DEVELOPMENT OF TRAFFIC INFORMATION SERVICE USING SOCIAL NETWORK SERVICES

Moon Byeongsup, Park Bumjin, Kang Weoneui & Heo Jinnyung
Korea Institute of Construction Technology
plus@kict.re.kr, park_bumjin@kict.re.kr, yikang@kict.re.kr, jnhuh@kict.re.kr

ABSTRACT

This study deals with a service system named "Real Navigation" and “Social Network Services (twitter)” which is used to collect and provide traffic information. In this "real navigation" service, a terminal, such as a Smartphone with camera functions, is installed in the vehicle, to obtain real road images and to share them on web sites. And this study thus was intended to develop the system which will collect and process the information from the traffic information providers (drivers) before converting it to useful information so as to display and distribute the current location of smart phone users or traffic information twitter of interested point, making use of the interface of the map.

This system is expected to provide the convenience in using traffic information twitter as well as assistance in promoting the use of the system.

1. INTRODUCTION

“We are smarter than me” is the words that can be representative of intelligence collective. With the recent appearance of smartphones, it became possible to realize our ideal — the pursuit of continuity in life on the move. The development of this powerful medium led Infortainment (Information + Entertainment) service, Twitter.

The essence of this service lies in the formation of an information exchange community to have fun and obtain information by establishing an human network in the end. This means that what we called "intelligence collective," new demands of the time, have raised.
In the mean time, if we review ITS (Intelligent Transportation Systems) business in information respect, a blind spot for traffic information is produced, as this project is a state - run plan for infrastructure and thus limited in efficient distribution of materials. In addition, smartphone mentioned above have powerfully lured information users enough to say that they terminated a mobile era and at the same time brought us new big bang in portable devices.

This suction force raises a probability of users being exposed to a variety of information and thus self centred demands are made. This then makes information users require customized high - end contents. In other words, it means that the competitive power relatively decreased in traffic information that be created by ITS. Therefore, this study was conducted to introduce a concept of intelligence collective to ITS, to get over the limitation in collecting traffic information, and implement high-end contents based on smartphones to raise the availability of information.

In this study Chapter 1 deals with general views on the purpose and background of this study, and Chapter 2 presents the establishment of a concept of collective intelligence and the service cases using collective intelligence , which were all carried out in the existing theoretical reviews and related studies. And Chapter 3 dealing with the system design field

makes a suggestion on a method of composing a smartphone real-navigation system and Twitter, which induced a concept of collective intelligence and prosumer. Chapter 4 presents technologies on filtering and processing information and the conclusion and significance of this study.

2. THEORETICAL REVIEWS AND RELATED STUDIES

2.1. Collective Intelligence

With an rapid growth in internet and web, the volume of information that users can utilize increased geometrically. In this situation a recommendation system, which performs a role of searching for the information suitable for demands required by users, is considered to be more important. The recommendation system is a system used to automatically search for the materials that meet users' potential demands for information.

In this sense information is produced through private participation and interaction between users, and thereby the collective intelligence that creates new values is used as a user group actively participate and share.

A concept of collective intelligence was genuinely explored in 1997 by Pierre Levy. But discussions on similar concepts ware previously made and related studies were also reported recently. Concepts such as " Wisdom of the Crowd"(Suroweicki, 2004), "Wikinomics" (Tapscott & Williams), and "Collective Intelligence" (Leadbeater), and "Produsage"(Aksel Bruns), etc. are basically similar in a concept group.

Media philosopher, Levy, defined that "collective intelligence" is the one that is distributed anywhere, in which values are granted, which is adjusted in real time, and which is mobilized in real competence. He clearly divided "groupism" where individuals become subject to a community and "collective intelligence" and in this sense he did not regard a communal action as collective intelligence. He stated that there is a key factor of collective intelligence in the organic relation which people form in the space of intelligence. Levy advocated an importance of "collective intelligence" in that no one knows all, but someone knows something so complete knowledge is spread over to the whole mass of mankind.

