Wi-Fi signals database construction using chebyshev wavelets for indoor positioning systems

ABSTRACT

Nowadays fast and accurate positioning of assets and people is as a crucial part of many businesses, such as, warehousing, manufacturing and logistics. Applications that offer different services based on mobile user location gaining more and more attention. Some of the most common applications include location-based advertising, directory assistance, point-to-point navigation, asset tracking, emergency and fleet management. While outdoors mostly covered by the Global Positioning System, there is no one versatile solution for indoor positioning. For the past decade Wi-Fi fingerprinting based indoor positioning systems gained a lot of attention by enterprises as an affordable and flexible solution to track their assets and resources more effectively. The concept behind Wi-Fi fingerprinting is to create signal strength database of the area prior to the actual positioning. This process is known as a calibration carried out manually and the indoor positioning system accuracy highly depends on a calibration intensity. Unfortunately, this procedure requires huge amount of time, manpower and effort, which makes extensive deployment of indoor positioning system a challenging task. approach of constructing signal strength database from a minimal number of measurements using Chebyshev wavelets approximation. The main objective of the research is to minimize the calibration workload while providing high positioning accuracy. The field tests as well as computer simulation results showed significant improvement in signal strength prediction accuracy compared to existing approximation algorithms. Furthermore, the proposed algorithm can recover missing signal values with much smaller number of on-site measurements compared to conventional calibration algorithm.

Keyword: Indoor positioning; Chebyshev wavelets; Wi-Fi fingerprinting; Real-time locating systems