Analysis on City Tour Routes in relation to Urban Spatial Structure and Pedestrian Movement

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Abstract

Gwangju has a plan for Urban Regeneration in an old urban center where it has witnessed the decrease of population and economic vitality, Gwangju tries to draw more tourists to the old urban center by introducing a large-scale cultural project. The Asia Culture Complex (ACC) scheduled to be completed in 2014 is the biggest cultural facility in Asia. It is supposed to bring many changes in urban spatial structure and to attract more tourists.
This study, utilizing Space Syntax modeling, analyzes the spatial structure of the old urban center in Gwangju and predicts the changes in urban structure after the ACC will begin operated. It finally attempts to suggest tourist trails in the old urban center and analyze their property in relation to urban tourism.

Key words : tour route, urban structure, pedestrian movement, space syntax

1. Introduction

1.1 Background and purpose of research

The changes of industrial structure and the development policy focus on the new urban centers and have resulted in the decline of old urban centers. The purpose of the urban regeneration project is to improve the economical and physical environment, as well as social revitalization of the old urban center. Urban tourism is one of the main issues related to redevelopment and regeneration. It is to pursuit economical development and environmental maintenance of the old urban center.

The city of Gwangju is building the Asian Cultural Complex (ACC) in an old urban center on the site where the provincial office had been situated until it was moved out of the city. Through fostering the cultural activities and urban tourism the Asian Cultural Complex (ACC) is to revive the old urban center, which has been for a long time the commercial and administrative center in Gwangju. In line with the development of a large-scale cultural institution in the old city center, it is necessary to predict the changes in physical urban structure around the ACC and its consequence in pedestrian movements in the old town of Gwangju. Accordingly, the routes connecting the tourists' attractions in the old downtown of Gwangju around the ACC seem to be an appropriate next step to be discussed. The tourist routes are to stimulate the tourists to visit those attractions in the old city center and to help them understand and appreciate the distinctive features and the beauty of urban structure of the area.

1.2 Research area and methods

The old city center in Gwangju has long been known as the nucleus of the city, since the Gwangju city castle had been established. It has been the center for business and administration before the city tried to build new urban cores around the periphery of the city as the city has been growing. This brought disastrous impacts on the old city center. Its economical vitality and the role as the center for civil life began shrinking. The city government is trying to revitalize this area with a bigger scheme, as "the hub city of culture" which includes the construction of the Asian Culture Complex in old downtown area. In line with the introduction of the ACC, a huge multi-functional cultural institute that could bring a big impact on the area in both the urban structure and people's behavior, especially pedestrian movement. This study suggests tourist trails will bring positive impacts to urban tourism in the old city center area. The study was conducted with the following procedures.

First, the tourist attractions around the old city center were examined, including the future ACC in order to categorize in terms of their locations and characteristics as references to make tour routes. Second, a space syntactic model was produced by utilizing Depthmap program on the old city center and the surrounding area within one kilometer. Using this model, the special structure of the old urban center was analyzed and tour routes in the area were drawn in relation to the urban structure. Finally the tour routes suggested in this paper were analyzed and compared. The relations between tourist routes and the spatial structure are figured out in terms of their syntactic properties and the relations to the urban structure in the old city center.

2. Urban Tourism and Spatial Structure

2.1 Urban tourism and urban regeneration

1) Urban tourism
Urban Tourism means "to make various sightseeing and leisure activities and to earn benefits from those activities. Residents or visitors can be the customers to enjoy existing city-scape, functional phenomena and image". In addition, it refers to "sightseeing in the city based on attractions, amenities and city image."[1]

2) Urban regeneration
Previously city maintenance projects such as urban reconstruction in the 1950's and urban renovation in the 1970's and 80's had purposes of economical vitalizations and physical environment improvement. However, when the purposes and the effectiveness of these projects had met the limitation, urban regeneration was introduced. Generally, urban regeneration refers to all the measures to heal physical, social and economical problems in which a city is experiencing. Urban regeneration includes the terms such as urban redevelopment, urban vitalizations and urban reform.[2]

3) Meaning of vitalization in urban tourism
These days, urban tourism becomes a big business in the city economy because it attracts more people into the city whose expenses can give the city an economic boost. In addition, the efforts for urban tourism usually include urban reform and the expansion of green space, which could eventually lead the environment regeneration in the city. From this perspective, urban tourism is strongly related to urban regeneration in regards to urban economy and environmental regeneration.

