가상 울타리 기술을 이용한 패키지 투어 여행자 관리 애플리케이션의 설계

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Design of Tourist Management Application for Package Tour using Geofence Technology

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요 약

본 논문에서는 패키지 투어에 참여하는 여행자들을 효율적으로 관리할 수 있는 가상 울타리 기반의 여행자 관리 애플리케이션을 제안하고 설계한 결과를 제시한다. 제안하는 애플리케이션은 특정 관광지 방문시에 투어 가이드가 가상 울타리 범위를 지도 상에 설정하고서 여행자들이 이 범위를 이탈하는 지 여부를 관리할 수 있고, 다른 관광지로 이동할 때에는 투어 가이드를 중심으로 한 원형의 가상 울타리 를 설정해 이 범위를 벗어나는 여행자가 있는지를 실시간 모니터링 할 수 있도록 한다. 이러한 두 가지 패키지 투어 활동에 가상 울타리 기술을 적용하게 되면 투어 가이드는 여행자들 관리에 따른 부담이 줄어들어 더욱 알찬 패키지 투어를 진행할 수 있을 거라 기대한다.

ABSTRACT

This paper proposes an architecture to develop a mobile package tour application using geofence technology to increase tourism management effectiveness and efficiency. The proposed application allows the tour guide to set a virtual fence on a map with a certain radius dynamically as the virtual boundary to keep tourists inside both when visiting a place or when the tour is moving. The virtual fences are set up for allowing the tour guide to monitoring the tourist's movement by sending a warning to the tourist to get back inside the fence and a notification for the tour guide. If this geofence technology is applied to the package tour application, the tour guide will able to manage the package tour easily and conveniently.

키워드

Package Tour Application, Geofence Technology, Tourists Activity Monitoring, Tourism Management

Ⅰ. Introduction

Activities of people traveling to and staying in places outside their usual environment for not more than one year consecutively either for leisure, business, or other purposes are called tourism [1].

To deliver tourism products, requires high coordination to work efficiently. Tourism management's responsibility relies on both individuals and tourism providers [2].

LBS (Location-Based Services) are services that involved geographical location through smartphones. Geofence is an LBS technology that uses Global Positioning System (GPS) equipped in smartphones

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to define geographical boundaries [3].

Geofence will create a user-defined virtual boundary in specific points, and when there is a transition such as entering the fence, exiting the fence, or dwelling inside the fence is detected, a notification is performed [3]. A form of location monitoring is required for geofence to work correctly. This technology will be used by a tour guide to monitoring tourists their whereabouts. Both tour guides and tourists will get notified if the tourist is triggering specific actions involving the virtual fence. Using geofence technology in a mobile tour package application will make tourism more convenient for tour guides and tourists, therefore increase tourism management effectiveness.

The remainder of this paper is organized as follows. Section II will discuss the architecture and design. Section III will discuss the challenges and issues. Lastly, Section VI presents the conclusions.

II. Architecture and Design

There will be two types of application, one for the tour guide and one for the tourist. The tour guide application will generate a QR Code before the tour begins. Each tourist needs to scan the QR Code with their application to register themself, and by registering, the tour guide can manage the tourists' data who joins the tour package.

There are two scenarios in the usage of geofence technology. First, the tour guide can set a polygonal geofence when arriving at a particular place. Second, the tour guide can set a geofence when the tour is on the move from point A to point B, thus the geofence will follow the tour pack. Both cases are illustrated in the figure below.

Figure 1. Geofence Scenarios

In Figure 1, the left picture is representing the first case from the tour guide's point of view. The green dot is shown on the map as the tourist that

stays inside the geofence, the red dot is shown as the tourist that is outside the geofence, and the blue dot shown is the tour guide. Therefore it is identifiable which tourist inside and outside the fence.

The middle picture in Figure 1 representing the second scenario from the tour guide's point of view. The circular fence is created by the tour guide and will follow the tour guide as the tour move along. Similar to the left picture in Figure 1, the different color of the dot represents the status of the tourist.

The picture on the right in Figure 1, shows the interface from the tourists' point of view. The tourists can see the tour schedule so they can keep track of what to do next.

