Enhanced Localization Using Trilateration Technique for Wireless Sensor Networks

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ABSTRACT

The concept of the challenge and importance of localization for wireless sensor networks (WSNs) is worldwide accepted, especially if cost-effective approaches are demanded, because any information of the sensor nodes would be useless without the wanted position for most of the applications.

In this thesis, we present an enhanced trilateration algorithm, which is a range-based localization method employing the received signal strength indicator (RSSI). The reason for choosing RSSI is that no extra hardware is needed for network-centric localization. Firstly, we introduce the corresponding concepts of wireless sensor networks and localization techniques, and present the current condition of study in these fields. Secondly, we discuss the relationship between RSSI and source-receiver distance and introduce a frequently-used mathematical model to express that relationship. In addition, we intensively analyze two factors which affect the measured RSSI values: non-isotropic path losses, and antenna orientation. Finally, we present an enhanced trilateration localization technique, which is expected to perform better than the traditional trilateration algorithm. A type of modified Tmote Sky node named Unode is chosen as experiment tools for all the tests. Then we evaluate the enhanced trilateration technique by comparing its results with the traditional trilateration through real experimental data.

Keywords: Wireless Sensor Networks, RSSI, Distance, Localization, Trilateration