PATH PLANNING SCHEME WHICH OPTIMIZES TRAJECTORY OF THE MOBILE ANCHOR NODE TO MINIMIZES THE LOCALIZATION ERROR

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ABSTRACT

A Movable Network contains of hundreds or thousands of nodes and a lesser amount of data gathering devices. Localization of these mobile nodes is an important concern in mobile systems since many requests the mobile to identify their positions with a great notch of precision. Many localization approaches grounded on movable anchor nodes have been suggested for helping the mobile nodes to govern their locations. But none of these approaches try to optimize the path of the mobile anchor node. Maximum localization mechanisms practice static anchors. A path scheduling arrangement is applied which optimizes path of the mobile anchor node to lessens the localization error. In direction to confirm performance of our proposed algorithm against other algorithms viz. DV-Hop, simulations are conducted on MATLAB.

Keywords: Base Station, Wireless Sensor Network, Log-Normal Shadowing Model, Received Signal Strength, localization and Tracking

1. INTRODUCTION

Wireless Sensor Network is a system which is made out of hundreds or a huge number of self-ruling, minimal cost and low vivacity sensor hubs that are utilized to watch physical or ecological information, for example, pressure, sound, heat, air impurities, and so on and include at least one base station (BS).The BS in a WSN gathers information from sensors and afterward examines and forms the data for particular applications.

1.1 LOCALIZATION PROCESS

Localization is the procedure to decide the geological area of every sensor hub in the frameworks. **.** Localization is a standout amongst the most essential and complex issue for WSN. The issues in this localization procedure incorporate the cost of additional restriction equipment, accuracy, scalability, robustness to failure and error, coverage, security and power.

2. RELATED WORK

Amanpreet Kaur et al. [1] describe the process of finding the location of sensors known as localisation which is one of the essential requirements in WSNs. The study shows the classifications of the localization algorithms, among them some algorithms were discussed with their advantages and disadvantages.

Sadik K et al. [2] Two approaches were used to determine the the distance between the mobile sensor node (i.e., bicycle) and the anchor node (i.e., coach) in outdoor and indoor environments. The approaches were log-normal shadowing model (LNSM) and hybrid particle swarm optimization–artificial neural network (PSO–ANN).

Anup et al. [3] Explains the importance of the localization in the field of wireless sensor networks (WSN) that has developed significant research interest among academia and research community.

Aditi et al. [4] Describes the process of localization techniques for wireless sensor networks in which further divided into two general classification of the localization one is range based localization and other is range free localization.

Debnath et al. [5] explains the architecture of wireless sensor networks and categorize the routing protocols according to some key factors and summarize their mode of operation with the comparative study on these various protocols.

Faheem et al. [6] Provided a detailed survey of different indoor localization techniques such as Angle of Arrival (AoA), Time of Flight (ToF), Return Time of Flight (RTOF), Received Signal Strength (RSS); based on technologies such as WiFi, Radio Frequency Identification Device (RFID),Ultra Wideband(UWB), Bluetooth.

Jiyan et al. [7] Proposed a novel RSS localization method with a closed-form solution based on a two-step weighted least squares estimator for the case with the unknown transmit power and uncertainty in PLE. Both the theoretical variance and Cramer-Rao lower bound (CRLB) are derived the relationships between the deterministic CRLB and the proposed stochastic CRLB are presented.

Xinrong et al. [8] proposed received signal strength (RSS)-based location estimation technique as a low-cost, low complexity solution for many novel location-aware applications. A nonlinear least-square estimator is presented and the performance of the algorithm is studied based on CRB and various simulation results.

Kan et al. [9] Proposed an energy-efficient localization and Tracking (e LOT) system, using low-cost and portable hardware to enable highly accurate tracking of targets. Various fingerprint based approaches for localization and tracking are implemented in eLOT. To achieve high energy efficiency, a network-level scheme coordinating collision and interference is proposed.

Lovepreet et al. [10] Review has been done on the localization algorithms and different taxonomy based on basic features. Localization is the common problem in wireless sensor network technology. Most of the applications, the network collects the data without location information which is not very useful. Location information plays a vital role in both networking and in other domains of wireless sensor network.

Rongfei et al. [11] To measure the accuracy of localization algorithms, a ranging error model for time of arrival(TOA) estimation is given, and the Cramer–Rao Bound(CRB) for the model is derived. Then an algorithm is proposed to deal with the case where (1) ranging error accumulation exists, and (2) some anchor nodes broadcast inaccurate/wrong location information. A method to detect anchor nodes whose location information is inaccurate/wrong is proposed.

Chien et al. [12] proposed a novel algorithm to enhance the accuracy of Mobile Station location prediction that utilizes time of arrival (TOA) measurements and the angle of arrival (AOA) information to locate MS when three base stations (BSs) are available.

