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Research Paper

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KEYWORDS : Wireless Sensor Networks; Localization Algorithm; Learning; Range.

Node Localization in Wireless Sensor Network using Pollination based Optimization

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ABSTRACT

Accurate location of each ode is highly desirable to achieve high performance of WSN and various optimization techniques are used like as Particle Swarm Optimization, Biogeography Based Optimization, Pollination based algorithm for the optimizes location determination of nodes in WSN. In this paper we have proposed PBO to determine the optimized location of target node. Here the nodes that get localized in iteration act as anchor node. A comparison of the performance of PBO& Hybrid (BBO&PSO) in terms of number of nodes localized,localization error and localization time,end to end delay, end to end loss ratio is presented..

I. INTRODUCTION

As we know that WSN has enormously grown in the last decade and it also consists of ten to thousand small nodes. This constraint increases the demand for the need of efficient management of sensors together with the un-favourable environment. Now the development of efficient routing protocols can be a key factor in WSN management and it is imperative that the well-suited routing protocol be employed which is most effective for the particular network [3].

There are many type of routing protocols which are developed to save power consumption and routing protocols specifies how routers communicate with each other. WSN are quickly gaining popularity due to facts like no fixed infrastructure, don't use any centralized controlling devices and ease of deployment. Due to this it motivates a huge effort in research activities, standardization process, and industrial investments on this field since the last decade [1]. In this research paper we are using routing protocols of clustering in WSN. The only source of life for the nodes is the battery in WSN.

When the nodes are communicating with other nodes it consumes a lot of energy in transmitting the collected data. In many cases the batteries are undesirable to replace that are depleted of energy [4].

Initializing WSN scenario

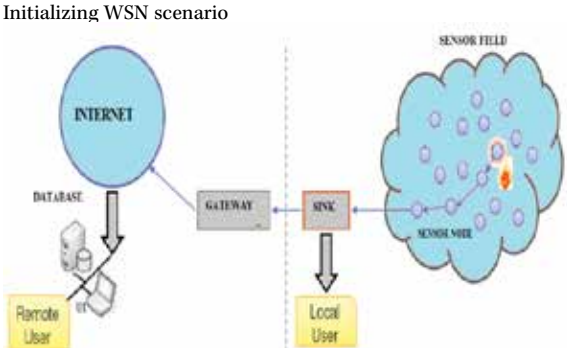

Fig.1 Internet through a gateway [3]

II. LOCALIZATION

Today, various techniques and technologies are available for the development of off-the-shelf location systems. The selection requirement of location systems can be more specific to suit different needs and environments such as accuracy, indoor/outdoor environment, positioning techniques, etc. From the technology point of view, classification of location systems can be represent in a tree as shown in Figure 2

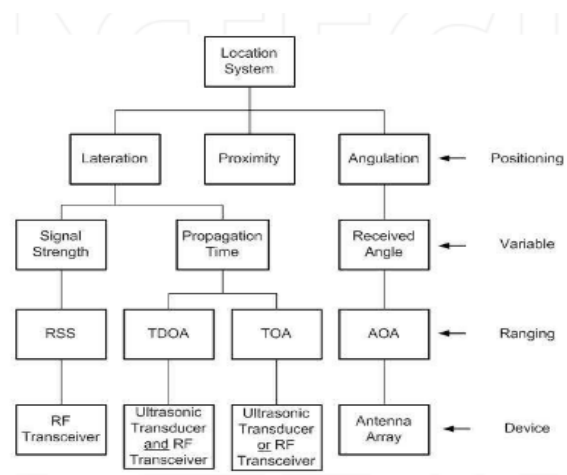

Fig.2 Location Tracking [4]

Localization is most active research area in WSN and it is usually refers to process of determining positions of unknown nodes that are target nodes using information of positions of some known nodes that are anchor nodes based on measurements such as distance, Time of arrival(TOA), Time difference of arrival(TDOA), Angle of arrival(AOA), etc. [3]. Many of the applications proposed for WSN require knowledge of sensing information which gives rise to problem of localization.

III. LOCALIZATION TECHNIQUES

A). Particle Swarm Optimization

PSO is based on the intelligence. It can be applied into both scientific research and engineering use. PSO have no overlapping and mutation calculation. The search can be carried out by the speed of the particle. During the development of several generations, only the most optimist particle can transmit information onto the other particles, and the speed of the researching is very fast. The calculation in PSO is very simple. Compared with the other developing calculations, it occupies the bigger optimization ability and it can be completed easily. PSO adopts the real number code, and it is decided directly by the solution. The number of the dimension is equal to the constant of the solution. The particles change its condition according to the following three principles: (1) to keep its inertia (2) to change the condition according to its most optimist position (3) to change the condition according to the swarm's most optimist position. [1]

