Performance Improvement of Connectivity-Based Localization Using Iterative Learning

Nyein Aye Maung Maung
Graduate School of Infonnation Science and Engineering
Ritsumeikan University
Kusatsu, Japan 5258577
Email:gr042065@ed.ritsumei.ac.jp

Makoto Kawai
Graduate School of Infonnation Science and Engineering
Ritsumeikan University
Kusatsu, Japan 5258577
Email:kawai@is.ritsumei.ac.jp

Abstract-Resource constraints of wireless ad-hoc and sensor networks prohibit range-based localization schemes which require specialized hardware for high location accuracy. On the other hand, cost effective range-free schemes which depend only on connectivity information offer lower accuracy and grant their applicability only to large-scale networks. This paper propose an efficient localization scheme which applies received signal strength (RSS) measurements to improve the localization accuracy of range-free schemes without any extra hardware support and to solve the applicability problem. Locations of the nodes are estimated with the proposed iterative location learning algorithm which utilizes both connectivity information and RSSbased distance information between the nodes to get more precise location estimation. To make our proposed scheme applicable for both small and large scale networks, we configure the connectivity information using the available RSS measurements and a predefined RSS threshold. Optimal RSS threshold value that minimizes the error for a particular network to be localized is derived as a function of the total number of nodes and the network size. The accuracy of the proposed scheme is further improved by introducing the use of regulated hop-count values. Experimental results show that our proposed scheme significantly improves the localization accuracy and works well under different network configurations.