As this concept of "collective intelligence" enters a media era, it is used for a variety of content classification systems. In these classification systems tag and folksonomy are usually used, where folksonomy is a compound word of folk(people) + order + nomos(law) and a "method by participation" that systemizes information through key words (tag) that users have selected freely. Folksonomy is neither systematic and is nor generated at random, compared to taxonomy, but it is characterized that meaning is granted on individual information as members are voluntarily engaged in and the information is systemized. As for technologies using tagging and folksonomy, a number of studies are being carried out on a variety of related technologies for automatic tagging, effective tagging systems, tag cloud configuration, collaborative tagging in multi-application, collaborative contents filtering, folksonomy-based relation extraction, folksonomy in connection with ontology. Thus, these tagging technologies are useful for users to efficiently classify, store, and search for enormous multimedia contents afterward, so it is necessary to make the consideration in service respect.

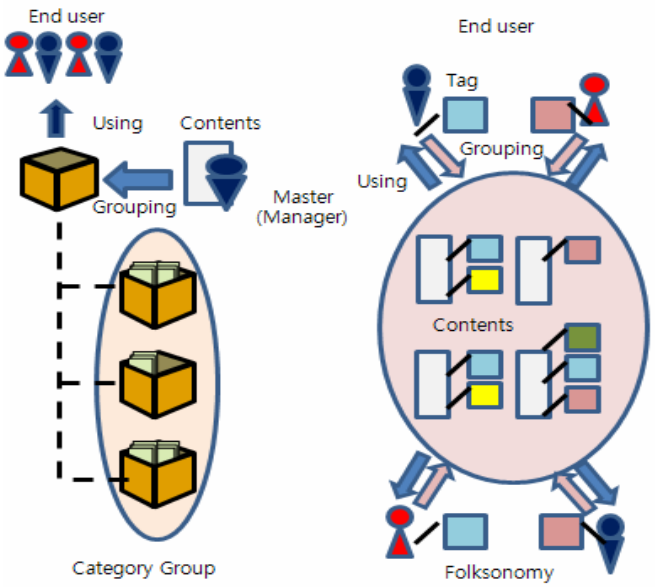


Figure 1 Comparison of Category Classification (Taxonomy) and Group Classification (Folksonomy)

2.2. Application Cases

In a system build - up using "collective intelligence," there are Wikipedia, Daum's Agora, Naver's Knowledge In, etc. In addition, a system using "collective intelligence" has been also established in a social network service, such as Twitter, Facebook, NPlugs, Link Now, Rookie, to individual interests and personalities by forming a wide range of human network between users. As a state - led case of having built up a system using "collective intelligence," Korea's Ministry of Land, Transport and Maritime Affairs and National Policy Agency have established Twitter as follows to provide text messages to users.

