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OLD AND NEW CITY: morphological analysis of Antakya

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Abstract

Cities are in a continuous process of change and readjustment of their different parts, which are spontaneously developed or deliberately planned under different socio-economic, natural and political conditions in different periods. Over the years, Antakya (Antioch), which is a city of Turkey, has undergone various physical and functional transformations. This paper investigates the morphological transformation of Antakya in terms of spatial integration including the comparison of traditional and modern centers of the city. Morphological structure of Antakya, which was built with the basic planning approach, has a history of 2300 years, natural conditions and has acquired a shape within human and society order, was analyzed. It was observed that in Antakya there were two different dimensions related to city structure; an old city between natural boundaries and a new city characterized by radial development. In this study, these dimensions were studied in detail. In other words, in this study, morphological differences between the old city pattern which appeared within 2300 years of history and the new city pattern which appeared within approximately 100 years of planned history and the integrations of these two different parts of the city were explored. These differences include public and private open spaces, urban webs and urban blocks. Four pilot districts were selected as sample areas, including two areas from the commercial districts of the old and the new city and two areas from the housing districts of the old and the new city. At this stage, the relations of the city with different structures of urban pattern were exemplified by using the modern morphological approach (space syntax method) and traditional approach; an analytical study of buildings, roads and open spaces, was conducted within the scope of the concept of livable area. These two different methods were comparatively analyzed to examine the subject in detail. In conclusion, we can see that there is a very strong relationship between the livable area index values and intelligibility for the selected sample areas. It was thought that these structural relationships that were found as the result of the present study could provide a contribution to further planning studies.

1. URBAN MORPHOLOGY

Urban morphology can be defined as an approach that provides an understanding of the form, creation and transformation processes, spatial structure and character of human settlements through an analysis of historical development processes and the constituent parts that compose the settlements. In this essence, urban morphology is used as an important assessment tool or method in determining the change-transformation processes of urban fabrics, making sense of the historical roots of spatial and functional structures and bringing them to the present day.

The development of urban morphology, which constituted a component of urban geography as a subject, as an independent scientific discipline and its use as a method in the analysis of the physical structures of the cities dates back to the first half of the twentieth century (Whitehand, 1986).

Buildings, gardens, streets, parks and monuments are among the main elements of morphological analysis. These elements, however, are considered as organisms which are constantly used and hence transformed through time. They also exist in a state of tight and dynamic interrelationship: built structures shaping and being shaped by the open spaces around them, public streets serving and being used by private land owners along them. The dynamic state of the city, and the pervasive relationship between elements have led many urban morphologists to prefer the term “urban morphogenesis” to describe their field of study (Moudon, 1997).

In the course of time, various approaches have emerged for morphological analyses;

In ISUF (International Seminar of Urban Form), the coming together of researchers from different language areas and disciplines is described as founded on common ground. First, there is agreement that the city or town can be “read” and analyzed via the medium of its physical form. Further, there is widespread acknowledgement that, at its most elemental level, morphological analysis is based on three principles.

1. Urban form is defined by three fundamental physical elements: buildings and their related open spaces, plots or lots, and streets.
2. Urban form can be understood at different levels of resolution. Commonly, four are recognized, corresponding to the building/lot, the street/block, the city and the region.
3. Urban form can only be understood historically since the elements of which it is comprised undergo continuous transformation and replacement (Moudon, 1997).

In Conzen’s approach, urban morphology is the study of the form and shape of settlements. Initial work in the field focused on analyzing evolution and change in traditional urban space (Carmona, 2001). Conzen considered land uses, building structures, plot pattern and Street pattern to be the most important (Conzen, 1960).

Buildings, particularly the land uses they accommodate, are usually the least resilient elements. Although more enduring, the plot pattern changes over time as individual plots are subdivided or amalgamated. The Street plan tends to be the most enduring element (Carmona, 2001).

The main topic of the studies conducted by Krier was the examination of urban history and historical urban pieces through morphological and typological analyses, (Krier, 1979) the study of sociological, cultural and psychological reasons for the formation of urban form and fabric (Rossi, 1966).

Urban morphology has become a common and important research method for the analysis of the physical structures of cities through the numerical content (Space Syntax) brought in these studies by Hillier especially with the support of the technological developments experienced in recent years (Hillier, Hanson 1984, Kubat, Dökmeci, 1994; Hillier, at al, 2007). Space syntax is a technique that can be used for morphological analyses of buildings, architectural plans, urban areas, and urban plans. Space syntax is also one of the few theories which allow us to understand how culture and society are embedded in the specific relational patterns constituting architecture and urban design.

Analysis of the characteristics and structures of local settlement obtained through the continuity of cultural and social values, evaluation of the historical values, and creation of a social conscience for the conservation of these areas are believed to lead to the preservation of present settlements through assigning them up-to-date functions. This will also be an inspiration for modern and contemporary designs.

