SPACE STRUCTURE ANALYSIS

OF COMPLEX CULTURE SHOPPING FACILITY.

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ABSTRACT: Recently super complex culture shopping facility development seeks consumer' convenience present and are coming restaurant neighborhood, cinema, shopping, hotel etc, according to intensive plan. Such as complex culture shopping facility was developed to most subway station area center and have concept that is space for a main facilities or space for environment protection, citizens' a rest in city. Howeve,r space of recently domestic large size complex culture shopping facility that do not plan systematically was lacking and caused result that do not use efficiently space. Limited extent of research that define complex culture shopping equipment and analyze form of space and present space planning with analysis of research connected with complex usage development.

Keywords: Space structure, Space Syntax, Complex Shopping Mall.

1. INTRODUCTION

1.1 Research Background and Purpose

In recently, commercial facilities have evolved from the existing department stores and shopping centers that simply provided product purchases and foods to various events and retail entertainment destination development due to the lifestyle change of the modern people and their increase of leisure times. Accordingly, there is a clear trend of complex and multi-scale development for most buildings these days.[1]

According to the development of super-size complex shopping mall that is becoming a prominent issue recently, the food courts, movie theaters, shopping malls and hotels are being built in accordance with the intensive plan to pursue the convenience of consumers. Such initiative is being evaluated positively in the sense that it can play a role of providing convenience for people to live out their lives. However, the present large-scale complex cultural shopping facilities in Korea lack the comfort and accessibility as they have not been planned systematically resulting in the ineffective use of space. This is due to the fact that they have been indiscriminately developed with the lack of essential points of considerations during the planning. Therefore, they brought numerous problems and required continuous developments including remodeling and surface change even after the completion of the construction even take into the consideration of financial losses.[2]

Space Syntax that has been verified and developed in various fields such as sociology, geometry and linguistics appears to solve significant part of such problems. Therefore, it is expected that a more rational, effective and appropriate hospital planning will become possible by analyzing the space efficiency, space accessibility and space articulation for two facilities that have been constructed and being used currently. Accordingly, the purpose is in understanding the application possibility in the space planning stage by conducting space analysis through Space Syntax methodology for the existing large-scale complex cultural shopping facilities.

1.2 Research Method and Scope

This study defined complex cultural shopping facilities based on the analysis of the existing studies related to complex purpose development, and limited the scope of study to presenting space planning by analyzing the forms of space.

As for the subjects of this study, two locations that currently represent large-scale complex cultural shopping facilities of Korea were selected, and the analysis was conducted for the standard level by considering the complexity of movement line and organisms among districts. The study methods per implementation stage are as follow.

First, the trend and the necessity of the study have been examined through the consideration of the related preceding research literatures.

Second, the definition and concept of complex cultural shopping facilities as well as Space Syntax have been examined.

Third, a space analysis was conducted for C.O.E.X. Mall in Samsung-dong and I' PARK Mall in Yongsan in

order to identify the current issues of the large-scale complex cultural shopping facilities of Korea.

Fourth, the characteristics of space have been extracted by examining the interrelations among spaces through the space structural analysis and quantifying the space depth and the number of connection of space.

Fifth, based on the study results, a development possibility into an ideal surface with good local accessibility that is well integrated overall will be presented by analyzing the significance of space structure.

As for the most frequently used analytical tool, S3 Axial Analyzer 2.1 and S3 Convex Analyzer that have been developed by the urban architectural space analysis laboratory of Seoul National University were used.

2. PREVIOUS RESERCH

2.1 Definition of complex culture shopping facilities

In 19th century, brought change of consumption pattern as mass production of goods becomes available to industrial revolution. Change of this consumption pattern gave birth to consumption space of department store and large size supermarket and was composed as various purchase activity is possible from space.[3]

To complex culture shopping facility heightens utility value of land, function that supplement mutually such as office, the hotel, apartment, shopping center is arranged and various kinds space to display synergy as complementary by reasonable plan. Furthermore It is way to intensively develop cultural function, entertainment, and institution etc. Residing, commerce, business, different function elements more than 3 such as lodging connect so that can have affinity mutually by one of city redevelopment way, synthesis that compose so that can give synergy by repletion mutually talks that is building or the building military.[4]