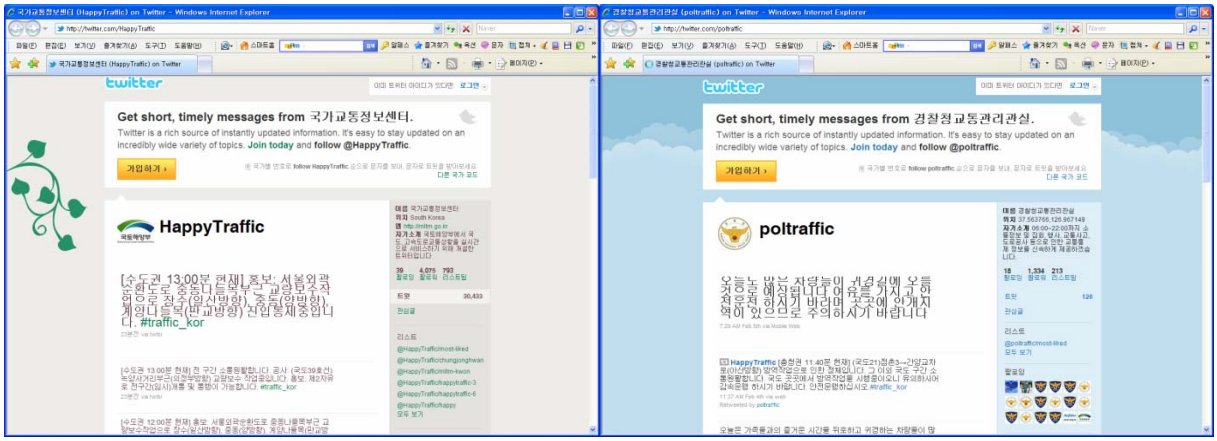


Figure 2 Traffic Information Twitter by Korea's Ministry of Land, Transport and Maritime Affairs and National Policy Agency

But the above system has limits of test message information and demerits that information is obtained in ITS - build up areas only. Therefore, this study aims to implement a system where we can expect to get over limits of such text message information and to extend an area of collecting traffic information.

3. SYSTEM DESIGN AND IMPLEMENTATION

3.1. Conceptual Diagram

In order for drivers to utilize "collective intelligence' while driving, it must be free to collect and provide information. In this case, the mentioned information includes information in a traffic situation, or those on incident, emergency, and disaster situations.

As stated in the introduction, the information collection and terminal use described in this study is done through a smartphone. Of course this smartphone must have functions required in this study, such as obtaining road images on the move and sharing information on web.

Currently, there are many web sites allowing drivers to share the road image pictures that they have taken in accident or congested regions, but these web sites are run through drivers' active participation so have limits to activating their participation if regular incentives are not given.

To get over those limits, the technologies presented in this study focus on devising the simple applications that enable drivers to upload traffic information without complex technical operations, and these technologies also allow service receivers to provide their services. This study deals with a service system named "real navigation," which is used to collect and provide traffic information.

In this "real navigation" service, a terminal, such as a smartphone with camera functions, is installed in the vehicle, to obtain real road images and to share them on web sites
The obtained data are the ones filmed in real time, which allows drivers to figure out the status of roads and to use these data for their driving. The following Fig. 3 is a system conceptual diagram on "real navigation."