It has seen that there are countless studies about Urban Morphology. In this framework, in this study, a comparative evaluation of modern (Space Syntax) and traditional morphological analysis methods in an universal sample area which has cultural, architectural diversity and rich in historical urban build up was aimed. An evaluation that can facilitate to urban planning in order to constitute the space perception and space quality especially in newly developed urban spaces was made.

2. SELECTION OF SAMPLES

Anatolia is rich in architecture and urban structure, reflecting its geographical location and the influence of several civilizations (Kubat, 2010).

Antakya is one of the oldest settlements in Anatolia. The city gained great importance during the Roman Empire. It was the third biggest city of Roman Empire. Its importance came from trade roads; it was located in the intersection of these roads. At that time, citizens of Roman Empire called Antakya as “The Queen of the East”. In the 7th century, the city was conquered by Arabians and Islamic properties began to show themselves. In time, Antakya lost its luxury that came from Romans. That was because of the privacy needs of Islamic culture. After 1516 Ottomans conquered the city but this has not resulted in an important change in its pattern. After that time, Antakya still maintained its importance until the new trade roads were discovered. Although it lost its importance in trade, it did not lose the importance in religion. In 1963, Antakya was chosen for pilgrimage by the Pope. At the present time Antakya is a very unique example with its mixed socio-cultural and economic factors. However, because of political and economic reasons it lost its beauty and unique properties (Demir 1996). Antakya has a different social, cultural and physical diversity within its boundaries. There is a combination of religions such as Christians, Muslims and Jews. Turkish, Arabic and Armenian cultural groups form a mixed culture in Antakya. Social and cultural ethnic groups have formed a very different and rich physical pattern in the settlement (Topçu & Kubat, 2007). The pattern of Antakya still bears the marks of its early Hellenistic and Roman structures, especially in the formation of geometrical grids. The configuration of the streets reinforces Islamic characteristics; cul de-sacs mean privacy and street structure is narrow (Topçu, 2003, Hakim, 1986).

Within the scope of the present study, four pilot districts were selected as sample areas from the newly developing planned district (New City) and the historical district that has an organic urban fabric (Old City) in the city of Antakya, two of which were from commercial districts of the old and the new city and the other two were from the housing district of the old and the new city. Each of the selected areas was 12.000 m^2. Of

the selected areas, A-Commercial Area (New City) and B-Residential Area (New City) were planned spaces that were formed as the result of the urban planning studies conducted during the period of the Republic of Turkey, while C-Commercial Area (Old City) was an Ottoman market where trade was conducted at different levels, which was named as bedesten (covered bazaar) and housed inns within the historical period. D-Residential Area (Old City) was selected as an area of the city of Antakya where all the urban changes have been experienced from the Roman period to the present day (Figure 1).

