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Title

Post hoc Indoor Localization Based on Rss Fingerprint in Wlan

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Document Type

Open Access

Degree Program

Electrical & Computer Engineering

Degree Type

Master of Science in Electrical and Computer Engineering (M.S.E.C.E.)

Year Degree Awarded

2014

Month Degree Awarded

February

Keywords

post hoc localization, indoor, wifi fingerprint

Abstract

In the investigation of crimes committed by wireless users, one of the key goals is to determine the location of the mobile device at the time of the crime. Since this happens during the investigative phase after the crime is committed, we term this the post hoc geographical localization estimation problem. In this thesis, we introduce the post hoc geographical localization estimation problem and present approaches for its solution based on radio frequency (RF) fingerprinting. Motivated by the goal of establishing a crime's location with enough accuracy to obtain a search warrant, our focus is on locating a criminal mobile device in indoor environments with roughly the granularity to distinguish between two adjacent rooms, without having the ability to enter those rooms or the building to gather input data for the RF fingerprinting algorithm. While empirical performance studies of instantaneous indoor positioning systems based radio frequency (RF) fingerprinting have been presented in the literature, the core of this thesis is the first empirical study focused on the post hoc version of problem from the viewpoint of digital forensics. In this study, we set up experiments in a residential area and collect a large set of raw data in order to analyze and evaluate the algorithms, the best of which provides a mean error distance of roughly 1.4 meters. In addition, we consider enhancements to the baseline algorithms if knowledge of the blueprint of the building is available. In particular, we consider whether compensating the raw data for the attenuation caused by walls can improve algorithm performance.

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