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A Study on the Architectural Planning for the Application of the Concept of the Cyberspace-Hyperscape Center in TriBeCa New York City

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Abstract: The purpose of this study is to explore the concept of the cyberspace and to apply it to the architectural design plans by replacing the intrinsic characteristics of the cyberspace with the architectural planning elements. For this purpose, this study grasped the architectural spatial meaning of the cyberspace and proposed to apply the concept of the cyberspace to the architectural planning elements. The concept of the cyberspace applied to the proposal of this study is summarized as follows. First, the concept of the cyberspace which is dominated by the concurrency and the immediacy has floating attributes of the form, the function and the structures of the space. It also provides the possibility of the free space setting which is not fixed. Second, the characteristics of space in the cyberspace where the time and the space appear concurrently are determined by the continuity of the interrelationship between the space of the building and the external environment. Third, the cyberspace that extends into a dynamic and variable space which does not have a clear boundary between the outside and the inside can be realized as a fluid space of a transparent form or a translucent shell having both the forms and the functions simultaneously. This study focused on the essential characteristics of the cyberspace which is psychological space recognition based on the human cognitive structure and showed the possibility to go beyond the limits of the existing space by applying it to the architectural design plans.

Key words: Cyberspace, hyperscape, architectural planning elements, New York city, TriBeCa, space

INTRODUCTION

In a modern society as a digital age, the concept of the cyberspace has already become a popular concept and the interest in the cyberspace, since, William Gibson spread to the public from the mid-1980's in the literary criticism and arts. This means that the discourse about the cyberspace in the field of the culture becomes abundant. There were many theoretical and practical results in the field of architecture at that time. The terms such as 'cyber architecture' or 'digital architecture' are no longer an unfamiliar concept. The nature of the cyberspace is somewhat like that of the deconstructive architecture. The theory of the deconstructive architecture which can be regarded as one of the post-structuralism is a critique of the western tradition at a fundamental level. The deconstruction is not a process of constructing a different structure for an existing structure but a process of creating an incomplete state and creating a different shape by avoiding the existing structure. In other words, it means breaking down the existing ideas that have been thought to be absolute within the existing order (Kim and Lee, 2004).

The concept of the cyberspace does not propose a new space that is completely different from the existing space and it should be considered as a proposal for a new system that provides a possibility to go beyond the limits of the existing space. The fact that the fundamental concept of the cyberspace is on the basis of the psychological recognition based on the human cognitive structure is an important criterion for the attitude toward the cyberspace. In modern architecture, computer-based planning has already become common and the concept of the digital architecture which was recognized only as a means of technology has developed to a level aimed at realizing the essential concept of the cyberspace. The conceptual discourse of the cyberspace is more important now than ever.

The purpose of this study is to explore the concept of the cyberspace and to apply it to the architectural design proposal by replacing the essential characteristics of the cyberspace with the architectural planning elements.

MATERIALS AND METHODS

Contents of the study: This study focuses on the fact that the concept of the cyberspace has become a creative alternative in finding a new architectural strategy in modern architecture. Therefore, this study aims to

understand the concept of the cyberspace and to figure out the architectural planning elements to form a building space based on the concept of the cyberspace. This study also proposes the architectural design plans for the application of the concept of the cyberspace.

The content and the process of this study are as follows. First, understand the theoretical background and the conceptual characteristics of the cyberspace. Second, based on the examination of the structural characteristics of the cyberspace, grasp the architectural spatial meaning of the cyberspace. Third, summarize the architectural planning elements for the application of the concept of the cyberspace as a practical alternative and propose architectural design plans based on the concept of the cyberspace.

