모바일 기기에서의 실내 네비게이션 시스템 아키텍쳐의 연구

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Research of the Architecture of Indoor Navigation System based on Mobile Device

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● Abstract ●

To spread the incredible experience of wandering around a building, we propose the architecture of indoor navigation system based on inter-floor. Firstly, we combine trilateration method with Fingerprint Positioning Algorithm for positioning and Dijkstra Algorithm for calculating paths. Then the system can get the user's current locations and provide relevant paths according to the user's choice. Moreover, it can also provide the navigation path which takes the inter-floor information into consideration. It breaks the traditional navigation based on planar graph and has abundant business value.

Keyword : Indoor Navigation, Mobile Device, Inter-floor

I. Introduction

Humans spend 87% of their time on earth indoors. And increasingly, they do so with mobile devices like smart phones in their hands. According to IDC, the worldwide market for smart phones has grown 42.6% in the third quarter of 2011. In fact, humans are so used to relying on their smart phones and getting instant directions from the current locations to anywhere. However, when people get into indoor environment, there are challenges to implement indoor navigation, such as the User Interface, the inaccuracy and so on.

With the Indoor Navigation System, companies can capitalize on the smart phone explosion to bring the power of LBS to their business processes. To satisfy the needs of both companies and consumers, many researchers manage to develop a system for indoor navigation, especially based on mobile device.

II. Related Work

All modern mobile devices have Wi-Fi built in, and wireless networks are common enough in indoor spaces that an app could easily scan for known access points and calculate user's position using trilateration.

The system provides Location Based Service and enhances the brand experience. It can also reduce operating expense at a cost that makes business sense. Meanwhile, there's a big difference between other indoor navigation systems that it can make proper paths for clients based on inter-floor information. The design makes it possible to optimize location-dependent business processes.

III. The Architecture of Indoor Navigation System

Main purpose

With the support of GIS and positioning technique, the system integrates business service data and then provides a kind of visual navigation service. Moreover, the system can recommend a path which includes inter-floor data.

As is shown in the following figure, the system is divided into five parts which are Database, Positioning, Navigation, Mapping and User Interface.
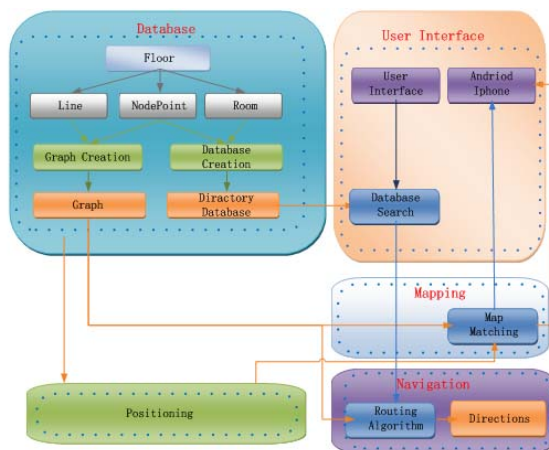
Fig. 1. System Architecture

1) Database

The Database provides the basic data which includes inter-floor information such as point, line and polygon. Among them, point is the key point in the road network. Line is the line which is between two points in the road network. And the basic data of rooms is stored in polygon. All real-time data is downloaded from LBS Server.

2) Positioning

The Triangle Localization Algorithm and Fingerprint Positioning are used in the Positioning Module.

3) Navigation

The module is used for determining optimal path of navigation system based on inter-floor information. It includes graphing and routing functions.

Graphing Function : It lets users know the current location and find their desired destination on the map. Then it displays a visual path for users to go to the destination.

Routing Function: The system supports navigation between floors. Each floor has its basic data for inter-floor navigation. The system sets that each floor has its corresponding entrance and exit. Assume that the user's current location is on A floor and the destination is on B floor, where A is different from B. The navigation process is:

- With Dijkstra Algorithm, it supplies a path from the current location to the exit which is set for A floor.

- With Dijkstra Algorithm, it supplies a path from the entrance which is set for B floor to the destination.

- According step 1 and step 2, it supplies a complete inter-floor navigation path. First, the user goes to the exit of A floor and by elevator or stair he can go to the entrance of B floor. Then he can go to the destination from the entrance of B floor.

4) Mapping

Obtain the information of nearest NodePoint on the basis of information from Positioning Module and set the starting point.

5) User Interface

The navigation results are displayed as follows in detail.

- Display the indoor map and the user's current location.
- Display the coupon information from nearby businesses according to the clients' requirements.
- Display the paths according to the clients' requirements.

IV. Conclusion

This paper discusses the architecture of Indoor Navigation System, which is based on inter-floor. The system has the function that offers the corresponding paths including inter-floor information according to the clients' requirements.

In the future, we plan to implement the system based on Android platform and promote its commercial value and advance.

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