RUDIMENTARY RESEARCH ON THE UNIVERSAL DESIGN OF URBAN SPATIAL INFORMATION CONSIDERING THE BEHAVIOR OF FOREIGNERS

J. Ge[1] and K. Hokao[2]

ABSTRACT: Some rudimentary researches on the design of urban spatial information from the viewpoint of foreigners were performed through the case study of Saga City, Japan. By means of questionnaire survey, on-site investigation and route-searching experiment, the present condition, especially the problems of the urban spatial information for the behavior of foreigners were analyzed and grasped, and some principles of the design of urban spatial information considering the behavior of foreigners were proposed, which could be regarded as the extension of the concept of universal design. The results of the research can not only provide the basic data for the design and improvement of urban spatial information, but also can help to enlarge the concept of universal design by considering the factor of foreigners in wider fields.

Keywords: Universal design, urban spatial information, behavior of foreigners.

BACKGROUND AND OBJECTIVES

Universal design has its beginning in demographic, legislative, economic, and social changes among elder adults and people with disabilities throughout the 20th century, and is now understood commonly as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." The practices of universal design till now were mainly concentrated on the barrier-free design of products, architecture, facility, environment and so on for the purpose of the elder and disabled.

Considering that the core of the concept of universal design is to benefit people of various abilities equally, we should realize that designs should stand on the base of "the weak", in other words the people with lower abilities. The scope of "the weak" is very wide, including not only the physically weak people such as the disabled or the elder, but also the minority who do not have the commensurate ability in the aspects of experience, language, education, background and so on compared to the majority. The foreigner in an unfamiliar country is one of the typical examples, who might run into a lot of problems physically and psychologically during their activities compared with natives.

On the other hand, with the rapid development of internationalization and globalization, the international activities such as international conferences, symposiums, events, as well as oversea travels and studies are becoming more and more popular. Foreign staffs are also increasing quickly in recent years. Therefore, the researches on the problems (weak points) of foreigners in an unfamiliar environment are of increasing importance and emergency. Till now, many efforts have been made to fit for the tendency of internationalization, however, in the field of urban planning or architecture design, the consideration and researches for foreigners are not so satisfied by far, especially in local cities.

In this paper, the design of urban spatial information considering the utilization of foreigners is discussed. Urban spatial information is one of the important components of urban design and planning, and also has great influence on the behavior of foreigners in an unaccustomed environment. If there are some problems with obtaining, understanding or utilization of the urban spatial information, it is sure that the foreigners will feel seriously confused in their behaviors. Furthermore, it also might have bad influence on the natives. One typical example is that the deficiency of the explanation of signals might cause the violation of the transportation rule, which might bring about accidents influencing the safety in a large scope.

At present, most researches in the field of spatial information are focused on the acquisition, construction, management, analysis, integration and communication of spatial data by utilizing survey and data management technology such as GIS. And in some researches, basic spatial data such as infrastructures are shared and accessed via Internet. However, these researches are mainly on the objective existing data while the human factors such as behaviors of people and their psychology

1 Associate Professor, Dept. of Architecture, Zhejiang University, CHINA; Dept. of Civil Engineering, Saga University, JAPAN
2 Professor, Department of Civil Engineering, Saga University, JAPAN

effects have not been taken into consideration.

Considering from the two aspects – universal design considering the factor of foreign, and urban spatial information from the viewpoints of human behavior, the main objectives of this research are:

(1) To grasp the present condition of the design of urban spatial information from the viewpoints of foreigners;

(2) To analyze the problems in the effective utilization of urban spatial information by foreigners;

(3) To grasp the potential requests on the urban spatial information of foreigners;

(4) To present the proposals of the principles for the design of urban spatial information for foreigners as the extension of the concept of universal design.

METHODOLOGY

In this research, Urban spatial information (USI) is focused on the information set in urban area or expressed by urban structure, see Fig. 1. It includes:

(1) Information Board (IB), such as signs, signals, guidance maps and so on, which can provide the information by words, figures, signals arrows, lines and so on.

(2) Urban Spatial Structure (USS), such as buildings, streets, crossroads and so on. Some buildings can provide the symbol of one area; streets and crossroads can show the direction or location of one place.

(3) Inquiry Offices (IQ), such as police boxes, guidance centers and so on, which can give the chance for people to ask or acquire necessary information through communication.

