Travel Footprint Sharing System Based on Location-based Services

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Abstract: With the popularity of WeChat "friend circle", "sharing" has become a way for travelers to share their feelings and convey happiness with relatives and friends. However, the current "friends circle" location information sharing function is limited, it can't meet the traveler's personalized sharing needs for real-time location information. This paper designs and implements the Travel Footprint Sharing APP based on Location-based Services. The user takes the client as the portal, completes the travel log publishing in real time, Pay attention to nearby traveler logs, mark and plan travel routes, records the travel revenue and expenditure, etc. It is beneficial for tourists to grasp the surrounding tourist information in real time and effectively improve the user's travel experience. The system test proves the practicability and validity of the system.

1. Introduction

With the rapid development of mobile communication and mobile geographic information technology, location-based services (LBS) are widely used in social, tourism and other fields. Researchers have done a lot of work on the application of LBS in tourism information service [2-7]. However, the application of these APPs is mainly limited to the services of tourism information inquiry, push, path planning, scenic spot information, etc., and does not make in-depth application research on the personalized sharing based on the user's real-time location during the travel process. The "Share" feature of WeChat "Friends Circle" has become a way for travelers to share what they see and hear on the journey and convey a happy mood. However, the location-based sharing function in the commonly used WeChat "Friends Circle" is relatively limited, and the shared information is relatively independent and the information consistency is weak. When sharing a place, you can only share the location information of the current location, but can not find other users near the location, and you can't plan the route on the Maps.

Based on the personalized demand of mobile location information in travel, this paper proposes a location-based service (LBS)-based travel footprint sharing system sharing APP. Users can not only share travel log in real time, travel path real-time planning, record revenue and expenditure, and quantitative analysis. It also "discovers" surrounding users and keeps track of their travel information in real time. This design can not only meet the user's location-based personalized real-time sharing needs, but also has a great practical significance to solve the problem of tourism information push delay and information asymmetry [7].

2. System design

2.1 System Architecture

The system is developed in C/S mode, and the client uses Android SDK for development and programming in Java language. The server uses Servlet for development and uses MySQL database. The design focus consists of two parts: the Android client and the Servlet server.

Android client: According to the characteristics of the Android system, the client structure is divided into three layers: the style interface (View), the function implementation (Class), and the

background data (Data). The system develops LBS-related functions by integrating the Baidu Map Development Kit (SDK).

Servlet server: Servlet development under Eclipse's Java EE built-in module, Servlet provides services for "login", "logging", "get log" and other functions, when the user uses the corresponding function, you can send a GET/POST request from the client to interact with the corresponding method of the servlet. The system architecture is shown in Fig. 1.
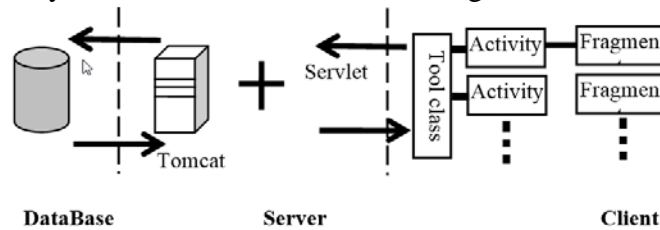

Figure 1. System architecture

2.2 Functional Design

The location service-based travel footprint sharing system enables users to write travel logs and publish them in the order of "timeline" at any time when traveling, such as on-the-scenes, impressions, photos, etc. Real-time "discover" other users in the vicinity and pay attention to their travel logs, grasp the surrounding travel dynamics in real time; customize the mark and path planning on the electronic map; recording the piecemeal revenue and expenditure information on the way, quantitative analysis and visual display of revenue and expenditure; call a third-party taxi or order service. The system has designed modules such as attention, map, log, and account to meet the needs of users. The system function is shown in Fig. 2.
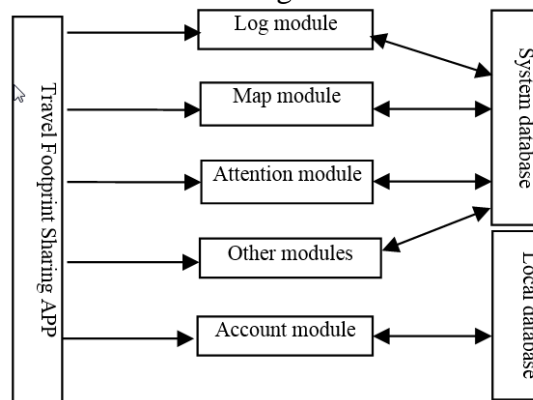

Figure 2. System function structure diagram

Log module: Write travel log edits and publish travel logs in "timeline" order. It is different from WeChat "friend circle" function, with the "timeline" design interface, the user can record the date and time of the log in detail while writing the log. The automatically generated "time node" makes the log form a whole.