Jeng et al. [13] Proven particle swarn optimization and cuckoo search algorithms to have a good ability for finding the global optimum. A hybrid algorithm based on PSO and CS is proposed to make use of the advantages of both PSO and CS algorithms. The proposed hybrid algorithm is employed as a new training method for feed forward neural networks (FNNs).

Marcin et al. [14] introduced a method which improves localization accuracy of the signal strength fingerprinting approach. According to the proposed method, entire localization area is divided into regions by clustering the fingerprint database.

Qinghua et al. [15] Presented a method for improved RSSI-based localization through uncertain data mapping (LUDM). Starting from an advanced RSSI measurement, the distributions of the RSSI data tuples are determined and expressed in terms of interval data.

Chiara et al. [16] Found a proper balance between communication and signal/data processing capabilities. Wireless sensor networks (WSNs) enable new applications and require non-conventional paradigms for protocol design due to several constraints.

3. PROPOSED WORK

The goal of our research work is to develop a scheme based on optimization of the trajectory of the mobile anchor node (Variable no. of anchor nodes) to improve the localization error. Performance evaluation of proposed algorithm against other algorithms viz. DV-Hop.

4. RESULTS AND DISCUSSION

4.1 To minimize the localization error and improve the accuracy of our localization system

Step1: Let us consider the position of few anchor nodes which are placed at random locations.
Step2: Now, let us vary the Network size of these nodes placed in the surroundings.
Step3: The anchor nodes are fixed at four different points and hence different readings are taken by running the same program for different network sizes.
Step4: We calculate the different localization error by varying the network size as 100,200,300,400,500.
Step4: For each network size, the no. of unknown nodes are varied as 5,10,15.
Step5: For each varying network size, various simulations are observed, and correspondingly the localization errors for these simulations are observed.
Step6: The minimum localization errors of all the simulation run are noted.

Case1: when network size=100

s.no	Network size	No. of unknown nodes	Minimum error reported(in meters)
1.	100	05	2.2669
		10	1.0613
		15	0.66084

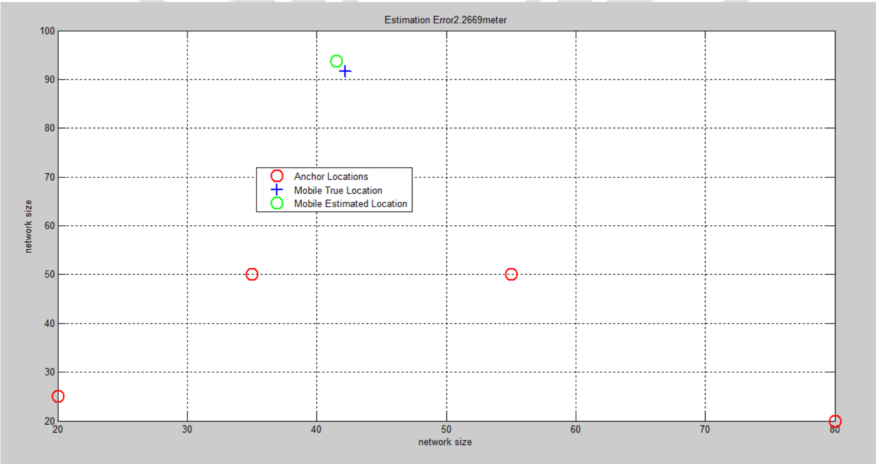


Figure:1

This fig shows the mininum localization error of 2.2669m when the network size is 100 and the no.of unknown nodes are 5.

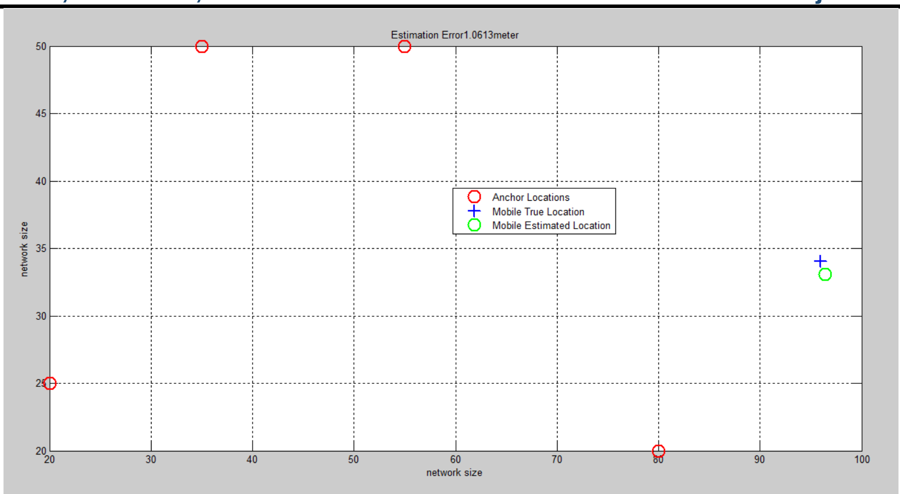


Figure:2

This fig shows the mininum localization error of 1.0613m when the network size is 100 and the no.of unknown nodes are 10.