2.2 Space Syntax theory

(1) Spatial pattern

It is wildly accepted that space is the key aspect of how social and cultural life are proceed, not the framework. As B. Hillier(1996) described that different human behaviour not just happen in space, it has its own spatial forms. No matter that space use for what purpose, gathering, interacting, teaching, eating or dwelling. The arrangement of spaces always constitutes a spatial pattern which B. Hillier call it spatial configuration. Hillier showed general types of spatial configurations. Although they have similar appearance in physical existing, their underneath topology are totally different. We could identify their different from figure 3a and 3b. These graphs we called justified graphs. According to the patterns, spaces are associated with number and chained in a sequence order, the higher the level represent that space reside deeper in the whole configuration, conversely, number with small value is regards as more integrated.

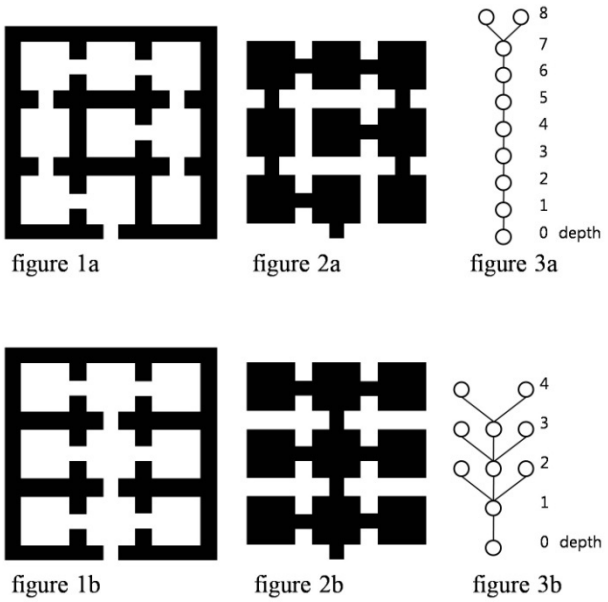

Figure 1.

①figures 1a and 1b : Arrangements of physical elements

②figures 2a and 2b : Arrangements of spatial elements

③figures 3a and 3b : Justified graphs of permeability relations in figures 1a and 1b

figure 1a ,2a and 3a are represented a chained sequence spaces which is hard for more users simultaneous; show little in privacy or community and more on intrusion.

figure 1b,2b and 3b show a tree branch shaped pattern that B. Hillier(1996) regarded as more flexible to the relation of privacy and community.

(2) Spatial elements, convex spaces and axial lines

The most important elements of space syntax are convex spaces and axial lines, B. Hillier et at (1984) had an imagery depiction of them as “beads” and “strings”. lines act as “strings” which connecting a sequence of convex spaces, the “beads”, to form a longest line of sight and access.

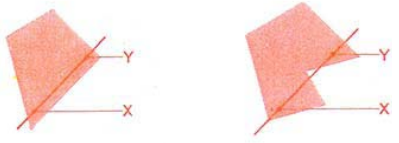

Figure 2.

Figure 3.

By definition Hillier et at (1983), a convex space (figure 2) will not contain concave part, any two points in a convex space can be joined by a straight line which does not go outside the boundaries of the space. Contrast to the definition of the convex space, an axial line (figure

3)always been identified as uncertain. Initially it was defined as the longest line that can be drawn through an arbitrary point in the spatial configuration. Because of the arbitrary characteristic of formation, it becomes the most controversial issue and caused many debate between researchers.

Figure 4

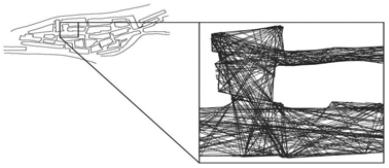

Figure 5

A convex map (figure 4)is composed of the largest and fattest convex spaces that cover the entire area being analysed. The preparation of convex map is regards as the most challenging job before the introduction of all-lines axial map.(figure 5) An axial map (figure 6)is the minimal set of axial lines that cover the area being analysed. With the help of new algorithm, minimal axial map can be obtained by the deduction of all-lines axial map.

