

---

# PERCEPTION AND INTELLIGIBILITY IN THE CONTEXT OF SPATIAL SYNTAX AND SPATIAL COGNITION:

reading an unfamiliar place out of cognitive  
maps

---

127  
sp

**Ezgi Tuncer**

*Faculty of Architecture, Yildiz Technical University*

**Keywords:**

Space syntax  
Intelligibility  
Cognitive map  
Unfamiliar place  
Spatial cognition

**Ezgi Tuncer**

*Department of Architecture,  
Faculty of Architecture, Yildiz  
Technical University, D-212,  
Besiktas 34349, Istanbul, Turkey,  
90 212 2597070 – 2339  
etuncer@yildiz.edu.tr*

## Abstract

The purpose of this paper is to read the intelligibility of a place out of its cognitive maps drawn by the newcomers. In this study, which routes are initially perceived and depicted nonetheless, the relationship between these routes and their syntactic values in the present map are the base research issues. The intelligibility of the settlement is tried to capture from the newcomers' newly formed cognition and its reflection on the maps. Ataköy Phase 2, a mass housing area in Istanbul, was analyzed in this case. After 25 students, completely unfamiliar with the place, had been given extensive information; they were brought to the area for an excursion taking a day. Next, they were expected to draw cognitive maps of the layout. The maps derived from the students and the present map were analyzed and compared by their syntactic values. As a result of the evaluation of the data, the most depicted five ways in cognitive maps are found to be the most used ways and the most integrated axes in the axial map of the present map. This uniformity supports that there is an emphatic relationship between the intelligibility of spatial configuration and spatial cognition.

## Introduction

Kevin Lynch, in *The Image of the City* (1960), concentrates on the visual quality of the American City – especially on its one particular visual quality: the apparent clarity or “legibility”: “the ease with which its parts can be recognized and can be organized into a coherent pattern.” To him, “legibility is not the only important property of a beautiful city but, it has an important meaning in thinking environments at urban scale of size, time and complexity”. To understand this, he thinks that it's necessary to consider the city perceived by its inhabitants not only as a thing itself. In many researches related with space syntax and way-finding, the ease of the perception of a place and the effect of configuration on its users in the context of ‘orientation’ and ‘wayfinding’ have been argued with the Hillier's “intelligibility” concept. In *Space is the Machine* (Hillier, 1996), intelligibility is defined as: “The property of ‘intelligibility’... means the degree to which what we can see from the spaces that make up the

system.” In this study, in the context of Lynch’s definition, the legible parts of the configuration are searched in the cognitive maps of an unfamiliar place drawn by the newcomers. In addition to that, the place is analyzed by the Hillier’s analysis technique and it is measured in intelligibility. Findings derived from the cognitive maps and from the syntactic analyses of the place are coherent to each other.

Penn (2001) refers to Kim’s doctoral study which investigates the relationship between urban configuration, cognition and behavior of its inhabitants. Kim and Penn (2004) found that “spatial syntax of configuration in real environments and spatial syntax of cognitive maps in spatial cognition are closely related”. In Baskaya et.al. (2004), the importance of unfamiliarity with the configuration is impressed. In Haq and Giroto (2003), the relationship between intelligibility and wayfinding is searched.

The purpose of this study is to read the intelligibility degree of a place through its cognitive maps composed of the representation of the perception of the strangers who had just experience the configuration. By this reading, the clear and legible routes which ensure the intelligibility of the place can be understood. In this study, the starting point is to search the routes which are internalized and transformed to the cognition and maps and the relationship between these represented routes and their syntactic values in real maps. Therefore, in this study, participating of the strangers is expected to be more efficient and appropriate. Furthermore, in some of the previous studies, it was seen that inhabitants’ orientation and behaviors occurring through the syntax of the place were lost because of the familiarity with the place. Consequently, in this study, it is aimed to reduce the misleading effect of the time so the newcomers were chosen as volunteers.

