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Design of Intelligent Cloud Guide System

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Abstract: In order to deliver accurate services to tourists' phone, intelligent guide system based on the Android platform solution is proposed. First describes the system architecture, including cloud service center, sensor networks and cell phone; then describes the function of each tier; last proposed the three-tier implementation. The testing results show that the system can provide better guide service.

Key words: Android, intelligent guide system, cloud service, sensor, GPS

INTRODUCTION

With the improvement of people's quality of life, the number of travel has increased year by year; the form of the traditional tour guide is increasingly unable to meet the needs of tourists. The question, that how we can provide better, useful guide service for tourists has become the focus of our concern (Jia and Sun, 2011). At home and abroad the research of intelligent guide system is also being carried out extensively. A wireless Internet phone, jointly developed by a number of enterprises from the United States and Japan, uses the electronic compass and the GPS chip to determine the specific location of the user and the phone will show the specific location on the phone screen (Lin, 2010). Zhejiang University carried out a similar study and they have developed a intelligent tour guide system based on the Android platform. Google API is applied to access Google Maps in the tour guide system. After calculating the right location of visitors, the mobile phone program will display information to its users, with the GPS chip within the tour guide platform to determine the location of the user (Ma *et al*., 2009).

There are some shortcomings in all these systems. Firstly, information is previously built in the guide terminal which results in the incapable of information update timely (Shi *et al*., 2010). Secondly, the Map information for smart guide platform is provided by a third party but some scenic spots have not been included by even providers such as Google and Baidu. Especially, in most natural landscape of Scenic Area, they can also not exactly determine the precise location of the small, not often used load, scenic spots and their nearby facilities, etc. In these cases, intelligent tour guide systems are not do good job (O'Grady and O'Hare, 2004).

This study presents a new three tier guides cloud services architecture, in which information and services are stored in the cloud, that make the tour guide systems can be achieved.

ARCHITECTURE OF THE SYSTEM

Intelligent cloud guide is based on the mobile phone operating environment, tour guide sensor network and guides cloudservices center technology platform. Intelligent tour guide system will provide introduction, tourist information and other relevant services.

Cloud guide system services architecture as shown in Fig. 1.

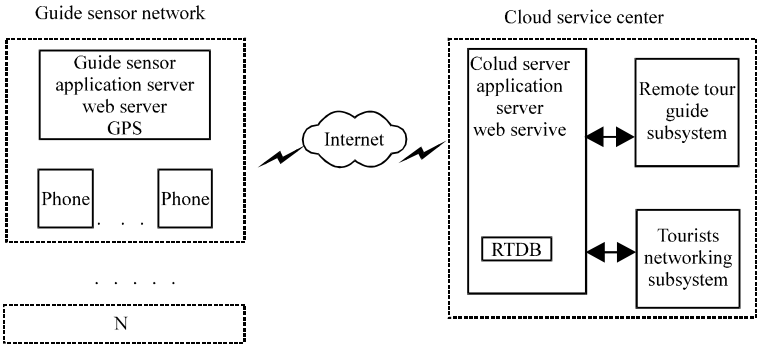

Fig. 1: Tour guide system cloud services architectures

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The basic steps to build the entire guide system:

- Establish a basic tourism service information storage system, including all basic information about scenic attractions, accommodation and shopping spots inside and outside the scenic areas. All these information will be centrally saved in the tour guide cloud service center server
- Set up a tour guide sensor network and the sensor is placed on the attractions and their supporting facilities nearby. Accordingly, voice and video information, location information and so on will be stored in the sensor. Then sensors would connect tour guide cloud server center by Internet
- Tourists can obtain location information through GPS. Attributed to the preset sensor, tourists are able to get the tour guide sensor network, using wireless short-range technology which will redirect the tourists to their recent sensor. Then the recent sensor will serve tourists and handle their information requirement

SYSTEM DESIGN AND IMPLEMENTATION

System mainly consists of three parts: Guide cloud service centers, tour guides sensor networks and mobile apps.

Guide service processes as shown in Fig. 2:

The following describes the implementation of these three parts.

Guide cloud service centers: Create a tour guide dedicated server, adopting Java EE technology, implement remote database operations by creating a Web Service. Working principle shown in Fig. 3:

Cloud service center mainly consists of two modules: Remote subsystem for scenery introduction. Tourist access the sub-module named "Guide Service" in Web Service module on the server, through the mobile phone and report their location to cloud service centre. After matching the information stored in the database the "Guide Service" will redirect the guide service to the appropriate server. Therefore the appropriate server will provide scenery introduction. Furthermore, if tourists are in dangerous areas, guided sensor networks can also give early warning tips.