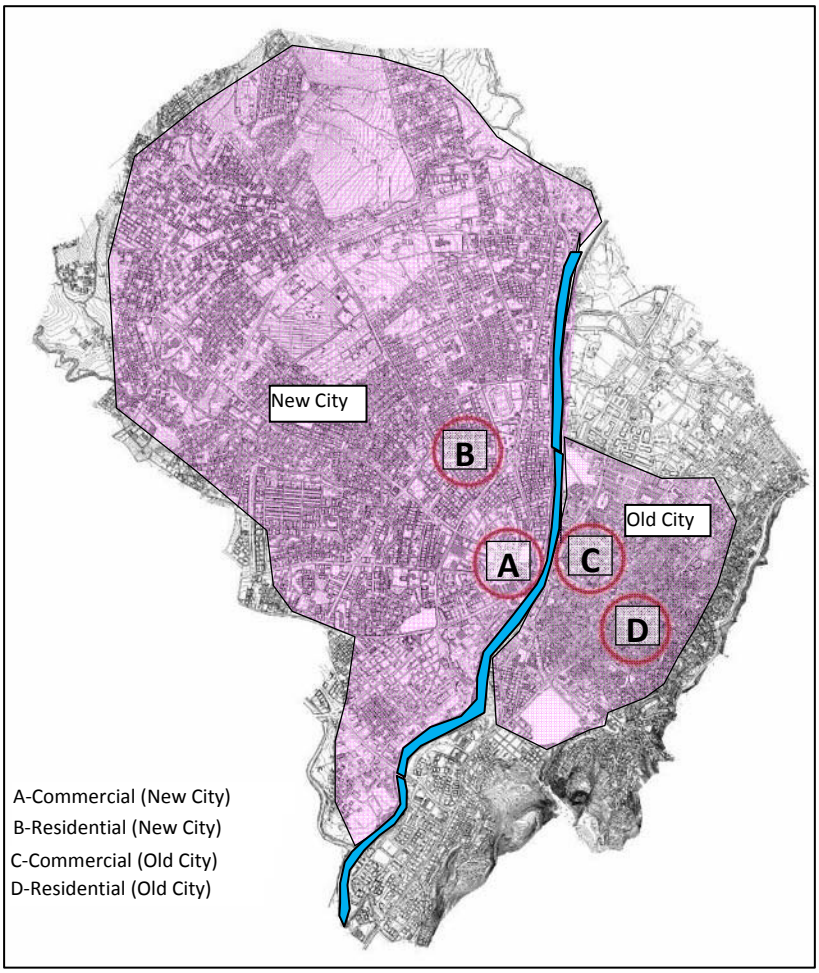

Figure 1 Settlement Map of Antakya and Selected Sample Areas

3. METHOD

Two different spatial analyses were performed in the selected sample areas and the results were compared. The first analysis involved morphological comparisons in the urban space. Within this scope, road areas, open spaces, built areas and total built areas on the urban space were respectively calculated for each sample area. Afterwards, proportional comparisons were conducted for the selected sample areas in terms of *built floor area use and total built areas* and in terms of *open spaces and road areas*. Then, an assessment was performed considering the proportion of walkable open spaces and total built areas within the scope of the concept of livable area index, which is an index used to identify the relationship between streets and

their densities and which gives a correlation between the total area of built environment and the total area of open spaces in a street zone.

Space syntax method was used in the second analysis. Space syntax was developed by Hillier and Hanson at the Unit for Architectural Studies, University College London (Hanson 1989; Hillier 1989, Hillier & Hanson 1984; Hillier et al 1983; 1992; 1993) and is a technique that can be used for morphological analyses of buildings, architectural plans, urban areas, and urban plans. Space syntax is also one of the few theories which allow us to understand how culture and society are embedded in the specific relational patterns constituting architecture and urban design. The aim of the technique is to describe different aspects of relationships between the morphological structure of human-made environments and social structures and events. It is possible to give quantitative descriptions of built spaces. This methodology contributes greatly to the understanding of the physical structure of the cases in this study.

First, an axial map of the entire city of Antakya was generated. Then, integration and intelligibility values were calculated on the generated axial map by using UCL Depthmap 8.15.00 software.

The central concept of space syntax is integration. The technique allows one to express integration in numerical values. As is the case with many other measures of spatial structure, these values are dependent upon the urban area. The integration of space is a function of the mean number of lines and changes of direction that need to be taken to go from that space to all other spaces in the settlement system. Integration is therefore about syntactic not metric accessibility, and the word 'depth' rather than 'distance' is used to describe how far a space lies. Every line in a settlement layout has a certain depth from every other line. The integration value of a line is a mathematical way of expressing the depth of that line from all other lines in the system. It is assumed that the distribution of integration across an urban area correlates with the movement pattern of an area. Urban areas can be distinguished by and compared in terms of different levels of integration (Hillier, 1996). Integration is used as a measure of quality for urban areas. By calculating integrated and segregated parts of a settlement, it is also possible to know whether a new design proposal fits into the existing structure of an area.

The syntactic intelligibility of an urban system is defined as the degree of correlation between the connectivity and integration values in the system. The term intelligibility is used because the stronger the correlation, the easier it is to infer the global position of a space from its directly observable local connections (Hillier at al 1983). This makes it possible to capture the way people can learn about large patterns from their experience of small parts or fail to do so when the correlation is weak (Hillier & Hanson 1984).

Within this scope, integration maps were created for the city of Antakya and the selected sample areas and intelligibility results were comparatively evaluated. Following the data collection and analysis procedures, the results obtained from the two separate analyses were interpreted and evaluated to shed light on the most important question of how these comparisons can contribute to the urban planning, urban morphology, space syntax and spatial design processes.

4. FINDINGS

A- Morphological Analyses

- **Building Densities:**

The tables of the analyses regarding building densities are presented below (Figure 2). Floor area values and the total built area values in the four different samples selected for the study were calculated based on the results of the analyses.

Floor area values for different urban fabrics of the sample areas selected from the city of Antakya were found as 56.693 m^2 for Area A, 70.532 m^2 for Area B, 31.022 m^2 for Area C and 68.093 m^2 for Area D. Total built area values were calculated as 231.976 m^2 for Area A, 149.183 m^2 for Area B, 180.625 m^2 for Area C and 106.044 m^2 for Area D (Table 1).