In data analyses, a congruent approach to Kim’s (2001) for the comparison of the cognitive maps and the real map of the settlement is used. By Kim’s analysis technique, a quantitative reading was achieved to the cognitive maps and a numerical comparison opportunity was provided. Kim’s study is very significant and inspiring in this case, for this study. Consequently, a similar approach is used however, in this study which is one of the pilot studies of a newly began doctorate thesis, the scope is restricted.

### ***Syntactic Description of the Place: Ataköy Phase 2***

The study area is one of Istanbul’s first suburban mass housing regions. The primal steps of this project, Phases 1 and 2 are today important examples of urban planning and architecture of the late 1950s and 1960’s. Ataköy is located on the west direction of the city, between the international airport and the metropolitan settlement region of İstanbul. The study area, Ataköy Phase 2, is bounded by Ataturk Avenue to the east, Conk Bayiri Street to the west and north and Aliriza Efendi Street to the south. For the syntactical analysis of the configuration, the layout of the study area Ataköy Phase 2 and its close surrounding, Ataköy Phase 1 and Phase 5 are represented as an axial map. Then, the global integration map of the region is produced. Its integration values range from black for the most integrated line to gray for the least integrated line.

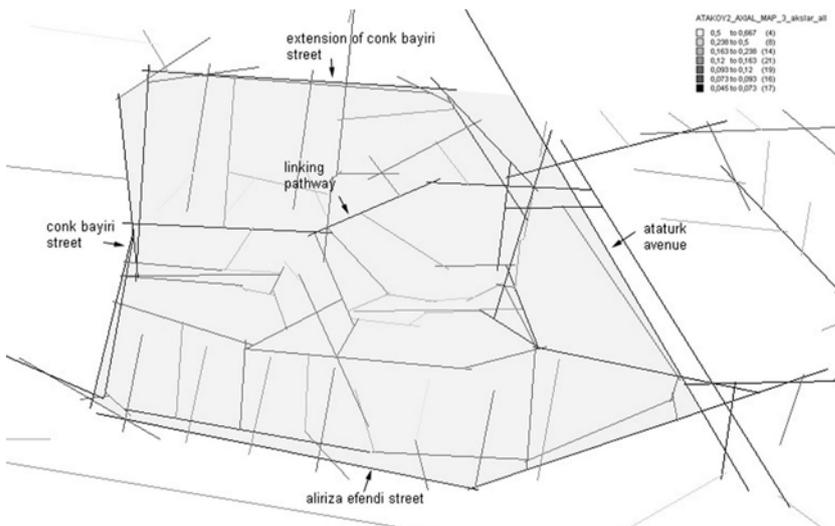
In Figure 1 the global integration map of the region is composed of 205 lines. Ataköy Phase 2 is surrounded by two highly integrated spaces, the Ataturk Avenue and Aliriza Efendi Street. Following the similar procedure, the local (radius 3) integration map is produced. These integration maps and the syntactic values of each space allow to a reading on the configuration.



127-03

**Figure 1:**

*The global integration map of Ataköy Region*



**Figure 2:**

*The local integration map of Ataköy Phase 2*

Figure 2 represents the local integration map of Ataköy Region showing how integrated or segregated each space is. As it is seen from the figure, the region is surrounded by the most integrated spaces that are connected to the most integrated road, Ataturk Avenue. The pathways between the buildings are the least integrated

roads however; one of those is more integrated than the others. It is the way linking the west road to Ataturk Avenue, passing by the market place and the primary school in the settlement.

