Wireless Localization Techniques and Systems

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The advances in localization based technologies and the increasing importance of ubiquitous computing and context-dependent information have led to a growing business interest in location-based applications and services. Today, most applications requirements are locating or real-time tracking of physical belongings accurately; thus, the demand for localization services has become a key prerequisite in some markets. This section aims to provide the reader with a brief review of wireless localization techniques and systems to deliver a better understanding of state-of-the-art technologies and motivate new research efforts in this promising field.

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1. GPS-Based

A GPS is the most popular and worldwide radio navigation system to find the location and the position of the objects, especially for the outdoor environment. However, poor coverage of satellite signal for indoor environments decreases its accuracy and makes it unsuitable for indoor location estimation.

2. Infrared radiation (IR) positioning

Infrared radiation (IR) positioning systems are one of the most common positioning systems that use wireless technology. The spectral region of infrared has been used in various ways for detection or tracking of objects or persons and available in various wired and wireless devices such as mobile phone, PDAs and TV.

3. Wi-Fi-based systems

The Wi-Fi-based system can work both indoors and outdoors. The RADAR system is an indoor location system relies on Wi-Fi signal. This system uses two methods to estimate location from signals information.

The first is to use a signal propagation model. The second method depends on fingerprinting.

4. Bluetooth

Bluetooth is a wireless technology that can be used for tracking and localization, especially at indoors. Bluetooth localization systems have similar working principles as the self-localization schemes of sensor networks.

5. ZigBee

ZigBee technology is an emerging PAN / LAN wireless communication standard for applications that do not require large data capacity but require low power consumption. As such, ZigBee is widely used in environments of the smart home. Localization is usually carried out using proximity and TOA methods based on distances from surrounding ZigBee nodes calculated using RSSI. Zigbee localization works on the RSSI principle, which uses the RSSI values of three reference nodes as the basis for calculating the distance .

6. RFID Technology

The RFID technology is a way of storing and recovering the data by an electromagnetic transmission of an integrated circuit that is compatible with wireless frequency and is now viewed as a means for improving data processing operations . In addition to the technique of proximity that provides the symbolic location of the RFID tag according to the location of the reader, there are many ways to accurately perform localization using RFID technology.