

Nine Assistant Guiding Methods in Subway Design – A Research of Shanghai Subway Users

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Abstract. In big cities, it often occurs that passengers (users) have great difficulties to recognize subway stations. Except improving the signs of subway stations, based on large amounts of field researches, we find 9 practical and effective methods to help passengers to identify subway stations. These 9 methods include visual design, aural design, and tactual design etc. This paper also tries to apply some theories of cognitive psychology about human memory in the research of subways. These methods are also applicable to other space design in subway and even general underground space design.

Keywords: User Research, Subway Station, Quick-Identification.

1 Introduction

The following photos of the 4 stations were taken in Shanghai Subway Line 1 from the same point of view from the train.



Fig. 1. 4 different stations in Shanghai subway

From both photos taken on the site and large amount to interview, we find that most stations in Shanghai Subway are similar. If we omit the signs which reads name

of a station, users can barely identify stations quickly through watching the platforms. In fact, the crowd condition of the train and the different user perspective all result in missing the sight of signs. In addition, from the research on familiarity of subway users and their behaviors, we find something very interesting: the more familiar a user with subways, the less he reliant on signs. Furthermore, the flood of advertisements also disturbed users' sight. Thus we propose to develop some assistant methods to help users obtaining guiding information form the environment. Biological cognitive theories emphasize on the *offers* of the environment, and the *offers* about human surviving can be obtained instinctively, or can be learned without much effort. This enlightened us to make good use of human instinct of identifying environment. Thus, through proper design, we can make it more energy saving and more convenient for users in guiding themselves in underground environment.

The way people guiding themselves on streets enlightened us that people seldom depend on signs in identifying familiar environment, such as the way home. People tend to build their cognition right from information provided by the environment.

In order to transfer the good experience on the ground to underground environment, we need to add more characteristic information for users to memorize. This may be a new way in subway guiding field. The researches on behavior and way of cognition of subway users will enlighten designers to build humane subway environment. The techniques of research include abundant observation and interviews, eye-track experiences and psychological experiences, questionnaires, and some literature reviews. We tried to find out new fields of guiding methods in subways through developing all kinds of senses of users, such as vision, hearing, and touching, and combine them with researches about human memories and human experiences.

2 9 Assistant Guiding Methods for Subways

2.1 Visual Series – Spatial Design Aids Guiding in Subways

Voice from a Beijing subway user: I absolutely won't miss Yonghe Palace Station! Even the passengers only have been there once, they also feel the same. Compared to those featureless stations, Yonghe Palace station is easy for users to recognize and memorize.



Fig. 2. Yonghe Palace Station, Beijing (left) VS the featureless Gulou Street Station (right)

In subway construction, we can add some features to subway space, thus effectively help passengers to recognize stations and guide themselves. Common method such as, setting several layers of ground or ceiling, making inter-junction of horizontal position, comparing different spatial areas, making different arrangement of the columns along corridors, etc. Even adding features in a part of the space is also effective, e.g. a clearstory in the ceiling or a raised plant container on the ground. Furthermore, we can imitate the way people recognizing surroundings above the ground, i.e. to build characteristic landmarks in underground spaces, which is also a good guiding method for users.

Spatial design can effectively leave strong memories in users' minds, because the ability of recognizing three-dimension spaces is people's instinct, and is continually developing in the process of human evolution. One person can store huge amounts of spatial memories in his mind. If we make good use of human brains, the results will be remarkable.

2.2 Visual Series – Color Design Aids Guiding in Subways

Applying a unique color for each station works well in the design of Hongkong subway lines. As long as the passenger recognizes the color of the destination station, he will take off at the right station. The result of our research shows that we should pay attention to three aspects in color design for subways:

1. Use colors with high saturation, avoid using compound colors. Make it easy for users to identify the hue of the color.
2. The area of the color should be large enough for users to identify through the window in every corner of the train.
3. Do not use similar color in two neighboring stations.