The core content in this system is maps and related information. Due to the system current test sites map is not detailed enough, we have employed the following policy map management:

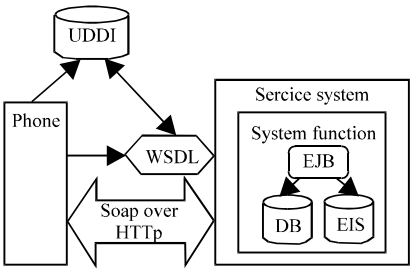

Fig. 2: Guide service flow

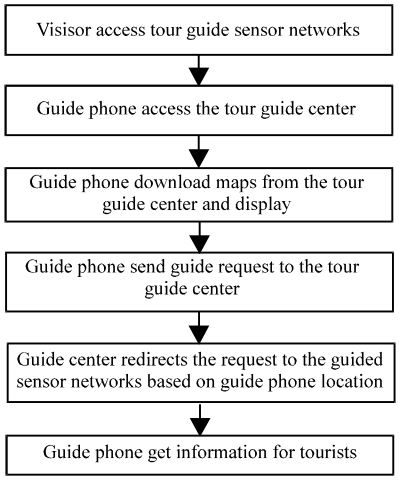

Fig. 3: Cloud service center works

Firstly we would have to manually set up the regional map. CorelDraw is applied to hand-draw maps of the road, rivers, lakes, mountains and plains, etc. For example, build a map, in which there are two points in a specific area and then determine the point in upper-left corner of the map latitude and longitude value (27.731553, 118.000116) and determine the point in the lower right corner of the map latitude and longitude value (27.731553, 118.000116) with GPS instrument.

Add other information to the map: building, scenic spots, shopping mall and so on. Meanwhile, their Latitude and longitude values should be saved to database. So when loading a map, all things about these places can be reached. Map will show their latitude and longitude. In order to facilitate the management of map, we construct "Silverlight" program on the server side.

Program running results as shown in Fig. 4:

Build an evaluation subsystem, to record tourists visited and offer download service. In addition, it can mine data on tourist information, optimize the scenic tour route and provide better services to tourist.

It works like this: when visitor access to the server-side on Web Service, the he server will record visitors'

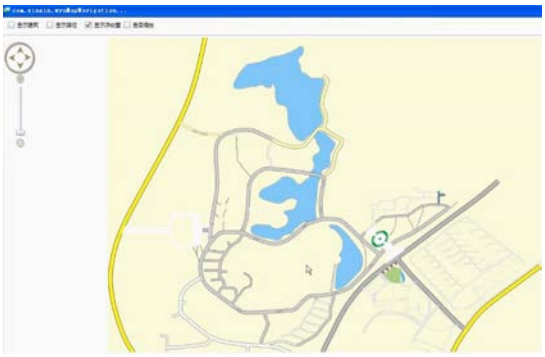

Fig. 4: Program running effect

location information, mark each of the tourists by only ID (mobile phone Wi-Fi module address label). So that the whole tour process can be stored. After statistical analysis, offer users with information feedback about tourist-visits number and how can they realize optimization of scenic tour route which make they can void too-crowded attractions and choose a more preferable time to visit attractions they want to visit.

Guided tours sensor networks: Base on the present situation that smart phones are generally equipped with a Wi-Fi module, System uses a mobile phone Wi-Fi to connect sensors preset in the scenic area. When the sensor sensed tourists are within the scope of the sensor, it can take advantage of the event sensor technology and recognition technology to perceive and acquire tourists networking data and feedback to service center. The service center will obtain phone data within the sensor network and then respond to customer's needs.

When building a tour guide sensor networks, this system should calculate each position of the sensor, according to the construction's and attractions' distribution. After that, emplace every sensor.

Each node in the network consists of two parts-a wireless router and a server. Thus, when visitors connect to the wireless router, they can access the server. And the server will provide them audio introduction. The pressure of tour guide cloud service center has been greatly reduced. As a result, Data is able to transmit more smoothly and the introduction of attractions meets customer requirements much better.

Tour guide mobile apps: Statistics show that, the global total number of smart phone equipped with Android system accounting for 30% of the whole amount. Our mobile tour guide system is also based on the Android platform.

Main work: Firstly download maps and acquired user's position data. Then display the data on the map, pass it to the tour guide center. Eventually get the tour guide information feedback to tourists.

Building, attractions and other information on the map are obtained through access to the server-side Web Service and shown on the map.

Get location information is divided into three steps:

- Add permissions to support access to the hardware (Nong *et al.*, 2010).<uses-permission android:name="android.permission.ACCESS_FINE _LOCATION"> </uses-permission>
- Get object LocationManager of the system service LocationManager loctionManager; String context Service = Context.LOCATION_SERVICE loctionManager = (LocationManager) getSystemService(contextService)
- Access to position provider. The position provider offer position data. In this process, you are permitted to choose to specify a specific position provider or allow system to match a position provider if you provide a standard set. The following are two ways to obtain the position (Li, 2013)
- Obtain the location provided by the GPS position (by specifying a specific position provider): String provider = LocationManager.GPS_PROVIDER; Location location = loctionManager.getLastKnownLocation(provider)
- Use standard set, allow system to match a position provider
- Criteria criteria = new Criteria

Criteria. setAccuracy (Criteria .ACCURACY_FINE):

- Criteria.setAltitudeRequired (false)
- Criteria.setBearingRequired (false)
- Criteria. set Cost Allowed (true)
- Riteria. set Power Requirement (Criteria. POWER_LOW)
- String provider = loction Manager. get Best Provider (criteria, true)
- Location location = loction Manager. get Last Known Location (provider)

Due to the high accuracy of position data acquired by the GPS, we should try to make a judge if GPS receiver is available in advance. If it is available, the system is preferred to obtain the position by GPS. Otherwise, we have to position through other methods.

