Visitors Viewing Path Similarity-based Contents Recommendation Service using LBS

Yoondeuk Seo and Jinho Ahn[1],

Dept. of C. S., Kyonggi Univ., Iuidong, Yeongtong, Suwon 443-760 Gyeonggi, R. O. Korea
{seoyd,jhahn}@kgu.ac.kr

Abstract. A Location-Based Service (LBS) is a mobile computing application that provides information and functionality to visitors based on their geographical location. Smartphone is the best device to provide the LBS in indoor location system. In this paper, we present a new visitors viewing path similarity-based contents recommendation service using LBS. It uses the distance measurement method using the Wi-Fi signal strength that is suitable for indoor location tracking. It divides an exhibition into the areas through analyzing the Wi-Fi signal strength and analyzes the areas where the corresponding visitor stays long by tracking his or her position. Also, it measures the similarity based on the viewing paths between visitors. By using the information and the similarity, it can recommend contents related with exhibits which are the visitor`s favorite.

Keywords: Distributed Information System, Location Based Service, Museum Viewing, Contents Recommendation.

1 Introduction

The appearance of different technologies such as wireless networks, Internet, Geographical Information Systems (GIS) and Global Positioning Systems (GPS), has introduced a new type of information technology called Location Based Service (LBS) [1][2].

LBS provides wireless users with different applications in the field of vehicle navigation and fleet management, location identification and emergency services. These services are widely recognized as a value added service and due to the diversity of user requirements research efforts are needed to improve the location determination capability and its accuracy and reliability. Recently the mobile device development has mainly concentrated on system integration of GPS, Wi-Fi and cellular wireless networks to cater for different LBS applications. For the integration of all sensor observations, an optimized model is required for optimal estimation of the current user's location [3][4].

Due to the growth explosive of the smart phones beginning with iPhone, the LBS is not becoming one of the killer apps with the possibility, but one of the successful killer apps in the market. The success of LBS in smart phones is attributed to the LBS

1 Corresponding author: Tel.:+82-31-249-9674; Fax:+82-31-249-9673.

technology support and openness of the platform. It established the foundation for the LBS vitalization in iPhones and Android phones by LBS API, DB, and hardware, such as GPS, WLAN, and digital compass, etc.. Also, the various LBS services including the foursquare is gathering the success based on this technological support. It is being connected with the other killer apps such as social network services (SNS), Augmented Reality (AR), mobile games, providing the various services. In addition, the various types of apps are expected through it in terms of safety and accident prevention [5].

In this paper, we present a new users viewing path similarity-based contents recommendation service using LBS. It uses the distance measurement method using the Wi-Fi signal strength that is suitable for indoor location tracking. It divides an exhibition into the areas through analyzing the Wi-Fi signal strength and analyzes the areas where user stays long by tracking the position of the user. Also, it measures the similarity based on the viewing path between users. By using the information and the similarity, it can recommend contents related with exhibits which are the user`s favorite.

2 The Proposed recommendation service

In this paper, the proposed recommendation service is a contents recommendation service using LBS and the similarity of the visitors viewing path in order to solve the problems due to tagging information that occurs in the existing proposed algorithm. GPS technology widely used for location tracking has the disadvantage that indoor such as museum is difficult to track because it requires a Line-of-Sight between senders and receivers. Therefore, in this paper, we used the distance measurement method using the Wi-Fi signal strength that is suitable for indoor location tracking [6][7]. It divides an exhibition into the areas through analyzing the Wi-Fi signal strength and analyzes the areas where the visitor stays long by tracking the position of the visitor. It extracts the areas that the visitor stays for more than an average time by analyzing the areas. It calculates the preference weight of the contents based on the extracted area.

The visitors viewing path similarity-based contents recommendation method recommends contents using path similarity between visitors.

User.Path represents the set of the viewing path of the current visitor and *preUser.Path* represents the set of the viewing path of the previous visitor. It calculates the similarity of the viewing path between two visitors through dividing the intersection of the two sets by *User.Path.Count* which represents the total number of the viewing path of the current visitor.

User.LongViewZone represents a set of areas where the current visitor stays long and *preUser.LongViewZone* represents the set of areas where a previous visitor stays long. In a similar way to the viewing path similarity, it calculates the similarity of the viewing area between two visitors through dividing the intersection of two sets by the total number of areas.

The preference weight of the similarity about viewing path between the visitors based on LBS can be obtained through the sum of the weighted preferences of the similarity

about each viewing area, *locationW*, and the weighted preferences of the similarity about each viewing path, *simW*.
In order to prevent the contents which are the visitor`s favorite but not tagged by the visitor from not being recommended, it adjusts the weight by using the visitor viewing path. *Path.Count* represents the total number of exhibits in the viewing path of the visitor. It adjusts the weights, *contents[i].Weight*, for the contents associated with the exhibits on display in the exhibition that exist in the visitor viewing path, *Path.contents[i]*. In addition, in order to prevent the degradation of QoS due to curiosity patterns, it uses the exhibition information that the visitor stays long. *LongViewZone* represents a set of areas where the visitor stays long. It adjusts the weights about contents associated with the exhibits on display in the exhibition that exist in the *LongViewZone*.
It calculates the weighted preference of the similarity of the viewing path, *simW*, and the weighted preference of similarity of the viewing area, *locationW*, about all contents by the adjusted weights.
If there exists any contents, *i*, in the shopping list, *preUser[j].BL*, it calculates the weighted preference of similarity of the viewing path about contents *i*, *contents[i].simW*, using the weight of contents, *contents[i].weight*, and *simPath(User, preUser[j])*.
In a similar way to *simW*, it calculates the weighted preference of the similarity of the viewing area, *contents[i].locationW*, about contents *i*.
The threshold defines 0.7, meaning very strong relation by Pearson correlation coefficient because the visitors having the similarity more than the specific value can be seen to have the similar tastes [8].

3 Conclusions

A LBS is a mobile computing application that provides information and functionality to visitors based on their geographical location. In this paper, we present a new visitors viewing path similarity-based contents recommendation service using LBS. It uses the distance measurement method using the Wi-Fi signal strength that is suitable for indoor location tracking. It divides an exhibition into the areas through analyzing the Wi-Fi signal strength and analyzes the areas where the corresponding visitor stays long by tracking its position. It extracts the areas that he or she stays for more than an average time by analyzing the areas. It calculates the preference weight of the contents based on the extracted area. Also, it measures the similarity based on the viewing path between visitors. By using the information and the similarity, it can recommend contents related with exhibits which are the visitor`s favorite.

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