(4) Dynamic Information (DI), such as pedestrian, route bus and so on, which can serve as the subsidiary measures for people to ask information directly or get hint from the bus route indirectly.

These urban spatial information might have a lot of characteristics in terms of scale, location, distance,

property and so on. They might be big or small; outdoors or indoors; far or near; visual or un-visual. The contents of urabn spatial information and their structure have strong relation with the judgement and behavior of people, therefore are of great importance.

In this paper, we focused on the part of the Information Board (IB) of the urban spatial information shown in Figure 1. In the study area of Saga City, we performed three surveys to foreigners including (1) questionnaire survey to get the data of evaluation on USI from the foreigners, especially those on IB, (2) route-searching experiment, in order to grasp the effect and problems of USI, especially IB, (3) on-site investigation, to grasp the present condition of IB. Through the analysis of these surveys, we proposed to present the principles of the design of urban spatial information considering the behavior of foreigners, which could be regarded as the extension of the concept of universal design. The flow chart of the research is shown in Fig. 2.
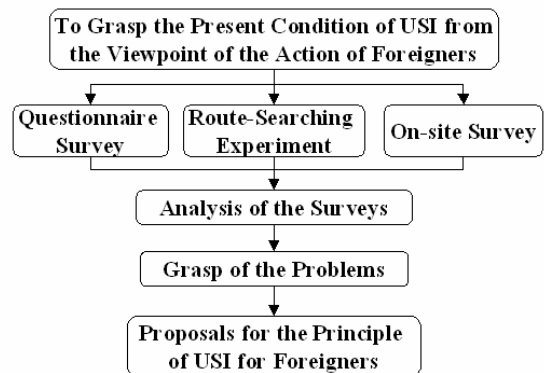

Fig. 2 Flow chart of the research

SURVEYS ON THE PRESENT CONDITION OF URBAN SPATIAL INFORMATION CONSIDERING THE BEHAVIOR OF FOREIGNERS

Questionnaire Survey to the Short-term Foreign Visitors

General condition of the questionnaire survey

In order to grasp the problems of foreigners during their behavior, their dissatisfying points as well as their potential demands on urban spatial information, we performed several questionnaire surveys to the short-term foreign visitors in Saga City from September to October 2002.

The questionnaire includes four parts: (1) personal attributes of the visitors; (2) activities in Saga City; (3) evaluations on the spatial information of Saga City; and
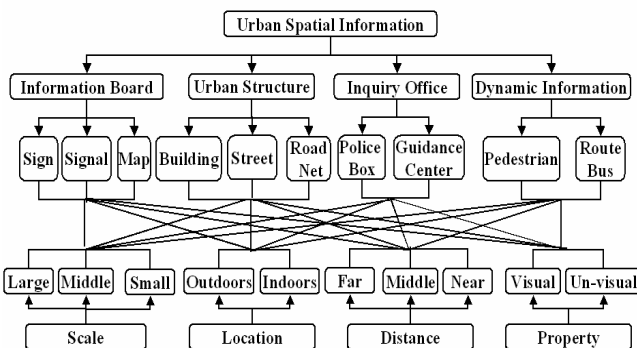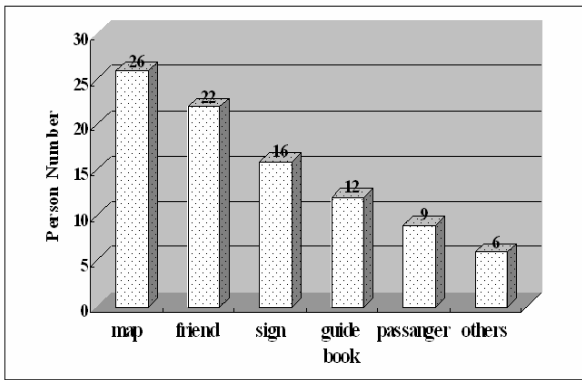

Fig. 1 Urban spatial information

Fig. 3 Helpful information sources

Fig. 4 Evaluation of urban spatial information

(4) comments and requests on the urban spatial information.

The samples included the participants to the International Symposium on Lowland Technology, and the visitors to the International Balloon Festival, totally 41 persons from East Asia (15%), South-east Asia (22%), Europe (43%) and America (20%).

Results of the questionnaire survey
(1) Relative evaluations on importance and satisfaction of USI components

The helpful information sources for foreign visitors are shown in Fig. 3. We can see that the most useful urban spatial information appeared to be the signs set in the streets, which ranked the third place following the information from the maps they brought with them and the information from friends.