Map module: The "Map" module inherits the Baidu map development toolkit and inherits Baidu map by calling Baidu API. The user performs path planning by drawing polygons on the map, drawing polylines, adding text icons, and custom tags through corresponding functions.

Attention module: Used to display the log information of the user concerned. The user can use the client to find users in the set distance radius and pay attention to the travel dynamics of these users.

Account module: The module is convenient for users to record the cost of scattered time at any time during the journey, and display the income and expenditure situation with a visual map, so that users can understand the real-time consumption dynamics. The user completes the detailed revenue and expenditure record of time, amount, type, and remarks through the "record an account" function.

Other modules: For the third-party application call, when the user needs, click the button to open the corresponding third-party application directly on the current interface through the interface. For

example, the user clicks "take a taxi", you can directly call the taxi software installed on the mobile phone. When adding the taxi software call interface, add the Baidu map call, so that the user can directly open the Baidu map. Use its location service.

3. System Applications

The system adopts the C/S computing mode, and the client uses the Android SDK. The design focus consists of two parts: the Servlet server and the Android client. The Android client part is encoded using Eclipse with Android ADT installed. The database uses the MySQL database, the server program uses the Servlet and the program is run on the Tomcat server.

3.1 Server Servlet Implementation

The server side of the system uses the Servlet as a bridge between the client and the database. The GET/POST request sent by the Android client is intercepted by the Servlet corresponding method on the server side, and the data is processed and interacted with the database. The Servlet is executed under the JavaEE built-in module of Eclipse, and the related methods of writing Servlet are provided for the functions of "login", "logging", "and getting logs" and so on. The Servlet class handles the GET/POST request sent by the client, mainly including the login operation class: LoginByGet and the log storage class: Log_sava. The login operation class processes the GET request, accepts the username and password sent from the client, and return the validation results. The log storage class processes the POST request, accepts the transmitted log information, and stores it. Since a log content will contain numbers, texts, etc., and the number of parameters is large, POST requests are used for transmission and interaction.

3.2 Android Client Implementation

The main interface of the Android side includes two parts: the main interface menu and the main interface function area. The main interface ribbon consists of two parts: the function entry section and the content section. Because the "map" module and the "log" module in the system need larger space, the interface adopts the structure of "sliding menu + main interface". Under this structure, the menu is hidden and the user opens it by clicking on the function entry of the maininterface. The main interface of the system adopts the drawer layout of Android system - DrawerLayout. The layout is a container control (ViewGroup). It contains two areas inside: one to show the main content of the interface and one to show the menu on the left. The main content of the interface adopts the "fragmented layout" of the Android system, that is, the layout file is not written in the Activity, but the function is switched by loading the Fragment of different modules in the Activity. The layout of the new and old modes is shown in Fig. 3.
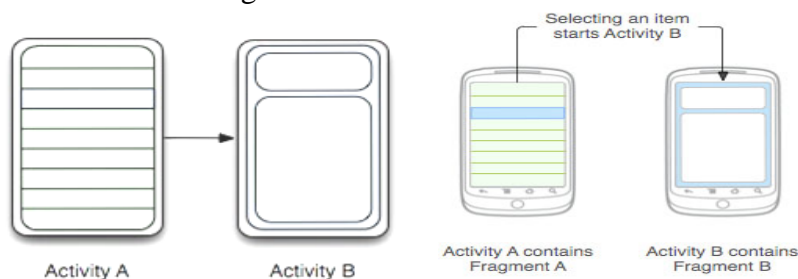

Figure 3. Comparison of new and old mode layout

- Log module implementation

The module interface is divided into two parts: the log header section and the log content section. The log title displays information such as the year, departure point, destination, and brief introduction of the log. At the same time, the user can click the "Add" button to add the log. You can edit the text content and edit the image content (optional) when adding the log. When you select a picture, you can take a photo on the spot to get a picture or you can select an existing picture directly

from the album. When the user selects the "Select from album" method to add a picture, the system will open a new interface, through the code to call the image in the phone folder for display, the container is GridView. When displaying the picture, the system adds a "selection mark" to the upper right corner of each picture. When the user selects the picture, the mark becomes brighter to indicate the selected state. Add and publish logs as shown in Fig. 4 and 5.
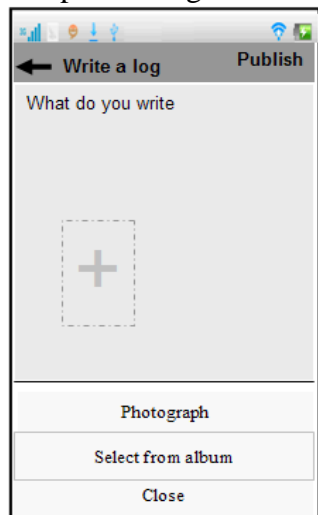

