A Study on User-Customized Local Information Notification Service Using Association Analysis

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***Abstract*— Recently, a vast amount of data is being generated due to the popularization of mobile devices and the increase of various internet services using smart phones. It is necessary to quickly provide the local information needed by the user through filtering of the information in order to satisfy the user's various information needs. Therefore, the study proposes a user-customized local information notification service system based user past history and local resident past history data based on Android. Data used in association analysis is weather information. This study helps users to make quick decision and provide information for making rational choices, and it is helpful for service providers for providing efficient service through user pattern analysis.**

Keywords-Local Information; Big Data; LBS; Association Analysis.

I. INTRODUCTION

Big data refers to a large cluster of data. Social Network Service (SNS) means online service that creates and strengthens social relations through free communication, information sharing, and network expansion among users. The biggest advantage is that anyone can produce content, and deliver content to a large number of people at high speed. As portable mobile devices diversify and network becomes available anytime, anywhere, a large amount of data is created as users use things such as SNS. Also, with the advent of the Internet of things, data is being generated from individuals or objects anytime and anywhere. These large amounts of big data are now recognized as important assets and it can be analyzed and reworked to produce meaningful information [1].

Association analysis is the process of finding association rules between items that exist between data. It analyzes the relationship of specific rules that appear when a user purchases a product or uses a service to provide better products or services to the user [2]. This study aims to provide users with customized local information by analyzing the relationship between user past history and local resident past history with weather. The aim is to analyze weather factors based on restaurant information and provide a recommendation list for users to select restaurants according to the current weather. Another aim is to provide users with quick recognition of restaurants that were frequently chosen by users through visualization. With the spread of various mobile devices, it is possible to use smartphones regardless of age and living area. In Korea, it is not difficult to use wired and wireless communication in rural as well as urban areas due to the development of network environment. This study is a system design that provides local information service more quickly through 'Associations Analysis' with user history, local history and weather. It is determined that the user-customized recommendation service user interface helps a user to make rational selections.

The structure of this paper is as follows. Session 2 describes the related studies, Session 3 describes the design of customized local information notification service, and Session 4 describes the conclusion of the paper.

II. RELATED STUDIES

There are a variety of efforts from companies and service providers to provide better products and services for consumers. Data mining is required to find association rules in various data [3]. Users register their experiences such as product reviews on Internet boards after using products and services, and these contents have been analyzed and applied to developing products and services. This is a product and service improvement method based on user experience. User experience is a concept that includes the overall experience, such as the emotional response, value, and attitude that users experience when using a product or service [4]. The study by Hwang used big data analysis to study a user experience evaluation methodology focusing on analysis of online reviews of Amazon Echo [5].

Among the analysis methods of big data, association analysis is a method of finding the association rule between the items existing in the data and figuring out the purchase characteristics of the customer. By analyzing the structured and unstructured data generated by customers using products and services, products and services that are right for the customers can be suggested in advance. The study “Spatial Association Analysis among Seoul Metropolitan Cities” by Park, analyzed the spatial association between Seoul metropolitan cities after the 1990s to provide basic data to support policy establishment [6].

In the case of application using Big Data, there is an example of solving the difficulties of citizens in Seoul by operating a night bus in areas with a lot of nighttime floating population. As a result of analyzing big data, using mobile

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phones, from midnight to early morning in March 2013, the bus route was improved by analyzing patterns of traffic demand and flow population in a specific area [7]. In Japan, the Nomura Research Institute has used a smartphone navigation service to minimize the damage to road traffic in the 2011 Great East Japan Earthquake [8].

In Park 's study, it was found that affinities, information, and reciprocity influence brand awareness in mobile advertising through Location Based Service (LBS) mobile location - based advertising [9]. Also, the study by Jung analyzed the sales data of restaurants to analyze the relationship with sales. She found that the number of times a consumer visits a restaurant is affected by variables such as weather, holiday and newspaper articles, and that weather affects restaurant sales [10]. The research in has been conducted to provide users with frequent location information and personal recommendation services through their location information and usage histories [11]. The purpose of this study is to analyze the relationship with the weather in choosing restaurants and to provide recommended restaurants to help the customer select a restaurant menu using weather variables. This study not only helps consumers to select a restaurant, but also analyzes the characteristics of purchases in restaurants in the area, and in the perspective of the vendor, it can help provide the right food for the consumers by analyzing the characteristics of the buyers.

III. USER CUSTOMIZED LOCAL INFORMATION NOTIFICATION SERVICE DESIGN

The system designed in the study makes it possible to provide local information notification service based on Android by using past user history, past history data of local residents and weather information. Figure 1 is a conceptual diagram of a customized local information notification service system.