Learning from the idea of depth from the justified graph, each axial line in the axial map is assigned a number that according to how many changes of direction separate it from the starting line. The least the number show more shallow in the graph, we called more integrated, whereas larger the number indicate deeper in the configuration and tends more segregated. If we apply the same idea to each line to every lines in the map to obtain a static global measure, we called the Global Integration, of the map. This average measure could make sense for comparing different spaces integration. Normalised Integration value can be used as measure to compare the status of streets in different cities. Local Integration measure has been proposed for maintain an accuracy measure in district level.[5]

3. OVERVIEW OF ANALYSIS AND SPACE ANALSIS

3.1 Overview of analysis

The subject of analysis of this study are the two representative complex shopping cultural centers of Korea C.O.E.X. Mall in Samsung-dong and I' PARK Mall in Yongsan.

Table 1. C.O.E.X MALL Overview

Building Name	C.O.E.X MALL
Location	C.O.E.X mall, trade center, Samsung-dong, Gangnamgu, Seoul, Korea
Land area	119.008.8 ㎡
Service	Various institution such as culture, entertainment, shopping
Scale	Underground 1 floor
etc	Subway line no.2 samsung station

Table 2. I' PARK MALL Overview

Building Name	I' PARK MALL
Location	Hangangro 3ga, Yongsan-gu Seoul, Korea
Land area	126.930.74 ㎡
Service	Sale and business equipment, culture and public space.
Scale	Underground 3 floor, Ground 10 floor
etc	Subway line no.1 Yong-San station KTX Ho-Nam line

As seen in the table, COEX Mall and I' PARK Mall are equipped with appropriate subway connection and cultural and merchandising facilities as large-scale complex cultural facilities, and their dimensions are also similar with about 120,000 square meters each.

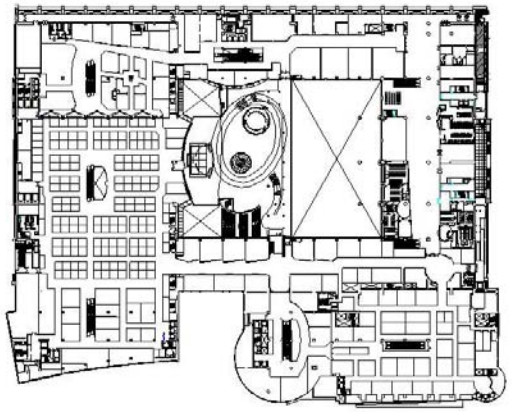

Figure 6. I' PARK MALL standard plane

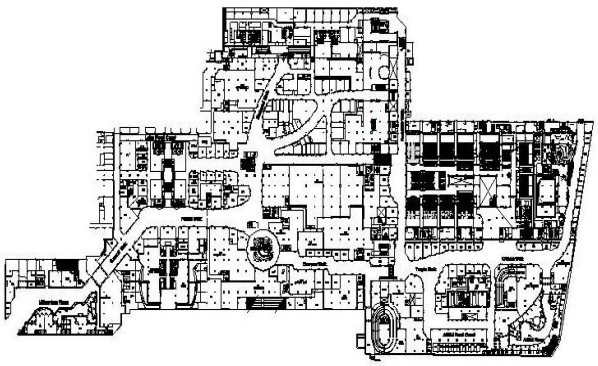

Figure 7. C.O.E.X MALL standard plane

Picture 6, 7 display the standard surface of I' PARK Mall and C.O.E.X Mall. I' PARK Mall is divided into 4 districts and, based on the event square located at the center of the connections of each space, there are commercial stores and cultural facilities located in its surroundings. C.O.E.X Mall utilizes open surface in a wide region with various stores and cultural facilities and resting spaces organically connected centering on the passage.