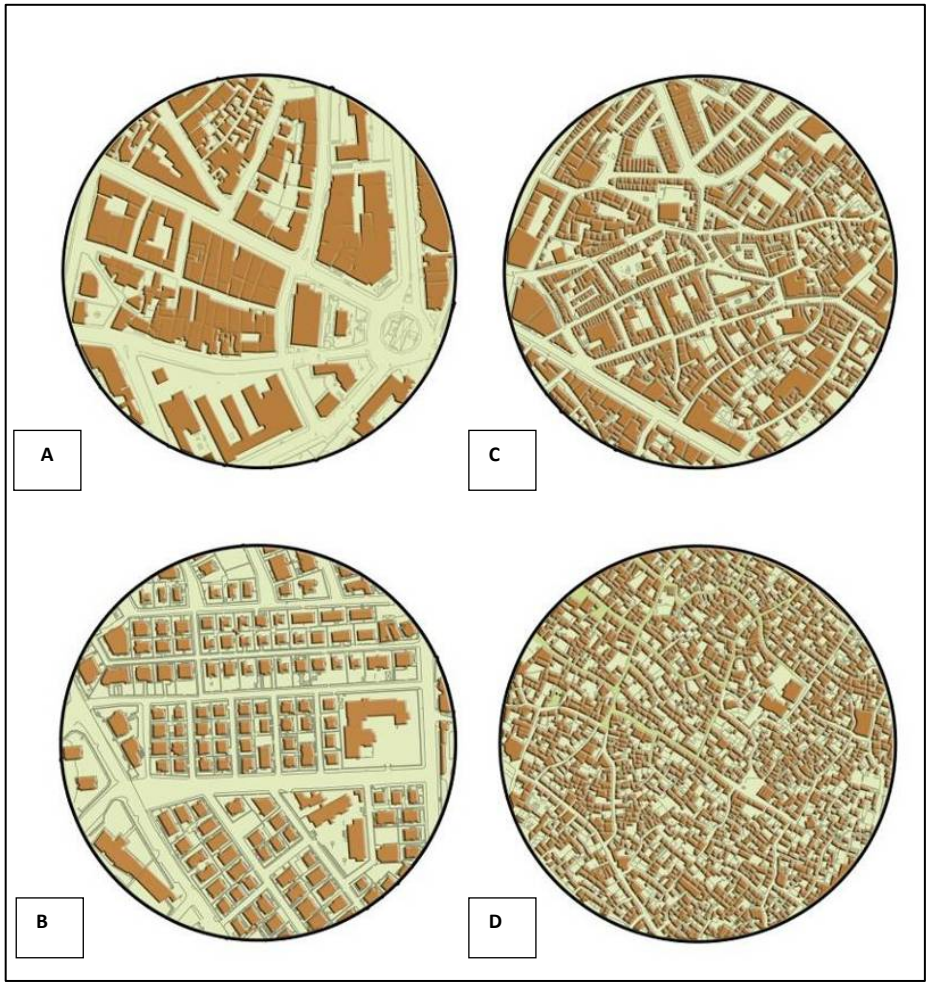

Figure 2. Built fabric of areas A-B-C-D selected from Antakya

Consequently, it was observed in the areas selected from the new and the old city that;

- There was not a very significant difference between the sample areas selected from the historical district (C, D) in terms of the rates of floor area use, but of the samples selected from the new city (planned district), the sample selected from the commercial area used 25.671 m^2 more floor area compared to the sample selected from the residential area.

- When the old and the new city were compared in terms of total built area use, it was observed that the total built area use in the sample selected from the commercial area of the new city was 51.351 m^2 larger compared to the sample selected from the residential area. In the samples selected from the old city, however, the total built area use in the sample from the commercial area was 43.139 m^2 larger compared to the sample selected from the residential area.

Table 1. Values of floor area and total built area use in the selected sample areas

Selected Areas		Area Use (m^2)		Total Built Area / Built Floor Area
		Total Built Area	Built Floor Area	
A	Commercial (New City)	231.976	56.693	4.1
B	Residential (New City)	180.625	31.022	5.8
C	Commercial (Old City)	149.183	70.532	2.1
D	Residential (Old City)	106.044	68.093	1.6

- **Road and Open Space Densities:**

Afterwards, roads and open spaces existing in the urban space were determined (Figure 3). Then, roads and open spaces (parking lot, courtyard, square, etc.) in the four samples selected for the study were calculated.