Cyberspace: The cyberspace is a metaphorical and fantastical term that first appeared in 1984 in William Gibson's science novel 'Neuromancer'. In some cases, the concept of the cyberspace and the concept of the 'virtual reality' are confused. However, the concept of the cyberspace which is a social space for the information exchange and the human interactive communication should be distinguished from the 'virtual reality' which is a space of the new experience created by the computer technology. Park (2006) In the cyberspace, the word 'cyber' is one of the most common concepts and terms that are already well known in science before the Gibson's novel. The etymology of this word, cybernetics is the word created by Norbert Weiner in 1948. It encompasses all areas of the control and the communication theory between the machines and the animals and has the concept of the interaction and the automatic control. The 'cyber' is used as a philosophical concept in the sense of determining the direction and the origin of ancient Greek which means steering. Cho (2013) The cybernetics which can be defined as the science of the control and the communication, originated from the prototype of the automatic regulating machine and developed into a social structural pattern from the communication and the control between the organism and the machine through the mechanics of Descarte's Model of the human body in the 17th century. It has developed into various fields ranging from the cognitive science to the computer system as a model for the brain. It is not a single discipline built by experts in a specific field but a consensus developed in various fields of the expertise and the insights (Cho, 2013).

The cybernetics theory focuses on the information among the three elements of the modern science and technology, the matter, the energy and the information. As the production base has been replaced by the machines and the complexity of the machinery has been increased, since, the Industrial Revolution. By being increased of the importance of the communication and the cooperation between the machines and the humans, the role of the information has become important. Both the biological and the mechanical systems have a system for recognizing and utilizing the information to achieve its purpose. This system is a process of preparing the following actions through the process of anticipating the result of the actions and it is continuously repeated while performing an action to achieve the purpose. In other words, both the biological and the mechanical systems perform self-control, so that, they can take the best action to achieve the purpose by the collecting and the processing the information from the outside. Norbert Weiner considered the general theories about the structure and the function of these control systems to be theoretically studied and develop the management control technology of the biological, the mechanical and the social as the basic task of cybernetics (Wiener, 2002).

The cyberspace is based on the immaterial space not on the existing space. Thus, the cyberspace has many possibilities to eliminate the physical limits. In the cyberspace, the time and space appear simultaneously. Therefore, it is possible to create a new space beyond the limits of the existing space. Compared with the physical space, the biggest difference of the cyberspace is that it could make the non-linear space by overcoming the limit of the linear continuous physical space. The cyberspace can break the temporal and the spatial continuity in the real world and realize a new concept of the space that is replaced by the simultaneity and the immediacy. In this sense, the cyberspace has the characteristics as an event space based on the dynamism beyond the inevitable order of the homogeneous space. Lee (2001) The conceptual characteristics of the cyberspace which can be found in the contemporary architecture include the phenomenon in the city, the morphological symbolism, the transfer of the feeling, the immateriality and the multilayer structures (Table 1 and 2).

Structure of the cyberspace: The structure of the cyberspace is characterized by the multiple functions, the hypertext and the interactivity. By Kim (1997) a tool commonly used for the cognitive adaptation in the cyberspace is a hypertext. The hypertext is a network of non-linear documents consists of a set of interconnected nodes that can move directly from one word to another on a text basis.

The structure of the hypertext is made by applying the concept of the hyperlink. The hyperlink has the function of connecting elements of the hypertext, allowing

Table 1: Conceptual characteristics of the cyberspace in the contemporary architecture

Conceptual characteristics	Contents
Phenomenon in the city	As a type rather than a material
	The buildings are connected together by the successive events
	Interconnection of the buildings through the successive events
Morphological symbolism	Morphological characteristics of the fluidity and the deformability
	Free curved surfaces, asymmetry
	Perceived form through the vision and the changes by the movement of the observer
Transfer of the feeling	Physical and psychological contents changed on the ontological basis
	Simultaneous feelings the objects viewed through the visual perception and the images stored in the memory
Immateriality	Blurred boundary between the reality and the imagination
	Blurred boundary expressed by the transparency of the building skin
Multilayer structures	Non-sequential, destructualized space that does not have a specific structure
	Multidimensional space beyond the concept of the conventional space

Table 2: Characteristics of the cyberspace (Kim, 1997)