Both cases are needed to make sure that the tourist is still in the designated area preventing the tourist to go anywhere they want and go missing, and also increasing tourism management.

The coordinates of the tourist and the tour guide-generated fence location both are uploaded to a cloud database, thus the tourists can see the fence, and the tour guide can see the tourist's position. Therefore, cloud database is a crucial component as the pivot point for communication. The tourists will receive a notification with a warning to get back into the fence if they step out of the virtual fence, and in addition, the tour guide will receive a notification on who is stepping out of the virtual fence.

The tour guide application can also set a time of how long the tourists have to be in that particular place according to the situation. The tourists can then see the time as a reminder of when they should be back at the gathering point to continue the tour, keeping it on time. Another feature in the application is that before moving to another place, tourists can manage their attendance status and the tour guide can see which tourists are present, on the way to the gathering point, or in the toilet, et cetera. Thus, there is no need to count the tourist manually every time. The architecture is shown in the figure below.
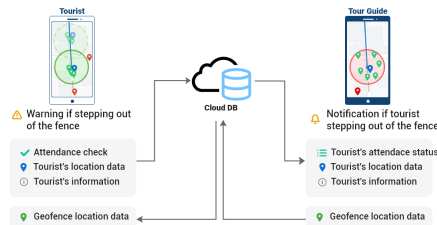

Figure 2. System Architecture

The requirements for both applications is depicted in the table below.

Table 1. Application Requirements

Tourist	Tour Guide
See tour schedule	Manage tour schedule
Receive notification	Receive and send notification
Send location data (lat/long)	View tourist location
View geofence mark	Manage a geofence
Manage attendance status	Manage tourist
	Send geofence data (lat/long)

Ⅲ. Challenges and Issues

3.1. Security

The main problem is that by constantly using GPS to pinpoint tourist locations, they are continuously exposed to the tour guide or, even worse, hackers. If tourists want to go to some private place and unwanted persons can see where they are, they will feel uncomfortable. Even though tourists can turn off their mobile location, the tour guide can no longer see the tourist location, creating confusion and misunderstanding.

The challenge is to find how to enhance privacy-related issues. Even though there is some way to hide the actual tourist location using an anonymizer server, this method will result in sending a false location to the tour guide. Thus, the challenge is to make the tourist's location is not exposed to unwanted persons but still fulfill the primary purposes of using the geofence.

3.2. Battery

GPS consumed battery. Even though many mobile phones were equipped with a massive battery, constantly using only GPS will eventually drain the battery. When tourists run out of battery power, finding a power source is troublesome in places like beaches, mountains, et cetera. The result is the need to carry a battery pack or power bank, making it inconvenient for some tourists.

The challenge is to find a way to efficiently use the battery to last longer than just a few hours. Even though there is a couple of methods that will help increase battery usage efficiency, such as using a periodic activation instead of continuous GPS usage or using the accelerometer sensor to trigger GPS tracking when the tourist begins to move, those methods require further research, especially to check the accuracy performance.

3.3. Network

GPS can work without cell service. However, without cell service, there will be no internet. The tourist cannot upload their location to the database and download geofence location from the database without the internet. The problem begins when the tour package is an overseas tourism. Thus, for tourist to upload their location, they need to carry a mobile Wi-Fi router provided by the tour guide, or they buy themselves, which ended up making an extra cost.

The challenge is to find a way to exchange locations between tourists and tour guides without putting an extra cost on subscribing to cell service and internet plans.

Ⅳ. Conclusion

Geofence is a technology that is a part of LBS that uses GPS as the primary input. Geofence allows users to create a user-defined virtual fence that will trigger a notification if action is involved with the fence. This research proposes two main scenarios that use geofence technology integrated inside a mobile application, making the tour guide can easily manage tourists when they visit a particular place or when they on the move. This research also proposes other features to make managing tourist is easier, such as attendance checking, and timely reminders. Combine with a Cloud Database, the tour guide will receive a notification if a tourist(s) is stepping out of the pre-defined virtual fence, and the tourist also will get a warning. In the end, geofence help increasing tourism management's efficiency and effectiveness.

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