Indoor Navigation System for Mobile Devices

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a system to help mobile phone users navigate buildings by tracking the locations of standard indoor light fixtures.

The new technology comprises hardware (a small low-power light sensor suitable for installation on mobile devices) and signal processing algorithms (running on mobile devices) to provide reliable, inexpensive indoor positioning. The system does not require modifications to fluorescent light fixtures or LEDs commonly found in modern buildings.

Overview

Airport travelers, retail shoppers and hospital visitors are a few of the millions of people who could benefit from improved indoor positioning. Yet even after decades of research, a simple and robust positioning system is lacking. Problems include high deployment overhead and inaccuracy.

One promising strategy exploits the unique frequency signatures of light fixtures, which are the result of manufacturing variations. A common cell phone camera may be used to detect these unique signatures and compare them with a database to determine one's location. However, cameras have significant drawbacks such as limited bandwidth and low dynamic range, making it difficult to measure the signatures of individual light sources on a high ceiling, for example, in a warehouse store.

The Invention

UW−Madison researchers have developed an indoor navigation system using a mobile device equipped with two photodetectors. The system is able to determine the angular position of different light fixtures while avoiding the limitations in bandwidth and sensitivity associated with standard camera detectors. It is suitable for facilities with high ceilings more than three or four meters above the floor

Specifically, the new method can be illustrated in three steps: (i) identify multiple light source signals within the field-of-view according to known light source signatures; (ii) determine the angles of the multiple light sources; and (iii) identify the location of the mobile device based on the angle of the multiple light sources and a known mapping of light sources to locations.

Applications

- Indoor localization software for a wide variety of location-based services
  - Robotic navigation
  - Physical analytics
  - Virtual/augmented reality

Key Benefits

- Accurate, reliable and easy to use

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- Low-cost implementation
- Suitable in many indoor environments, even high ceilings

Stage of Development

Prototype code and hardware were built and used for testing. The system has been shown to resolve 3-D location with 0.6m precision and recognize a user's heading direction with 15-degree resolution.

The development of this technology was supported by WARF Accelerator. WARF Accelerator selects WARF's most commercially promising technologies and provides expert assistance and funding to enable achievement of commercially significant milestones. WARF believes that these technologies are especially attractive opportunities for licensing.

Tech Fields
- Information Technology : Computing methods, software & machine learning

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

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