OPTIMAL PATH PLANNING FOR MOBILE ANCHOR NODE LOCALIZATION WITH NS 2

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ABSTRACT

In this paper, we proposes an optimal path planning method for the mobile anchors used in the localization scheme presented by Ssu et al. Here a single mobile anchor is used to enable the sensor nodes to construct two chords of a communication circle of which they form the centre point, and the intersection of the perpendicular bisectors of these two chords is then calculated in order to pinpoint the sensor position. However, the mobile anchor moves randomly through the sensing field (i.e., in accordance with the Random Waypoint model), and thus it is possible that some of the sensor nodes cannot be localized. Therefore, the path planning scheme proposed in this study is specifically designed to both minimize the localization error of the individual sensor nodes and to maximize the number of sensor nodes which can determine their locations Later this path planning algorithm is adjusted so that it suits most of the effective localization algorithms. The performance of the proposed scheme is to be evaluated through a series of simulations with the ns-2 network simulator

Keywords: Beacon, NAM, Localization, Mobile Anchor, PPL, TCL, WSN

I. INTRODUCTİON

1.1 Algorithm Description

We describe the Path Planning Based Localization (PPL) [1] with regard to single mobile anchor in WSN environment. This algorithm is typically a range based distributed algorithm. The Node Localization problem is viewed as finding the positional information i.e. spatial coordinates of all the nodes over a region of interest in a network. Localization becomes very critical when there is an uncertainty about the position of the nodes. Location information of a node lays the foundation [1] for all other applications such as routing, topology control, reporting the origin of events, coverage, node life-time control and target tracking. Node localization was initially done by adding Global Positioning System(GPS) to the nodes but it is quite unfortunate that adding GPS to all the nodes in a WSN environment leads to the following demerits:- (i) Cost factor increases. (ii) GPS cannot work in indoor environments or during the obstacles such as Line of Sight(LOS) obstructing the GPS satellites.(iii) GPS consumes more power thereby decreasing the battery power of individual nodes and hence reducing the life time of nodes in a sensor network.

In order to overcome these demerits, Node localization was done by configuring few nodes as reference nodes either manually or using GPS in order to determine the location of the remaining unlocalized nodes in the network. Basically there are three set of nodes namely anchor nodes, unlocalized nodes and localized nodes. The first set of sensor nodes whose positions are known i.e. reference nodes are termed as anchor (or) beacon (or) location aware nodes [2].

1.2 Node Configuration Setting

The sensor nodes are designed and configured dynamically, designed to employ across the network, the nodes are set according to the X, Y, Z dimension, which the nodes have the direct transmission range to all other nodes.

1.3 Localization algorithm

In the localization scheme, a single mobile anchor node moves randomly through the sensing field broadcasting periodic beacon messages containing its current coordinates. it is assumed that the communication range over which a sensor node can detect broadcasts from the mobile anchor node is bounded by a circle and the sensor node is located at the center of this 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 range.

1.4 Mobile Anchor Path Planning Scheme

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. The distance between two successive vertical segments of the anchor trajectory (i.e. the resolution of the anchor trajectory) is specified as $R-X$, where R is the communication radius of the mobile anchor node and X is set in the range As a result, the mobile anchor node will pass through the circle more than three times