The foreigners were asked to give assessment on their satisfaction of the urban spatial information of Saga during their behaviors, with the 5-grade evaluation scale from dissatisfied very much (1 point) to satisfied very much (5 points). The evaluation items included the conveniences to ride a train, a bus or a taxi, the ease of finding a bus stop, understandability of the maps, signs in the streets, and road formation, the comfort and safety of the behavior in the city. The evaluations results are shown in Fig. 4.

(2) Problems of Urban IB

We could find that the items obtained low evaluations are the ease to find a bus stop, the convenience to ride a taxi, the understanding of the maps, signs in the streets, and the understanding of the formation of the roads. The obtaining and understanding of spatial information seemed to be a big problem. As to the comments or suggestions from the foreigners, most people referred to the difficulties in understanding maps, guidance and signs set in the streets. At the same time, the ease to find a taxi also seemed to be a serious problem. The
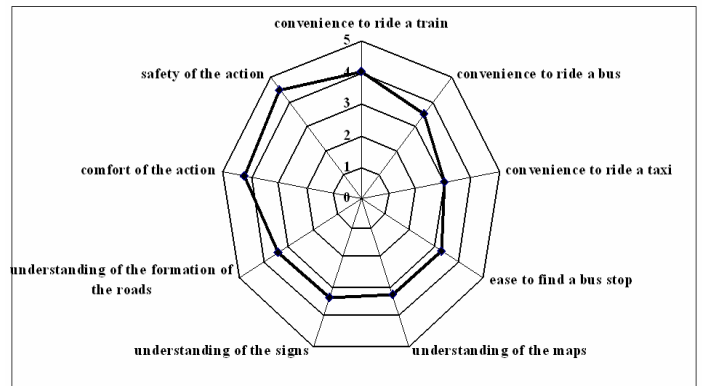
understanding of the announcement of the bus is also referred frequently.

On-site Investigation of Urban Spatial Information for Foreigners

In order to analyze the problems found in the questionnaire surveys in more detail, we performed the on-site investigations in the areas and roads around Saga Railway Station and Saga Bus Station in November 2002. We think that the railway station and bus station are the typical places for the investigation on USI, considering that the utilization frequency of these areas for foreigners are high, the components of the urban spatial information are plenty, and the conditions related to moving behaviors are complex.

We walked around the study area, firstly, to record the urban components expressing spatial information; to classify the information according to the effective utilization of foreigners; and to analyze the characteristics of each type. As the result, we evaluated the spatial information in the study area by such typical points of **IB** as (1) clearness of words, expressions and marks; (2) comprehension of figures and explanations; (3) correct explanation in English.

Good Evaluation Type: From the investigation, we can see that among these kinds of information, the figures, marks and expressions are all very clear, easy to clarify and understand. For example, in some signs of the streets, the words, figures, signals and arrows are all very clear, and all of them are indicated with the English explanations, so that it is easy to be understood by foreigners and useful to their behaviors. Fig. 5 (a) is the photo of example of this type, which is taken in the Railway Station of Saga City.

Fair Evaluation Type: Although the expressions are not so bad and some of them also have English translations, sometimes it is quite difficult to understand, partly because the English explanations are not native so that it is difficult to grasp the meaning, and partly because the

understanding of the information needs Japanese background. This type will make foreigners feel confused and benefit little to their behaviors. Figure 5 (b) is one of the examples outside the Saga Railway Station. Only small parts of the guidance map have clear English explanations, while others might be meaningless to foreigners.

Fig. 5 (a) Example of good evaluation type of IB - inside Saga Railway Station
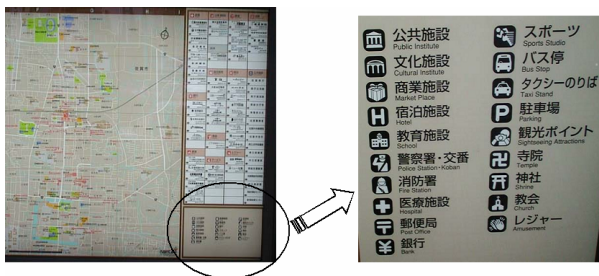

