Advanced Science and Technology Letters
Vol.32 (Architecture and Civil Engineering 2013), pp.43-46
http://dx.doi.org/10.14257/astl.2013.32.10

# A Study on Cognitive Differences in Wayfinding through Space Familiarity

Gyu-heon Chang[1] , Soo-ho Lee [2], Gyu-yeob Jeon[3], Won-hwa Hong[4]

[1] Master's course, School of Architectural, Civil, Environmental, and Energy Engineering, Kyungpook National University, South Korea, wkdrbgjs@naver.com
[2] Doctor's course, School of Architectural, Civil, Environmental, and Energy Engineering, Kyungpook National University, South Korea, cowsday@gmail.com
[3] Assistant professor, Department of Architecture, Jeju National University, South Korea, hi.gyuyeob@gmail.com
[4] Professor, School of Architectural, Civil, Environmental, and Energy Engineering, Kyungpook National University, South Korea, hongwh@knu.ac.kr

**Abstract.** This paper focuses on both the acquisition of visual information, which depends on one's capability of acquiring space, and the subsequent behavior of wayfinding. To analyze the acquisition of visual information, one Action Camera was attached to the subject's head and one was attached to the subject's chest during the experiment. To obtain routing information, a closed-circuit television (CCTV) was installed in the experimental space. As a result, Group A, who were familiar with the experimental space, moved along the shortest path. While 66.67% of Group B who were unfamiliar with the experimental space, also moved along the shortest path. In addition, Group B spent about 12% of the movement time in cognizing the visual signs.

**Keywords:** Visual Judgment, Perception-Cognition, Space Familiarity, Wayfinding

## 1 Introduction

Humans take messages from the surrounding environment, convert them into images through cerebration, and think and make determinations according to the images.[1] Their cognition is achieved by the images in their mind, and the images are defined as the figures that emerge due to a broad framework that encompasses the internal processes of the mind concerning external experiences.[2] The cognition is primarily done by human eyes; therefore, the visual images that humans possess are not copies of the environment, but reproductions of it. In terms of the question of how images can reproduce the environment, people read visual cues, make a judgment, and behave accordingly. [3]

ISSN: 2287-1233 ASTL

# 2 Experiment Design

## 2.1 Experimental Site

The space selected for the experiment was a horizontal space with a total area of 2,133.42 $m^2$. In order to identify the person's movements, a total of 11 closed-circuit televisions (CCTVs) were installed. Information about the CCTVs' compartments and detailed drawings are described in Fig. 1.

**Fig. 1.** Layout of Building

## 2.2 Participants and Condition

Regarding the people who were involved in the experiment, 30 people (Group A) were familiar with the given space, and another 30 (Group B) were not. The Action Camera attached to the subject's head was to derive the direction of the person's viewpoint, while the second camera attached to the chest was to derive the person's walking direction.

## 2.3 Record and Analysis

1) For stimuli, by setting a certain area in the screen of the viewing angle, we established stimuli as the time when a sign, that is, visual information, enters into this zone.
2) For perception, if a sign was fixed in the center inside the stimuli area, we considered that one's visual attention/concentration took place; and, thus, we set this as perception.

 

3) Perception was set based on the assumption that a visual understanding had taken place, cognition stopped to understand visually, moving intervals shrunk, the direction was different from the direction of the body's movements, or the person concentrated on a sign.


**Fig. 2.** Image division for Stimuli-Perception-Cognition

## 3 Results and Comparison

### 3.1 Movement Circulation and Time

All 30 people in Group A, who were familiar with the given space, moved to the final destination by the shortest path. In addition, the average time spent from the starting point to the end point was 35.13 seconds. In the case of Group B, who were unfamiliar with the space, only 20 people out of 30 used the shortest path as shown in Fig. 3; the remaining 10 people selected various paths. Accordingly, the average travel time was 40.14 seconds, indicating a difference of 5.01 seconds between Group A and Group B in their average travel times.

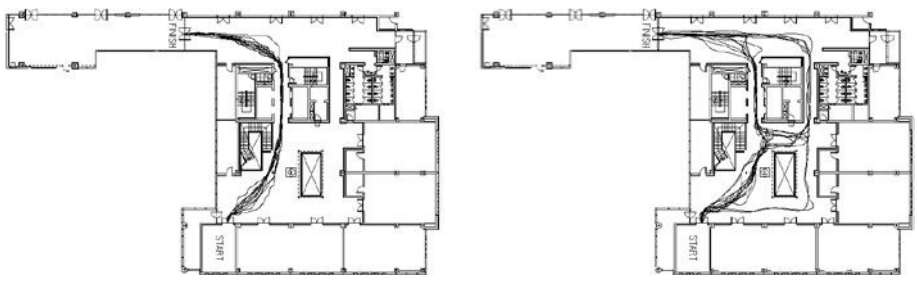


**Fig. 3.** Movement path of Group A (left), Group B (right)

### 3.2 Sign Cognitive Time and Walking Speed

As a result of distinguishing between stimuli, perception, and cognition in terms of one's attention/concentration of signs, in the case of Group B, stimuli occupied a total of 2.11 seconds within the average travel time, while perception and cognition occupied 1.58 seconds and 1.22 seconds, respectively.

To confirm that speed decreases due to perception and cognition, in terms of Group B, average speeds of 1.29 m/s from start point to finish point were derived. While the average speed of the perception and cognition was 0.87 m/s. It can be known that Perception and Cognition affect walking speed and time.

## 4 Conclusion

As the results show, only 66.67% of Group B, who were unfamiliar with the experimental space, selected the shortest path. The travel time of Group A was 35.13 seconds, while that of the inexperienced group was 40.14 seconds. This indicates a difference of 5.01 seconds between the two groups in terms of their travel times. Stimuli, perception, and cognition occupied travel times by 2.11 seconds, 1.58 seconds, and 1.22 seconds, respectively.

Comparing Group A and Group B, the experiment results reveal a difference of 5.01 seconds. Although there is some difference in travel time, this is a consequence from the fact that both perception, which shows visual attention/concentration, and cognition, which displays visual understanding, affect moving speed.

**Acknowledgments.** This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government (MEST) (No. 2011-0028133)

## References

1. Kenneth Boulding, The Image, Michigan Press (1982)
2. Lee, J., Study on The Space Construction Method by Mental Image. Seoul National University (1990)
3. Henry Sanoff, Visual Research Methods in Design(1991), VNR, pp. 14
4. Im, S., Environmental Psychology Haengtaeron, BoSung Cultural, pp. 43
5. Lee, J., An Analysis of Visual Dynamics Using Agent-based Simulation Model, Master's Thesis, Korea University (2012)
6. Kim, D., An Experimental Research on Building Recognition, Architecture Institute of Korea, Vol.9 No. 10 (1993)

 