National Institute of Technology Rourkela

Synopsis Seminar

| | |
|---|---|
| Seminar Title | : Minimization of Position Error of Amorphous Algorithm for Wireless Sensor Networks |
| Speaker | : Pujasuman Tripathy ( Rollno : 519cs1016) |
| Supervisor | : Prof. Pabitra Mohan Khilar |
| Venue | : Convention Hall |
| Date and Time | : 13 Jun 2024 (11.30 AM) |
| Abstract | : In our work, we introduced four range-free localization strategies aimed at minimizing the localization error associated with the conventional Amorphous algorithm. We conducted simulations and experiments to assess the effectiveness of these proposed schemes. In the first proposed work, an ensemble approach is proposed using both DV-Hop and a weighted Amorphous algorithm to enhance the localization accuracy. Two distance measurements are calculated to obtain the distance from an unknown node to the beacon node by considering hop value and size. Finally, the probabilistic distance estimation is applied to the obtained distances to get the actual distance. The proposed approach is compared with the traditional Amorphous and three other improved Amorphous algorithms. It is observed that the proposed approach provides higher accuracy in terms of MAE (Mean Absolute Error), MSE (Mean Square Error), and RMSE (Root Mean Square Error). To further address the limitations of the Amorphous algorithm, we have proposed a PSO-based Amorphous algorithm in our second work. The proposed work reduces the average hop size of anchor nodes and the localization error of the Amorphous algorithm. The simulation results demonstrate that, in comparison to other existing Amorphous algorithms, the proposed PSO-based Amorphous localization algorithm has a superior performance in terms of MAE, MSE, and RMSE. In the third work, the position error of the Amorphous algorithm is minimized by optimizing the hop size. For optimization of the hop size of the Amorphous algorithm, two different optimization algorithms, such as ALO and GWO, are considered. It is observed that the position errors of Amorphous-ALO and Amorphous-GWO are nearly the same. In order to determine the suitable optimization algorithm for Amorphous, the parameters such as minimum, average, and maximum execution times of Amorphous-ALO and Amorphous-GWO are considered for evaluation of the performance of the proposed algorithms. Whichever algorithm has lesser execution time is considered to be the suitable method for the localization of Amorphous. In the fourth work, a hybrid localization algorithm, Weighted Centroid Amorphous, is proposed to minimize the localization error. Instead of conventional centroid algorithm, a weighted centroid algorithm is used where weight is considered as a function of the hop value and hop size estimated by the Amorphous algorithm. The simulation findings show that the suggested Weighted Centroid Amorphous method outperforms the Traditional Amorphous, Improved Amorphous, and Ensemble Approach, respectively, with better accuracy rates of 90.41%, 89.57%, and 86.10%.<br>Keywords: Wireless Sensor Network Localization Amorphous Algorithm Mean Absolute Error Mean Square Error Root Mean Square Error. |