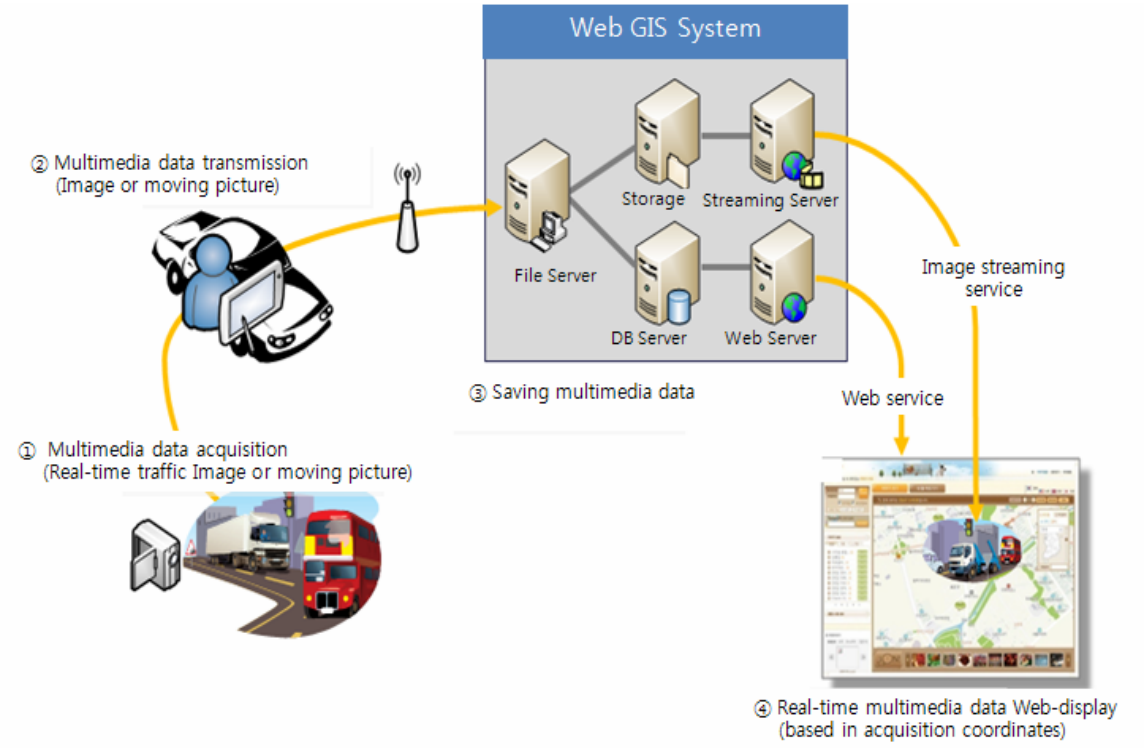
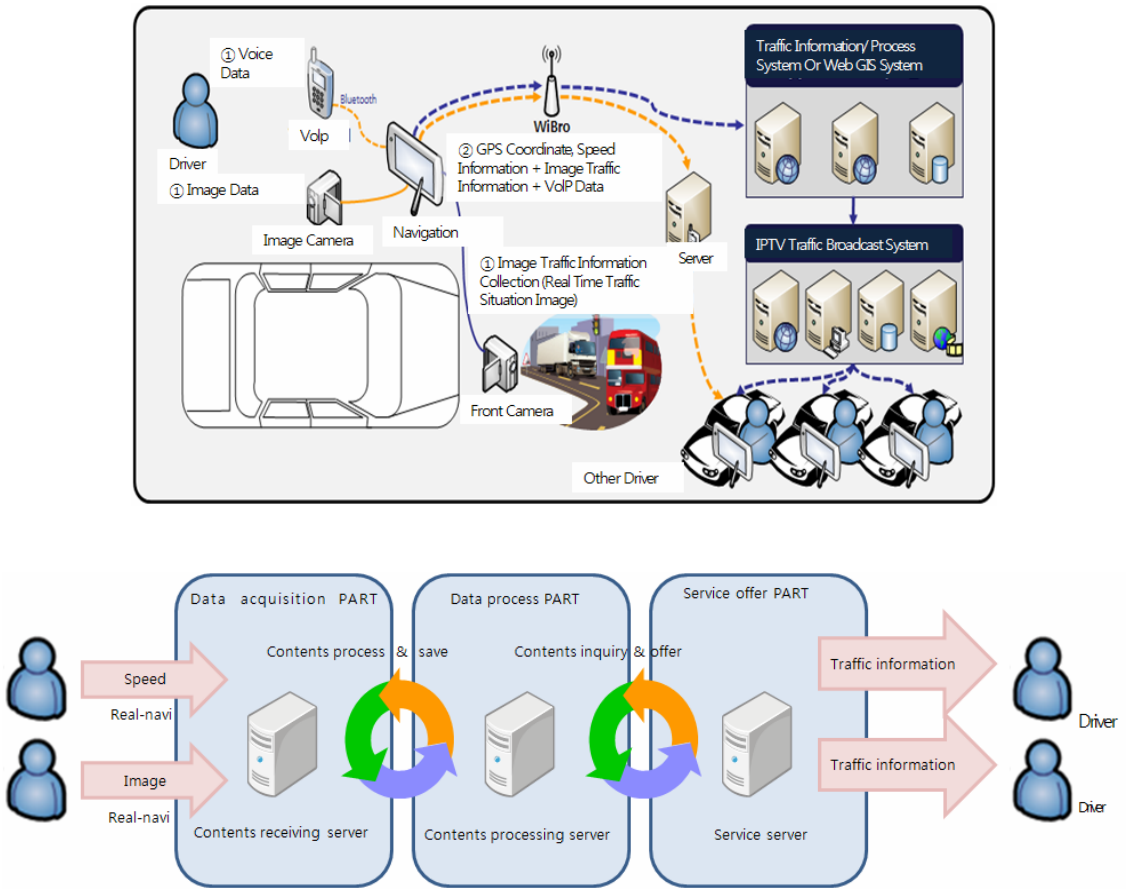


Figure 3 Conceptual Diagram

3.2. System Configuration

The system centers around the smartphone, consisting of the 5 parts: " transmitter units," "data acquisition part," "data process part," "service offer part," and "client terminal units." Fig. 4 shows a system configuration map.