Fig. 5: Phone program run effect

The function of Guiding-Information is to provide tour guide information from tourists needs. The guide information is stored in guide sensor network, for users to download and play.

Phone program's effect is shown in Fig. 5:

SYSTEM FEATURES

Tour location and event sensing:Provide position service and safety hazards and emergency events warning.

Networking tourists statistics: Store the networking tour visitor information and their traveling records; do statistical classification.

Tour introduction: mobile phone automatic voice guide service; in a key to replay; in a key to get help; in a key to obtain introduction of the attractions nearby; in a key to find directions through internet; download their own history route.

The phone tour guides management: entitle the service website to track tourist routes; offer security risks mobile phone warning and emergency warning; to control and track the crowd flow; to give them contingency remote control tips and linkage command.

Table 1: Download speed and buffer time

Number of connetions	Average download speed (KB/s)	Average buffer time (s)
10	525	18.3
20	506	19.0
30	478	20.1
40	435	22.1
50	394	24.4
60	346	27.8
70	297	32.3
80	243	39.5
90	184	52.1
100	122	78.9

Table 2: Fluency of the test

Fluency	Times	Ratio
Smooth	408	89.67%
not smooth	31	6.81%
very not smooth	16	3.52%

Table 3: Fell of users

Fell	Ratio
better	83%
same	10%
worse	7%

SYSTEM TEST

In order to test the efficient of the solution, we build a small-scale system. The system contains 1 cloud service center and 10 guide sensors. Hardware configuration of cloud service center is: Intel Core 2.4 GHz, 4G memory, 1000M NIC; hardware configuration of guide sensor is Intel P4 2.0 GHz, 2G memory, 100M NIC, TP Link 54M wireless router; the connector between cloud center and guide sensor is Cisco WS-C 2960-24 LT-L. The average speed when different number of guiders connected to the system is shown in Fig. 6.

The explanations time is 10 min, we made a MP3 file which size is 9.6M. We will know that the buffer time is less than 90 seconds when there are 100 connections,
while the explanation time is 10 minutes, the whole guide process would run very smoothly. The test result is shown in Fig. 7.

Table 1 shows the test result more accurately.

The speed is a very import indicator of the system, as well there are other indicators which are also very import. Then the test is in a much more large scale (3 milles) and last for a much long time (30 days). We called 200 volunteers and got the feedback information from them. The volunteers record whether the system runs smoothly each time when they use it. Table 2 shows the result.

At last we get the feelings from the 100 volunteers compared with other tour guide means. The data is shown in Table 3.

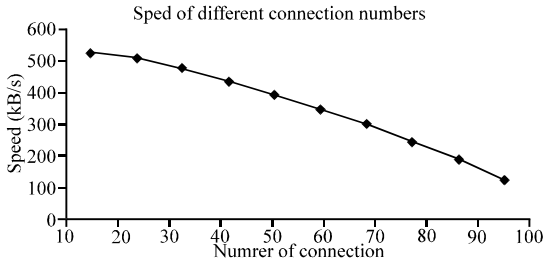

Fig. 6: Speed of different connection numbers

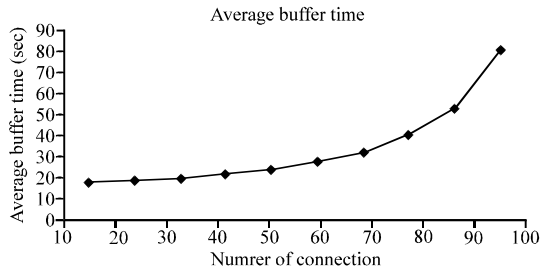

Fig. 7: Average buffer time

After the whole test, we an get the conclusion that generally the system can provide better service.

CONCLUSION

At present, the program has been proven in small-scale to provide visitors guide service well but the program still has many shortcomings: The program supports only Android system and also it needs tourists to download the program. In addition, in order to maintain the scenic quiet environment, tourists are required to carry mobile phones supporting headset. To some extent, it is inconvenient. Further more, due to the higher bandwidth requirements of video; we are not able to provide video services for tourists yet.

Technology advances gradually change human habits and mode of operation. It also brings the convenience of living. Under the condition of high mobile phone penetration, to combine guide with mobile phone will produce a new spending habits (Wu and Lin, 2010). Mobile communications will play an increasingly important role in tour. We believe that with the development of new spending habits of culture and technology progress, more and more tourists would be willing to use mobile phones guide service mode (Wakkary and Hatala, 2007).

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