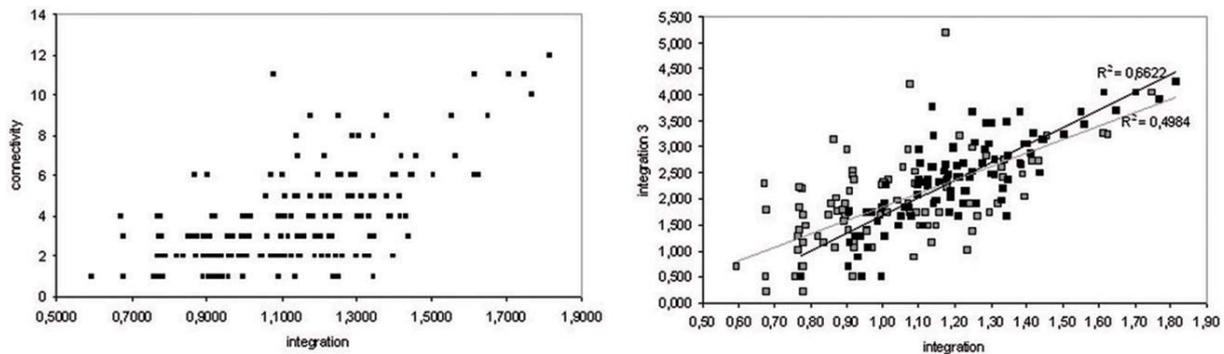
Table 1 below notes that the local integration map has 99 spaces with the max and min integration values. The max integration 3, as well the min RA\_R3 values belong to the space representing Ataturk Avenue as the most integrated space. Hillier's (1996) reading of the intelligibility from a diagram is defined as the degree of the correlation between the connectivity and the integration values of each line representing the layout.

**Table 1:**

*Local integration*

No of space	99		
max con.	12		
max integration	1,8167	max integration 3	4,2522
min integration	0,7736	min integration 3	0,5
Intelligibility - r square			
(integration - integration(3))	0,6622		
(integration - connectivity)	0,3976		

127-02



**Figure 3:**

*The scattergram of the intelligibility of Ataköy Phase 2*

To the exposition of the scattergram, this settlement is not much intelligible. As the points didn't form any perfect line, for Hillier (1996), "connectivity is no longer a good guide to integration and therefore as we move around the system we will get very poor information about the layout as a whole from what we see locally". Hillier (1996) defines intelligibility by the relationship between the local and global integration also. Thereby, it could be inferred how a local area connects to its environment. This relationship presents if an area is intelligible in its global context. The scattergram of the intelligibility of Ataköy Phase 2 is formed by the integration and integration 3 values show a similar direction of a fine level correlation (at right, in figure 3). The local area represented by black dots doesn't form an exact linear scatter as it is explained in Kim's paper (2001). Consequently, this settlement doesn't have a perfect intelligible layout. Hereafter, if this settlement is not much intelligible, what was depicted in cognitive maps of the volunteers related with the settlement?

**Procedure**

Extent to an international workshop in Ataköy Phase 1 and 2, a group of academic architect and students from different countries had come to Istanbul for a week. After they had been given extensive information about the settlement; they were brought to the area for an excursion taking a day. After the bus-tour around the whole region, the volunteers were left to discover the settlement. In the second day, after a brief explanation about this study, a task, composed of a survey and a base map for the cognitive map, is given to 28 people. Next, they were expected to draw cognitive maps of the spatial layout of Ataköy Phase 2 in 15 minutes. To get a common language in scale of drawings, five important focal points are defined on the paper; the

mosque, the park, the market place, the primary school and line of the railway. The volunteers were asked to draw to the scale of the base drawing and to depict the routes with two parallel lines.

### Data Analyses and Results

48 % of the volunteers are in the age between 20 – 25 and undergraduate student, 88 % of them are from the faculty of architecture, and 56 % of them are female. Firstly, despite of the errors, incompleteness of the layout, distortions of the roads in the cognitive maps of the newcomers, 25 of them were found acceptable to be analyzed. Secondly, the most depicted roads were counted from the maps. As a result of this counting of the figures in cognitive maps, five roads; Ataturk Avenue, Conk Bayiri Street, the extension of C.B.S., Aliriza Efendi Street and the pathway linking C.B.S. and Ataturk Avenue were found as the most depicted roads. For the next step, the sketch maps were digitalized and axial maps of each map were drawn to measure the mean syntactic values of the configuration. Because of the distortion on the drawings, there was decreasing or increasing in the number of axes of the roads. This type of perceiving mistakes are taken into consideration in comparison.

