Localization in Wireless Ad Hoc Networks

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1 Introduction

Node localization, position estimation, and geolocation are all terms that are widely used to describe the process of estimating the position or location of a mobile node (MN) with respect to some spatial coordinate system\cite{8}. In this chapter, we discuss the challenges and highlight current research developments in the area of node localization in wireless ad hoc networks\textsuperscript{1}\cite{2, 6}.

1.1 What Are Ad Hoc Networks?

As communication devices become more intelligent and detached from wired networks, researchers are envisioning a truly ubiquitous computing environment that will allow users to communicate from anywhere and at anytime. Wireless ad hoc networks\cite{6}—an emerging network architecture with several unique characteristics, are part of this vision. Ad hoc networks are infrastructureless self-organizing, peer-to-peer, and rapidly deployable\cite{9, 5, 22}. They are comprised of wireless nodes, which can be deployed anywhere, and must cooperate in order to dynamically establish communications using limited network management and administration\cite{7}. Nodes in an ad hoc network may be highly mobile, or stationary, and may vary widely in terms of their capabilities and uses\cite{15}. The primary objectives of this new network architecture are to achieve increased flexibility, mobility and ease of management relative to infrastructured wireless networks. This is achieved by eliminating the need for fixed base stations (BSs) (as in cellular networks and wireless LANs); thereby, enabling instant infrastructure wherever ad hoc nodes are activated, and eliminating many of the constraints to node mobility that are imposed by a fixed network. Due to their inherent flexibility, ad hoc networks have the potential to serve as a ubiquitous wireless infrastructure, capable of interconnecting thousands of devices\cite{23} and supporting a wide range of networking applications. It is hoped that ad hoc networks will emerge as an effective complement to infrastructured LANs

\textsuperscript{1}The term \textit{wireless ad hoc network} includes both mobile ad hoc (MANETs) and sensor ad hoc networks.