Design of Customized Local Information System Based on Big Data Analysis

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Abstract
With the development of information technology, there is more active communication and sharing of information through SNS, which is increasing unstructured data. The increase in unstructured data is occurring in text mining, based on natural language process technology, and opinion mining, based on specific language process, which includes positive and negative. The studies that are currently gaining attention are social network analysis based on the analysis of connection structure between agents, and cluster analysis, which form groups of similar characteristics. So this study aimed to make information easily available by providing local information based on user’s location and by providing customized data through big data analysis, which uses open source-based statistical language R. It especially focused on information about job-searching and recruiting, direct transaction, and foods and restaurants.

Keywords: big data, location-based system, smart phone, regional information system.

Introduction
With the recent development of technology, rapid increase in data is encouraging studies of big data. Due to the expansion of web, widespread use of smart devices, and development of social media, the amount of data that users produce is increasing exponentially [1]. In 2012, Garner said big data is accumulated and renewed in great ‘volume’ and ‘velocity’, it is information asset with high level of diversity, and in order to improve decision making, finding insight, and optimizing process through big data, a new form of information process is necessary[2]. To the two characteristics, ‘volume’ and ‘velocity’, IBM added ‘veracity’, and Brian Hopkins again added ‘variability’, eventually composing ‘4V’. In other words, the mixture of various forms of scattered data, either structured or unstructured, is big data [3].

As of June 2014, 98.3% of mobile internet users over 6 years of age had smart phones and the rate is continuously increasing. Most smart phone owners use SNS or apps to get specific services [4]. Like this, smart phone and mobile internet have become tools that are commonly used in our daily life, and the amount of data processed is increasing exponentially [5-6].

The unstructured data is expanding in text mining, which is based on natural language process technology and in opinion mining, based on specific language process, which includes positive and negative. These days, studies that are gaining attention are social network analysis based on the analysis of connection structure between agents, and cluster analysis, which puts together groups of similar characteristics [7]. As for the techniques that visualize meaning and value of analyzed data, there are NodeXL, Gephi, and packages based on R[8].

As for successful examples of big data within Korea, Seoul city government’s support of late-night bus route, trial service of national health care warning, service of early warning on drug safety, store evaluation service to support small start-up businesses, and smart news service. More specifically, in Seoul city government’s support of late-night bus route, connection analysis was conducted among CDR(Call Detail Recode) data of KT Co., information on user statistics, and data on the use of taxi in Seoul, and the place where bus routes are most needed in terms of users’ moving route was set as the center. Based on this, considering passengers’ optimal use of bus in terms of efficiency, and modifying the interval between buses, the service could improve civic benefits, prevent regional disputes regarding bus routes, and improve satisfaction level of users. It was a good example that big data could play a significant role in policy making[9].

This study aims to contribute to satisfying service providers and service users through regional information system by analyzing the pattern of using services and finding effective ways to offer them. Also, it aims to develop a system to provide customized information, based on the users’ location and their frequently used categories. For example, such a system will offer local news and living information, information for job seekers and recruiters, and a service that connects businesses and customers. The system to be proposed in this paper is a customized information system.
useful for various users including information providers, advertising agents, businesses, and general users and it is effective for each of them to use.

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1) **Structure of regional information system**

The system proposed here offers location-based regional information. In connection with regional information providers such as newspapers and broadcasters, it offers regional news. Users of the information can get information based on their current location, or based on the frequently used categories such as the information on jobs and jobseekers, which is found through the analysis of log data utilization. Users can get individual recommendations through their history of use. For businesses, they can use it for advertising or selling goods. Therefore, the system needs structure and environment that are appropriate for various users. Figure 1 is Use Case diagram.

![Figure 1: The UseCase Diagram of the proposed system](image)

The proposed system has the structure through which various users can approach and use information. Database should be effectively designed and managed. This paper designed data base as the following structure. Figure 2 is the structure of data base.

![Figure 2: The structure of the Database system](image)

2) **The user interface design of the proposed system**

The system proposed in this study was used for creating an application, through which users can get information. Screen for users, screen for regional information, screen for management of businesses, screen for managing employees were provided with features appropriate for different users and usages. Figure 3-5 is an app screen regarding regional information, advertisement, and businesses. Figure 4 is the screen of a local information provider offering location -based news, information, and weather. It was designed to search and see the information on local news, information, and weather using a list box.

![Figure 3: Local information](image)

Figure 5 is the screen where a business can switch settings related to advertising. It was designed to change the order of menus by analyzing the hourly usage patterns. Figure 6 is an app screen for employees, through which orders can be checked in real time. The screen offers registering and monitoring function for coupon issuance, delivery, and collection so that several employees can deliver and collect items without overlapping.

![Figure 4: Employee dashboard](image)
Figure 6, 7 is an app screen showing a personally recommended menu and delivery location. Users basic usage history is recorded and stored such as which categories were referred, keywords that were used for keyword research, added favorite pages, and order history. Using this information, the usage pattern of each user can be analyzed. Figure 6 is offers personal recommendation service using text mining, opinion mining, and statistics that are based on R of user’s log. The data used for this service is deduced from the analysis of the kinds and flavors of food the user has had according to season, time, age, and the analysis of reviews of restaurants around the region.

Figure 6: Personalized menu with big data analysis recommended

Figure 7 is the screen that the user is checking location of delivery item after ordering it. Using this, the user does not have to wonder without any clue or call to ask whether the item was sent for delivery or when it will arrive. Using the app improves access to information.

Figure 7: Staff-related order confirmation screen
Conclusion
Local information service should offer useful information to service users, and an opportunity to make profits to businesses. This study devised a customized service based on big data analysis, so that service users will have easier access to useful information and business can switch hourly recommended menus through the analysis of usage patterns. Information providers can have opportunities to make profits by offering local information and exposing advertisements to users who search information. Also, the functions like displaying delivery location provide optimal service for user’s needs. Future studies need to move a step forward from the analysis of usage patterns to various data analysis including access route, so that information services can raise users’ satisfaction and maximize the advertising effect.

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References