A Design Study of Interactive Learning Environment for Joyful Behavioral History in Taiwan

Guan-Ze Liao

can@mail.nhcue.edu.tw
National Hsinchu University of Education, Hsinchu City, Taiwan, R. O. C.

Abstract. The study presents the case study of the virtual reality style interactive learning environment for toy-based behavioral history in Taiwan. It uses the browsing process in spatial wayfinding as the design concept, in turn used to understand the spatial structure and user spatial perception. Results of the study summarize the cognitive models of wayfinding behavior and visual information reception for users in the interactive learning space, along with the operational procedures for webpage browsing style.

Keywords: design thinking, case study, interactive learning environment, joyful behavior

1 Introduction

According to Harnish (2002), memory is a kind of mind activity. Because of the memory ability, humans can connect with the external environment, objects, and events. Even though they are not physically present, the process of encoding, storage, and search can allow people to retrieve their cognitive images of the external environment and its objects. MRC Centre for Synaptic Plasticity (2010) proposes simplifying the compositions in spatial memory in this stage, into a map of the room in memory, in which three relationships exist: 1) what elements exist in the space? 2) what are the relative locational relationships among elements. 3) what are the relative relationships between the self and location of elements, and between the self and the spatial environment. Regarding wayfinding models in the real environment, Christian & Andrew (2008) proposed that, in the spatial structure constructed by humans in the real environment, wayfinding model could be considered the cognitive process by which people are continuously affected by the presentation of visual elements in space. Spatial structure and structural elements in the real environment, as well as corresponding relationships to walkable areas, the overall cognitive representation of the agent, and the corresponding agent operations actually comprise a repetitive interactive process. In the virtual world, Mark (1998) proposed the design principles for a good wayfind-ing model by designing comprehensive guidance visual information in the virtual space: 1) determine what angle would be used to present the overall appearance of space; 2) wayfinding paths can permit different movement speeds when

penetrating space; 3) visualize possible wayfinding paths, and analyze the dynamic development of paths in order to remove doubt and inadequacies; 4) information media in the space should be interactive operational devices; 5) when trying to observe one's location, the map should provide "You-are-here" information; 6) attempt to personalize paths to conform to the needs of the majority; 7) when encountering strange spatial targets, there should be good path suggestions provided to create the concepts of optimal path and shortest path; 8) on the maps there should be clearly labeled and comprehensively stratified information.

2 Design of Interactive Learning Environment

(a) Webpage learning forms (b) Integration of the virtual reality style interactive learning environment

Fig. 1. Toy-based Behavioral History (Compiled by this study)

The study constructs the Toy-based Behavioral History for the analysis of a practical virtual space. The research steps are: 1) learning content design (inclused the past, the recently past, the present and the future toys); 2) virtual space design; 3) webpage learning design; 4) visual interface integration. In this stage, the Quest 3D is used to integrate the joyful behavior development interactive learning environment of web-page browsing style and spatial wayfinding style. As the Figure 1a, the purpose of webpage construction is to integrate all learning content and presentation methods, which absolutely affect the learning effects of users. The learning avatar can use the virtual space to browse content of joyful behavior development in different periods, and the wayfinding route is known through the relationship between spatial structure and unit organizations. In addition, (see Figure 1b and the website of project results: http://can.elt.nhcue.edu.tw/elt972sp/index.php) the information layout of virtual space also provides the interface function of quick links to other periods, the interaction between the learning avatar and virtual objects, and information browsing and other behavioral features all assist the user to understand the virtual space.

