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MOVING TARGET LOCALIZATION IN WSNS

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ABSTRACT

An embracing hotchpotch application of wireless sensor networks is tracking or locating the moving target in the surveillance area. In this paper, we have projected an optimization framework using a selective approach algorithm for locating an object and to improve the energy of sensors. By this algorithm, the sensors placed in the region of target alone go to awake mode. So the energy is saved to a large extend which results in better performance in the system. We have estimated the proposed algorithm with existing method of blind source separation methods. By the simulation results, our investigation shows that the proposed algorithm can suggestively progress the energy and accuracy of sensors.

Keywords: *Wireless Sensor Networks, Mobile Target Tracking, Selective Approach Algorithm*

1. INTRODUCTION

Wireless Sensor Networks (WSNs) consist of several numbers of nodes or sensors distributed in a cooperative area [1] -[3]. Each node can communicate with other sensor nodes wirelessly in the premeditated communication assortment. WSNs have a group of applications like moving target tracking, ambiance monitoring, health check observes, micro surgery, armed forces operations, farming, surveillance, industrial process manages, child education, monitoring smart building etc. [4] -[5]. In WSNs, localization means determining the position of every sensor node. A number of extraordinary sensor nodes recognize their position by a fitting global positioning system (GPS) device, or manual design.These types of nodes are called as reference node or anchor node or beacon mode. Conversely, endowing GPS in all sensor nodes would be greatly luxurious and not practicable because it cannot be monitored in mines and indoor environments. In view of that, tracking target is the essential problem in wireless sensor networks [6].

To tackle this problem numerous localization algorithms are created. Extent based and range free calculations [7] are the two essential sorts of localization algorithms. The most important task of localization is to achieve the accurate position of every sensor node in the two dimensional (2D) or three dimensional (3D) plane [8]. The significant tracking method of WSNs is tree based, cluster based, prediction based tracking and Peer to Peer wsn[9]-[11] for tracking. The deployment of sensors in wireless sensor networks can be grouped into two sorts [12]: Physics-based and Geometric based. In Physics-based methodology the sensor is accepted as focuses subject to alluring alternately horrible powers like Newtons Law of strengths while in Computational geometry based methodology the sensor is expected as focuses.Different patterns of deployment like Dense or sparse deployment, Deterministic or random deployment, Virtual Force Based Approach, Enlargement Support Approach, Prototype Based Approach, Replica of Deployment Problem, Strip-based Deployment Pattern, jewel design, etc [13] .

The rest of the paper is systematized as follows. Section 2 analyses Research of Node Localization Algorithm for Wireless Sensor Networks. Section 3 analyses related work. Section 4 describes the proposed method. We evaluate the various performmance in section 5. We conclude the paper in section 6.

2. RESEARCH OF NODE LOCALIZATION

In vast scale remote sensor system, connectivity,deploying and their flexibility of the sensor nodes is more attentiveness from the manufacturing and investigation society. Action which aim to serve and support the sensors is the enlargement of low power message hardware, microcontrollers,discover the node failure,actuators

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and integration of systems [14]. Generally in sensor networks, high inspecting rates of modern advanced sensors are not required. The more basic significance of sensors is the power capability and their turn-on and turn-off time.

Following moving focuses with wireless sensors is one of the noticeable uses of remote sensor systems. To track targets, utilizing a system of sensors with wireless communication capacity empowers both expense and execution successful ways because of the accessibility of a lot of information gathered by sensors [15]**.** Depending upon the applications, sensors with particular detecting modalities, for instance, acoustic, seismic, infrared, radio, and appealing can be conveyed for following unmistakable sorts of targets. As a rule, information gathered by sensors is total information or mixtures of signals from individual targets. For instance, radio sensor in a field of investment may get signal strength from more than one target. Clearly, tracking targets in view of mixture signals can't be precise when obstruction from targets other than the one of the investment is not immaterial. The signals gathered by the sensors represent an enormous test to target-tracking resolution [16]. In WSNs, the practical resolution to an extensive assortment of applications is to track the moving target. In moving target tracking applications, intelligently organize the disasters like energy depletion of sensors, unbalanced communication links, atmospheric condition and mischievous attacks [17].