<Figure 4> Real Navigation System Conceptual Diagram

The system is configured as follows.

"Transmitter units" refer to the smartpone (real navigation) with camera functions, which transmits video data and image data in a MPEG or H.264 format along with speed information to the "contents receiving sever" through the communication network.

"Data process part" plays a role in storing and streaming image information before the data received through the contents receiving server of the "data acquisition part" are transmitted to the server and is also responsible for managing the location where images have been filmed, vehicle's speed, and information on data owner.

The collected images are again transmitted to the service offer part, the GIS service server, processed so that they can be smoothly expressed on GIS. Lastly, "client terminal part" allows users (drivers) to check out traffic information they want as they get an access to the web site in connection with wireless or fixed - line networks such as WiBro, etc. This web service is a representative type of Web 2.0 services, GIS - based Web 2.0 service.

The system developed in this study adopts "Open API" provided by a commercial map and thereby Mash-up - typed services have been implemented. The Web GIS implemented in

this study features selection of a client/server system, high interoperability, OS independent systems, distributed computing environments. etc.

3.3. Traffic Information Filtering Method

To implement the above system where a concept of "collective intelligence" has been introduced, it is necessary to take measures on incorrect or inappropriate information.

These incorrect or inappropriate information serve to lower the reliability on the whole traffic information and acts as a factor of obstruction in activating this service.

Thus, this study describes a method to process privately - unloaded information into more valuable information. The traffic information using the "real navigation" mentioned earlier are summarized in <Table 1>. To sum up the descriptions provided in Table 1, the traffic information offered in this study are images, not expressions in the existing quantified numbers which are given in traffic speed, time required. This means that all the information are dependent on subject judgements.

In this case if the manager does not purify these information by being involved in, they can be "mere images taken a picture of the road," not "traffic information." But it is almost impossible for the manager to check out and verify all the traffic information.

Table 1 Features of Traffic Information using Collective Intelligence

Segment	Features
Information Type	Multi-media type such as pictures, videos, etc., qualitative type not quantitative
Information Gathering	Camera, installed in "real navigation" of the driver's smartphone, works
Information Processing	Processed depending on the driver's subjective judgements so has limits to expressing objective facts
Information Delivering	Single direction delivery on web

Thus, in this study a process was set up as follows to recommend more reliable traffic information by using "collaborative filtering."

First, a stage of user's analysis on situations examines user's profile, contents preference such as the current location. In this case user's preference may be composed by collecting his/her pattern on contents use.

Second, a contents grouping stage means a process of analyzing and grouping properties of collected information.
The grouped information will be used as basic data to allow users to minimize creation of overlapped data and check out the accuracy of newly-created traffic information. Since this information is provided in an picture image and video form, it is important to adjust

information lasting time in consideration of raising the reliance from users, so that uploaded data can reflect the current traffic conditions.

Third, a contents classification stage is designed to enter additional information using a tagging process after the users in a grouping stage use contents. These additional contents deal with a concept of "collaborative filtering" using "collective intelligence" to recommend contents, which features the use of information collected from a number of users other than those from special users.

In addition, it is also considerable to add rating information such as reputation evaluation of contents and traffic information producers as well as tagging information to allow contents users to use them.

Fourth, "recommendation system" is used to search for the information that fit into user's conditions in the contents by collective intelligence and thereby provide these information to the users. Then, the users can continuously raise reliability and search application on used contents through tagging or reputation evaluations.

