Research on Indoor Positioning Technology Based on Wlan

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Abstract: With the development of society and the advancement of technology, location-based services (LBS) are widely used in traffic navigation, logistics management and other fields, gradually expanding from outdoor scenes to indoor environments, from production services to life and entertainment. Its application prospects will be very broad. A necessary prerequisite and important foundation for the application and development of LBS is good positioning technology, but the existing indoor positioning technology has many shortcomings in positioning accuracy, system cost, user experience, etc., which restrict the development of indoor LBS. Wireless Local Area Networks (WLAN) positioning has the advantages of low positioning system construction cost, support for more user terminals, and convenient use. It has become a hot spot in the research of indoor positioning technology. This paper conducts a more in-depth research on WLAN positioning technology, focusing on the commonly used location fingerprint positioning algorithms, and analyzes the propagation characteristics of wireless signals in the indoor environment from the perspective of positioning. The problems in computing time and other aspects are studied, and the corresponding solutions are given. Through experiment comparison, the effectiveness of the given method is verified.

1. Introduction

At present, the rapid development of computer technology and Internet technology has made people's lives easier and more convenient. Among them, various services based on the positioning system are the research and development content of many large computer software companies. How to strengthen the positioning system Application has become an important content that needs to be studied. It is understood that among many positioning system technologies, WLAN-based indoor positioning technologies are the most widely used. They are based on receiving WLAN signals to accurately locate objects without adding additional hardware devices. This technology is available in shopping malls and hospitals. Other places play an important role. However, it cannot be ignored that there are still many problems with this technology, such as signal stability and connection problems that need to be further resolved. In addition, there are a lot of interferences in many indoor positioning, which will have a great impact on the positioning effect. How to solve these problems and improve the stability and high speed of WLAN-based indoor positioning technology is a problem that needs to be solved urgently. Therefore, the author’s research is very necessary, which will lay a certain foundation for the subsequent upgrade of WLAN-based indoor positioning technology. Theoretical basis.

2. Concept of Indoor Positioning Technology in Wlan

Indoor positioning technology is to use satellite positioning assistance to solve the problems that the satellite positioning signal cannot reach the bottom surface or the signal reaches the bottom surface is weak and cannot penetrate the wall, so as to use indoor positioning technology to accurately find the location of the object. At present, there are many kinds of indoor positioning technologies, mainly including Bluetooth technology positioning, infrared technology positioning, RFID technology positioning, ZigBee technology positioning, ultrasonic technology positioning and ultra-wideband technology (WLAN) positioning, and WLAN-based indoor positioning technology is many indoor positioning. One type of technology, it mainly has two working modes,

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one is the indoor positioning technology of the infrastructure mode, which mainly uses the access point or AP to achieve the coverage of the wireless network, so as to achieve the positioning effect. The other is the point-to-point mode, which does not require wireless network coverage and access point equipment, and uses temporary peer-to-peer wireless networks to achieve resource sharing and indoor positioning. Among the two working modes, the indoor positioning technology of the infrastructure mode is the most widely used, and has been applied to various aspects such as logistics, warehousing, and medical treatment. Its working method is to use many APs to cover the indoor wireless network, and then form a basic service set, and use this basic service set for indoor positioning.

According to the data, there are many indoor positioning technologies, such as the common ones: indoor positioning technologies present ibeacon, wifi, RFID, UWB, Abell, LPWAN, optical communication and other technologies in industrial manufacturing, logistics, retail, wearables, assets and personnel The latest applications in the tracking field are shared; indoor positioning technologies such as optical tracking, magnetic field, infrared, and ultrasonic, but how to use these technologies in actual projects is the focus of this article. Relevant technical personnel should discover the use and research of their WLAN indoor positioning technology, which can help relevant industry personnel solve problems and reduce complexity.