3. RELATED WORK

In [13],Li, Shengnan, et al.describes the broad-spectrum of target tracking in WSNs. The sensor nodes can be all the more legitimately sent with all the more effective and precisely where the scope and integration issue must be unease. Various protocols for target tracking was investigated in wireless sensor networks. Bhatti et.al [17] projected a narrative Fault tolerant convention for following the focus on remote sensor systems. They examined the execution of overheads and adaptable natural life of deficiency tolerant with LEACH algorithm and demonstrated FTTT ingests 25% less vitality than LEACH algorithm.In [18], Bhatti, et al. Illustrates the broad-spectrum process of target tracking to save energy in wireless sensor networks. To confirm this, the sensor nodes are in active which sense the target at the same time the left over nodes are inactive. Tsai, et al. [19] proposed dynamical object tracking protocol to track an opponent or a wild animal in wireless sensor network. The troubles, advantages, improvements and the performance comparison of target tracking techniques are analyzed in [20].In [21],the author proposed two low complexity blind source separation techniques for mixing two signals in a distributed sensor network at low bit rates.

Zou, et al. [22] proposed virtual force technique to boost the coverage and also projected probabilistic target localization scheme used by cluster head. In [23], the author proposed scalable tracking using networked sensors for tracking moving objects problem. They also proposed drain and balance method for building tracking problems on one dimensional and two dimensional networks. Shrivastava et.al [24] outlined geometric calculations and found the essential show breaking points of exactness of the target tracking for binary proximity sensors in a two dimensional field. To gauge the speed of the target they utilize the connections between binary detecting and examining hypothesis. Demigha et.al [25] concentrated on the popular critical vitality effective techniques of target tracking. They arranged the effective techniques in view of the coordinated effort of correspondence and the detecting subsystem of a solitary sensor.Zhu et.al [26] proposed blind source separation (BSS) method. Since this method affect separation performance,it is very crucial to track the target.

In our approach, we propose an optimization framework for selecting the positions of wireless sensors to detect mobile targets traversing a given area. Here, we consider two main objectives: minimizing the number of nodes deployed (cost) and maximizing the exposure of the least-exposed path. Unlike in previous work based on coverage quality, the capability of the network to detect a mobile object moving along a given path depends on the distance from sensors and is measured by the path exposure.

4. PROPOSED METHOD

An optimized An optimized framework has been proposed to select the position of the sensor nodes to detect the target moving in the given area. The main objective is to maximize the exposure of the least exposed area. In the proposed system we use a Selective Approach Algorithm (SAA)-based tracking algorithms in which energy is harvested by sleep/awake control in sensor network.

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4.1 Selective Approach Algorithm

The key step in SAA-based tracking algorithm is based on one hop neighbors.The one hop neighbor means that the nodes which are placed in direct coverage of the sensor nodes where the target is currently moving shown in fig.1.

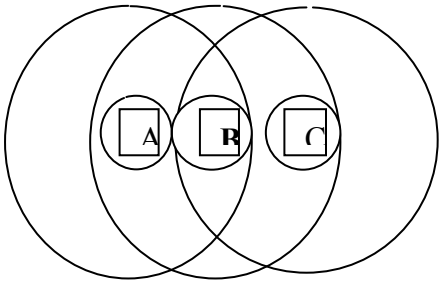

Figure 1: One hop Neighbor

Here A is a one hop neighbor of B, B is one hop neighbor of A and C, C is the one hop neighbor of B.

In Selective Approach Algorithm, energy is harvested by sleep or awake control in sensor network. In the beginning stage, all the nodes observe the target regularly,when the mobile target come in the network.Gratuitously nodes far away to the target nodes are not turned on all the time. So, the sensors near the target only set off to wakeful mode. Also, they call the one hop neighbors to come to awake mode.Sensors can collect the information and send the information all the way through multi hop communication.