3.4. System Implementation

3.4.1 *Real Navigation Service*

As described in the previous section, the said traffic information is collected in a multi-media format after the driver takes a picture of them himself/herself. In this study a form functioning as an efficient traffic information collector and a traffic information providing service at the same time was considered, named "real navigation."

Fig. 5 shows a service flow chart.

If the driver executes the real navigation, the real navigation engine operates as shown in the figure, and it receives image data and coordinates information from the GPS. Then, the real navigation searches for paths with the help of its self engine, display these information, and provide them to the driver as shoe in Fig. 6.

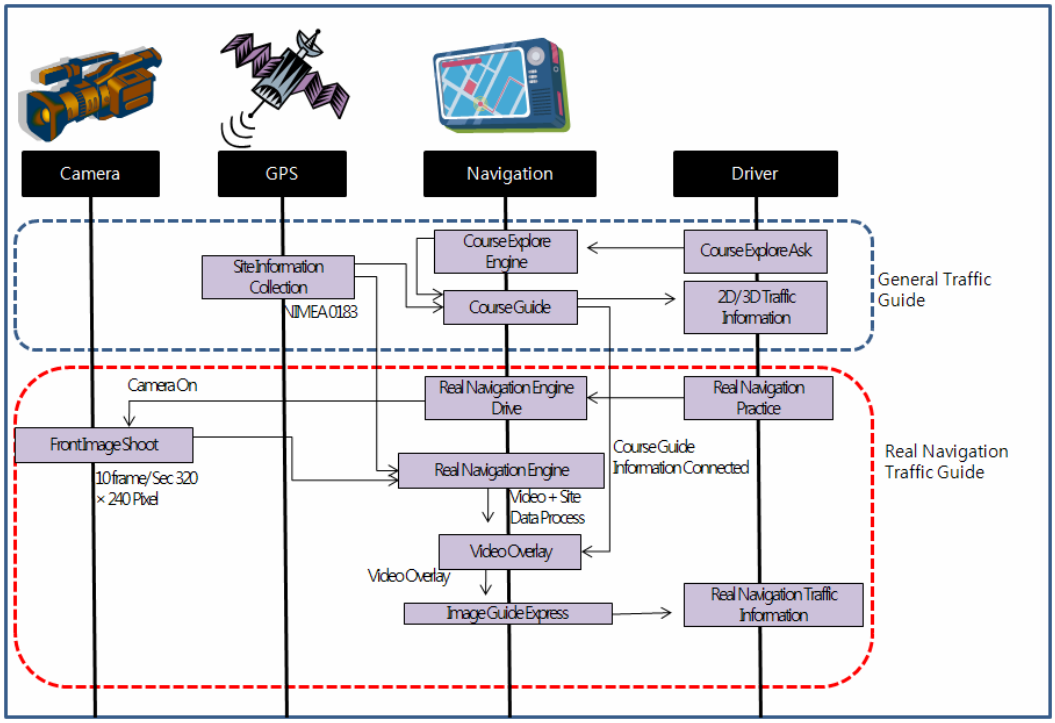


Figure 5 Real Navigation Service Flow Chart

As seen in Fig. 6, the real navigation is a new conceptual navigation system that directly displays traffic information on the photographed live - act image using the camera built in a smartphone. In expressing traffic or path information, this displaying method is more realistic than the existing navigation systems. The real navigation is not only an attractable system because of its new conceptual service to provide traffic information but a meaningful technology in that it provides the basic data that can be shared between drivers.

Figure 6 Transportation Service Example

The left picture in Fig. 6 shows an existing 2D - screen and the left picture is a real screen implemented in a 3D format. This 3D - screen displays a direction to destination on a live-act screen, expected to give drivers better understanding than the existing screens. In addition, as mentioned earlier, it is possible to conveniently upload photographed images using the real navigation to share them with other drivers. This function was named "Traffic Twitter" in this study, explained in the following section.