4) Types of urban tourism
Focusing why tourists visit a city, Law(1993) identifies the people-drawing elements into seven categories: historical memorials, museum/gallery, theater/concert hall, night entertainment activities, café/restaurant, shopping facilities, and office.

This research categorizes urban tourism types based on Law's categories as follows: historic/cultural,

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[1] Kim, H. J. and Yoo, J. Y. (2000) *Urban tourism development research*, p.5

[2] Lee, C. W. (2002) *Urban regeneration and Cultural identity*, Institute of Daegu and Kyeongbuk Development, p.40

shopping, cityscape tourism. With this categorization, the paper later presents tour routes according to their major purpose and activity.

2.2 Urban spatial structure and tourist route

1) Space Syntax Theory

The spatial analysis framework that this paper adopted is based on the space syntax theory and its analytical methods developed by Bill Hillier and Jullian Hanson[3]. The space syntax theory is used to figure out the urban spatial properties by means of quantitative methods of physical spatial relationship represented through nodes and edges on the layout patterns of streets. The syntactic analyses have shown that pedestrian accessibility is related to urban spatial structure. This can be interpreted as an index to show how easily people can comprehend the structure of a region or a city.

2) Space syntax indexes used in this research

(1) Global integration
The global integration refers to the general accessibility and connectedness of each and every space in the whole spatial system. The higher integration value a space has, the more accessible it is from other spaces. It generally means that a space with high integration value has a good chance to become a place for gatherings and interaction between people.

(2) Local integration
The local integration represents an accessibility and connectedness within a part of the whole spatial system. This value is calculated only several steps form a certain space, usually within three in depth. Previous researches indicate that the local integration can be interpreted by the hierarchy of accessibility and local movement of pedestrians.

(3) Intelligibility
The term intelligibility represents the interrelationship between local integration/connectivity and global integration/connectivity. It shows greater clarity or easier understanding of spatial layout patterns if the correlation is high. This index is usually presented in a scattergram with regression lines showing the correlation between local and global integration values. The spatial structure clarity is interpreted high when the regression line is over 45˚ and the dispersion is dense.

(4) Integration core
The integration core is a subset of axial lines or spaces with higher integration values, usually the highest of 5%, 10%, or 20% depending on the characteristics of spatial system and the purpose of research in both global and local syntactic system. This core becomes the most accessible region in a building or a city to which people can easily reached even though they are not familiar with the circulation system.

(5) Embeddedness
The embeddedness is an index to show how much a certain spatial system is overlapped with the global integration core. In other words, this is the degree of overlap between a local system and the global system. It can be obtained through the percentage of how many axial lines in the local system are found in the integration core in the global system. If the value is high, the local system is strongly related to the global one.

3) Radius for analysis

The syntactic model in this study includes the surrounding area within one kilometer in radius to analyze the target area. This is to get rid of the edge effect which may cause unexpected results while analyzing only the target area. Figure 1 shows the target area(the inner polygon) and the area of the

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[3] Hillier, B. and Hanson, J. (1984) *The Social Logic of Space*, Cambridge University Press

syntactic model(the outer polygon).

Figure 1 Area of syntactic model.

4) Method to create routes for urban tourism

In this study the following three aspects were considered for creating tourist routes. First, the routes should be created in a systemic and holistic way. This allows tourists to get access to the various attractions in a city while they are using the routes. Second, the routes should be created for pedestrians. By walking, tourists should be able to access the attractions sequentially. At the same time they should be relaxed and entertained. Third, there should be a clear and local identity and an image that tourists can experience. The distinctive and unique city image is the main strategy to draw more tourists.