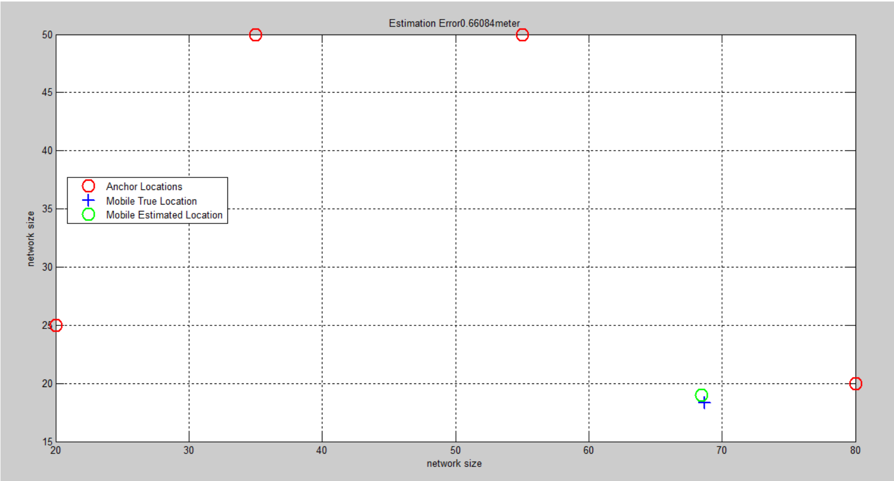


Figure:3

This fig shows the mininum localization error of 0.66084m when the network size is 100 and the no.of unknown nodes are 15.

Case2: when network size=200

s.no	Network size	No. of unknown nodes	Minimum error reported(in meters)
1.	200	05	2.502
		10	3.9928
		15	2.4262

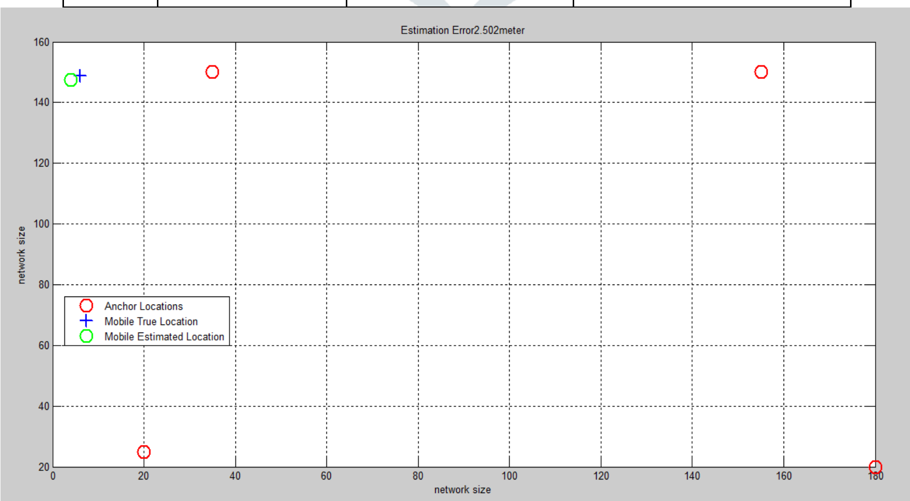


Figure:4

This fig shows the mininum localization error of 2.502m when the network size is 200 and the no.of unknown nodes are 5.