Fig. 3. Hongkong Subway: Zhonghuan Station is red (see the left picture), while Jiulongtang Station is blue

Chicago subways are named by color. Stations of the same line all continuously bear the same colored ribbon in and out of the stations. It is easy for a user to know which line he is taking, thus strengthen the guiding effect of color. Surely enough, when we use colors to mark different subway lines, large areas of high saturated color is needless; otherwise, with all the stations of one similar color, memories of the users will be disturbed.

2.3 Visual Series – Decoration Design Aids Guiding in Subways

The result of eye-track experiments shows that testees are able to identify a station by decoration. Another interesting finding is that memories of decoration is not accumulating with time, but appears to be a salutatory process, i.e. once or twice a user is attracted by some decorations, he will soon form a vivid memory of it. If he sees the same decorations again, he will recognize them immediately. Considering the limited space for users to pass, when we apply this method for guiding, we'd better use big and global decoration in the station, or set the decorations along the only path for users. Furthermore, as users need to identify a station from a train window quickly, the decorations in the platform should be distinctive and eye-catching; otherwise it will reduce the resolving power of it. As for the big decorations in other places, even not so eye-catching, users will identify them when passing by.

2.4 Visual Series – Lighting Design Aids Guiding in Subways

Lighting is inevitable in underground spaces. Use lighting system to guide users is a good idea. Especially in the transfer stations, sometimes, it is too crowded for users to find the features of ground and wall. Then, using lights on the air for guiding is another effective way.

There are two kinds of lighting design to aid guiding in subways: the shape of the lights and the color of the lights. As most lights in subways are fluorescent lamps, we advice that we should make different arrangement of these lamps, thus take advantage of the shape of the lamps. Fig. 4 shows with low cost, the guiding effect will rise. Condition permitted, the lighting system design in Japan is better in effect. As for using the color of lights for guiding, colorful lights such as LED is needed.



Fig. 4. The different arrangement of fluorescent lamps in Beijing subways



Fig. 5. Lidabashi Station, Japan, designed by Makata Sei

2.5 Visual Series – Product Design Aids Guiding in Subways

In our interviews, some sensitive passengers said that they use seats, billboards, newspaper boards, lamps, and advertisements to identify destination stations. Products which can aid guiding in subways are not only unitary but also diverse. They can help the users who pay great attention to details identifying stations quickly. Fig. 6 shows two subway stations with different multi-functional billboards in Vienna, which also serve as a symbol for station identification.



Fig. 6. Different multi-functional billboards in Vienna subways

2.6 Visual Series – Material Design Aids Guiding in Subways

In the interview to Hongkong subway users, the effect of material in guiding is confirmed. Different materials are used in different lines of Hongkong subways. Thus the inter-changeable station Lijing Station between Quanwan Line and Dongyong Line use mosaic on one wall and plastic-aluminum board on another.

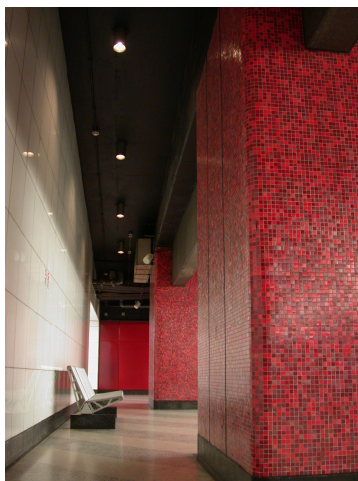


Fig. 7. Lijing Station of Hongkong subway

In the research of Shanghai subway users, some users said: Shanghai South Railway Station is relatively new. Thus proves that some passengers do use material to help identifying stations. But most passengers haven't perceived the different materials used in Shanghai subways. Experiment shows that the effect of material in guiding is relatively poor. Only when the feature of material is enlarged and form a global impression, the effect will be obvious.

2.7 Aural Design Aids Guiding in Subways

Some Shanghai subway users identify stations by sound. We got following comments in our interviews:

I know which station is People's Square even with my eyes closed, because almost all the people on the train will take off at this station with a big noise.