Along with the above consideration, this study attempted to create tourist routes through the following procedure. First, based on the investigation of attractions in the target area, the old city center, the tourist attractions were listed and categorized by the themes that could characterize the attractions' most distinctive features. This was done to reflect tourist attraction network to tourist route design. Second, tourist routes were carefully drawn up based on the spatial structure analysis through Space Syntax. This provided easy orientation and accessibility for tourists to visit various places. In addition, this can give the design of each route a thematic identity through grouping of attractions in each route according to their thematic categories. Third, thematic tour routes were evaluated and analyzed in terms of their own syntactic characteristics and its relation to the urban spatial structure.

2.3 Previous researches

B. S. Kim(2008) studied a pedestrian network through categorizing historic elements of point, line and area in a land where no tourist routes had been planned. He analyzed the connections between historic elements and the impact on tourists but didn't show the consequences by the new routes and its influence to the urban space.

H. W. Shin's 2006 research, "Historic routes considering space structure" dealt with an investigation of the existing tourist routes in a historic region in Seoul, Korea through space syntactic analysis and made new tourist routes. The research attempted to suggest the meaning of historic tour routes in the urban spatial context, yet it didn't consider the characteristics of the tourist and the tour route itself.

3. Spatial structure of Gwangju and tourist routes

3.1 Summary of research area

The research area is the old urban center of Gwangju, which is now located in the eastern part of the city. Its configuration had been shaped by the old city castle which was destroyed to build streets in the early twentieth century. At the eastern tip of the old city center, there is the site for the ACC, where originally the provincial office had been situated until it moved out of the city in 2005(fig.2). The main land use of the old center currently is commercial and residential. Retail shops, private academies, lodges and inns, and community facilities are mixed into the area along the main street, Choojangro.
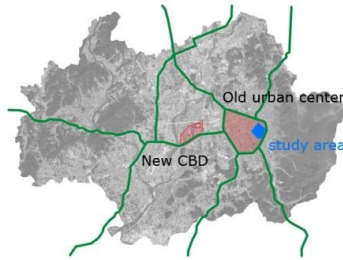
Figure 2 Gwangju and the old city center

3.2 Tourist attractions in research area

In the old city center, the ACC and the Street of Arts poses as cultural resources. The May 18th Democratic Movement Memorial Site and the site of Gwangju Castle as historic elements and the street of Choojangro and Daein Market as commercial elements also exist. In addition, the area has natural environments, such as the Gwangju river, the Gwangju Park and the Sajik Park.

1) Point elements
As point element, there are various spots scattered around in the old city center area where major events had taken place during the May 18th movement in 1980. There should be a concrete strategy to connect these places together. In addition, there are urban follies along with the former site of the city castle. These places all have their own historic significance, yet need to be assembled and organized as a tour route (fig 3).
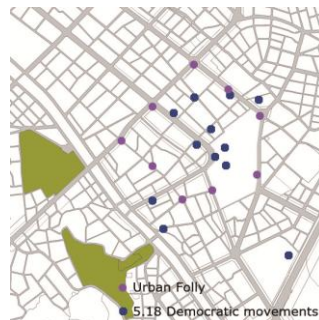

Figure 3 Point elements

2) Line
One of linear elements in the old center is the Street of Arts, which has a long history as one of the most prestigious places having an artistic aroma. According to our investigation, it is necessary to build a relation between the Street of Art and other main streets in the old center. Another linear element is the Gwangju River, which is an important environmental element as well. It is necessary to build relationships between the Gwangju river, the ACC and the Choojangro street. Also, there is potential to build an urban green linkage amongst the river, the Gwanju, and the Sajik Park (fig 4).