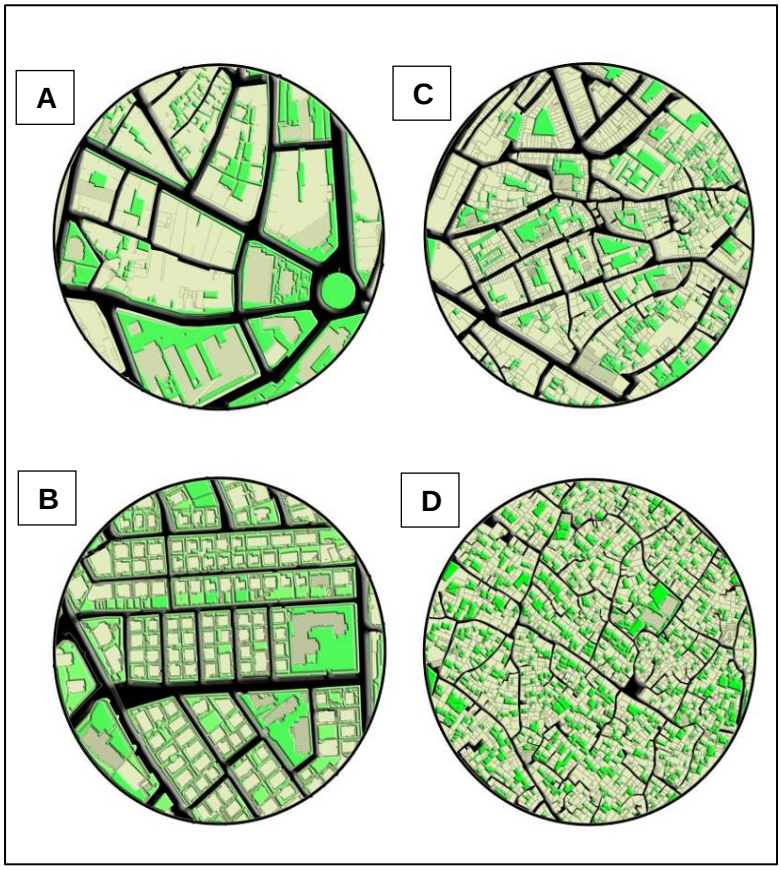

Figure 3. Roads and open spaces of areas A-B-C-D selected from Antakya

The percentages of road and open space use were determined on the basis of the sample areas selected from the new and the old city.

The values obtained as the result of the comparison of the **road** areas in different urban fabrics of the sample areas selected from Antakya were calculated as 28.826 m^2 for Area A, 32.039 m^2 for Area B, 24.638 m^2 for Area C and 15.536 m^2 for Area D. Total open space values were calculated as 35.481 m^2 for Area A, 57.036 m^2 for Area B, 25.830 m^2 for Area C and 37.371 m^2 for Area D (Table 2).

Therefore, in the areas selected from the new and the old city;

- It was seen that in terms of *road area use*, road use in the commercial zone of the areas selected from the old city was 9.102 m^2 more compared to the road use in the residential zone, whereas road use in the residential zone of the new city was 4.116 m^2 more compared to the road use in the commercial zone.

- When the values obtained regarding *open space use* were examined, it was seen that open space use in the residential zone of the sample areas selected from the old city was 11.541 m^2 more compared to the open space use in the commercial zone. When the sample areas in the new city were examined, it was seen that similar to the old city, open space use in the residential zone was 25.555 m^2 more compared to the open space use in the commercial zone.

Table 2 Values of road and open space use in the selected sample areas

Selected Areas		Area Use (m^2)	
		Road Area	Open Space
A	Commercial (New City)	28.826	35.481
B	Residential (New City)	32.942	57.036
C	Commercial (Old City)	24.638	25.830
D	Residential (Old City)	15.536	37.371

As a general interpretation of the findings, it can be understood from the graph presented in Figure 4 that the total built area use in the samples selected from the new city was higher compared to that in the samples selected from the old city. However, when we look at built floor area use, it can be seen that floor area use was higher in the old city. It is seen that road area use was slightly higher in the new city samples. However, it appears that open space use was higher in residential samples in both the old and the new cities.

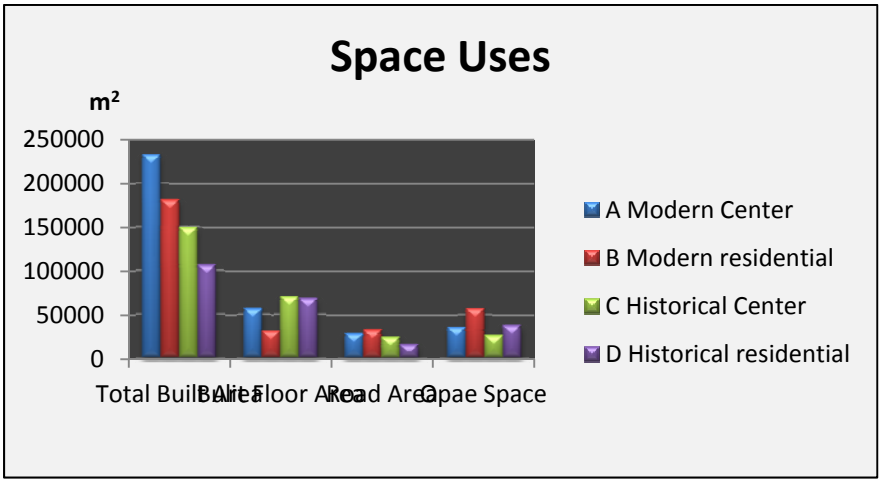

Figure 4 Graphical display of space use in selected sample areas

- **Livability Index**

An index named as 'livable area index', was used to identify the relationship between streets and their densities. This index gives a correlation between the total area of built environment and the total area of open spaces in a street zone. The open space concept is defined in a more detailed way in this study as well. Open space concept is divided into three parts as pedestrian's areas, parking areas and recreational areas. (Bölen, et al, 2005).