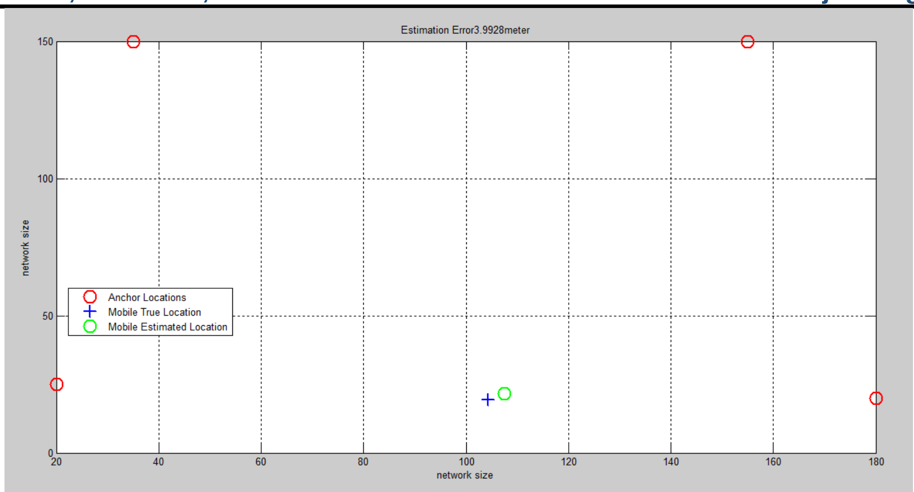


Figure:5

This fig shows the mininum localization error of 3.9928m when the network size is 200 and the no.of unknown nodes are 10.

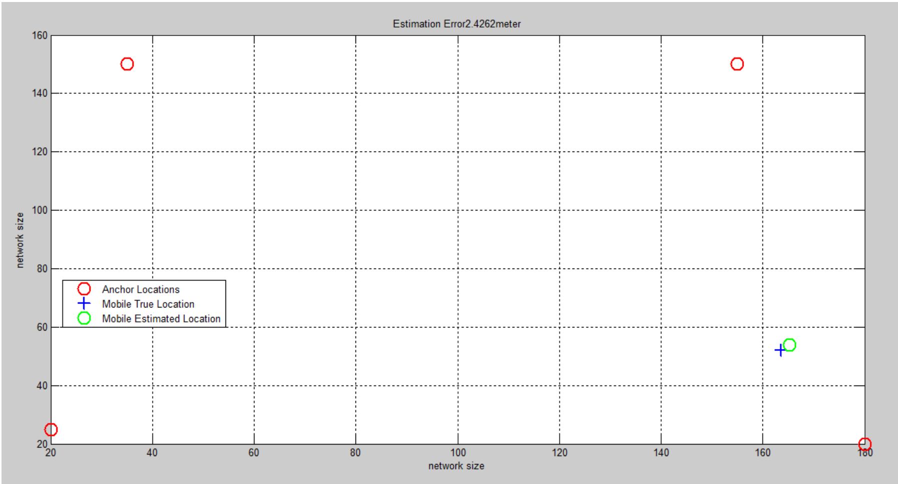


Figure:6

This fig shows the mininum localization error of 2.4262m when the network size is 200 and the no.of unknown nodes are 15.

Case3: when network size=300

s.no	Network size	No. of unknown nodes	Minimum error reported(in meters)
1.	300	05	2.5594
		10	4.9708
		15	3.9496

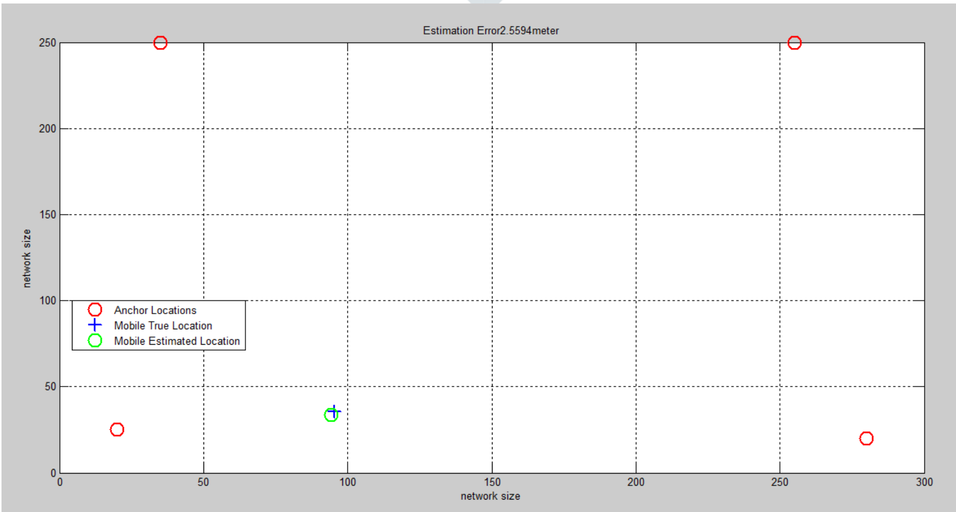


Figure: 7

This fig shows the mininum localization error of 2.5594m when the network size is 300 and the no.of unknown nodes are 5.

