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Trilateration based localization method using mobile anchor in wireless sensor networks

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ABSTRACT

Localization in wireless sensor networks (WSNs) is essential in many applications like target tracking, military applications and environmental monitoring. Anchors which are equipped with global positioning system (GPS) facility are useful for finding the location information of nodes. These anchor nodes may be static or dynamic in nature. In this paper, we propose mobile anchors assisted localization algorithm based on regular hexagons in two-dimensional WSNs. We draw a conclusion that the number of anchor nodes greatly affect the performance of localization in a WSN. An optimal number of anchor nodes significantly reduces the localization error of unknown nodes and also guarantees that unknown nodes can obtain high localization accuracy. Because of the mobility of anchor nodes high volume of sensing region is covered with less period of time and hence the coverage ratio of the proposed algorithm increases. Number of communications also decreases for the reason that the system contains $\log_e$ (n) number of anchor nodes which leads to less energy consumption at nodes. Simulation results show that our LUMAT algorithm significantly outperforms the localization method containing single anchor node in the network. Movement trajectories of mobile anchors should be designed dynamically or partially according to the observable environment or deployment situations to make full use of real-time information during localization. This is the future research issue in the area of mobile anchor assisted localization algorithm.

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1. INTRODUCTION

A sensor network comprises of a large number of sensor nodes that are densely deployed in a field. Each sensor performs sensing task for detecting specific events. The sink node is responsible for collecting sensed data reported from all the sensors, and finally transmits the data to a task manager. If the sensors cannot directly communicate with the sink, some intermediate sensors performs the operation of forwarding the data to sink [1]. Wireless Sensor Networks (WSNs) have emerged as one of the key enablers in recent years for a variety of applications such as environment monitoring, vehicle tracking and mapping, and emergency response. One important problem in such applications is finding the position of a node. To solve the localization problem, it is natural to consider placing sensors manually or equipping each sensor with a GPS receiver. Constraints such as cost and power consumption make these two methods inefficient in the network, especially