The working principle of Selective Approach Algorithm is as follows: i) The node id and position of the source node will be sent to the one hop neighbor. ii) If the one hop neighbor has already received the message or if the message does not contain a node id, then drop the message. iii) Else receive the message. iv) To forward the message, select a set of neighbors based on one hop neighbor information.v) To cover the two hop neighbor the nearest one hop forwarder should be selected.

This framework consists of three modules: 1. Establish the sensor nodes 2. Generate the mobile target 3. Construct a base station node. Initially the signal of the mobile target node is sensed by the sensor node. Calculate the distance from the target. Then the sensor nodes pass all the information to the base station. The base station will easily find the exact position of the mobile targets because already it have the proportions of the sensors. The role of these algorithms are exposed in fig. 2. Also to increase the tracking performance, we use the error distance. The accuracy of the tracking performance is measured by the mean and standard deviation of error distance.

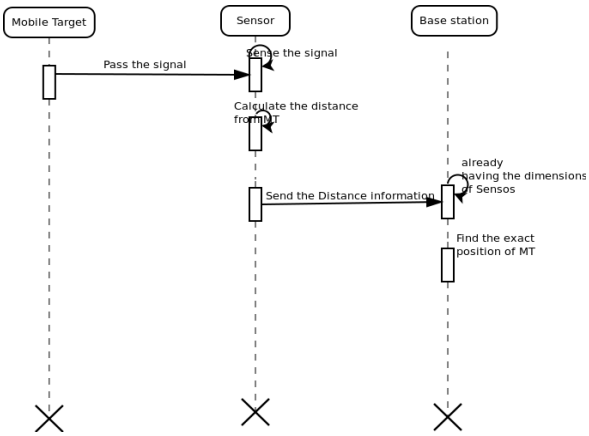

Figure2. Modules of Selective Approach Algorithm

We have used NS2 simulation to estimate the proposed algorithm with existing blind source separation algorithm [26]. Also, we have tried the hardware setup for tracking the moving target shown in fig.3. In this experiment we have used 4 senors with IC LM358 in a sensor board. When an object enters in the particular area the nearby sensor alone in awake mode and sense that object and display the position in the system.

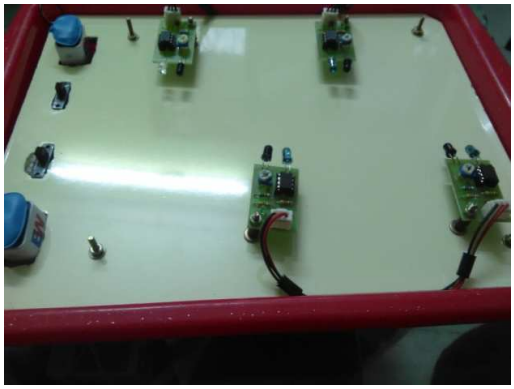

Figure 3. Hardware setup

5. PERFORMANCE ANALYSIS

In this analysis, we have deployed 101 sensor nodes randomly in a field of size 100m X 100m. We have chosen 101th node as a base station, 100th node as mobile target and all the other 99 nodes are used for monitoring the mobile target. The green color nodes indicate the awake node and the gray color nodes indicates the sleep node. The

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target node is moving on the network the position of the target is at (312,438) displayed in base station is shown in fig 4.