The infrared positioning is implemented after the special infrared (InfraredRay) emitted by the infrared transmitter obtained by the optical sensor in the project. The infrared outdoor positioning structure Active BadgeSystem performed by Cambridge students AT&T Lab is called the first-generation indoor positioning structure; Ambiplex released the IR.Loc structure in 2011 to achieve positioning through detection of thermal radiation, and the positioning accuracy within 10 meters is achieved. 20-30 cm. Infrared indoor positioning accuracy is very high, but it cannot pass through obstacles, but is transmitted in a straight line of visible range. The effective distance is very short, and it is greatly interfered by indoor layout and lighting. The positioning cost is high, and there is a large amount of basic application. The restriction.

It uses the reflection detection method, combined with the time difference between the transmitted ultrasonic wave to the reference node and the corresponding echo calculation and the interval between the reference node, and uses the triangulation method to calculate the position of the target to be inspected. ActiveBat is a pioneer in the ultrasonic positioning structure. After a series of ultrasonic receivers are deployed in a centralized manner, the positioning accuracy of 3 cm is achieved. SonitorIPS is an ultrasonic positioning processing plan that can be used for commercial applications. It has been used in many large hospitals to track patients and medical facilities with room-level accuracy. Moreover, it can be transmitted under non-visible distance, with high positioning accuracy and small deviation, but the ultrasonic information transmission attenuation is serious, the positioning feasible range is limited, and the facility cost is high. It is suitable for indoor positioning applications under special conditions.

Bluetooth positioning method, this is the current popular iBeacon. With the help of iBeacon positioning equipment, the smart phone software can realize positioning and navigation. iBeacon technology uses Bluetooth Low Energy to realize that iBeacon devices can run for a long time only on button batteries. The current iBeacon applications mainly include two types. One is to push messages after entering the iBeacon area; the other is to deploy base stations and use signal strength for positioning. Both of these are related to location awareness. iBeacon's location sensing is based on its signal strength RSSI, and the change in the RSSI value is used to determine how far the user is from the iBeacon device. If the RSSI of a certain distance (1 meter) is known, then the distance is less than 1 meter if it is greater than this value, and the distance is greater than 1 meter if it is less than this value. By deploying multiple base stations, the approximate location of the user can be found by the relative distance from two or more base stations. The indoor positioning advantage of relying on Bluetooth is that the facility is usually very small, consumes less energy, and has a short connection time period. It can be used for small-scale positioning. The disadvantage is that you need to guide the user to turn on Bluetooth. At present, these problems are not too big a problem in some scenarios.

3. Algorithms for Indoor Positioning Based on Wlan

As a world-recognized authority on regional networks, the specifications created by the IEEE 802 working group have dominated the regional networks in the past 20 years. Such agreements cover 802.3 Ethernet measures, 802.5 Token Ring measures, and 802.3z 100BASE-T rapid Ethernet measures. In 1997, after seven years of operation, IEEE formulated 802.11 measures, which was the first agreement in the field of wireless areas to be recognized internationally. In September 1999, it released the 802.11b “High Rate” measure, which is used to fill the 802.11 protocol. 802.11b increased the throughput of 5.5Mbps and 11Mbps at the rate of 1Mbps and 2Mbps of 802.11. , And then developed to 54Mbps of 802.11g, until now 108Mbps of 802.11n. Using 802.11b, mobile customers can obtain the same features, system throughput, and availability as Ethernet. This norm-based technology encourages managers to choose a reasonable local area network method to build their own network according to the environment, and meet the requirements of their business customers and other customers. As with other IEEE 802 specifications, the 802.11 protocol is critically operated in the lowest two layers of ISO measures, namely the physical layer and the information link layer. All the operating procedures of the local area network, the network working system, as well as TCP/IP, Novell NetWare, can all work together on the 802.11 protocol, just like it runs on 802.3 Ethernet. The basic framework, features, and services of 802.11b are defined in the 802.11 specification. The 802.11b protocol focuses on some adjustments on the physical layer, introducing high-speed information transmission characteristics and connection security.