From this point of view, the correlation between walkable open space and total built environment was evaluated for the selected sample areas (Table 3). The most important point here is to be able to put *the open spaces that are walkable* to good use. We can easily calculate the walkable open space of the new city by subtracting the road areas and built floor areas from the total sample area. However, the concept of walkable area in the old city requires a more detailed evaluation and examination for both the sample in the commercial area and the sample in the residential area, because the present fabric of the old city resembles the spatial structure observed in traditional Islamic settlements (Hakim, 1986). For this reason, it is seen that

roads and open spaces are used in a different dimension. The narrow width of the roads does not allow driving vehicles and the roads are used only by pedestrians (Figure 5-D). Open spaces, on the other hand, are mostly used as courtyards inside buildings. In the commercial area of the old city (Figure 5-C), courtyards are open spaces that everyone can publicly use. However, they are used as private spaces rather than public spaces in the residential area of the old city. Within this scope, the sum of road areas and open spaces was accepted as “walkable area” in the commercial sample, whereas, since almost the entire open spaces were in private use, only road areas were regarded as “walkable areas” in the residential sample. Afterwards, livable area values were found by calculating the ratio of the walkable areas to the total built area for each sample.

Table 3. Correlation between total built area and walkable open space

Selected Samples		Livable Space Index
A	Commercial (New City)	0.153
B	Residential (New City)	0.316
C	Commercial (Old City)	0.338
D	Residential (Old City)	0.146

Therefore, the commercial area selected from (Figure 5-A) the new city and the residential area selected from the old city had close values in terms of the livable area index. Similarly, it was observed that the residential area (Figure 5-B) samples selected from the new city and the commercial area samples selected from the old city had values close to each other.

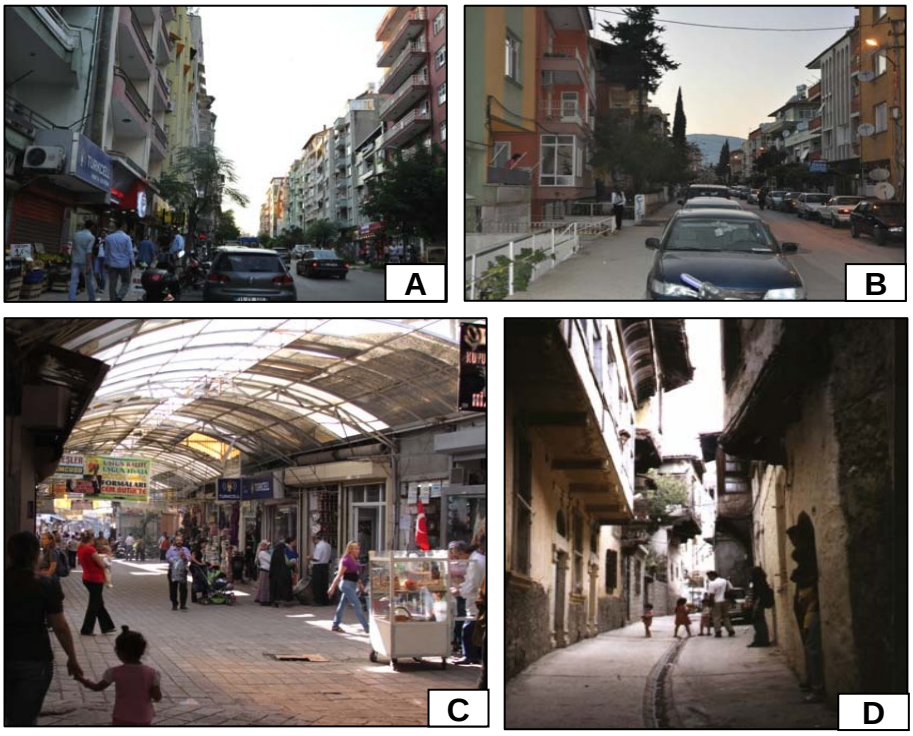

Figure 5. Street pattern Selected samles

B- Space Syntax Analysis:

Firstly, the axial map of the city of Antakya was generated and the Space Syntax analyses were performed by using Deptmap software. Based on the results of these analyses, the integration values of the city were calculated and an integration map was generated (Figure 6). Furthermore, the integration maps of the selected sample areas with respect to the whole city are presented in Figure 7.

