

THE DISTRIBUTION OF SIGNS AND PEDESTRIANS' WALKING BEHAVIORS IN UNDERGROUND SPACE -A CASE STUDY OF THE UNDERGROUND SHOPPING CENTER IN TENJIN, FUKUOKA-

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지하공간에 있어서 사인의 분포 특성과 보행특성에 관한 연구

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Abstract The objective of this research was to investigate the way information is used by pedestrians in underground space. Furthermore, we wanted to know how pedestrians utilize information from signage of signs by pedestrians. Thus, we conducted an investigation on the pedestrians' walking behavior in Fukuoka City, Tenjin underground shopping centers, and 1) checked routes taken by the subjects; and 2) categorized the signs that were observed, the pedestrians' movement patterns, the way information from signage is used by the pedestrians, the signs' locations, the relationship between the spaces, the heights of the signs and the types of signs offering directions. The results showed that there is a need to solve certain problems related to the locations of the signs and the walking behaviors of the subjects. To solve the problems exhibited by the subjects' walking behaviors, we came up with a variety of guidance information that could be used. The contents of the guidance information differ depending on the specified heights for the placement of signs and the information used depending on the location. The results also showed that the continuity between places needs to be shown more effectively by the guidance system, and that too many signs are positioned in places where the frequency of use is low.

요약 본 연구는 지하공간에 있어서 보행자의 정보활용에 관한 연구의 일환으로, 후쿠오카시 텐진지구 지하상가를 중심으로, 보행자의 보행형태로부터 사인의 이용현황을 밝혀내는 것을 목적으로 아래와 같은 분석을 실시하였다.

1) 피험자가 통과한 Route의 체크에 의한 보행선형의 비교, 2) 피험자가 본(이용한) 사인을, 보행동선과, 사인의 이용상황, 사인의 설치장소, 사인의 높이등과의 관계에 있어서 구간별로 분석시, 동선의 Type를 분류 위의 텐진 지하상가에서의 보행특성분석의 결과로 부터, 사인에서의 배치의 문제, 안내 사인의 이용률의 부족 등 보행특성상의 문제의 해결해야할 과제가 밝혀졌다.

그것에 대한 해결책으로, 1)사인의 배치문제에 관해서는 사인을 다양한 높이와 설치장소에 활용하여 제공할 수 있는 안내 유도정보제공의 필요성, 2)피험자의 보행특성에 나타난 문제점에 관해서는, 보행자가 보다 다양한 안내정보를 이용할 수 있도록 사인의 안내정보시스템을 활용한 보행지원과, 설치되어 있는 사인은 많지만 이용률이 적은 곳, 보행의 동선문제에 있던 장소와 장소를 연결하는 곳에 적절한 정보제공의 필요성을 제시하였다.

Introduction

The purpose of signs in public space is to provide

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information (convenience) for the user.

Underground spaces represent a major turning point in the use and increase in the efficiency of public space in general (J. Archit. Plann. Environ. Eng., AIJ, 1996). Regarding the sign system used to direct pedestrian behavior, it cannot be said that much thought is put into the general needs of pedestrians in underground

spaces. This is because safety and convenience are provided for and communicated to the pedestrian one-sidedly (Lee, 1996; Yokota, et al. 1997; Murakashi and Shimizu, 1989). Although there are numerous studies on pedestrians' walking routes on roads and in buildings using signage, only a few research have been conducted to investigate the pedestrian's use of information from signs in underground spaces.

In this paper, which is one in a series of papers on the use of information by pedestrians in underground spaces, we investigated pedestrian walking behavior and the use of signs in an underground shopping center in Tenjin, Fukuoka.

Methods

The following three problems have become clear from our research to date (Choi and Morita, 2002). First, we have found problems related to the kind and quantity of information provided by signs. Second, we have found problems concerning the placement and distribution of information signs. Often too much or too little information is provided because of the dispersal or concentration of signs. Third, we found that often the number and type of signs are similar in different places, so that the signs cannot be distinguished.

Thus, an investigation on which type of signs are easily noticeable to pedestrians in underground spaces was conducted. In addition, another aim of this study was to identify the routes pedestrians followed using the pedestrian information sign system in Tenjin. The investigation site is shown in Fig. 1. It is an underground shopping center in Tenjin, Fukuoka. The site consists of an entrance, a passage, an open space, a crossing, and other spaces. An entrance at the northern part of the central passage was used as the starting point, and the experiment was conducted involving the information sign in the parking zone near an entrance along the central passage to the southern parking zone (see Fig. 1).