Characteristics	Contents
Multiple	Information processing using the various sensory functions information
	Sensory information appropriately matched to the human senses
Hypertext	Network with nodes and links
	Multiple interaction with the various information
	Structure with the linked information
	Search, selection and movement of information according to purpose
Interactivity	Feedback of the communication
	Immediate, optimized form of structure
	Options given to the user

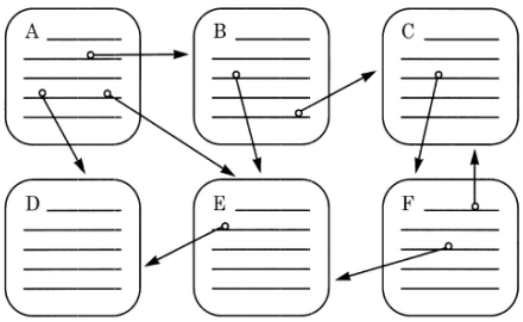

Fig. 1: Structure of the hypertext consists of nodes and Links (Kim, 1997)

to overcome the linear constraints and to move directly to the point of interest (Han, 1997). Fig. 1 illustrates the structure of the hypertext consists of 6 nodes and 9 links. The advantages and the disadvantages of using the hypertext are summarized in Table 3 (Han, 1997).

Spatial characteristics of the cyberspace: The word cyberspace created by William Gibson means the space based on the concept of the cyber. This should be understood as one of the various endeavors to simulate the reality through the possible vision and it should be recognized as a space that strongly associates with the reality rather than a space of the illusion or the hallucination (Cho, 2013). The cyberspace implements a

Table 3: Advantages and disadvantages of the hypertext (Han, 1997)

Characteristics	Contents
Advantages	Easily identify and follow the flow of the information
	User-oriented system can be reconfigured according to user's needs
Disadvantages	Difficulty of locating user's location
	Increased uncertainty of choice

Table 4: Comparison of the cyberspace and the real space

Cyberspace	Real space
Metaphorical space	Ontological space
Space which created by the computer system consists of the connectable networks	Physical reality or sensory reality

new space based on the concept of the postmodernism that disassembles the structural form of the space with a single center point and erases its center point through the interaction of each element and the non-linear combination of the nodes. In addition, the cyberspace deviates from the concept of the modern spatial planning that divides the space on the basis of the physical distance and deviates from the limit of the modern architectural space standardized on the basis of the place (Park, 2006) (Table 4).

The process of the information processing in the cyberspace has much in common with the architectural design process that requires the control, the communication and the systematic thinking which is focused on the interaction between the elements. Therefore, the application of the concept of the cyberspace can be possible in the planning of the architectural space that creates the environment to interact between the land and the architecture. In other words by defining the relationship between the land and the architecture as a communicable reality through the mutual interaction, the architectural space has the potential to become a physical entity capable of interacting with the surrounding environment. The cyberspace is a space where the communication takes place. The communication in the cyberspace is free of the space and the time constraints and has an autonomous and decentralized structure. In the concept of the

cyberspace, the space is dematerialized and instantaneous by the information and the data (Benedikt, 1991).

In the early 1990's, Markos Novak and Greg Lynn attempted to create a new concept of the space by treating the space geometry as a mathematical method, away from the existing traditional architectural planning method. Novak proposed the architecture with the meaning and the characteristics as a metadata based on the various data sets which are infinitely generated and transformed by the algorithms. Lynn introduced the concept of the time into the architecture and developed the static art form of the architecture into a dynamic reality (Lee, 2005). It seems that the concept of the cyberspace in their projects is being applied with the emphasis on the creating new forms. However, in order to realize the essential concept of the cyberspace as physical realities, it should be completed by the realization of the recognition system based on the human perceptions such as the emotions and the images in the architectural space. The human perception in the cyberspace can be divided into two major categories. One is an imaginary relationship with a process of self-identification and the other is the symbolic relationship by the relationship with the real space (Lee, 2005).

