Drop

To drop a packet at the particular node, overhearing must not be there in the network. also the over loading of the data cause a problem and coming the data too fast to the node also lead to drop the packet and data loss will be there. Result of packet drop with respect to time shown in Figure 3.

D. Throughput

Is the capacity of the network how much data is possible to transfer from node to the base station in given amount of the time. The required result in this project is getting after that amount of time which should be as minimum as possible Result is as shown in Figure 4.

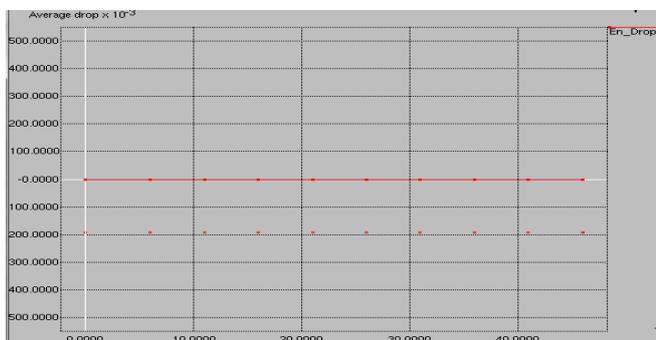


Figure 3. Packet Drop

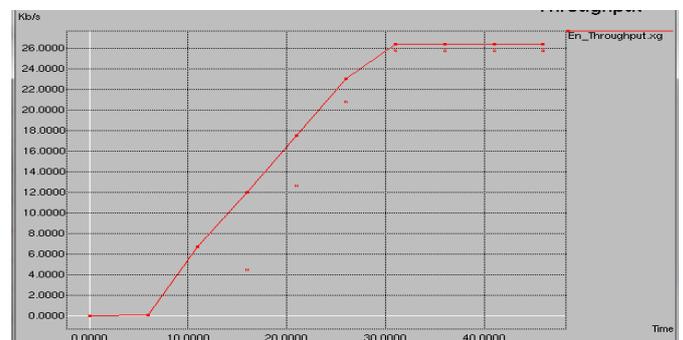


Figure 4. Throughput

IV. CONCLUSION

In this project of target tracking we successfully track the moving object which is moving randomly in the area of sensor network. We are using the LEACH algorithm in this project. We observe Average energy consumption to know the remaining energy of the network. Packet delivery ratio with respect to time which is part of MAC protocol. Also the packet drop in the network to avoid overhearing. and finally throughput of the network.

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