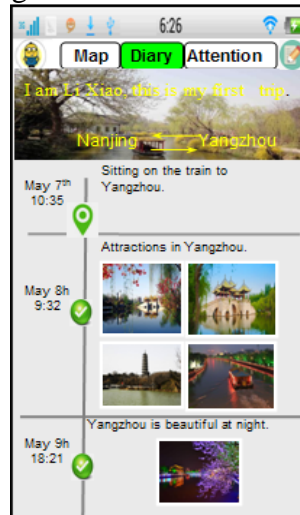Figure 4. Add "log"   Figure 5. Publish "log"

- Map module implementation

The "Map" module implements related functions based on Baidu maps by calling Baidu API and customizing the development. The main body of the module is an electronic map placed in the Fragment, which develops its own MapFragment by inheriting and rewriting the related methods of Fragment. Add a function entry button in the lower right corner of the map, including: marker, drawing, map button. When the user clicks the "Mark" button in the module, they can mark it on the map. When the map is clicked, the system will call the Baidu Map SDK's click monitor: com.baidu.mapapi. Map. BaiduMap. OnMapClickListener. When entering the sub-module, it will automatically locate. After the location is successfully monitored, the RadarUploadInfo class in the Baidu Map API is used to encapsulate the user's location and nickname information, and the UploadInfoRequest class is automatically uploaded by the code. After the upload is successful, other users can enter the map menu and use the "Surrondings" function in the map menu to search for nearby users. In addition, the user clicks on the "discovery" function of the map menu, selects the range to discover the surrounding users on the map, and the system displays the users found in the vicinity as icons on the map. The user clicks on the icon on the map to view the nickname and distance information, and clicks the "Attention" button to attention.

- Attention module implementation

When the user searches for and pays attention to other users in the map through the "discovery" function, the user-related information can be viewed. If the user has not followed any other users before, the user will be prompted with the message "You can pay attention to others!" If the user has previously paid attention to others, the interface will display the log information of the object of interest, and can view the information of the latest log of the user concerned and the date, time and location information of the log. It is the realization of the sharing function in the overall demand. Attention others' logs as shown in Fig. 6.

Figure 6. Attention other people's logs

- Account module implementation

In this module, the database uses a lightweight database SQLite inside the Android system. The use and creation of the database is directly in the code. The module provides a concise display of total spend and revenue, and users can click on the time board to query for information on a specific date.

- Other modules implementation

The calling interface of two third-party applications is added to the main interface menu, and the corresponding third-party application can be directly opened on the current interface through the interface. On the code, use the Intent method, pass in the package name of the third-party application that needs to be called (for example: com.sdu.didi.psnger) and the main class name (for example: com.didi.sdk.splashActivity) to implement the call.

4. Testing

Table.1. Main test cases

Precondition	Test procedure	Expected results	Test Results
attention module	Search and follow other users around the map with the "Discovery" feature of the map	Can browse the log content of the user being followed	The log information of the object of interest is fully presented in the way of the practice axis
map module	Open the map and click the marker button to mark it on the map	Map opens, navigates to current location, and can mark custom symbols on the map	Open the map and navigate to the current location to mark custom symbols
log module	Fill in the text and add a picture via the camera	Can complete the release, display content after publishing	Successfully posted, can see the published image and text information
Account module	Click the "Record an account " button, fill in the content, click OK, and view	You can record data and prompt. After saving, you can check the accounting data and statistics.	Successfully added records, can complete the review of revenue details and statistics
other modules	Select " take a taxi" in the module	Open the third-party taxi software "Didi taxi "	Didi taxi software opens

The system is an Android application, and the Android version under the development environment is 4.4.2. Test equipment selection real machine test: Meizu MX4 Pro, Android system

version: 5.1.1, product version: Flyme OS 5.1.5.0A. Network environment: The home wireless network, the mobile phone and the computer are in the same local area network, and the client directly accesses the Tomcat server of the computer to interact.

Unified testing of system functions, interfaces, controls, database access, and prompt information. Test and actual operation show that the Travel Footprint Sharing System Based on Location-based Services, all functions of the system can run as required. The test is shown in Table 1.

5. Conclusion

By analyzing the traveler's information needs for mobile location, this paper designs and implements a location-based travel footprint sharing system, which realizes travel route planning, real-time travel log release, peripheral user information attention, and record revenue and expenditure information.   The system makes full use of mobile positioning technology to realize the location-based personalized needs of travelers, and to some extent provides ideas for solving the problem of tourists' asymmetric information in tourist destinations.

Acknowledgements

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