B).Biogeography-based optimization

Biogeography-based optimization (BBO) is an evolutionary al-

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gorithm (EA) that optimizes a function by stochastically and iteratively improving candidate solutions with regard to a given measure of quality, or fitness function. BBO belongs to the class of met heuristics since it includes many variations, and since it does not make any assumptions about the problem and can therefore be applied to a wide class of problems. BBO is typically used to optimize multidimensional real-valued functions, but it does not use the gradient of the function, which means that it does not require the function to be differentiable as required by classic optimization methods such as gradient descent and quasi-Newton methods. BBO can therefore be used on discontinuous functions. [1]

C).Pollination Based Optimization

Optimization is a natural process embedded in the living beings. Pollination is a process of transfer of pollen from male parts of flower called anther to the female part called stigma of a flower. Some flowers will develop seeds as a result of self-pollination, when pollen and pistil are from the same plant, often (but not always) from the same flower [4]. Other plants require cross-pollination: pollen and pistil must be from different plants. Plants benefit from pollinators because the movement of pollen allows them to reproduce by setting seeds.

IV. PROPOSED WORK

The previous work which we taken into consideration is to propose various migration variants of Biogeography-Based Optimization(BBO) algorithms and Particle Swarm Optimization(PSO) for distributed optimal localization of randomly deployed sensors. The iterative methods are used to get the anchor nodes and to final determine the location of target node. In their work the comparison between PSO and different migration variants of BBO in terms of number of nodes localized, localization accuracy and computation time is made. So in our work, we will enhance this work by using Pollination based optimization to determine the optimized location of target node

Basic Design of Proposed Work

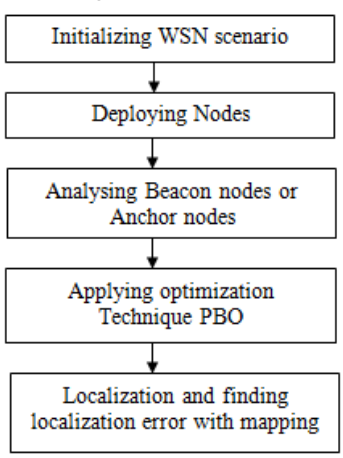

Figure.3 Flow of Work

Algorithmic Steps:

Step 1.Initialization of WSN scenario

Step 2. Find the actual location of the node based on anchors and beacons

Step 3.Applying PBO for reducing localization error.

Step 4. $R - r = (A * D)\frac{(A*D)}{(a+A*D)} + \frac{\frac{a}{a+A*D}*N^P}{A^P+N^P} - c(N+D)$

Here,

A=1.2, A=0.9, D=1.2, N=0.9, P=2

a = average vector content

A = average investment in nectar content of species.

D = individual investment in display

N = individual investment in vector

P = pollinators learning efficiency.

P = m*a+c

Here m and c are constant range from 0.1-25 and 2

C = proportionality constant relating investment to reductive cost.

Plants = nodes, Season = iteration, Weeks = distance

Step 5. Apply R formula to find routing scheme in WSN

Step 6. Find routing before and after localization of the nodes.

Step 7. Find error value between routing scheme before and after localization of nodes.

Step 8. Find localization error and compare it.

Step 9. End of loop

V. RESULT

In this research the localization error is removed by analysing anchor node and beacon nodes are analysed and optimization is done by using PBO. Localization error occur when nodes are deployed to some another place rather than the predicted place. This can be known by using GPS system; by this we can easily get the position of nodes.

In this research the localization error is removed by analysing anchor node and beacon nodes are analysed and optimization is done by using PBO[5]. Localization error occur when nodes are deployed to some another place rather than the predicted place. This can be known by using GPS system; by this we can easily get the position of nodes.

Table of Results:

	Pn=2		Pn=5	
EAs	E1	Time(s)	E1	Time(s)
Hybrid(BBO&PSO)	.2018	.590	.3514	.629
PBO	.1716	.460	.3036	.587

A summary of results of Hybrid (BBO&PSO) & PBO Simulation Table

Parameter Name	Value
Channel	Wireless channel
Propagation	Radio-propagation
Number of Nodes	20
Mobility Model	Random-motion

Parameter Name	Value
Antenna	Omni antenna
Layer	LL Layer
Mac version	802.11
Simulation Time	90s
Routing protocol	AODV
Area	670*670
Topology	Flat grid
Packet Size	512
Queue	Drop Trail
Hello Interval	2s
Traffic Rate(packets/s)	10s
Network Interface	Physical
Delay	25us
Minimum Delay	50us

Scenario 1

Fig 4 In this scenario 20 nodes are deployed.

Scenario 2

Fig 5 In this scenario unpredicted is written above some nodes these nodes showing that we do not need to predict these nodes because positions of these nodes are known.