3.2 Analysis of the space analysis

This study analyzes space structure by classifying in quantitative analysis units for two complex cultural facilities and using Space Syntax. In the establishment of unit space here, there are two methods using Convex Space and Axial Line. In general, Convex Analysis is often used in the analysis of external space especially urban space organization, but Axial map method can be used even in the interior of a structure in the case of strong lineal property or the analysis focusing on movements, therefore, the two analytical methods of Convex Analysis and Axial Line were used in this study.[6]

(1) Space Syntax Axial Analysis

The result of axial line analysis revealed that the mean value of the overall integration level of I' PARK Mall of picture 8 was 0.8083, and one passage revealed as the strongest axis with the highest overall integration level value (1.3163). This is the data that displays how easily the axis located at the center with the darkest color can access the entire space, and signifies the depth and interrelations of the space. The reason why the integration level for the central one passage and the passages that meet perpendicularly is because of this. The mean value of the integration level of C.O.E.X Mall of picture 9 is 1.1669, which shows significantly higher integration level compared to that of I'PARK Mall. The fact that the event square is playing the central role of the space as the most crowded area can be seen from the space analysis result that shows the highest overall integral level value for the axis at which the passages of three points meet at the center.

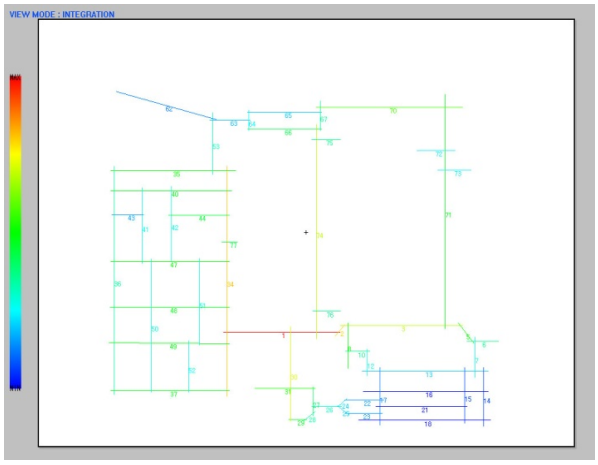

Figure 8. I' PARK MALL Integration

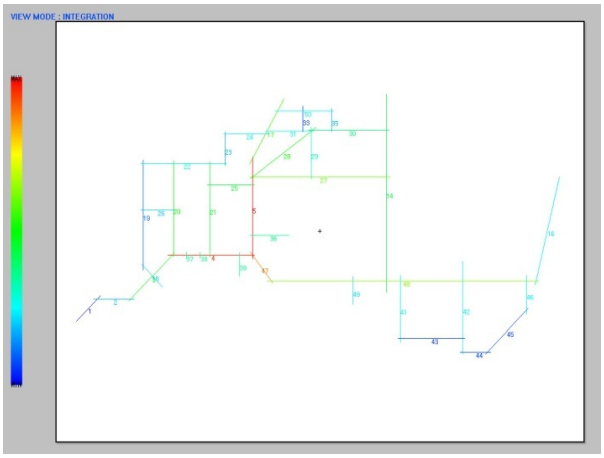

Figure 9. C.O.E.X MALL Integration

Table 3. Axial Analysis figure

Division	Axial Analysis figure (Means of top 10)		
	Connectivity	ControlValue	Integration
I'PARK MALL	4	1.4135	1.0643
C.O.E.X MALL	4.9	1.8048	1.5798
Mean Value	4.45	1.6092	1.322

Table 3 is the mean value of the space analysis for the top 10% and, as it can be seen from the table, C.O.E.X Mall shows a higher integration level. The reason why the overall integration level value has such high value is because the connection level is high from the cross shape of the space and the depth of space is shallow. In here, the difference of the mean value between the space with high integration level and low integration level is significant. Accordingly, it can be seen as the movement line being concentrated to the central corridor.