3 Discussion on Cognitive Model

Sensory elements are important in the production of digital instructional materials, information perception, and interactive design, and can affect how users perceive and construct the structure of content knowledge. The study by Chen & Stanney (1999)

shows that, at the beginning stages of human construction of information cognitive models, it begins with the information processing of visually perceived information, to establish one's relative relationship to the spatial structure as well as the available spatial behavioral features. Design of the wayfinding mechanism can refer to three auxiliary procedures: intuitive cognitive mapping, wayfinding plan development, and design of physical movement or navigation in the environment. In the wayfinding process, their perceived experiences, personal abilities, motivations, search strategies, and layout of environment when engaging in wayfinding all require deep consideration. Kwan (2001) used the perspective of cognitive behavior to propose the behavioral cognitive model for users in the internet space. Chang & Hsu (2007) discussed the inadequacies of Kwan's cognitive model, such as: the individual's internal cognitive procedures are too simplified, as well as the insufficiently clear explanation regarding the interaction of the access interface and the cyber-environment; the memory processing stage in the access interface does not analyze the correlation between interface features leading to long and short term memory; the knowledge constructed in environments related to the virtual space have not been discussed, how spatial behavioral features produce corresponding spatial perceptions; and finally the three main parts of the cognitive model: insufficient description of the relationships among the individual, the access interface, and the cyber-environment.

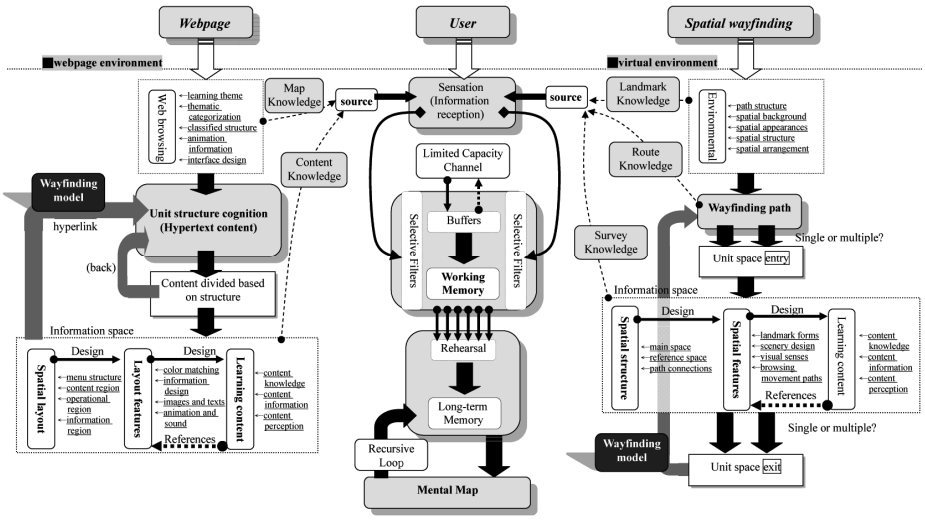

Fig. 2. User-centered virtual space information cognitive models for joyful behavior development (Compiled by this study)

After analyzing the user's behavioral features in the virtual space of joyful behavior development, the cognitive model in Figure 2 is constructed. The cognitive model primarily exhibits the user-centered joyful behavior development virtual space information. When the user conducts the wayfinding model: spatial browsing and wayfinding process, they primarily observe/interpret the conditions of personal space, and

continued accumulation of landmark knowledge as guided by visual cues, including environmental features: route structure, spatial background, and appearance, the arrangement relationship between the spatial structure and virtual objects, such as different periods of joyful behavior development, to use a structurally significant spatial appearance to strengthen the spatial memory of where the user is located. When facing the route choice, there may be multiple paths in the space so that there is different movement in the space; route knowledge must be due to participation and behavioral features for construction. Thus, when engaging in spatial browsing and movement, the basic cognition for the space is determined on the condition of the information space, in order to construct survey knowledge, including describing the perceptive impressions of "spatial structure": such as the main space (or the theme hall features of the period), reference space (the basis of difference between theme halls), and path connection (browsing processes between halls). Describe the conditions of the "spatial features": landmarks, sensations produced by scenery forms (such as the forms of virtual objects), and the behavioral features that determine the following procedures.

4 Future Study

Future studies should apply this cognitive model, including the spatial wayfinding model: the route structure of environmental features, spatial background and appearances, arrangement relationship between spatial structure and virtual objects, and the webpage browsing model: homepage content, unit structure perception, content structurally divided, webpage layout and features, and the connection to learning content, as well as webpage wayfinding mechanisms for empirical studies.

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