Figure 4 linear elements

3) Area
Area elements found in the old center are composed of a group of programs. For instance, Choojangro Street is a representative of commercial areas, and the Daein Market has also succeeded the traditional town market in old center area. The Choongjangro street was a main commercial area before the city grew rapidly with the development of other commercial districts. Still there are many shops and

restaurants along the street. Because of its location and length, the Choojangro is the most favorable candidate to connect nearby tourist attractions.

The ACC, another area element in the region, is a main facility that is expected to bring the actual turn-around changes in the old center with multiple cultural functions and tourist attractions.

The Gwanju Park and the Sajik Park are the only two major natural green spaces in the old center. Not only do they provide rest areas but they contain historic and cultural heritage, including early missionary dwellings and churches. These parks also need to be connected to the other tourist attractions (fig 5).

Figure 5 Area elements

3.3 Spatial structure analysis in old urban centers

This research utilized the space syntax analysis by syntactic measures such as integration, intelligibility, and embeddedness to figure out the characteristics of spatial structure in the old urban center.

1) Global Integration Analysis
Figure 6 shows the global integration analysis of the old center with ACC and surrounding areas. It shows that the most integrated area in the old center is the Choojangro street and the Keumnamro street and the secondary streets connected into these two streets. The inner loop or ring roads composed of several roads is also found to be the most integrated. The riverside streets and the streets connecting the Gwangju railway station to the city center are found integrated (fig 6.).

2) Local Integration Analysis
According to the analysis of local integration, the overall pattern in how the most locally integrated spaces are placed doesn't look much different from the global integration. Again the Choojangro and the Keumnamro and the Jooangro streets are found to be the most integrated along with several cross roads. Considering the accessibility into the old city center, the Keumnamro and the Jooangro are the best choices, but they can't connect the two parks across the river into the center. The Choojangro and the Street of Arts are found to be easily connected to the Keumnamro and ACC (fig 7).
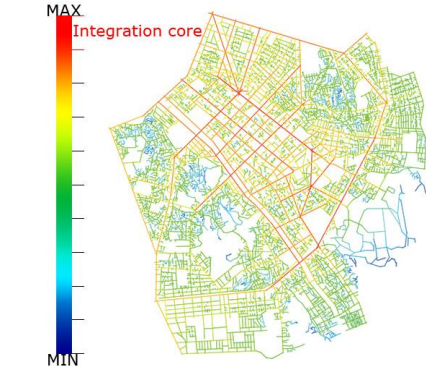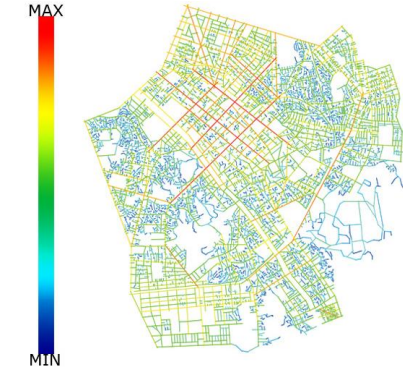

Figure 6 Global integration analysis

Figure 7 Local integration analysis

3.4 Setting-up of Tourist routes

As Figure 8 illustrates, the intelligibility of the old city center has turned out to be quite low (R^2 = 0.204). Generally, this indicates that the urban spatial structure or the layout pattern of streets in the old city center region is not easily recognizable by the visitors who are not familiar with the region. In fact, this bad clarity of spatial organization may cause a way-finding problem to the visitors and can bring inconvenience to tourists and give a bad image. Therefore, it is necessary to provide easy routes for tourists for better understanding and easy experience of street organizations, eventually leading to a better city image.
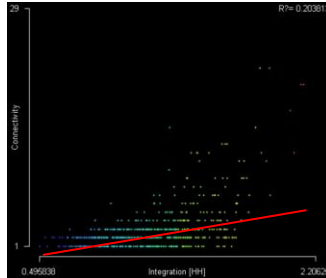

Figure 8 Scattergram on intelligibility of spatial structure in old urban centers