1.5 NAM file Network Animator File (path.nam)

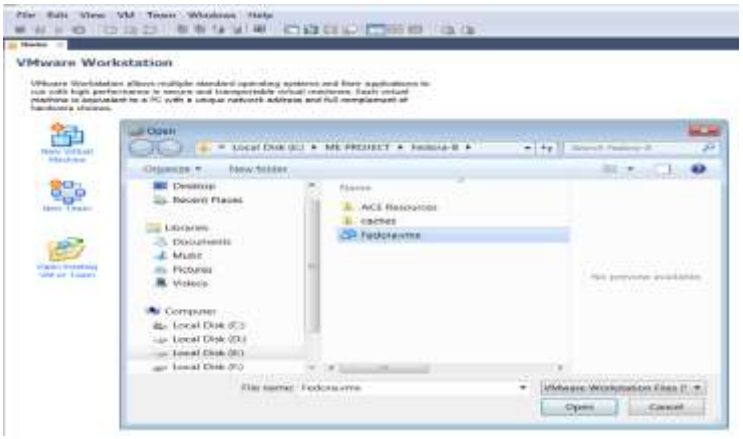
When a simulation is finished, NS produces one or more text-based output files that contain detailed simulation data, i.e **path.nam** if specified to do so in the input Tcl (or more specifically, OTcl) script. The data can be used for simulation analysis (two simulation result analysis examples are presented in later sections) or as an input to a graphical simulation display tool called Network Animator (NAM). NAM has a nice graphical user interface similar to that of a CD player (play, fast forward, rewind, pause and so on), and also has a display speed controller. Furthermore, it can graphically present information such as throughput and number of packet drops at each link, although the graphical information cannot be used for accurate simulation analysis

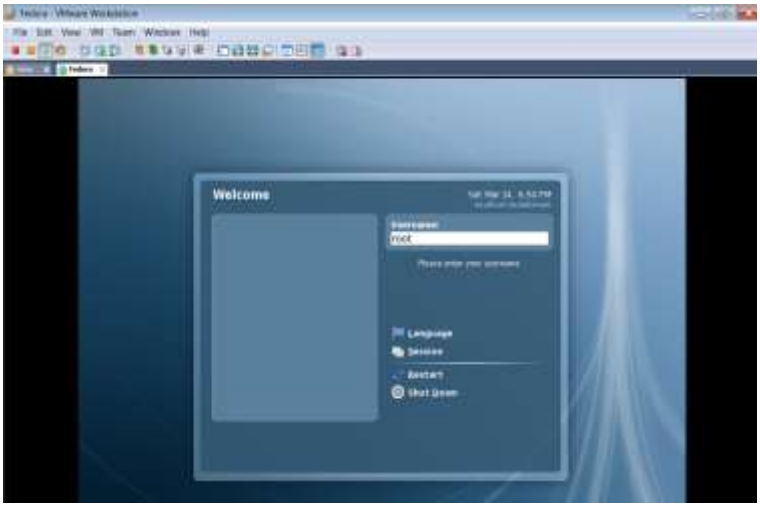
1.6 Location Details (location anchor)

Another text based file is generated after end of simulation which gives the desired location of all nodes. Like Source, Neighbor, SX-Pos, SY-Pos, Distance (d)

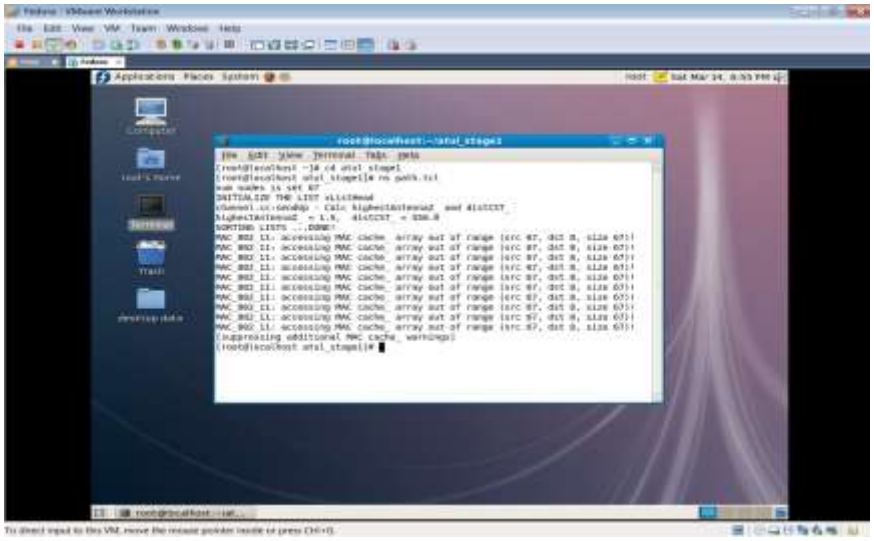
II. EXECUTİON STEP

1. Install VMware Workstation on PC which already installed 64 bit Windows 7.
2. Run VMware Workstation as a administrator
3. Open & Login pre installed Fedora machine.