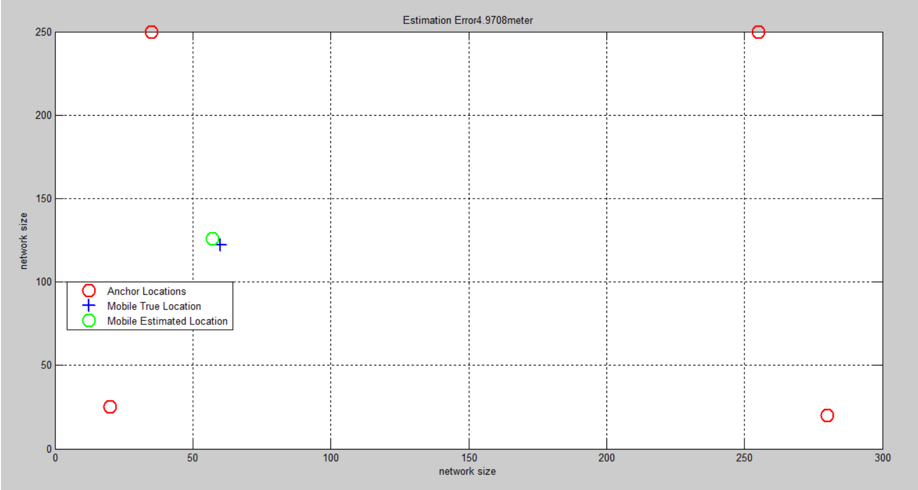


Figure: 8

This fig shows the mininum localization error of 4.9708m when the network size is 300 and the no.of unknown nodes are 10.

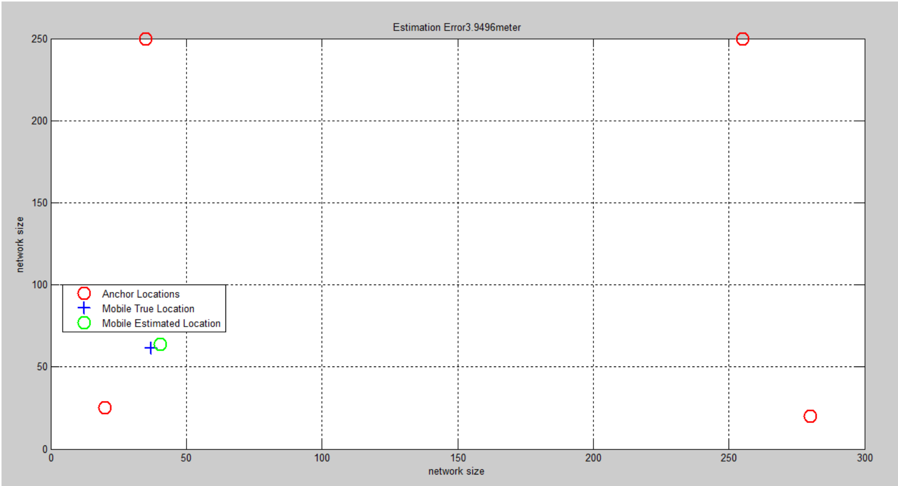


Figure: 9

This fig shows the mininum localization error of 3.9496m when the network size is 300 and the no.of unknown nodes are 15.

Case4: when network size=400

s.no	Network size	No. of unknown nodes	Minimum error reported(in meters)
1.	400	05	6.4228
		10	5.4697
		15	3.7135

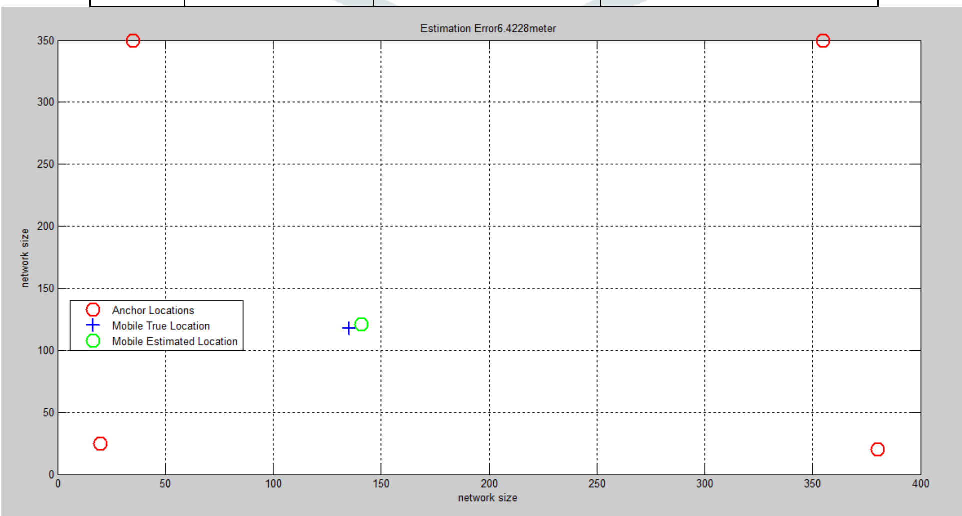


Figure: 10

This fig shows the mininum localization error of 6.4228m when the network size is 400 and the no.of unknown nodes are 5.

