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A Secure and Efficient Node Localization for Wireless Sensor Network

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ABSTRACT: In a Traditional way for wireless communication follows efficient routing by multi hop communication. Node localization technique is an important technique which affects, accuracy and effectiveness of the wireless sensor networks (WSNs). In WSNs, Sensor nodes are deployed in distributed manner with holes. Existence of hole in a WSN affects shortest path or distance between nodes which causes low accuracy in localization. Proposed system present dynamic way to provide packet delivery with shortest path selection, node key management and provide more security to the data transmission on the network using position-aware, secure, and efficient mesh routing approach (PASER) ,Extended Kalman Filter Multidimensional Scaling (EKF-MDS) localization algorithm. EKF-MDS algorithm defines the position of the nodes in WSN and defines he shortest path between two nodes.

KEYWORDS: multi hop communication, node localization, EKF, shortest path.

I. INTRODUCTION

Clustering of sensor nodes in wireless sensor network is one of the most used methods because of its good scalability and the support for data aggregation. These sensors are dividing into clusters and each then connecting to other and establish a network. Data aggregation combines data packets from multiple sensor nodes into one data packet by removing same information. This reduces the transmission load and the total amount of data. To establish the connection between nodes requires position of that node which is known as node localization. The current localization is mainly classified into two categories, namely range-free and range based algorithms. Range-free localization methods do not depend on the localization data. The node localization is estimated based on the communication connectivity of the sensor nodes or by measuring their sensing capabilities to stablish the shortest path. For range-based localization methods, the WSNs is assumed to be a combination of anchors and nodes. Different methods have been proposed for solving the node localization problem; most of the solutions for the anisotropic networks with holes are not efficient.

II. RELATED WORK

WNS had several obstacles to secure their network some previous work related to WNS shows as follows. In 2010 Mo Li et al developed [1], Range-free schemes suffer from poor accuracy and low scalability. Without the help of a large number of uniformly deployed seed nodes, those schemes fail in anisotropic WSNs with possible holes. They proposed the Rendered Path (REP) protocol. REP is the only range-free protocol for locating sensors with constant number of seeds in anisotropic sensor networks.

In 2013 BiljanaRisteskaStojkoska[2], proposed an algorithm for nodes localization in WNS based on multidimensional scaling (MDS) technique to improve MDS by distance matrix refinement. Using extensive simulations they represent in details methodology regarding different network topologies, various network parameters and performance issues Improved MDS (IMDS) algorithm outperforms well known MDS-MAP algorithm in terms of accuracy.

In 2013 et al Proposed [3], A localization algorithm based on TOF (time of flight) ranging and Unscented Kalman Filtering (UKF). Firstly, TOF ranging was selected to measure the distance between beacon nodes and unknown nodes. By applying TOF data, the distance measurement was obtained and optimized, and node localization method was achieved by using Unscented Kalman Filtering, which avoided the fault of linearization error in Extended Kalman Filtering (EKF).

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In 2014 Tianxu Du, Zhi Wang proposed [4], an improved Bearing-Only Semidefinite Programming (IBOSDP) method for evaluation the positions and orientations of unknown nodes in large scale WSNs. they introduced a new triangular linear equation constraint, IBOSDP algorithm could solve the node localization problem effectively. Different from the previous work, only bearing information is required to estimate the unknown nodes, which could minimize the node's power consumption. Moreover, the localization accuracy of the new IBOSDP is unrelated to the deployment of beacons in the network.

In 2014 Jun Luo developed [5], novel model of range error correction for the wireless sensor node localization problem, which is further resolved by exploiting the technique of semidefinite programming (SDP) relaxation, Based on the sparse prior of large ranging errors. Proposed novel model in which range measurement improbability is approximated as the combination of small dense Gaussian noise and large sparse errors. They reformulate the localization problem to clearly correct the range errors and develop an algorithm based on SDP relaxation.

In 2015 LiyangRui et al developed [6], measurement for filtering the erroneous positions and clocks of the anchors during the localization and synchronization of a sensor node in a wireless sensor network. They solved highly nonlinear problem in closed-form through parameter transformation and multi-stage weighted least squares processing. Their estimator was able to provide the CRLB accuracy for both the sensor node and the anchors under sensible amount of Gaussian errors.

In 2016 Eva Tuba et al proposed [7], localization algorithm based on recent fireworks swarm intelligence metaheuristic, using standard benchmark data and compared it to other algorithms. That fireworks based localization algorithm proved to be superior considering most performance indicators that included average localization error with different number of radio signal strength measurements, different number of nodes, different number of anchors and different radio signal strength noise levels.

In 2016 Zhenping Chen et al proposed [8], In order to reduce the energy on assumption in wireless sensor networks (WSNs), distributed event-triggered communication for time synchronization. The clock feature of each node is modeled as the discrete-time second-order dynamics. Each node in the network determines whether and when to broadcast it states to its neighbors based on an event trigger mechanism .For each node in the network, the trigger function is designed based on the disagreement between its current states and those estimated from last transmitted, which thus is independent of the states of its in-neighbors. Then the condition about the updating period and the control gain is presented to guarantee the time synchronization of the network.

In 2016 proposed[9], efficient and effective secure node localization and a dynamic key management solution for WSN. Proposed scheme was secure node authentication with distance measurement and secure information verification by malicious node cleaning. key management schemes; assumed that key information is stored in very powerful and reliable sensor node and not in individual nodes. It was an important issue for protecting the powerful node by which the sensor network can be made secure, energy efficient and cost effective because moving anchor node plays a major role during localization process.

In 2016 Sim Zaidi proposed[10], localization accuracy may greatly use from joint manipulation , at no cost, of the information already provided by the forwarding nodes between each anchor (i.e., position aware) and sensor nodes pair. novel range free localization algorithm, derive its average location estimation error (LEE) in closed-form, and compare it in LEE performance with the best representative algorithms in the literature. Proposed algorithm overtakes in accuracy all its counterparts.

III. OBJECTIVES AND CONSTRAINTS

Main objective of this system is to node localization in WSN and find shortest path . Node localization is done using EKF-MSD algorithm which requires anchor node. EKF-MSD algorithm defines the position of sensor node in WSN. The original idea behind using multipath routing approach in WSN was to provide path resilience and reliable data transmission.Holes are present in the network which is cause the failure of node localization. Localization gathers the position of the sensor node in WSN. Presence of holes In WSN causes the low accuracy and error in measurement of shortest path distance, hence this system represents the EKF-MDS algorithm by knowing few anchor nodes for node localization with position aware secure routing approach .

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IV. CONCLUSION

Novel EKF-MDS algorithm for node localization in anisotropic WSNs with holes has been proposed. By exploring the virtual node, proposed system construct the shortest path to estimate the distances between unknown nodes. The distance matrix is optimized using geometry to make the distance value approach the real value. EKF-MDS algorithm has need of fewer anchors and provides better performance compared to the DV-Hop algorithm and the MDS-MAP algorithm in WSN.

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