(2) Space Syntax Axial Analysis

The result of Convex Analysis showed that the mean value of the overall integration level of I' PARK Mall of picture 10 was 1.3227 and, unlike axial line, two passages have the highest overall integration level values (2.3654, 2.3382) as the strongest axis. It is estimated that the reason why different results have been extracted from axial line map is because the axial line map is the result of analyzing the space centering on corridor, and the convex space map is the result of analyzing centering on the space and corridor. The mean value of the integration level of C.O.E.X Mall of picture 9 is 1.4811 and, compared to the result of the highest values for three axial line in axial line map, the fact that the event square and its right side space revealed to be the areas of the highest integration level can be seen. Although this appears to have resolved the overload of population through inter-complementation through the connected space for the two axial lines compared to the existing three axial line map, one remaining space is estimated to have lower connectivity compared to other corridors with frequent over population phenomenon. Although it is showing a relatively higher integration level compared to that of

I'PARK MALL, the fact that the difference does not measure up to the axial line map.

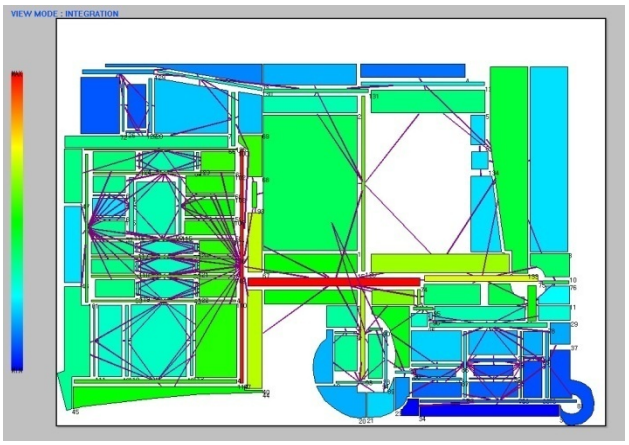

Figure 10. I' PARK MALL Integration

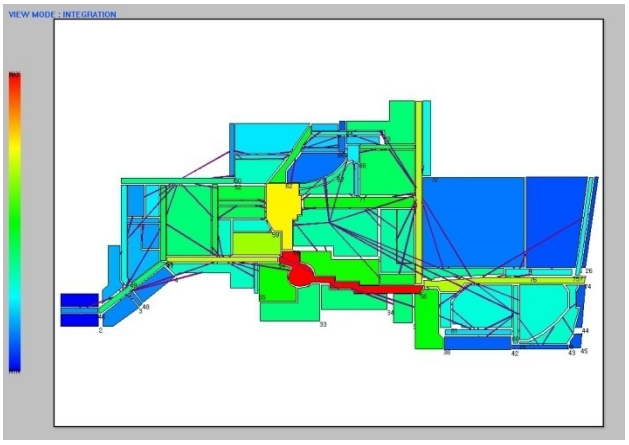

Figure 11. C.O.E.X MALL Integration

Table 4. Convex Analysis figure

Division	Convex Analysis figure (Means of top 10)		
	Connectivity	ControlValue	Integration
I'PARK MALL	7.8	1.9316	1.9256
C.O.E.X MALL	7.8	2.26	2.1351
Mean Value	7.8	2.0958	2.0304

As seen in table 4, the values of connectivity of C.O.E.X Mall and I'PARK Mall are identical, but the integration level value of convex space map displays a higher value for C.O.E.X Mall like axial line map.

4. CORRELATION ANALYSIS

Based on the preceding study results, the articulation level of space is deduced by examining the connectivity of space and the interrelation of the level of control. Here, the articulation level of space is also called perception coefficient, and expressed as the coefficient of correlation between the connectivity level and integration level. The relative high articulation level signified that the understanding of the overall layout structure of the space is easy. As this is the variable of expressing the overall characteristics of the space organization, it is used as the variable of comparing a space structure with another space structure rather than the variable of comparing individual block spaces.