This study proposes the conceptual planning elements for the architectural space based on the human recognition system in the cyberspace. The cyberspace goes beyond a linear space based on the temporal and the spatial continuity and it has characteristics of the post modern space dominated by the simultaneity and the immediacy. The cyberspace is a dynamic space with fluid properties of the form, the function and the structure. Therefore, the architectural space based on the concept of the cyberspace can have various properties of the form, the function and the structure. In addition, it can be perceived as a reality beyond the limit of the existing space by newly establishing the order of the space not denying the order of the existing space.

The architectural space based on the concept of the cyberspace extends to a dynamic and variable visual space that excludes the physical forms. This space is described as a transparent or translucent envelope that is not divided by the architectural planning elements such as windows, walls, roofs and the boundaries between the outside and the inside. The meaning of the transparency here is the elimination of the visual presence, even though there is a material boundary. This refers to an intermediate space between the outside and the inside and means a space having both the continuity and the disconnection of the space from the outside to the inside and from the inside to the outside (Kim and Lee, 2004).

Fig. 2: TriBeCa in New York city

New york city: The city structure of New York city is made up of urban blocks of a regular grid structure. The lattice city is the most basic pattern of the planned city and it is common throughout the world. The urban planning technique based on the grid-shaped lattice system is a standard proposal that can be applied to all kinds of land. This is because it is difficult to find a better solution than a lattice system in a way that distributes the land equitably or in an easy way to divide the land (Kostof 2007). Especially, New York as a typical lattice city is distinguished from other lattice cities because the system of the formal grid is quite systematic and the order of the urban landscape is stronger than any other lattice cities.

TriBeCa in New York city: Tribeca area is the South of New York's Manhattan Island and the TriBeCa is used as an abbreviation for Triangle Below Canal Street. It is a region that has a different shape than the urban structure of New York's strong lattice system. In this area, a number of the triangular-shaped lots of land were generated with the order of the lattice blocks starting from Midtown and the order of the lattice blocks starting from the Hudson River. In addition, this region is an area with a few distinctive urban landscapes that is being done before the Manhattan urban planning (Fig. 2).

Design concepts: In the Modern society, it requires the re-establishment of the space concept according to the constant demand for the new space and the new way of space usage. This can be done by the process of the space setting in the cyberspace. This is because that the cyberspace has postmodern characteristics based on the temporal and the spatial continuity and the cyberspace could be controlled by the simultaneity and the immediacy. The cyberspace is a dynamic space which has a fluid property of the form, the function and the structure of the space.

This study aims to apply the concept of the cyberspace to the architectural space as a feasible alternative to the cyberspace which grows with the digital civilization. Therefore, the concept and the characteristics of the space in this proposal are not determined by the

Table 5: Two types of recognition structures in the cyberspace (Lee, 2005)

Imaginary relationship	Symbolic relationship
Unrepresented cyberspace→ Represented cyberspace	Unrepresented cyberspace→ Represented real space
Reflection space	Represented space
Ideal space	Normative space
Identification	Signification
Representative Subject	Representative Object
Transcendental and Priori Space	Substantive and experiential space
Premise of spatial experience	Results of spatial experience

Table 6: Characteristics and the planning elements of the architectural space

Architectural space	Characteristics of the space and the planning elements
Inside	Definite boundary
	Independent space
	Facilities with the programs
Outside	Background of the architecture
	Functional connection to interior space
Semi-outside	Dependent space
	Creative space
	Functional combination of the inside space and the outside space
	Visual connection of the inside space and the outside space
	Depends on the characteristics of the boundary
	Physical properties of building envelope
	Position, size, shape of opening
	Pillars, walls, canopy

form and the function of the building but by the mutual continuity between the space constituting the building and the external environment.