In order to establish tour routes to connect tourist attractions in the old center, the entrances or the starting points for tours are to be selected (fig. 9). Next, several actual routes are to be drawn up by the main themes which can be identified from the general characteristics and programs of attractions on each route. The tour routes can be classified by the circulation form and the program on the route; the loop and the network types in terms of circulation form, and the historical/cultural, the shopping and the city landscape types in terms of the program. Each route is setup by the order of integration value in order for the tourists to find the ways for accessing major attractions. The make-up of tour routes is also determined by how much the routes can be overlapped with the integration core of the old city center.
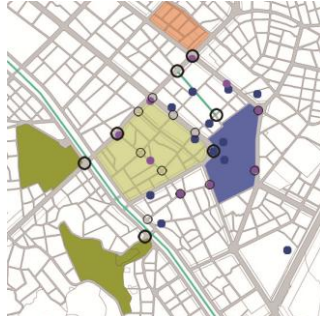

Figure 9 Entrances for the main tourist attractions.

1) Circulation types of tour routes
The loop type is formed by a path circulating all the attractions located along the route in either direction. Tourists are to follow the route in one direction to visit all attractions. Overlapping of tour routes can be minimal but there is a limit of freedom for tourists to choose ways and attractions as they wish. Figure 10 delineates the city center circulation route which circles around the old city center region and connects various attractions in a loop (fig 10).
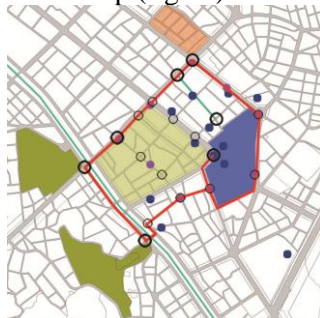

Figure 10 City center circulation course.

The network type is composed of several local loops and has multiple paths to travel from one spot to another, resulting in long circulation travels and more choices for the tourists to take. In this study, the network routes are to begin from the ACC, the most attractive spot for tourists, and to stretch out to several different routes according to each tour route designated by the main theme of attractions on it. The routes intersect each other to proceed to the next destination. There are various attraction possibilities for tourists to choose. Table 1 shows several options for the routes from the ACC to various attractions in the old city center. The route starting from the ACC can go to one of three different attractions as the first destination. It also has more alternative attractions that extend from that point as the second destination, and then third, fourth, and up to six steps. Each route can have its own traits based on tourists' choice and some parts of the route can be overlapped while traveling to the next destinations. For example, route 1 provides historical and cultural experience, while route 2 is basically for commercial attractions. In this scheme, the Gwangju Park and the Sajik Park are the final destinations among various tourist attractions.

Table 1. Network of alternative routes from the ACC

	1	2	3	4	5	6	
Asian Culture Complex	Street of Arts	Daein Market	Site of Gwangju City Castle	Choongjangro Street	Gwangju river	Gwangju Park	1
						Sajik Park	
				Gwangju River	Gwangju Park		
					Sajik Park		
		Site of Gwangju City Castle	Choongjangro Street	Gwangju River	Gwangju Park		
					Sajik Park		
				Daein Market			
			Gwangju River	Gwangju Park			
				Sajik Park			
	Choong-jangro Street	Site of Gwangju City Castle	Street of Arts	Daein Market			2
			Daein Market	Street of Art			
		Gwangju River	Gwangju Park				
			Sajik Park				
	Site of Gwangu City Castle	Street of Arst	Daein Market				
		Choongjangro Street	Gwangju river	Gwangju Park			
				Sajik Park			
		Daein Market	Street of Art	Choongjangro Street	Gwangju River	Gwangju Park	
						Sajik Park	
		Gwangju River	Gwangju Park				3
			Sajik Park				