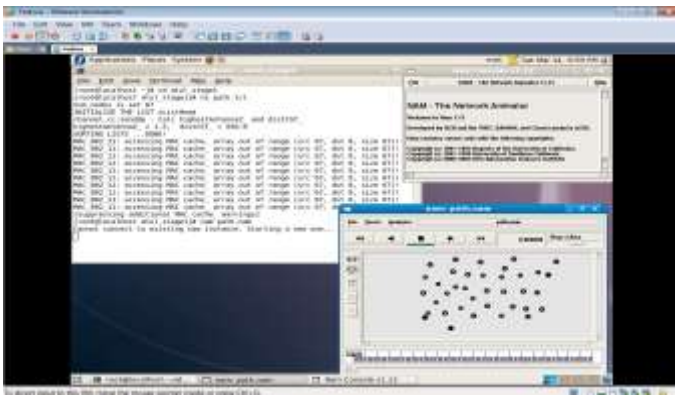




4. Open **Terminal** window and run the TCL file by giving the path where your TCL script is save. And enter.



5. Run Nam file (nam path.nam) and you will get network animator window.



6. Play network animator file and you will get the following result

III. RESULT

We propose an optimal path planning method for the mobile anchors used in the localization scheme presented by Ssu et al. Here a single mobile anchor is used to enable the sensor nodes to construct two chords of a communication circle of which they form the center point, and the intersection of the perpendicular bisectors of these two chords is then calculated in order to pinpoint the sensor position. However, the mobile anchor moves randomly through the sensing field (i.e., in accordance with the Random Waypoint model), and thus it is possible that some of the sensor nodes cannot be localized. Therefore, the path planning scheme proposed in this study is specifically designed to both minimize the localization error of the individual sensor nodes and to maximize the number of sensor nodes which can determine their locations

We use the NS-2 simulator for examining our desired results we get following output.

1. After run the TCL script **(path.tcl) & path.nam** NAM file in terminal by command we get fig 1. In witch The mobile anchor node is moving.