Fifteen subjects participated in the experiment: 8 women and 7 men between 20 and 31 years old. The subjects were instructed to find and look at all available public information sign along the route between the starting point and the destination. Subjects carried a

portable tape recorder and were asked to record their impressions of each sign they found and observed. The observer followed the subject from a distance of 5 meters and recorded the course the subjects followed as they looked for the signs. The subject's movement were recorded by drawing the line of route taken by the subject using a pencil on a copy of the floor plan of the shopping center. Data collected included the signs the subjects noticed, the line of movement of the subjects between signs, how often a sign was used, and the placement and height of the signs. These factors were then combined according to the type of path followed by the subjects between signs. These results were then analyzed to examine the relationship between sign placement and how effectively pedestrians could use the information provided by the signs to find their way in the shopping center. (Hikaru, et al. 1997; Inoue, et al. 1997)

To evaluate the subject's ability to find and use signs in the underground shopping center, subjects were instructed to search for signs belonging to shops in the vicinity of the walking course destination. Thus all the public signs in the underground shopping center were target signs because we wanted to find out how well people could use the signs in this underground shopping center. In addition, subjects were also asked to find the parking zone however, this was an optional destination. However, since the layout of the center was simple and subjects may have been familiar with the overall layout of the center, they might not have used the signs to find their way through the center from the start point to the destination.

In order to investigate the use of information signs for pedestrians in underground space, the subjects were given the name of the starting point and the destination. The points or places where the subjects stopped to find their way were recorded and observed at a distance of 5 meters from the subject. Subjects were supplied a voice recorder and were asked to verbally describe the signs they used when searching for a particular kind of information, and the difficulties encountered when searching for information.

Results

In order to analyze how and where subjects looked for

signs, we compared the routes taken by the subjects according to the following four points: first, the relationship between the information signs found and the walking paths between signs; second, the relationship between the placement of a sign and the walking paths between signs; third, the relationship between the sign height and the walking paths between signs fourth, a classification of pedestrian walking paths according to type. The results are shown in Fig. 1. This figure indicates the walking paths of the subjects. The signs found by the subjects in the underground shopping center are indicated by a dot (●). The height of signs found by the subjects was divided into four groups, as shown in Fig. 1. Heights (from the floor) were between 0-1m, 1m-2m, 2m-3m, and higher than 3m. In Fig. 1, it is shown from the position of the dots that subject A found signs directing to the open space, crossings, the passage, and exits/entrances. In Fig. 2, it is shown from the walking paths that all subjects often found signs in places where the signs needed to be used.

Considering the results of all subjects, we can see in Fig. 2 that in the open space there are sharp trajectories in the line of movement. Before reaching the destination, all subjects on average consulted the information signs 14 times in total.

Signs consulted by subjects can be divided into four categories according to where they were placed: signs at crossings, exits/entrances, open spaces, and other spaces. The signs at crossings were consulted by subjects in 93 of 220 cases (42.27 %); signs at exits/entrances, in 67 cases (30.45%); signs at open spaces, in 32 cases (4.55 %); signs in passages, in 22 cases (10 %); and signs in other spaces in 6 cases (2.73 %). Concerning the rate of sign use, although the rate of use was quite high for signs at the crossings and in the exits/entrances, the signs placed at the exits/entrances were not used often, even though the concentration of signs was highest in these places. In terms of the height of the signs (from the floor), 8 cases were found (3.63%) in the 0-1m group, 13 cases (5.90%) in the 1-2m group, 196 cases (89.09%) in the 2-3m group, and 3 cases (1.36%) in the more than 3m group. Most signs subjects found were placed at a height of 2-3m. Regarding the information signs consulted by subjects, in the 0-1m group 3 cases were found at crossings, 5 cases were found at exits/entrance, 1 case

was found in passages, and 1 case in the open spaces. Wasn't it mentioned in the previous group that signs at the exit/entrance have a low usage. In the 1m-2m group, 1 case was at crossings, 7 cases were at exits/entrances, 7 cases were in open spaces and 1 in others. In the 2-3m group, 88 cases were at crossings, 57 at exits/entrances, 27 in open spaces, 23 in passages, and 5 in others. However, in the more than 3m group, only 2 cases were found at exits/entrances: almost no subjects found the signs. In summary, most signs were found at crossings, in the 2-3m height group.

The pedestrian walking path relates to how easy or difficult it was for subjects to find signs.

In order to get a clear picture of subject walking paths from place to place, we divided the walking paths into crossings, exits/entrances, open spaces, and passages. The shapes of subject walking paths give rise to various interpretations. When the walking path to a destination was simple, the most efficient number of signs could be found, and the number of signs found was often small. Regarding the placement of signs, there was a difference between the rate of sign use and the number of signs installed. Moreover, in certain places, subject walking paths became complicated (open spaces, others).

In other words, the positions where signs were installed may not have been suitable. Most subjects found the guidance signs at a height of 2-3m. Moreover, in places where the walking paths were complicated, such as open spaces, the ratio of the use of signs was lower than that compared with exits/entrances and passages.