4.1 Intelligibility of axis analysis

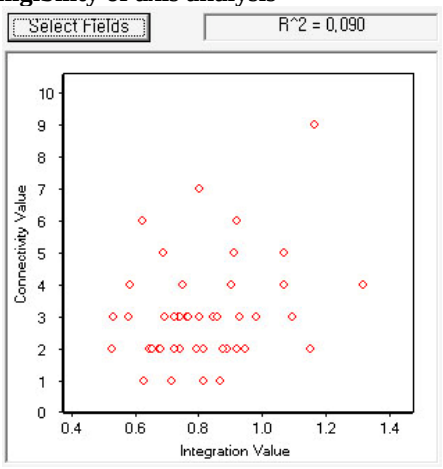

Figure 12. I'PARK MALL

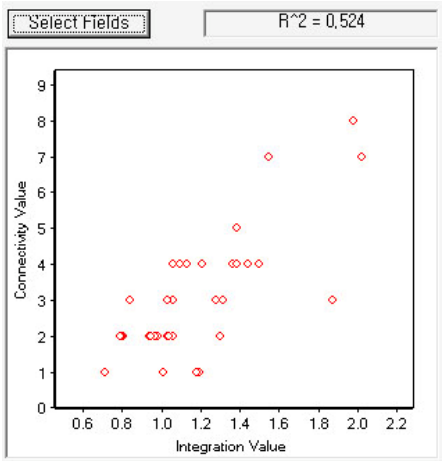

Figure 10. C.O.E.X MALL

4.2 Intelligibility of convex analysis

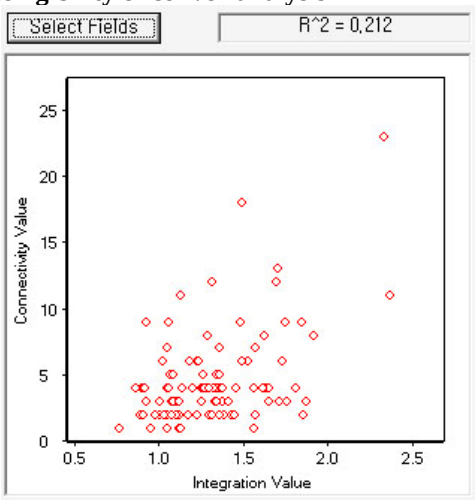

Figure 14. I'PARK MALL

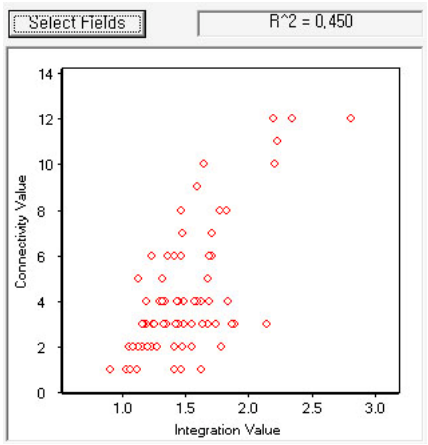

Figure 15 C.O.E.X MALL

Examining the information for the study of the evaluation index for the articulation level of space structure of interior space reports that the situation of the patrons hardly perceiving the shape of the space can occur, as the articulation level of space is extremely low at lower than 0.4 of articulation level. Picture 12, 14 show the scattering of the points of not showing consistent correlations as the articulation level of each graph of I'PARK Mall. In addition, as seen in table 5, the two indices reveal that the correlation and the space structure articulation level are low, as the coefficients of correlation are respectively 0.090 and 0.212. On the contrary, picture 13, 15 show a better space structure articulation level as the points show a consistent shape compared to that of I'PARK Mall even though the coefficients of correlation are low values of 0.524 and 0.450 as the articulation level of each graph of C.O.E.X Mall. Through this, it has been summarized that the perceptibility of the large-scale complex cultural shopping facilities in Korea was very bad.

5. CONCLUSIONS

The space structure of the large-scale complex cultural shopping facilities has been examined using Space Syntax. As the result, the current circumstance is that the concentration of the development of one place has resulted in the exclusion of space structural planning for the rest of the places when looking at the characteristics of the current complex cultural shopping facilities in Korea. Accordingly, the fact that the developments that have not considered space structural planning are taking place was confirmed. First, it is estimated that crowed spaces will occur in the vertical movement spaces of I'PARK Mall and C.O.E.X Mall, as their connectivity is high. Second, the patrons can easily perceive their surroundings when the control level is high for the hall and central areas. Although most spaces show good control level, the other spaces excluding the central area show very a low control level. These spaces will not be able to properly play their roles and can cause inconveniences to visitors. Therefore, an accurate planning for future complex cultural shopping facilities to be constructed is needed through a more careful analysis in the future.

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