

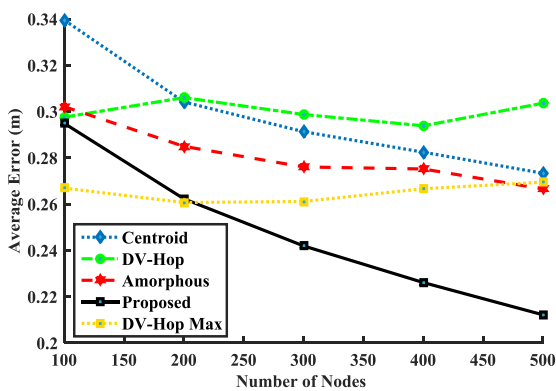






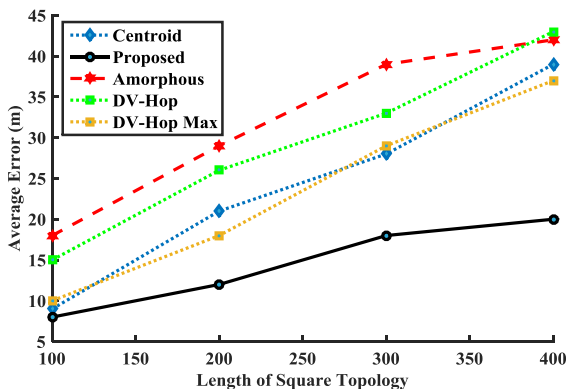


Network parameters	Values
Size of Network topology	100 to 400 m <sup>2</sup>
Sensor nodes deployed	100 to 500
BS Position	50×50
E <sub>o</sub> Node Initial Energy of	0.5J
ε <sub>fs</sub> ( free space signal)	10pJ/bit/m <sup>2</sup>
ε <sub>mp</sub> (Multi-path fading coefficient)	0.0013pJ/bit/m <sup>4</sup>
E <sub>elec</sub> (Energy in electronic circuitry.)	50nJ/bit
E <sub>DA</sub> (Energy in data aggregation at CH.)	5nJ/bit
d <sub>th</sub> Threshold Distance	83m



**Fig. 4** Average localization Error Vs number of nodes with topology size (250×250) m<sup>2</sup>

From above Fig 4, it is obvious that the average localization error decreases with an increase in node density due to the decreased ( $D_{avg}$ ) which is used in the estimation of reference node localization. Initially proposed algorithm also shows a higher average error, but with increased node density in the topology algorithm shows less average error.



**Fig. 5** Average localization Error vs Network size at 200 number of node

Localization error for different sizes of the network would be different as shown in Fig. 5, Initially, in a comparatively small network, comparatively node density is high therefore less localization error occurs. On the other hand, with the same node density will be topology with increased size, high localization error exists, as all positioning estimation depends at  $D_{avg}$ , Which uses node density.

## 6. Conclusion

In this paper, a novel anchor free localization technique for single-hop wireless sensor networks using inter node distance is presented. The proposed algorithm is investigated on the metric of node density and varying network size. Results have shown that the proposed strategy performs better than the existing classical localization techniques such as Centroid, Amorphous, DV-Hop, and DV-Hop Max.

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