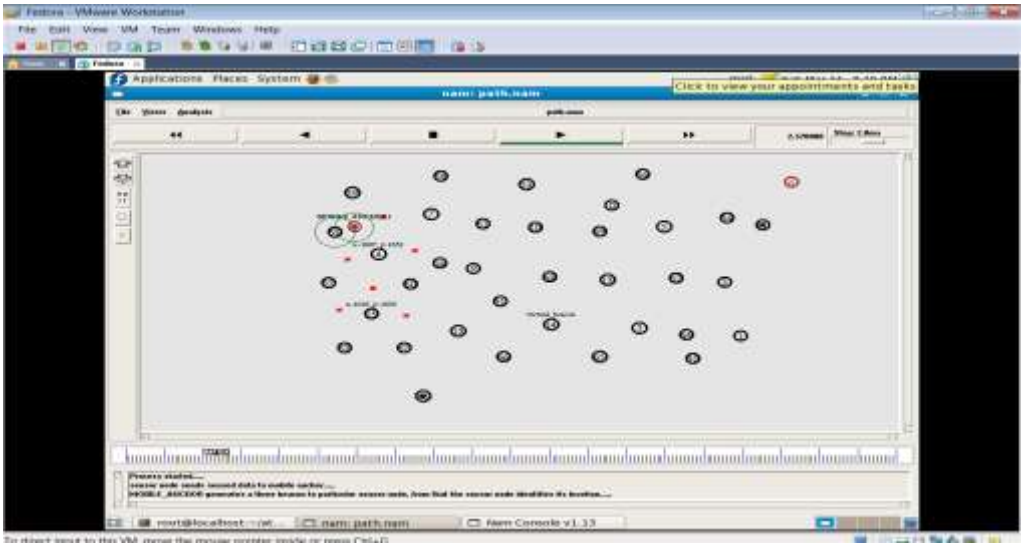


Fig1. Movement of Mobile Anchor Node

2. In fig 2 Mobile Anchor Node moving & Changes it's Position.

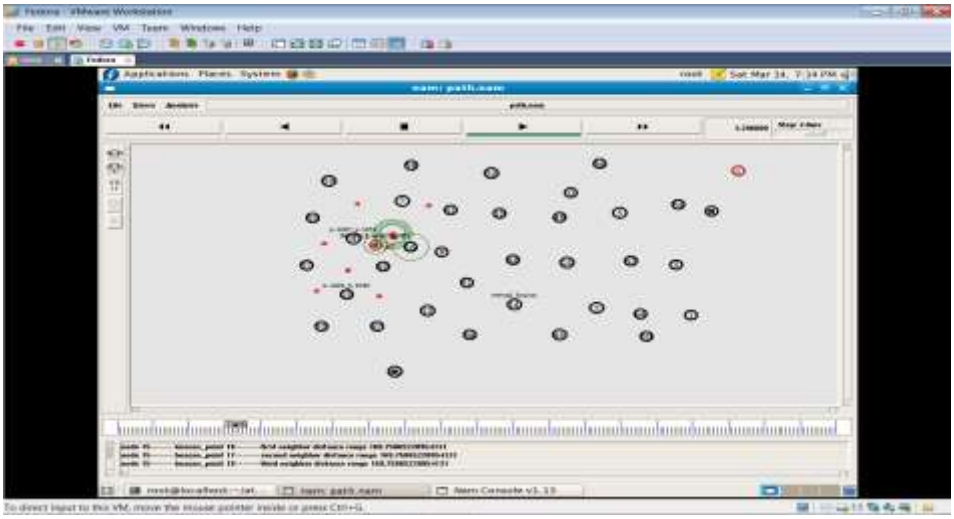


Fig2. Mobile Anchor Node Changes its Position.

3. In fig 3 we will see the Mobile Anchor Node broadcast Beacon points and all nodes with there beacon points in red color. In fig 4 All Nodes with Beacon points and X-Y points