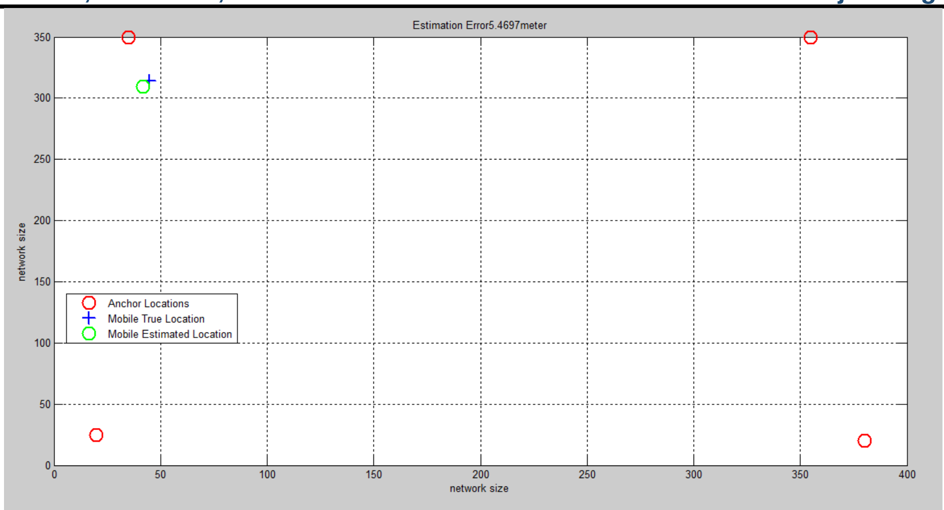


Figure: 11

This fig shows the mininum localization error of 5.4697m when the network size is 400 and the no.of unknown nodes are 10.

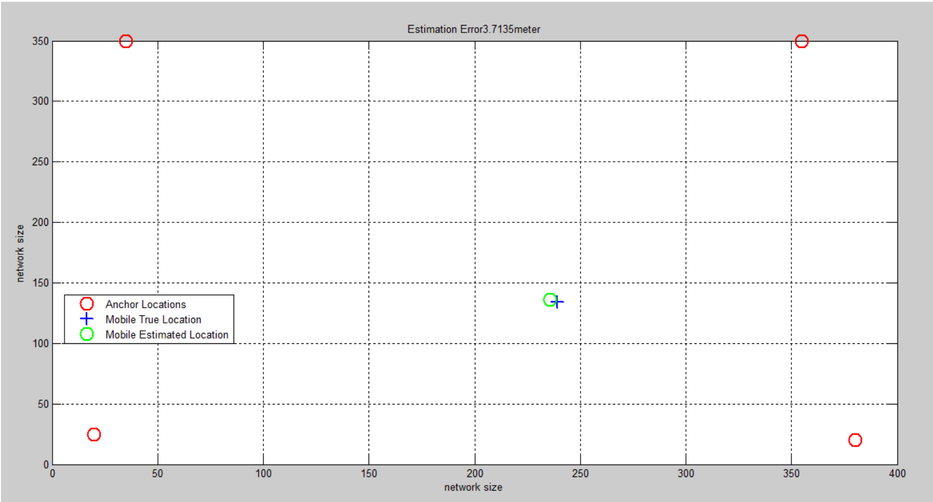


Figure: 12

This fig shows the mininum localization error of 3.7135m when the network size is 400 and the no.of unknown nodes are 15.

Case 5: when network size=500

s.no	Network size	No. of unknown nodes	Minimum error reported(in meters)
1.	500	05	1.4348
		10	8.1055
		15	4.1852