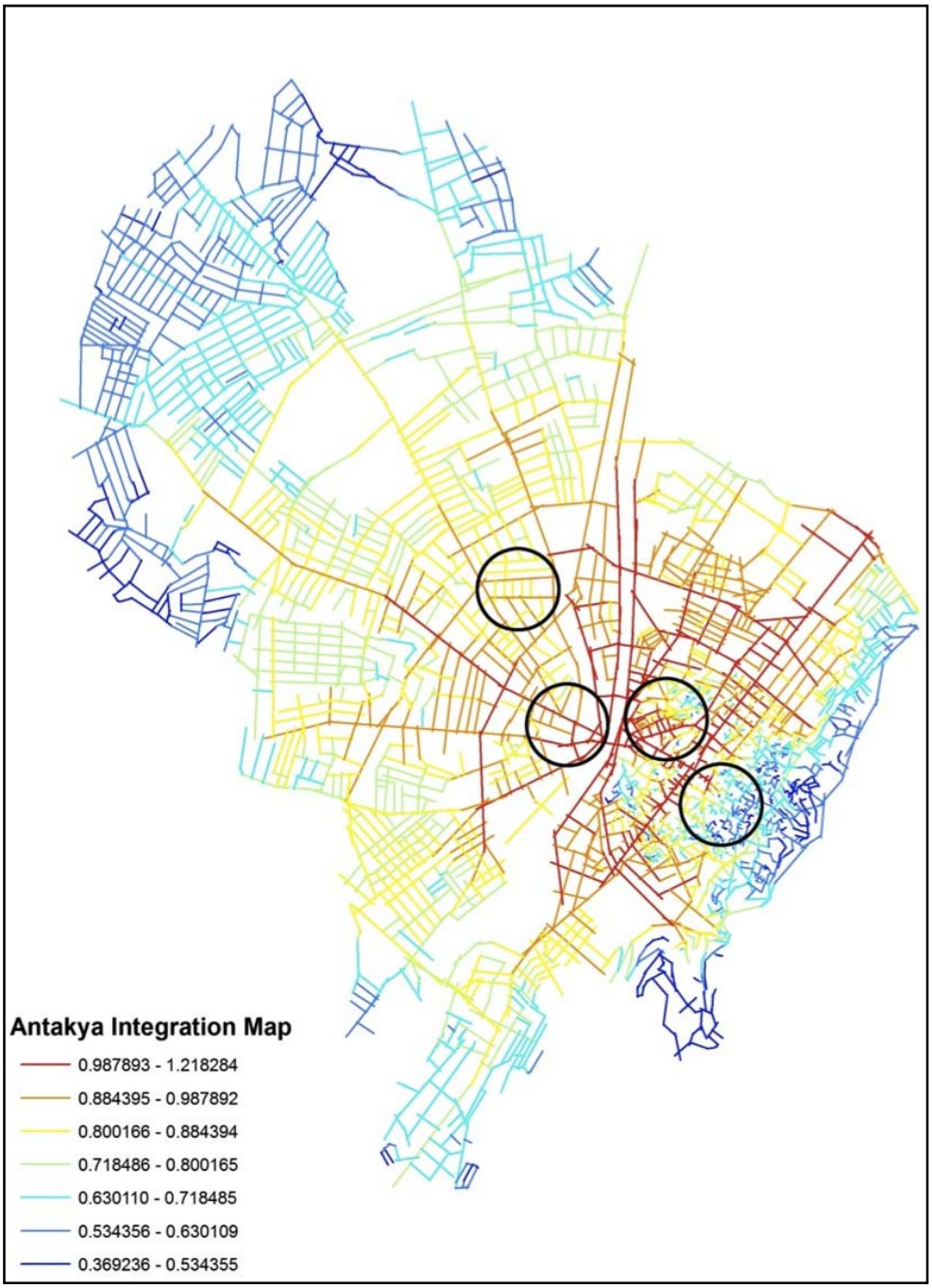

Figure 6. Integration map of the city of Antakya

Afterwards, integration values and intelligibility values of the whole city and the defined sample areas were comparatively analyzed.

