

Public Abstract

First Name:Sridhar

Middle Name:

Last Name:Tulabandula

Adviser's First Name:Chengshan

Adviser's Last Name:Xiao

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:LOCALIZATION OF WIRELESS SENSOR NETWORKS USING MULTIDIMENSIONAL SCALING

Wireless sensor networks found their way into a broad variety of applications including industrial automation, medical applications, highway monitoring, habitat monitoring, military applications, environmental applications, and at the bottom commercial applications like personal health diagnosis, automated grocery checkout, remote controlled heating and lighting, etc. Except commercial applications most of them require thousands of nodes deployed for sensing and controlling. Recent advances in internet, communications, information technologies, and sensor design made these applications possible and the design of cheap low power nodes using MEMS help envision all potential applications. All these applications require knowing the locations of nodes, thus demanding a localization algorithm that is less complex in terms of computations, communication overhead and increasing the overall lifetime of the network with low life-cycle costs. In this thesis we give details of a simple mathematical technique, classical multidimensional scaling and how it solves the localization problem. It is simple for it does not have iterations or loops. This so called MDS-MAP algorithm is able to find the relative positions of nodes and with few anchor nodes available derives or maps the relative coordinates to absolute coordinates. When using a complex localization algorithm highly sophisticated nodes must be deployed and this increases the overall cost of deployment of the network. With a tradeoff between complexity and accuracy this less complex MDS-MAP algorithm derives absolute positions of nodes with accuracy sufficient enough for most of the applications. In support we present simulation results of the MDS-MAP algorithm on three different topologies. Also discussed are the simulation setup of an ad hoc network and topology control of the network with varying network characteristics. All the simulations are carried out in MATLAB.