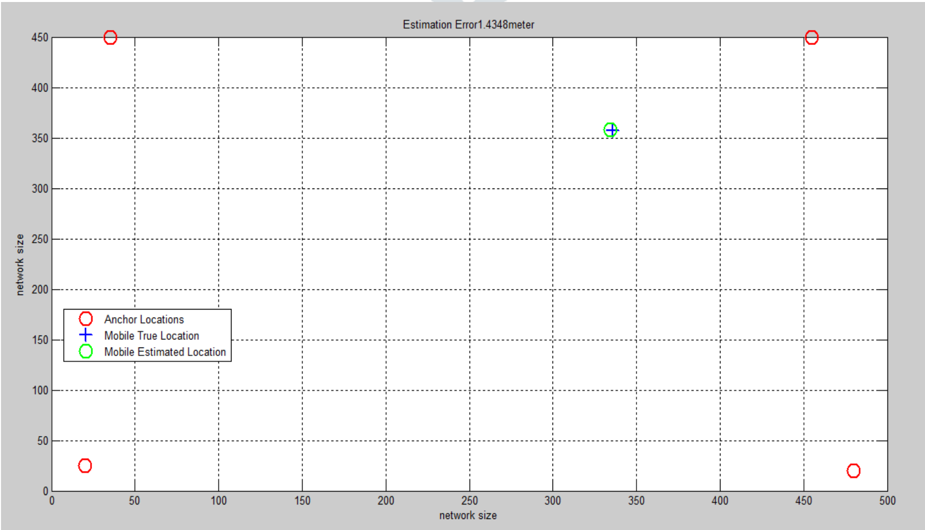


Figure: 13

This fig shows the mininum localization error of 1.4348m when the network size is 500 and the no.of unknown nodes are 5.

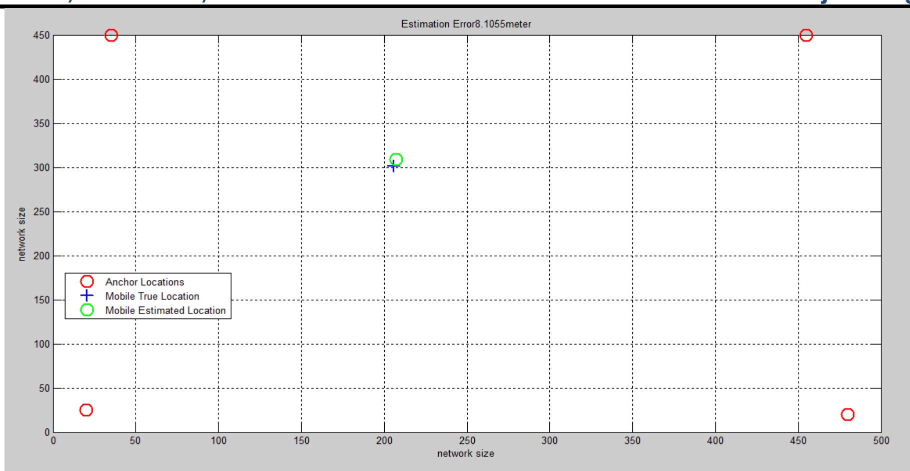


Figure: 14

This fig shows the mininum localization error of 8.1055m when the network size is 500 and the no.of unknown nodes are 10.

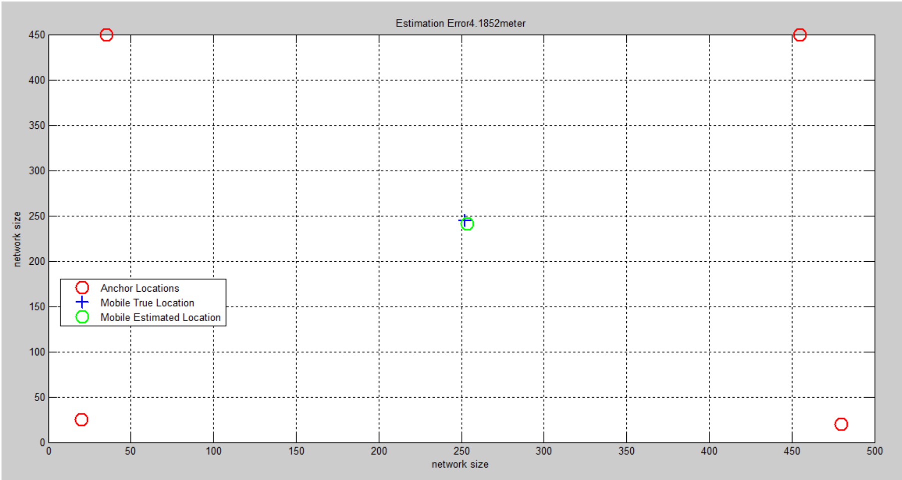
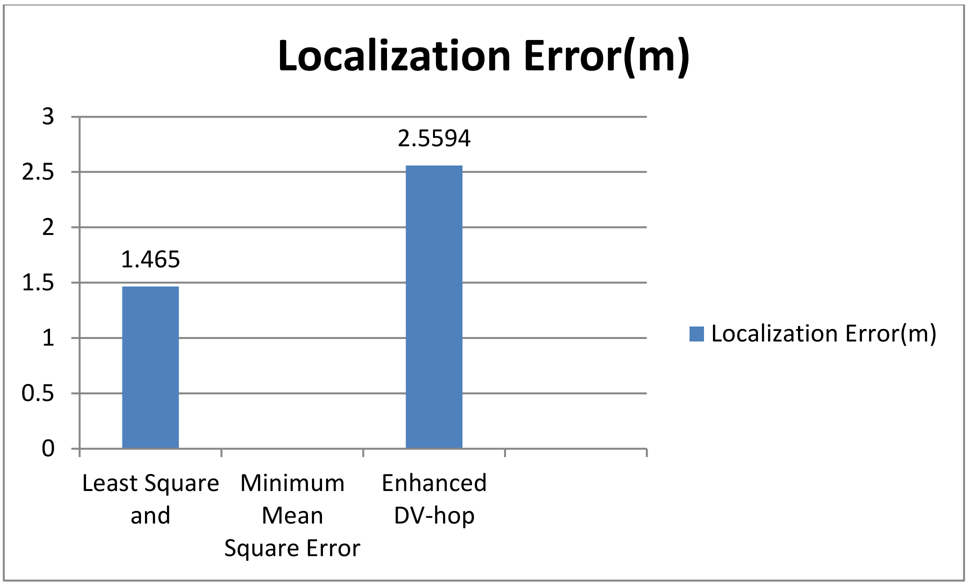