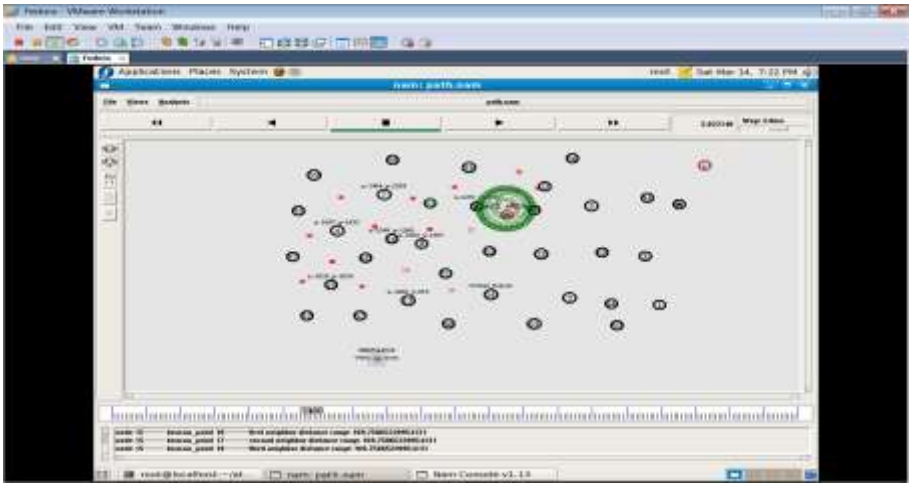


Fig3. Mobile Anchor Node with Beacon points

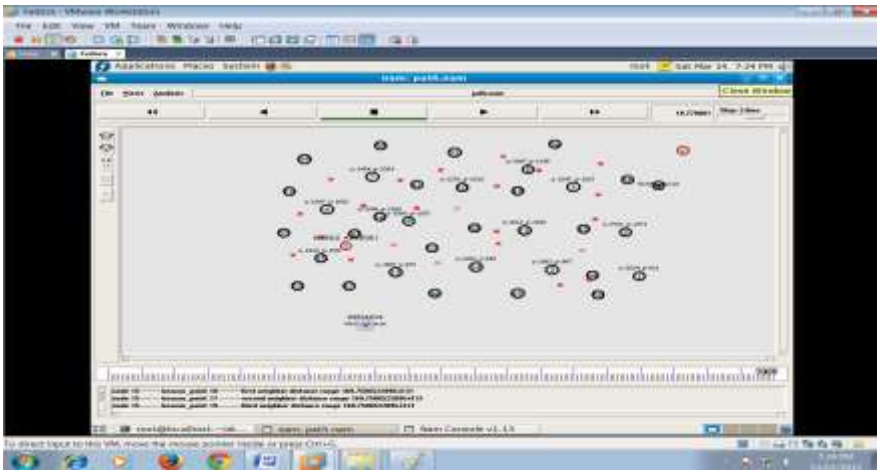


Fig4. All Nodes with Beacon points and X-Y points

4. In fig 5 we will see the localization scheme details with the help of location details file which shows Source, Neighbor, SX-Pos. SY-Pos & Distance (d).

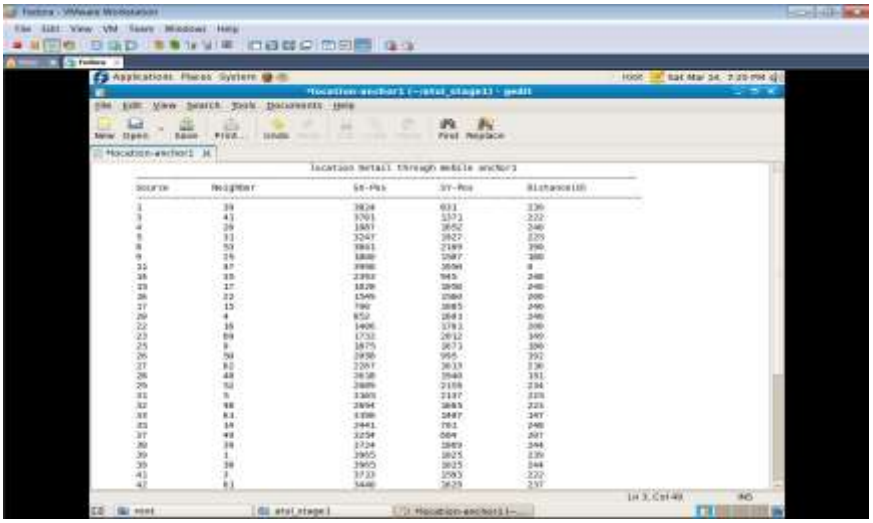


Fig 5. Location-anchor file

IV. CONCLUSION

After simulating the Localization Scheme with Single Mobile Anchor Node localization technique on Network Simulator (version 2.32) widely known as NS2 , a scalable discrete-event driven simulation tool.

Building high performance WSN network systems requires an understanding of the behavior of sensor network and what makes them fast or slow. In addition to the performance analysis, we have also evaluated the proposed technique in measuring, evaluating, and understanding system performance. The final but most important step in our experiment is to analyze the output from the simulation. After the simulation we obtain animation which shows the movement of single mobile anchor node along with the snake type dynamic movement and various beacon points. With the help of that we will identify the location of all nodes finally the location details file generated which contains the Source, Neighbor, SX-Pos, SY-Pos, Distance (d).

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