Conclusions

Based on the results of this investigation of sign placement, which was conducted via an analysis of walking paths through analysis of pedestrians movement pattern in an underground shopping center in Tenjin, Fukuoka, we think that the following changes might be necessary to improve sign placement and use. First, more information could be provided for pedestrians than before in order to guide them to use this underground shopping center easily. Second, many signs were installed in some place, but few were installed on others, and the continuity between places needs to be shown more effectively by the guidance system.

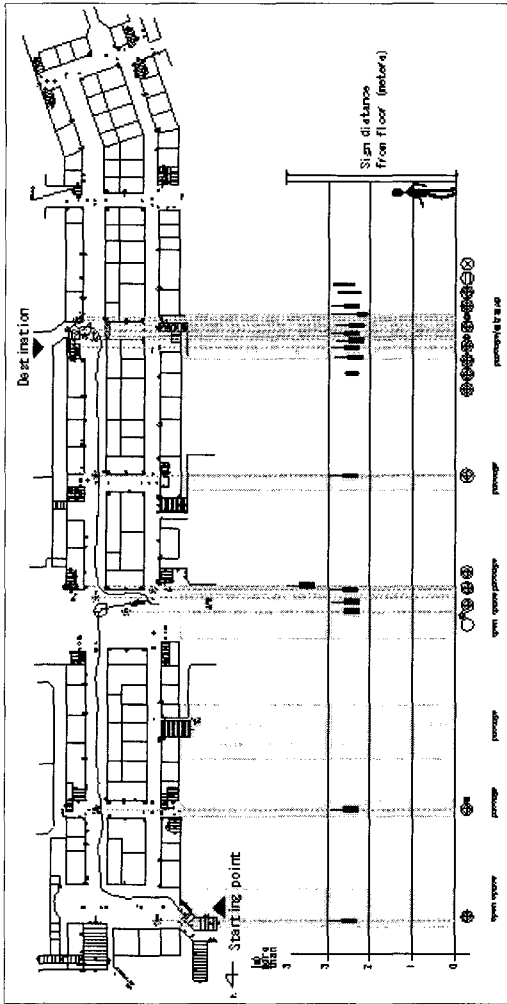


Figure 1. The distribution (subject A) of the subject's walking path and the height of the signs found by the subject. The figure indicates the subject's walking path. The signs consulted by the subject in the underground shopping center are indicated by a dot (●)

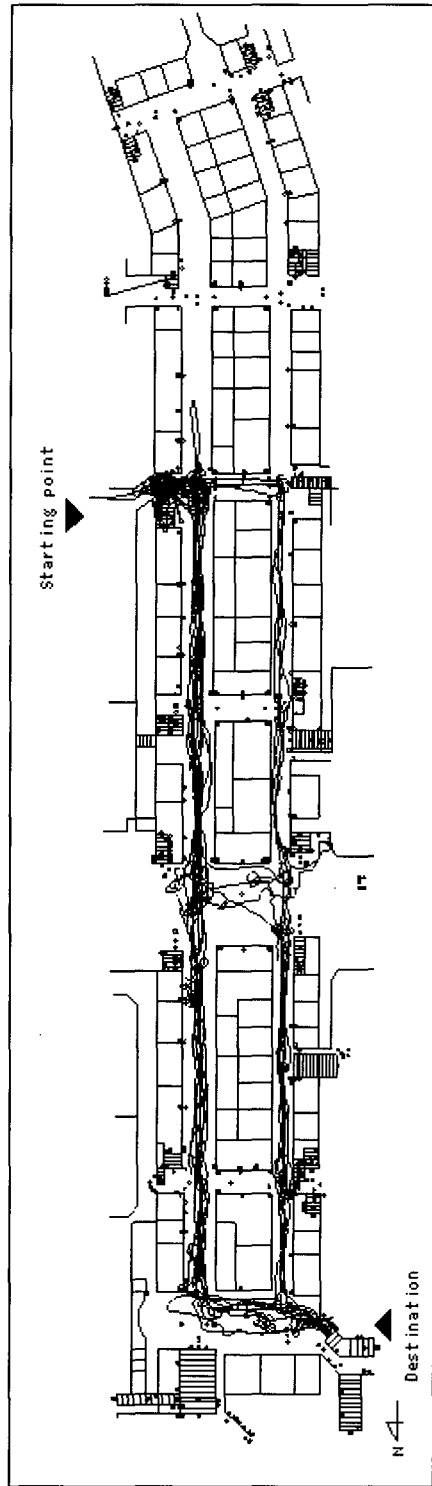


Figure 2. All subjects' walking paths. The directions followed by the walking paths indicate that all subjects found the signs.

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