2) Thematic types of tour routes

 (1) Historic/cultural route
It is designed to travel mainly the historic and cultural assets in the old center. Since the historic and cultural attractions are dispersed all over the area, it is difficult to access them in a simple loop. Therefore it is necessary to design pedestrian route to connect all points in combined fashions of loop and network types (fig 11).
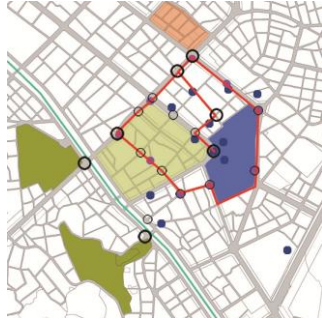
Figure 11 Historical/cultural route

(2) Shopping route

The attractions along with the Choongjangro Street and inside of the Daein Market are mostly shopping. These points of interests can be grouped and form the shopping route in a linear path (fig 12).
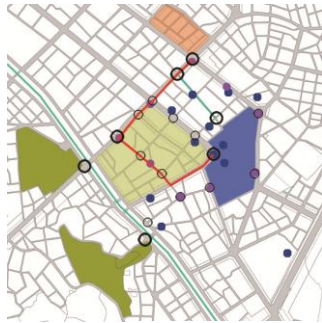

Figure 12 Shopping route

(3) Cityscape route

Cityscape route is for tourists to recognize the characteristics of old city center as it basically follows the lines where the walls of the city castle used to exist. The route extends to the Gwangju Park and the Sajik Park which are located across the Gwangju River (fig 13).
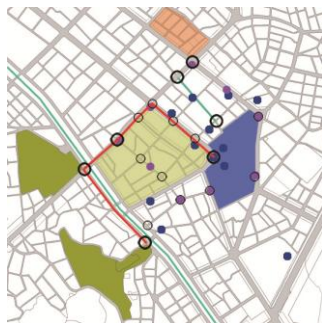

Figure 13 Cityscape route

3.5 Comparison between tour routes

Table 2. Results of space syntax analysis of tour routes

	City center circulation route	Historic/cultural route	Shopping route	Cityscape route
Global Integration	1.53407	1.53976	1.52717	1.5758
Local Integration	3.3778	3.82364	3.73663	3.89588
Embeddedness	63.63%	54.54%	50%	100%

In global integration, the cityscape route is found to have the highest value. It means that the cityscape route is most overlapped with the overall spatial structure of the old city center than any other routes to be established in the study. The city center circulation route and the historic/cultural route have similar integration values. The lowest integration is found in the shopping route which can be interpreted that

it is the least integrated with the major urban thoroughfares.

In local Integration, the cityscape route has the highest value as in the global integration. However, the city center circulation route has the lowest local integration value among the four tour routes. It can be explained that the route mainly follows the periphery of the old city center and it causes difficulties in accessibility from the integration core. Whereas the shopping route is found to have a relatively high local integration value compared with the lowest in global integration. This result shows that the shopping route, or the major commercial streets, is highly integrated at the local level and forms parts of the local integration core. It also is a shorter distance from the major urban corridors than the city center circulation route.

In regards to embeddedness, cityscape route is found to be overlapped 100% with the old city center's integration core. This implies that on this route, travelers can easily recognize where they are in relation to the other part of the region and are able to find their ways without big trouble. Other routes show lower embeddedness value, which implies that they may need to be provided with information devices for routes.

5. Conclusion

Identification and urban revitalization as cultural city is the vision for the city of Gwangju. In line with this vision, Gwangju is introducing the Asian Culture Complex in the old city center to proliferate the cultural activities and urban tourism. This research aimed to develop tour routes in a more systematic way both in terms of circulation types and the main function of attractions or themes of each route in the old urban centers. The routes are evaluated, compared and analyzed in relation to the urban spatial structure through the syntactic analyses.

This study has found that the old city center area can cause some problems to the visitors recognizing the spatial structure and finding ways to their destination since it has a low level of clarity of spatial structure or intelligibility. The study, therefore has established four major tour routes in relation to the thematic characteristics of attractions and the urban spatial organization. It also has suggested that it is necessary to create tour routes which are highly integrated with the urban structure and to establish complementary devices or additional attractions, especially on tour routes with low integration and embeddedness to improve their intelligibility and accessibility.

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