The area of the architectural space that constitutes the building is divided into three areas according to their nature: the inside, the outside and the semi-outside. Among them the place where the most well revealed the nature of the boundary is the semi-outside. This is an intermediate space between the outside and the inside where the visual boundaries are present but the visual existence has disappeared. This is a place where is both the continuity and the discontinuity of the space from the outside to the inside and from the inside to the outside. It also has the spatial characteristics of the dynamic and the variably extended cyberspace excluding the physical reality.

Architectural space based on the concept of the cyberspace: This study proposes the architectural design plans based on the human recognition system in the cyberspace. Thus, the recognition structure of the symbolic relationship by the relationship with the real space based on the human recognitions in the cyberspace summarized in Table 5 and 6 is replaced with the architectural planning elements.

The architectural space based on the concept of the cyberspace which discussed in this study is summarized as follows. First in the sense that the concept of the

Fig. 3: Proposed Site of TriBeCa in New York city

cyberspace is based on the free space setting which is not fixed to the form of the space, the concept of the architectural space also should not be determined by the form and the function but by the continuity of the relationship between the space that constitutes the building and the external environment. Second, the characteristics of the cyberspace where the time and the space appear simultaneously are supposed to be replaced by the space of a non-continuous event that occurs dynamically. Third, the cyberspace which expands into a dynamic and variable visual space that excludes the physical reality does not have a clear boundary between the outside and the inside. Therefore, it requires the property of a fluid type of the transparent or the translucent envelope which has both the continuity and the discontinuity of space and which can feel the inside from the outside and the outside from the inside.

Proposed site: The proposed site of this study is Tribeca, New York. Unlike any other areas of the New York city, it does not have a formalized urban organization and it has a variety of the morphological, spatial order (Fig. 3-5).

This study aims to find a new space concept based on the concept of the cyberspace which goes beyond the limits of the existing architectural space by reconstructing the relationship between the order of the urban organization and the architectural space.

Site plan: The properties of the proposed site for this study have characteristics that are different from those of typical urban blocks of New York city. Due to the different order of the triangular shape of the proposed site and the surrounding urban organization, this site has spatial characteristics that must change its environment according to the relation of the inner and the outer space and the surrounding situation. Therefore, this proposal was designed to have a circular shape of the building

Fig. 4: Site plan

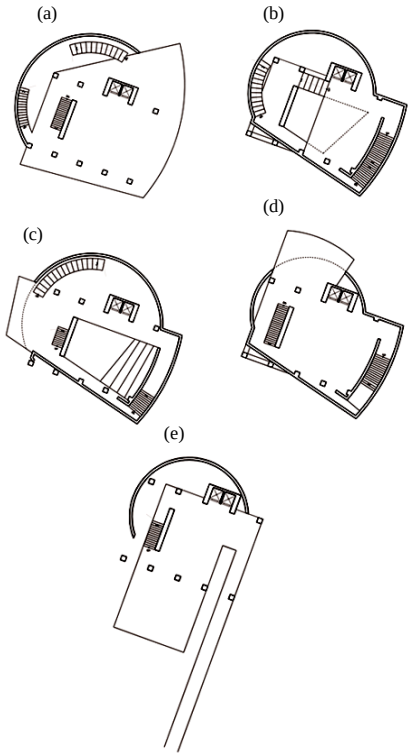

Fig. 5: Floor plans; a) Ist floor plan; b) 2nd floor plan; c) 3rd floor; d) 4th floor and e) 5th floor plan

envelope that excludes directionality. The space enclosed in the circular shape of the building envelope can accommodate the surrounding situation from a neutral point of view, so that, the spatial order inside the building can follow the urban order of New York city. This is the unique characteristics of the cyberspace in terms of that it is a space with the dynamic properties based on the form, the function and the structure, the attention to the interaction between the elements and the interaction in response to the surrounding environments. This study proposes a new communication system between the city and the architecture.