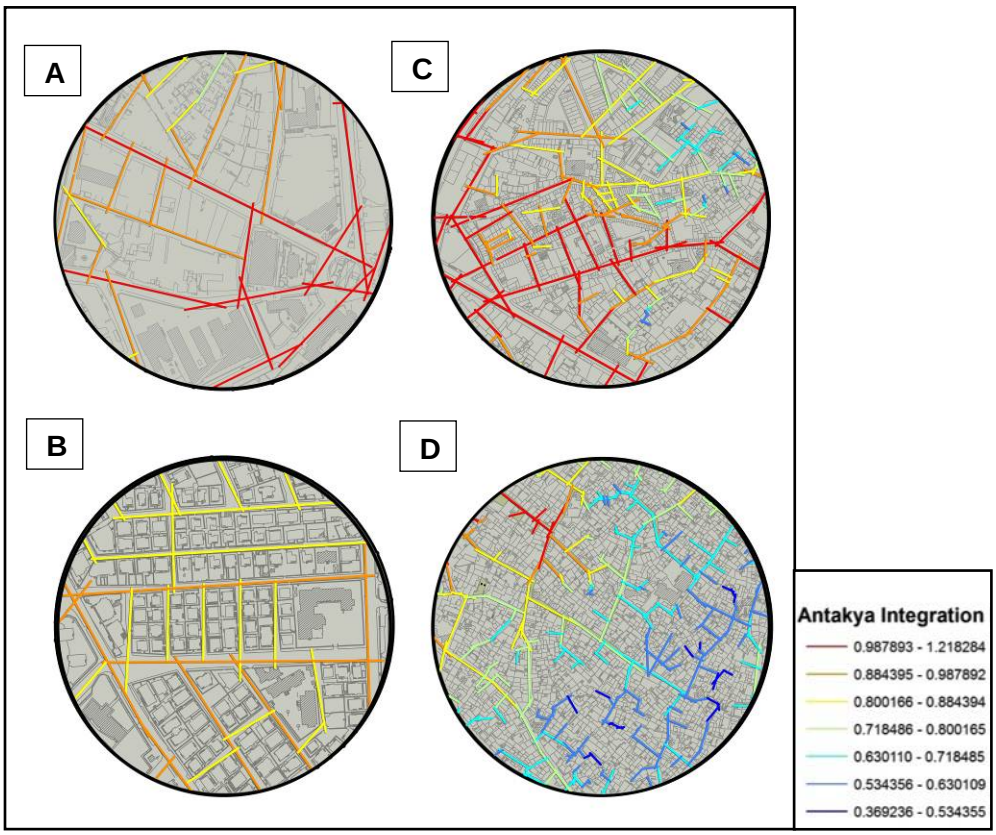

Figure 7. Integration map of the selected sample areas

When we examine **the mean integration** values in the selected sample areas, it can be seen that the commercial area sample selected from the new city has the highest mean value (0.932). The residential sample in the new city and the commercial sample in the old city have close integration values, whereas the residential area sample in the old city has the lowest integration value. This situation can also be observed in the maps presented in Figure 6 and the values presented in Table 5.

The intelligibility value for the whole of Antakya was found to be 0.327. As for the selected sample areas, intelligibility value was found as 0.541 for the commercial area and 0.384 for the residential area selected from the new city. These values were found to be 0.353 for the commercial area and 0.572 for the residential area selected from the old city (Table 4).

Table 4. Intelligibility values calculated in selected sample areas

Selected Samples		Syntactic Measures	
		İntelligibility	**Mean Integration Values**
A	Commercial (New City)	0.541	0.932
B	Residential (New City)	0.384	0.857
C	Commercial (Old City)	0.353	0.863
D	Residential (Old City)	0.572	0.677

5. EVALUATION AND CONCLUSION

Urban morphology is the study of the form and shape of settlements. Appreciation of morphology helps urban designers to be aware of local patterns of development and process of change. (Carmona, 2001).

In urban morphology, urban form is understood through the study of the processes shaping it (Larkham, 2002). In the present study, two separate comparative analyses were performed for the four samples which were selected from the Old and the New city and each of which had experienced a different spatial shaping process.

In the evaluations that were performed based on the livable area index, the commercial area selected from the new city and the residential area selected from the old city had values close to each other. Similarly, the residential area sample selected from the new city and the commercial area sample selected from the old city had close values.

When the mean integration values are examined, it can be seen that the commercial area sample selected from the new city had the highest mean value (0.932), whereas the residential area sample in the new city and the residential area sample in the old city had values close to each other, and the residential area sample selected from the old city had the lowest (0.677) integration value.

When the intelligibility values are examined, it can be seen that the values for the commercial area sample selected from the new city and the residential area sample selected from the old city were close to each other. Similarly, the values for the residential area sample selected from the new city and the commercial area sample selected from the old city were found to be close to each other.

In conclusion, we can see that there is a very strong relationship between the livable area index values and intelligibility for the selected sample areas.

Table 5. Numerical evaluations conducted for the selected sample areas

Selected Samples		Area Use (m^2)					Syntactic Measures	
		Total Built Area	Built Floor Area	Road Area	Open Space	Livable Area Index	İntelligibility	Mean Integration Values
A	Commercial (New City)	231.976	56.693	28.826	35.481	0.153	0.541	0.932
B	Residential (New City)	180.625	31.022	32.942	57.036	0.316	0.384	0.857
C	Commercial (Old City)	149.183	70.532	24.638	25.830	0.338	0.353	0.863
D	Residential (Old City)	106.044	68.093	15.536	37.371	0.146	0.572	0.677

When we visually examine the spatial area use, a comparison of the commercial area sample selected from the new city and the residential area sample selected from the old city shows that intelligibility values and livable area index values were found to be very close to one another, whereas integration values were found to be highly different.

It was observed that the residential area sample selected from the new city district and the commercial area sample selected from the old city district not only had close intelligibility and livability index values but also had close mean integration values (Table 5).

The conclusion we have reached here is that no matter how different the spatial formation process of each selected sample is, it is a fact that the analysis of the structural and numerical data regarding the use, shaping and the design process of the space will provide very important contributions to understanding the stage reached today and the space design processes to be performed in the future.

It is considered that the comparisons performed in the present study will contribute to the work of urban designers, urban morphology studies and planning.

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