Fig. 5 (b) Example of fair evaluation type of IB - outside Saga Railway Station

Bad Evaluation Type: The information is meaningless to the foreigners. For example some of the lines and signals of the roads are meaningless to foreigners without explanation at all. They cannot understand the separation of bicycles and walkers, or the correct walking direction of the road only by some white lines without explanations, see the example of Fig. 5(c).
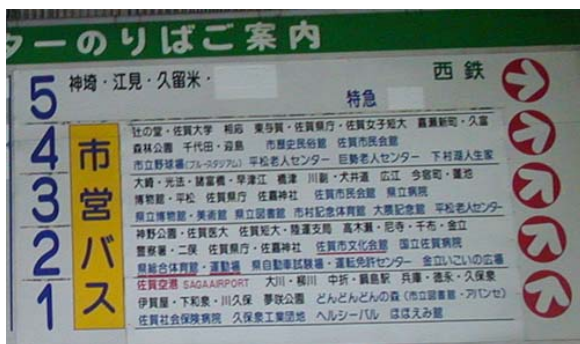

Fig. 5 (c) Example of bad evaluation type of IB - inside Saga Bus Station

Inside and around Saga Railway Station, there are 13 signs for providing direction for passengers, among which only three could be judged as good type, while the middle type is two, and bad type is eight. We should notice that Saga Railway Station is the central place of the city. Even within this area there are so much problems on spatial information for foreigners, we could imagine that there might be the same or more serious problems in other places.

Route-searching Experiment of Foreigners Unaccustomed to the City

General condition of the route-Searching experiment

In order to grasp the role of USI during behavior, as well as the main problems of the present condition of USI more comprehensively and vividly, we performed a route-searching experiment on the foreigners in December 2002. Compared with the above two surveys, the route-searching experiment could lead the study from plane to spatial, from static state to dynamic state.

During the experiment, we chased their behaviors of finding a place person by person. The objects of the experiment are eight foreigners who have come to the city within two months, and all of them did not know the target before. There were two departure points: one is Saga University; the other is Saga Railway Station, and the target was Saga History and Folk Museum. The means to approach the target were chosen by themselves, which might be by bus, by bicycle or on foot. Furthermore, the information they prepared in ahead of time was also without limitation.

Through the experiment, we could grasp the real condition and feeling of the moving behavior of foreigners in an unaccustomed city by chasing their behavior of finding a place on-site. Furthermore, the problems obtained in the questionnaire surveys and on-site investigation could be understood more deeply and lively.

During the experiment, we recorded in detail the behaviors of the foreigners, including their route from start to the goal; the time spent; what they looked at or what they did; what kind of information were obtained by what means during the experiment; where they missed the road if any; what helped them to judge the direction at the intersections, and so on. In short, every behavior they performed during the experiment was recorded carefully. After they arrived at the target, we also asked them about the place where they felt dangerous or worrying; the thoughts about the whole route-searching process; as well as the requests or suggestions to the spatial information of Saga City.

A typical case of the experiment

The route of a typical case of the experiment is shown in Fig. 6 (a female Indonesian student from Saga University). The explanations of symbols of Fig. 6 are shown in Table 1.

Table 1 Explanations of the symbols on the map

Explanation		Symbols
Miss the Road	Stop and Confuse	×
	Select Wrong Way or Meet with Other Problems	?
Obtain Information	Information from others Ask the people	Δ
	Spatial Information Look at the sign set in the street	S
	Look at the map set in the street	□
Departure		○
Goal		●
Route		—
Moving to the next behavior		→