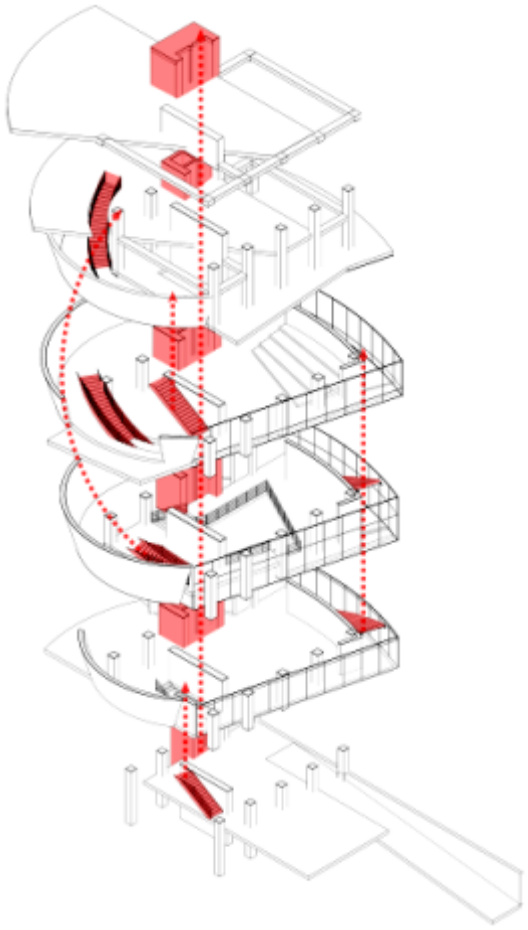

Fig. 6: Circular network diagram with the concept of the hypertext

Floor plans: The proposed site of this study requires a building with the form and the function to adapt to the surrounding urban environment of various characters. Therefore, this proposal was designed to have a variety of the forms and the functions of the space to respond to the everyday circumstances of New York city. As a result, the envelope of the building has a circular form which is a neutral form, unlike the surrounding buildings that follow the orthogonal system. It is planned to communicate with the order of the existing urban organization by planning the internal form of the each layer, the level of the floors and the direction of the opening in various ways. The main programs of this proposal consist of tourist information center, auditorium, restaurant, library, etc.

Sections: As for the circulation of the building in (Fig. 6) addition to the direct stairway connecting each floor, a separate circulation planned, so that, the direct

Fig. 7: Diversity of the interior space

Fig. 8: Fluid space of the transparent or the translucent envelope

connection with the adjacent programs and the user's utilization of the optional space are possible and a vertical space can be felt in a vertically continuous space. This is the application of the concept of the hypertext that is commonly used for the cognitive adaptation in the cyberspace. It also constitutes a circulating network system that can be moved from one point to another directly.

This vertical consecutive circulation system of this proposal not only enriches the relationship between the inner spaces visually and spatially but also enables the functional connection of each program and the visual connection between floors. The openings of the various directions are determined by the relationship between the continuous interior space and the urban environment of the building. This appears to be a morphological characteristic of this proposal (Fig. 7-12).

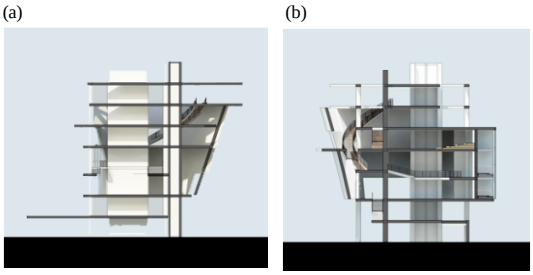

Fig. 9: Sections

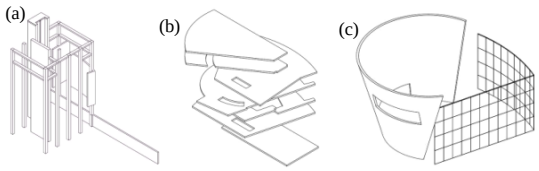

Fig. 10: Structures, slabs and envelopes of the building

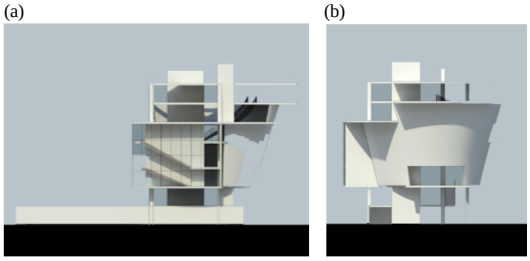

Fig. 11: Elevations

Fig. 12: Bird's eye views from the street

Elevations: The various openings planned on each floor follow the urban order of New York city around the site and reflect the function of each floor and serve to capture the surrounding cityscape. This is a symbolic planning element to complete a new communication system with the existing order of the city.