Figure: 15

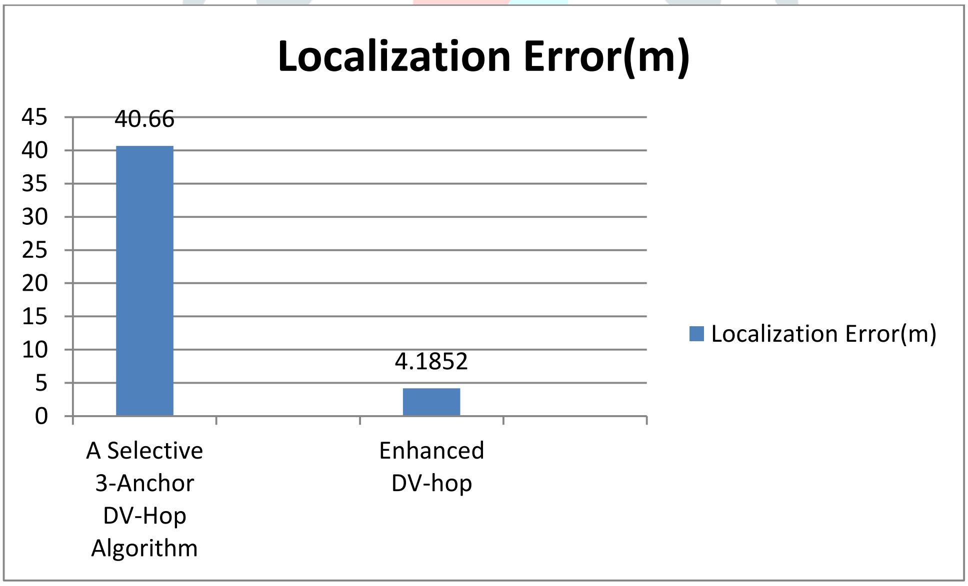
This fig shows the mininum localization error of 4.1852m when the network size is 500 and the no.of unknown nodes are 15

No. of unknown nodes	Minimum error reported(in meters)
05	2.2669
10	1.0613
15	0.66084
05	2.502
10	3.9928
15	2.4262
05	2.5594
10	4.9708
15	3.9496
05	6.4228
10	5.4697
15	3.7135
05	1.4348
10	8.1055
15	4.1852

Author/Year	Technique	No of Nodes	Localization Error
Z.Mary Livinsa 2014	Least Square and Minimum Mean Square Error	300	1.465m
Proposed	Enhanced DV-hop	300	2.5594m



Author/Year	Technique	No. of Unknown Nodes	Localization Error
Hichem Sassi 2014	A Selective 3-Anchor DV-Hop Algorithm	20	40.66
Proposed	Enhanced DV-hop	15	4.1852



CONCLUSION

Sensor nodes connected to each other via wireless links, some node are anchor node and some are unknown which are simulated on the MATLAB. The range-free localization practises connectivity data among nodes, the nodes which know their locations are named anchors, whereas others are named regular nodes. Anchors are normally fixed but regular nodes are generally mobile. To estimate their positions, regular nodes first collect the connectivity data as well as the locations of anchors, and then estimate their identifiable positions. To overwhelm the badly-behaved of node let-down and connection breakage, we have relocation of sensor nodes and used the movable anchors to confine the nodes. The movement of mobile anchors is such that it travels in the networks in a zigzag form such that it can competently shield the whole sensor field. DV-hop algorithm is modified and implementation in Matlab and the simulation outcomes are equated and analysed. A path scheduling arrangement is implemented which optimizes path of the mobile anchor node to lessens the localization error. In order to confirm performance of our projected system against other systems viz. DV-Hop, simulations are showed on MATLAB. The simulations of algorithms are randomly run many times for each result and the average values were used as final results. The average localization or distance error is considered for comparison.

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