Fig. 6 A case of the route-searching experiment

Examination of the route-searching experiment

(1) Common route searching pattern and main problems

The common pattern of the route-searching process is shown in Fig. 7. The main missing points are concentrated at the intersection spaces, such as the intersection in front of Saga University, Prefecture Office, Central Post Office, Saga Shrine, and so on. It is understandable that at the intersection, they fell in lost for they did not know which way to choose. They needed more information to make correct decision. The wrong uses of the lines separating the bicycle and pedestrian lanes were also seen frequently, as well as the direction of moving. It was an unsafe factor to the transportation. We noticed that there were no guidance of the road lanes and the direction of moving. Maybe it is a matter of course for the natives to walk on the left side, but could not be understood by foreigners who were lack of the background.
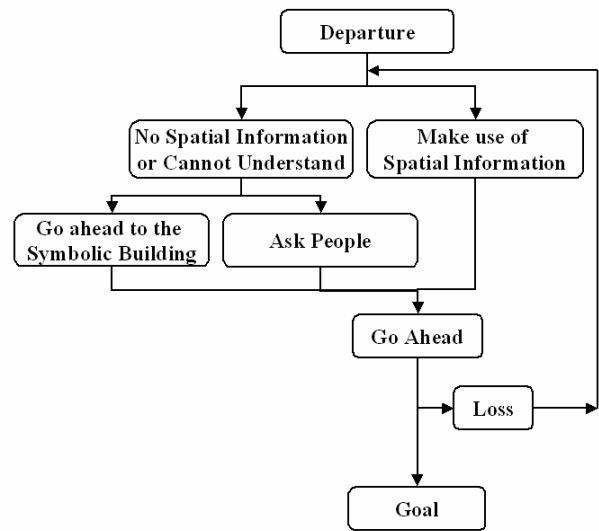

Fig. 7 Common pattern of the route-searching process

(2) Utilization of Information Sources

There are three types of information sources for people to get to a place, which are memory related to the place, information brought with them such as maps, and site information set in urban space or expressed by urban structure (USI). As to a foreigner or a person unfamiliar to the place, the first type of information, i.e. memory is almost blank. As the result of our experiment, the frequency about the utilization of different information during the whole process is shown in Fig. 8.
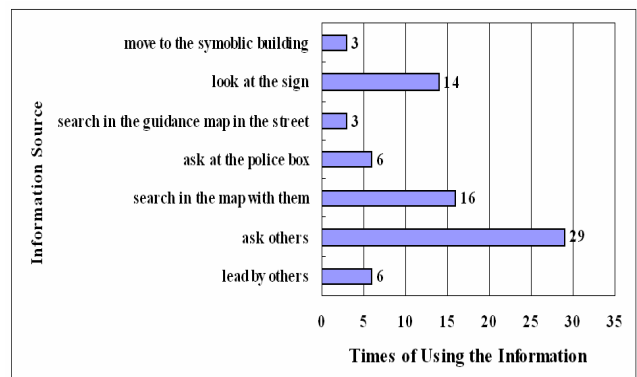

Fig. 8 Utilization frequency of information

It was very interesting that although all of the eight people could not understand Japanese at all, they asked passengers about the way very often, and the frequency of using this information type is at the first place. Since almost all the people could not grasp what the Japanese said, the results generally led to two solutions: one was that the Japanese people guide them to where they wanted to go; the other was that the foreigners lost his way again. We might image that because the spatial information provided to them were so few that they had no choice but to ask people whose answer they might not understand at all. On the other hand, the urban spatial information can also be beneficial to the communication between foreigners and pedestrians. For example, the conspicuous symbolic building, the understandable street structure, as well as the clear maps or signs, will be very helpful for the foreigner to understand the answer when they ask Japanese pedestrians about their ways.

Sign in the streets is the third frequently used spatial information, however, the effect of using them are not so satisfied. We found that the signs of good type were very few, and although the foreigners looked at the sign very carefully, they could not catch the meaning. Furthermore, the guidance maps set in the streets were few, so that the frequency of using it was the lowest among all information sources. In this experiment, the guidance maps in the streets were used three times among all the behaviors, but all of the three times had led the foreigners go ahead to the correct direction. We might consider that the maps brought by them are general maps, which were not in detail about one place or one intersection. On the contrary, the maps placed in the streets were detailed maps describing the nearby places in detail so that it could help a lot to the route searching. In addition, it should be mentioned that all of the three maps in the streets were with English explanations.

ANALYSIS ON THE PROBLEMS AND POTENTIAL REQUESTS OF URBAN SPATIAL INFORMATION FOR THE BEHAVIOR OF FOREIGNERS

There are three steps for the route searching of people, which are departure step, process step and target step, and each step need various information. During the departure step, people need to grasp the situation of the target, the transportation node and street net. During the route searching process, people need to identify the dynamic and relative location between themselves and the target. Therefore they need the comprehensive street maps to measure their relative situation, and the road attached information to judge the safe and correct direction, clear symbolic buildings and street structure will help a lot. During the target step, they need the detailed area information such as detailed block map and the clear sign of the target.

Considering the above three steps of route searching behavior and the various needs for the urban spatial information in each step, we analyze the main problems and the potential requests of the urban spatial information for the behaviors of foreigners from the above surveys in Saga.