WLAN-based indoor positioning is to use WLAN wireless signals for indoor positioning, mainly using indoor fixed APs to analyze specific locations based on mobile terminal data. In addition, mobile devices with WIFI receiving and radiation functions should also be distributed in the indoor environment. In this way, regardless of whether the AP is static or dynamic, it can use the WLAN channel transmission mode to locate the location. Among them, AP is very important. It is the core of WLAN-based indoor positioning. When we turn on the mobile terminal, we can scan the AP signal to obtain information about the surrounding APs. According to the influencing factors existing indoors, the positioning environment is roughly divided into three types, namely static AP, dynamic AP, and static and dynamic hybrid AP, to specifically analyze the indoor positioning algorithm based on WLAN. Assume a scenario where too many APs will cause interference between signals, so 5 static APs are set up, which are distributed in all corners of the room, so that when people walk in each position of the room, It only needs to use mobile positioning equipment and rely on the VFDA algorithm to accurately locate the person's location. The schematic diagram of the room is shown in Fig 1.

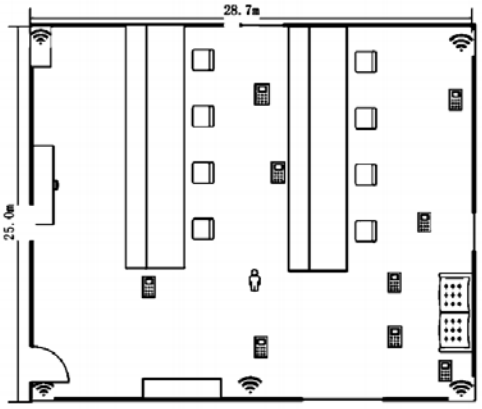

Fig.1 Schematic Diagram of the Room

The third situation is also the most complicated situation in the room, that is, static AP and dynamic AP are mixed. At this time, we calculate the signal intensity value based on the signal intensity value radiated by the dynamic AP and the static AP according to the channel propagation model and the TOA principle. Corresponding to the physical distance, the triangle algorithm of TOA uses the distance information from the target to be measured to at least three known reference points to estimate the target position. This algorithm is divided into two stages in the WIFI channel

environment positioning: ranging and positioning. In the ranging stage, the point to be measured first receives AP information from three different known locations, and then calculates the distance from the point to be measured to the AP according to the wireless channel transmission model. In the positioning stage, when calculating the position of the point to be measured by the triangle algorithm, the geometric principle of the intersection of circles and the channel propagation model for indoor positioning are used to calculate the radius of the circle. During the positioning process, take the physical positions of any three APs as the center (known), calculate the signal strength value of the AP receiving the location of the point to be measured, and calculate the corresponding distance between the point to be measured and the AP according to the indoor WLAN channel transmission model. This is used to calculate the geometric position of the triangle. The triangulation measurement diagram is shown in Fig 2.

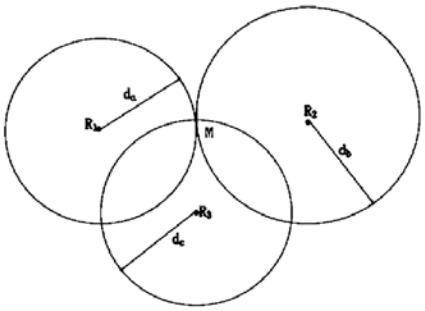

Fig.2 Triangulation Measurement Diagram

4. Conclusion

This article mainly introduces the indoor positioning technology based on WLAN in detail. It simulates the calculation of an indoor positioning technology algorithm through the scenarios of static AP, dynamic AP and static and dynamic AP, so as to let everyone know about indoor positioning technology. At the same time, this article also introduces the current status and problems of indoor positioning technology. I believe that with the rapid development of wireless local area network technology, indoor positioning technology, especially WLAN-based indoor positioning technology, has attracted more and more attention, and the indoor positioning system is accurate On the basis of the continuous improvement of the positioning accuracy and the premise that the positioning accuracy is not affected, continue to improve the ease of use of the indoor positioning system, the adaptability to the dynamically changing environment, and further promote the location-based services, so as to achieve practical application China is developing in the direction of being more convenient, more portable, and more user-friendly.

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