RESULTS AND DISCUSSION

The purpose of this study is to explore the concept of the cyberspace and to substitute the essential characteristics of the cyberspace into the architectural planning elements and to apply it to the architectural planning.

This study focuses on the essential characteristics of the cyberspace as the psychological space recognitions based on the human cognitive structure, deviating from the concept of the digital architecture which can be recognized only as technical means. This study has the significance of the research in terms of implying the possibility of applying the essential characteristics of the cyberspace to the architectural design proposal and showing the possibility to go beyond the limitations of the existing space.

CONCLUSION

This study examined the theoretical background, the conceptual characteristics and the structural characteristics of the cyberspace. Also, this study grasped the spatial meaning of the cyberspace and proposed the architectural design plans as an alternative which can be realized by summarizing the architectural planning elements necessary for applying the concept of the cyberspace.

The concept of the cyberspace which applied to the proposal of this study is summarized as follows. First, the concept of the cyberspace has a postmodern characteristic that transcends the modern concept of the space based on the temporal and the spatial continuity and is controlled by the simultaneity and the immediacy and the form, function and the structure of the cyberspace are flexible. Therefore, the concept of the cyberspace enables to set the space which is not fixed to the forms and provides the possibility of forming a new space beyond the limit of the existing space. Second, the characteristics of the cyberspace where the time and space appear simultaneously can be replaced by the space of a non-continuous event that occurs dynamically. Therefore, the architectural space based on the concept of the cyberspace should not be determined according to the form and the function of the space but should be determined by the successive interrelationships between the architectural space and the external environment. Third, the cyberspace which does not have a definite boundary between the outside and the inside can be realized as a space in the form of a fluid, transparent or translucent envelope which has both the continuity and the discontinuity of the space from the outside to the inside and from the inside to the outside.

REFERENCES

Benedickt, M., 1991. Cyberspace: First Steps. MIT Press, Cambridge, Massachusetts, ISBN:9780262023276, Pages: 436.

Cho, E.H., 2013. Gamephobia, from Homo Ludens to cyberspace. J. Korea Contents Association, 13: 137-146.

Han, K., 1997. Cognitive adaptation in cyberspace. Proc. J. Korean Psychol. Assoc., 1997: 129-144.

Kim, M. and K. Lee, 2004. A study on interaction of deconstruction architecture and cyberspace. Proc. J. Archit. Inst. Korea Plann. Des., 24: 845-848.

Kim, S., 1997. Changes in communication, awareness and learning paradigm in cyberspace. Proc. J. Korean Psychol. Assoc., 1: 95-128.

Kostof, S., 2007. The City Shaped: Urban Patterns and Meanings Through History. Bulfinch Press, New York, USA., ISBN:978-0821220160, Pages: 352.

Lee, J., 2001. Cyber space and post human phenomenological study on cybereconomy and human future. Res. Philosophy Phenomenol., 17: 268-303.

Lee, K., 2005. A study on epistemic structure of the architecture in cyberspace-a comparative analysis on Novak and Lynn based on Lacan's subject theory. J. Korean Inst. Interior Des., 14: 224-233.

Park, J., 2006. A philosophical and ethical contemplation of cyberspace. J. Digital Des., 6: 153-162.

Wiener, N., 2002. Cybernetic System in Cyber Reader: Critical Writings for the Digital Era. Phaidon Publisher, London, UK.,.