(1) Spatial information is inadequate in the urban spaces, especially in the intersections where the choices for directions and roads are complicated. As a result, foreigners have to ask for people about the information but they might not understand or might not be understood. Thus, more plenty of spatial information is expected.

(2) The suitable and effective type of spatial information should be analyzed carefully considering the use of foreigners. It appeared that, guidance maps set in the streets were more desirable compared with signs, because of its plenty information expressed not only by words, but also by figures, arrows, symbols and so on, which would increase the possibility of being understood and grasped. Two types of guidance maps are necessary, which are comprehensive street maps to identify the position, and the detailed block map to find the target.

(3) The expression of the urban spatial information should be examined well. The proper expressions were too few to make the information meaningful to the foreigners. At least the correct English explanation should be indicated together with the native language.

(4) As one of the important spatial information, the information of road separation and moving direction should be appeared clearly and fully. Although it is normal and nature for natives to move along the left side of the road, while bicycles moving on the right side of the walkers, the foreigners should be informed on-site by apparent and understandable expression, such as symbols, marks and explanations.

(5) The utilizations of public transportation were quite difficult to foreigners. Firstly, bus stops and taxi were difficult to be found without standard and apparent symbols. Secondly, none of the schedules and passing routes written on the bus stop plates was expressed by English explanations, which seemed meaningless for foreigners. Furthermore, the guidance of bus stop or taxi stand in urban space could not be seen at all.

CONCLUSIONS

Conclusions of the Investigations Focusing on IB

With the development of internationalization and globalization, people are communicating with each other more frequently and moving more widely, which brought about a lot of problems during the activities in foreign countries. Some rudimentary researches on the design of urban spatial information design for foreigners were performed in this research through the case study of Saga, and the concept of universal design is considered to be extended to a much wider scope by adding the factor of foreigners. On the other hand, the content, structure and properties of Urban Spatial Information from the viewpoints of people behavior are also presented. The following two principles for the universal design for Urban Spatial Information for foreigners were then proposed from the viewpoints of quantity and quality.

(1) Quantitative aspect: USI should be obtained adequately and conveniently. The information should be available conveniently to people with diverse nationalities, experiences and backgrounds. Enough amount, various types and remarkable place of information are desirable. For the people who are not familiar to the place, more information is required compared to the residents. As we made clear in this research, the quantity of the spatial information such as signs, maps are not enough in the streets, especially in the intersection of the roads. Moreover, the facilities where a lot of information assembles such as inquiry box and information office etc. are needed in some central places with remarkable signs. As we presented in Fig.1, the content, structure and properties of USI should be studied in detail, and be set adequately and conveniently.

(2) Qualitative aspect: USI should be understood easily, correctly and perceptibly. The expressed information should be easy to understand without confusion, regardless of the user's experience, knowledge, background, and language skills. Such items should be taken into consideration: be consistent with user expectations and intuition; accommodate a wide range of literacy and language skills; arrange information consistent with its importance; use different modes (pictorial, verbal, tactile) for redundant presentation of essential information; maximize "legibility" of essential information, and so on.

These principles could not only be applied in the design of urban spatial information as studied in this paper, but also be useful to the urban planning and architecture design. Furthermore, they are expected to enlarge the concept of universal design by considering the factor of foreigners in wide fields such as the design of environment, product and community and so on.

Studies in the Future

(1) In this research, among the structure of Urban Spatial Information (USI), the main investigations and analysis are focused on Information Board (IB). In the future, the other contents as Urban Structure (US), Information Offices (IO), and Dynamic Information (DI) also need to be made clear.
(2) The evaluation index and its structure of USI should be more systematically and comprehensively.
(3) Further various behavioral tests should be performed to identify the roles of each components of USI and grasp the structure of USI more clearly, in order to guide the ideal direction of USI design.
(4) As to some special urban areas such as lowland, where the topographic features are not so plenty, the researches of USI are of more importance. Therefore the structure of USI and the roles of each component could be studied more deeply and comprehensively.

ACKNOWLEDGEMENT

REFERENCES

Universal Design Homepage: http://www.universal-design.co.jp
Kitaoka T. (2002). New Concept of Universal Design. Meiseki Press.
Qin D. and Funehashi K. (2002). Research on the Surveys of Route-searching Behaviors of Foreigners around Osaka Railway Station, Proceeding of the Urban Planning Division, Japanese Society of Architecture, No.11.