Notice and Invitation

Oral Defense of Master's Thesis

The Volgenau School of Engineering, George Mason University

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A Sequential Detection Approach to Indoor Positioning Using RSS-Based Fingerprinting

Tuesday, April 4th, 2017 10:00 am

Room 3507 Engineering Building

All are invited to attend.

Committee

Dr. Jill K. Nelson, Thesis Director

Dr. Bernd-Peter Paris

Dr. Daniel M. Lofaro

Abstract

Indoor positioning has received significant research and commercial attention during the past two decades. Real world applications of indoor positioning appear in, for example, hospitals, warehouses, shopping malls, office buildings, and parking garages. This thesis focuses on localizing a robot (or other user) navigating an unfamiliar building. Since GPS is generally not a reliable solution for indoor localization, other wireless technologies are suggested. A common approach in modern applications is using received signal strength (RSS) observations from nearby Wi-Fi access points (APs) to localize. Such approaches are referred to as fingerprinting techniques. This thesis presents a sequential detection approach to RSS-based positioning that employs a Bayesian metric, in addition to k-nearest neighbors (KNN) algorithm, to identify the most likely path traveled by the user given a time series of RSS measurements. RSS measurements are collected as the user is traveling its path and are provided as input to the proposed algorithm to find the best path estimate. A trellis is used to model different possible paths the user could travel, and the Viterbi algorithm is applied to find the most likely path.

The performance of the proposed approach is evaluated using data collected in the Nguyen Engineering building at George Mason University at varying times of day and across several days. Results show that the proposed approach achieves strong performance even when only a small series of RSS measurements are available. In fact, in most cases, there is great improvement in performance, reported both in terms of average distance error and probability of correct path estimation, when the second set of RSS measurements is added beyond a single location observation.