3.4.2 *Traffic Twitter Service*

If the images photographed using "real navigation" are collected through a up link using a WiBro network, they can be used in a UCC form for service. Thus, these information are very useful as traffic data. As mentioned in the previous section, this study is considerably significant in that the images photographed by the driver's real navigation, based on traffic information sharing and providing service, Web-GIS service, can be shared with other users and thus can be applied as a new conceptual service for providing traffic information. The left in the above <Fig. 7> shows a Traffic Twitter system configuration diagram and the right is the real case provided to a web site through Open API.

Figure 7 Traffic Twitter Configuration and Service Offer Example

4. CONCLUSION AND DISCUSSION

Korea's industry is facing another great turning point in structure as smartphones were supplied as of November in 2009. A smartphone is regarded as a high - performance portable computer because it performs almost of functions that the existing computer can do. Thus the smartphone is playing a leading role in having made innovative changes in IT industry. For this reason, there is a spreading view that smartphones must be used in creating traffic information in the future, but the reality is that the existing traffic information systems have a number of limits in terms of utilizing information through smartphones.

The existing traffic information is divided into 2 systems in collecting information. One is through ITS infrastructures consisting of sensors and CCTVs installed on roads; the other is through traffic information providers. In the former method the amount of investment can be excessively estimated, as stated earlier. In addition, investment should be made for maintenance and repair and it costs a great deal. Moreover, if these information are provided in a real service form, it takes long to process them so the time loss is expected. Thus, it is almost impossible to provide traffic information in real time due to the time loss. In the latter traffic information are collected by mobile carriers' own systems or the third providers. In this case the providers are paltry in a sales scale, so it is impossible to secure

robe vehicles in a sufficient scale and to continuously to collect traffic information on roads. And it is unavoidable to suffer a time loss because of the process. On the contrary, the real navigation described in this study has numerous merits in investment, accuracy, and performance in real time. Of course, it is considered that these merits must be backed by the continuous investment and operation of the existing ITS's operating system to maximize a synergy effect in collecting information using "collective intelligence."

The current traffic information are collected one-sidedly through a ITS detection system and thus provided to unspecified individuals at random. If the core of u-transformation in traffic information intends to provide the information that a user wants depending on conditions, it is necessary to make a qualitative, quantitative improvement of the information by turning off from the existing one-sided system, adopting the information that the user produces himself/herself, and thus establishing such a system. Therefore, creating traffic information using "collective intelligence" will be evaluated as a technology enabling us to get accustomed to the urban environment where civic participation conditions are met in technology, and will makes it possible to implement an ITS establishment system to integrate the traffic information, dispersed in Korea's ITS promotional structure, through collective intelligence and a Twitter concept, which is also the findings of this study.

REFERENCES

1. Gyeonggi Research Institute, *"A Study on Improving Traffic Information on Gyeonggi-Do by Utilizing User Created Contents(UCC/Web 2.0) Final Reports"*, 2007
2. Korea Institute Construction and Technology, *"Developing Technologies to Provide, Mangage and Evaluation Traffic Information Final Reports"*, 2010
3. NCHRP Report 576, *" Trans XML : XML Schemas for Exchange of Transportation Data Report"*, 2007
4. Roy T. Fielding and Richard N. Taylor. *"Principled Design of the Medem Web Architecture", ACM Transaction on Internet Technology*, 2 : 115 – 150, 2002.
5. Sunjin Kim, " Modeling and Implementation of Multilingual Meta-search Service using Open APIs and Ajax", 2009, Korea Society of Industrial Information Systems
6. Soonchul Jung, " REST based Call/Messaging Open API for Telecommunication Services", 2008, Proceeding of the ITFE Summer Conference
7. S.Jung, M,K,Jange, and D.W. Choi, "Mid-Call Service System controlled by a caller using Parlay API and SOAP", Communication Software, pp67~70, 8007
8. http://twitter.com/HappyTraffic
9. http://twitter.com/poltraffic