Scenario 3

Fig.6 In this scenario predicted and unpredicted nodes are shown.

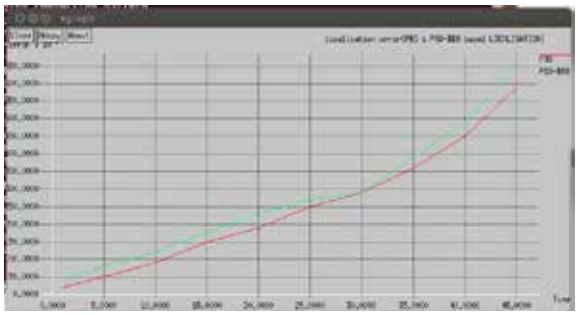

Fig.7 Localization Error

In above graph localization error is shown .localization error occur when nodes are deployed some another place rather than predicted place. It is shown that localization error is reduced after applying PBO.

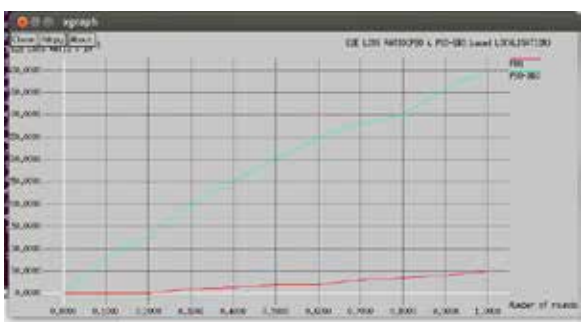

Fig.8 End To End Loss Ratio

In above graph E2E loss ratio is shown. E2E loss ratio is the loss of data between node to node. It is shown that E2E loss ratio is reduced after applying PBO.

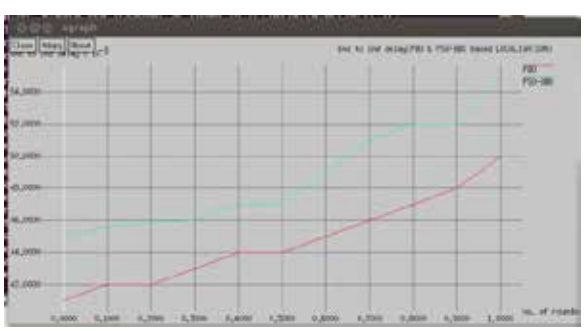

Fig. 9 End to End Delay

In above graph end to end delay is shown .end to end delay is the time taken by data to from one node to another node. It is shown that end to end delay is reduced after applyingPBO

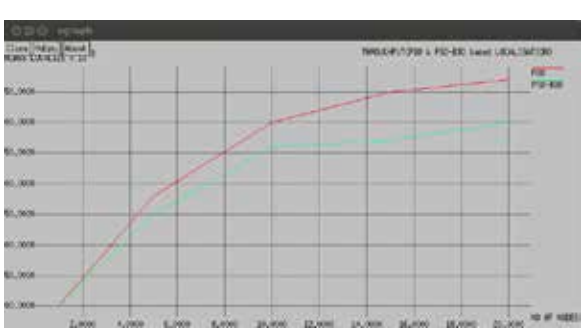

Fig.10 Throughput

In the above graph throughput is shown. It is the average at

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which data packet is delivered successfully from one node to another over a communication network. It is shown that throughput is increased after applying PBO.

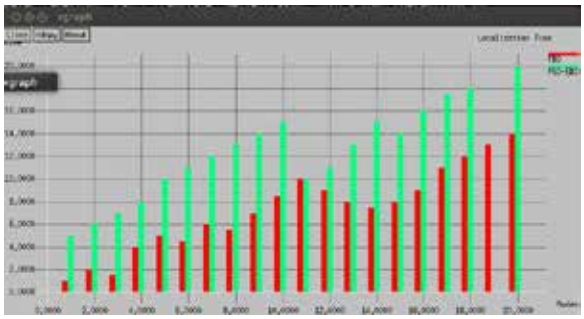

Fig.11 Localization Time

In the above graph localization time is shown. Localization time is the time taken by the node to get localized. It is shown that localization time is reduced after applying PBO.

VI. CONCLUSION AND FUTURE WORK

In this paper the localization error is reduced by analysing anchor node and beacon nodes are analysed and optimization is done by using PBO. Localization error occur when nodes are deployed to some another place rather than the predicted place. This can be known by using GPS system, by this we can easily get the position of nodes. The position can be better optimized by using PBO hence the error is minimized. Results taken after applying PBO is better hence the localization error is reduced, E2E loss ratio is reduced and end to end delay is also reduced. In future this can be better optimized by using some artificial intelligence technique which can predict the position easily.

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