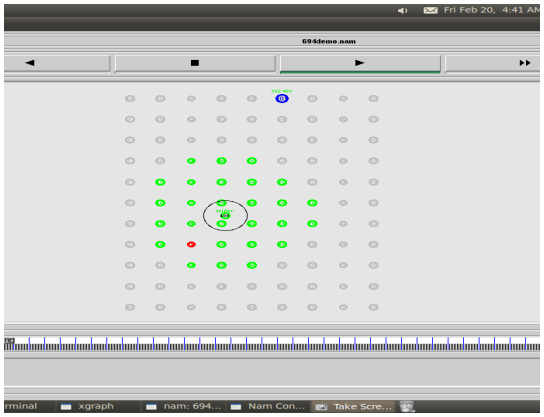

Figure. 4. The mobile target is at (312,438)

In this analysis, we scrutinize the consequence of the energy.The energy of each node is calculated by deducting the transmitted energy and received energy from the current energy. Fig 5 shows the comparison graph of energy between the existing Blind Source Separation (BSS) method [26] and the proposed Selective Approach Algorithm (SAA) system.

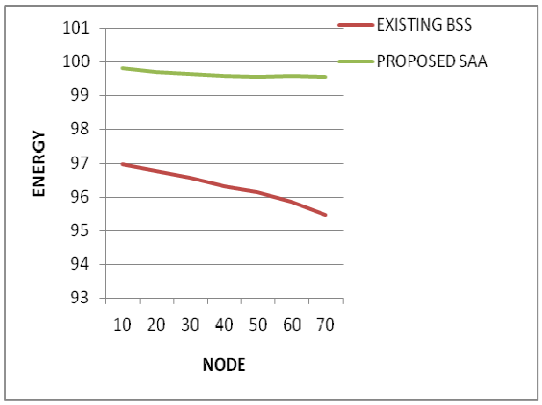

Figure 5 . Energy Vs Node id

In this investigation, we analyze the consequence of the mobility. The Mobility of each node is calculated by finding the distance per time. Fig 6 shows the comparison graph of Mobility between the existing Blind Source Separation (BSS) method [26] and the proposed Selective Approach Algorithm (SAA) system

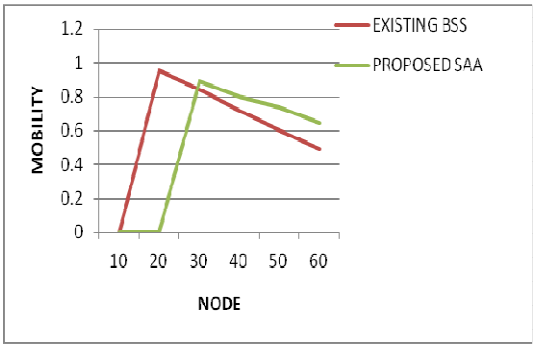

Figure 6. Mobility Vs Node id

In this investigation, we analyze the effect of the accuracy. The Accuracy depends on mobility and the area covered by the target. Fig 7 shows the comparison graph of Accuracy between the existing Blind Source Separation (BSS) method [26] and the proposed Selective Approach Algorithm (SAA) system

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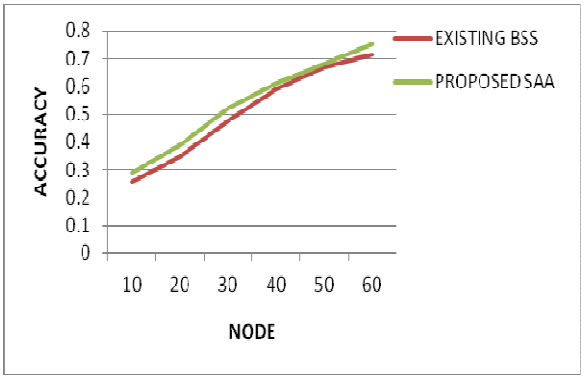

Figure7. Accuracy Vs Node id

6. CONCLUSION

In this work, we have proposed an optimization framework using a selective approach algorithm for locating an object and to improve the energy of sensors in the network.The energy is harvested by sleep or awake control. In this algorithm,the sensors placed in the region of target alone go to awake mode.So the energy is saved to a large extend which results in better performance in the system. We have estimated the proposed algorithm with existing methods of blind source separation method.By the simulation results, our investigation shows that the proposed algorithm can suggesvely improve the energy and accuracy of sensors.

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