Although I miss the broadcast of the name of a station, it will be fine, because the following broadcast will introduce some tourist sites for passengers. Once I heard a familiar name, I know it's time for taking off.

What's more interesting is the musical broadcast in Pusan subway in Korea. If the train will soon stop in a station with sea nearby, you will hear the sound of ocean wave and sea-gulls. If the station is near mountains, you will hear birds twittering in the woods. Commuters will easily identify stations with those sounds of nature.

Subway users take advantage of all kinds of sound to help identify stations. Based on memory theory, music is easier for people to memorize than other sounds. Using background music to guide passengers is feasible. Especially for those people who with poor eye-sight, a familiar tune is more friendly than any other guiding method.

2.8 Scent Design Aids Guiding in Subways

We have not find any example about how scent help Shanghai subway users identifying stations in our research, but some passengers did mentioned that sometimes a

special scent will remind them of a place. For example, a user who frequently takes off at Xujiahui Station mentioned that he can even smell the path to Pacific Bazaar because there is a W.C. on the way. These interesting reports excite us to explore how scent memories aid guiding in subways.

As we all know, the nose of human being can help to store large amounts of information in human memory. Compared to other sense organs, nose is more reliant on intuition. Once a memory of scent is formed, it is hard to forget.

2.9 Experimental Memory Aids Guiding in Subways

From some interesting interviews we find that some passengers' guide themselves by a special experience in a certain station in the past, i.e. they memorize the station because they did something special in such place.

Yes, I can identify Shanghai Railway Station because there is a W.C. on the platform.

That's true. I have been there, too. Haha~

Our interview proved that if we provide some additional functions in subways properly, e.g. commerce, entertainment, and exhibition, those colorful experiences will also help users memorizing and recognizing subway space.

Subways in Paris and Japan, which built many years before, also have lots of commercial areas. Underground commerce can not only bring great profits, but also brings more stories about subways, and makes the dull trip a colorful experience.

2.10 Other Aspects of Design Aids Guiding in Subways

There are many more interesting methods about how users guide themselves in subways, which is beyond our list. Only when we merge ourselves into real sites, can we hear them, see them, and feel them. For example, one passenger said he identify stations by watching the side of the opening door. Another passenger said that, we only need to remember one featured station, and then count the stops for destination. Other passengers remember the inter-change station by noticing other passengers' behavior. We also meet a passenger who marks the number of the door to get on the train in the morning. Some passengers are so smart that even they have fallen asleep on the train; they will wake up automatically on the destination station.

3 Conclusion

The 9 methods mentioned above are rooted in clues from different human senses. We hope that through proper design, underground spaces can provide adequate methods for users to memorize, thus let users identify and get to their destination quickly and conveniently. Make it easy for passengers forming cognizing-map in their minds, improve the efficiency of underground traffic. But we should notice that many users have their unique methods to identify underground environment, the construction conditions in different cities are also various, it is not possible for designers to consider every details. So how these methods make effect depends on the development of subway design and the purpose of constructors.

What's more, the reorganization to environment of human beings is a global system. Based on theories of Gestalt psychology, perception of human beings is an integrated Gestalt, which is inseparable. Thus the 9 methods mentioned above are guide lines for designers in their exploration. It was the comprehensive effect of all the methods that make users identify underground environment quickly. A really good designer is who can guide users to use facilities conveniently and efficiently, thus bring pleasant and humane experiences.

Reference

Li, J., Tang, Y., Qu, L., Zhang, D., Chen, R., Yao, Z., Xi, W., Zhou, X., Ren, H., Yu, L., Zhao, Z.: All the data in this paper is from the PRP Creative Project of Shanghai Jiaotong University (Serial Number: PRP-C10067) and National Creative Experience Project of College Students (Serial Number: ITP040). Project team members include the graduate and undergraduate students as follows