**Table 2:**  
Connectivity

	no. of spaces	connectivity	Mean Int(3)	Mean Int
Ataköy Region (whole system)	205	3,620	2,107	1,105
Ataköy Phase 2	99	4,323	2,379	1,209
Cognitive Maps	8,360	2,162	1,237	0,959

It can be read from the Table 2 above, although whole system has 205 spaces and the study area has 99 spaces in the integration maps, the connectivity value in the local area is higher than it is in the global context. It means the local area has more connection than its environment. To compare the values in the local area with the cognitive maps', it could be remarked that an average the cognitive maps have faint spaces and connectivity. It means the local area could be perceived by only its highly legible roads.

In Table 3 below, it is seen that the most depicted five roads in 25 cognitive maps have the highest local integration values in the real map. At time same time, the intensity of the movement is mostly observed in the most depicted ways. In the axial map of the real map, three roads have more axes than they have in the axial maps of the cognitive maps. It means these three ways were perceived more straightly. Ataturk Avenue has one straight axis in the axial map of the real map as it is the same in the axial maps of the cognitive maps. The linking pathway was perceived and drawn in the cognitive maps as nearly the same as it is in the real map.

**Table 3:**  
Most depicted roads with highest integration values

Most often depicted roads in 25 cognitive maps	Degree of appearance in cognitive maps %	Int.3 in real map	Number of axes in real map	Number of axes in cognitive maps
Ataturk Avenue	92	4,2522	1	% 81 – 1
Conk Bayiri Street	88	3,2196	3	% 46 – 1
Ali Riza Efendi Street	84	3,4888	3	% 68 – 1
Linking Pathway	60	3,2380	3	% 44 – 3
Extension of Conk B. Street	56	3,4579	2	% 73 – 1

### Conclusion

The paper tried to state the connection between the perception and intelligibility of a spatial configuration. If the perception of a place is easy then it may be considered that its configuration is legible. As a result of this case study, although the settlement is not seemed to be much intelligible neither in the local nor in the global context, some of the common features of the settlement are gathered from the

127-02

cognitive maps that give an idea about the perception of the configuration. The most depicted five ways in cognitive maps are found to be the most used ways and the most integrated axes in axial map of the present map. It means the most integrated roads which have the highest potential of the movement passing on it are the most perceivable and legible roads that they were drawn mostly. Having a high integration with the whole system makes a road easy to be perceived. Consequently, the intelligibility is significant for perception of the spatial configuration. There is a continual connection between the intelligibility of a spatial configuration and perception of the configuration and its effect on the spatial cognition.

### References

- Baskaya, A., Wilson, C., Ozcan, Y., 2004, "Wayfinding in an Unfamiliar Environment Different Spatial Settings of Two Polyclinics", *Environment and Behavior*, 36, 6, 840.
- Haq, S., Giroto, S., 2003, "Ability and Intelligibility: Wayfinding and Environmental Cognition in the Designed Environment", J. Hanson (Ed.), *Proceedings*, 4<sup>th</sup> International Space Syntax Symposium, UCL, London.
- Hillier, B., 1996, *Space is the Machine*, Cambridge University Press, Cambridge.
- Kim, Y.O., Alan, P., 2004, "Linking the Spatial Syntax of Cognitive Maps to the Spatial Syntax of the Environment", *Environment and Behavior*, 36, 4, 483.
- Kim, Y.O., 2001, "The Role of Spatial Configuration in Spatial Cognition", J. Peponis, J. Wineman, S. Bafna (Eds.), *Proceedings*, 3<sup>rd</sup> International Space Syntax Symposium, Atlanta.
- Lynch, K., 1960, *The Image of the City*, M.I.T. Press, Cambridge.
- Penn, A., 2001, "Space Syntax and Spatial Cognition Or, Why The Axial Line?", J. Peponis, J. Wineman, S. Bafna (Eds.), *Proceedings*, 3<sup>rd</sup> International Space Syntax Symposium, Atlanta.