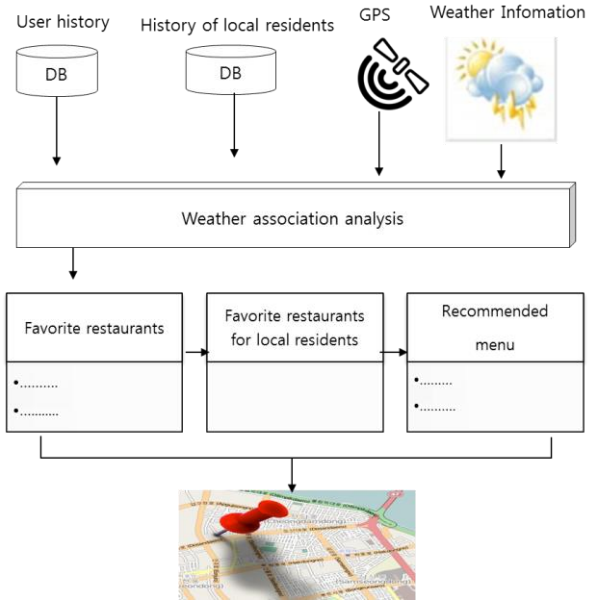


Figure 1. System conceptual Diagram

The data used in the study include past user history, past history data of local residents, and weather information uses cloudiness and precipitation to classify into clear, overcast, rain, and snow. Past user history is used to show the list of restaurants that the user often visited in relation to today's weather through association analysis with the weather. Also, a list of surrounding restaurants that match user menus frequently searched by residents is created, a list of surrounding restaurants where residents most often take deliveries is created, and menus the local residents often order in relation to the weather is also recommended. In addition it is a service that visualizes the related data on the map. Figure 2(a) shows data obtained from analysis of past user history and association analysis with the weather, and it is a screen that shows a list of restaurants frequently visited by the user. When the menu is selected, it is directly linked to order. Figure 2(b) shows a screen visualizing a list of restaurants that local residents frequently visit based on current location.

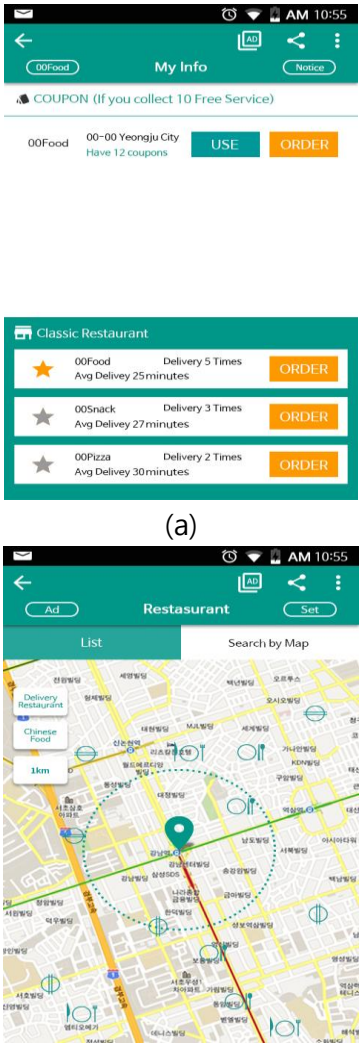
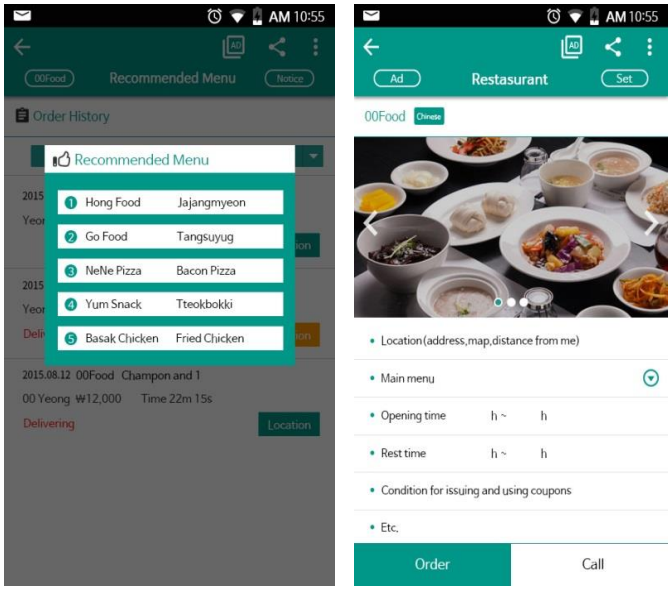


Figure 2. Favorite restaurants and single stree map

Figure 3(a) is a screen that shows user –related recommended menu lists when a restaurant is selected. Figure 3(b) shows the selected final restaurant order screen. 'Jajangmyeon' is a Korean food name and Noodles with Black Soybean Sauce



(a) (b)

Figure 3.Menu recommendation and ordering UI

Table 1 is a table of major associations extracted for association analysis. To analyze whether food is associated with the weather, we analyzed it using the 'arules' library of the R programming language.

TABLE 1. MAJOR ASSOCIATIONS EXTRACTION

lhs		rhs	support	confidence	lift
{}	=>	{jajangmyeon}	0.533333	0.5333333	1
{rain}	=>	{jajangmyeon}	0.444444	0.8333333	1.086957
{sun}	=>	{naengmyeon}	0.444444	0.5797101	1.086957

As a result of extracting major associations, it was confirmed that "rain" was 53% within the total, and in the case where "rain" and "jajangmyeon" appeared at the same time, it was 44% of the total. The effect of "rain" on "jajangmyeon" was found to be 83%, which confirmed a very high association.

IV. CONCLUSION

Local information refers to all information relevant to the corresponding community, and 'local information service' refers to a service that provides this everyday and practical local information. The study provided a customized local information notification service through association analysis between weather and delivery food to help quick decision-making in users and provision of efficient service by businesses. Through the study, it was possible to analyze restaurant order characteristics in a region and businesses can analyze purchase patterns to aid in providing user customized service.

ACKNOWLEDGMENT

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