

VĚDECKÉ SPISY VYSOKÉHO UČENÍ TECHNICKÉHO V BRNĚ

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**Integration of Social Life  
with Urban Space Syntax**

BRNO UNIVERSITY OF TECHNOLOGY  
FACULTY OF ARCHITECTURE  
DEPARTMENT OF THEORY

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**INTEGRATION OF SOCIAL LIFE  
WITH URBAN SPACE SYNTAX**

Integrovaní společenského života  
a urbánní prostorové syntaxe

Shortened Version of the Ph.D. Thesis

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## Introduction

The literature on human cognition suggests that configurational aspects of the environment have significant consequences on the way in which people constitute a mental representation of space and behave. For example, in Lynch (1960), for the area to be imageable, a high continuity and distinctively interconnected parts are required. Golledge and Stimson (1997, cited in Kim & Penn, 2004) emphasized that the path used in everyday behavior becomes a critical feature of the individual's spatial image. Tversky (2003) suggests that people perform better on spatial judgment and memory tasks for places that can be accurately schematized and integrated with other spatial knowledge. While studies in the field of space syntax, suggest that certain configurational aspects of space of both buildings and urban forms affect human activity (Hillier, 2007) and (Hillier & Vaughan, 2007).

In attempts to fill the gap in this area, some studies focused on bringing together these two aspects; through the investigation of the relationship between syntactic configuration of space and people's spatial cognition although from different perspectives. For example, Kim and Penn (2004) investigated the effects of the spatial configuration of the local environment on residents' spatial cognitions of their built environment. Haq and Zimring (2003) investigated whether people's topological knowledge changes as they get to know a setting. Abram (2006) examined the relationship between environmental configuration and spatial cognition. They have found a considerable link between the two aspects. However, they all proceeded from a common thought that considers configuration of space as a key base for people's cognitive mapping process.

On the other hand, there is a view which considers cognitive mapping as a process that is culturally constrained, and results in the filtering of messages from the environment where they live. It stresses the "importance of cultural cognitive habits in order to understand the way in which the environment is conceived and structured by the individual" (Rapoport, 1977: 108). This means that the cognitive mapping outcomes depend on the way in which people give meaning to a certain urban form or specific space layout. In other words, the cognitive mapping is considered to be an outcome of environment structure that is influenced by people's values and settings across cultures, it reflects people's understanding of what is the satisfactory place or the acceptable environment, based on the congruence between the environment structure and their values.

Based on this view, this study examines the relationship between space configuration and spatial cognition within two culturally different environments. It deals with a main question, whether the association between these two aspects; space configuration and spatial cognition within study areas that have people with different values and cultural background, runs in parallel with the results that have already been confirmed by the aforementioned studies. To what extent the environment structure matches people's values, or whether the evaluation of space from the perspective of the cultural values remains a point of concern to people, will be determined by investigating the aspect of place satisfaction in order to examine whether the difference in the cultural values affects the outcomes of cognitive mapping, and its relationship with the configurational features.

### **Research Objective**

The main purpose of the study is to investigate the association between configurational features and cognitive representations and, thus, throw light on how the difference in peoples' cultural background affects this association. This investigation will be discussed in the light of the following research questions:

1. Is there a link between spatial cognition and people's satisfaction about their local place?
2. How does people's satisfaction about their local place affect the association between space configuration and spatial cognition?
3. Which cultural values are most associated with the findings of spatial cognition?

The author hypothesizes that the cognitive mapping process (the way in which people schematize and recall their local space layout) depends on how people value and satisfy with the given space, based on their values and other cultural considerations as a basic filter for space evaluation. This means that the association between space configuration and spatial cognition will be affected by the aspect of place satisfaction; since we will have different outcomes of cognitive mapping that do not only depend on the configuration of space, but also on how people value and satisfy with their space. Several cultural settings are taken into consideration to examine whether the local space suits people's values, and as a result, how they are satisfied with this space. The thesis

essentially hypothesizes that the more the people are satisfied with the space, the more accurate the process of recalling and schematizing the space layout will be.

## **Cognition and Culture**

Based upon reading of the literatures, on people's cognition of environmental knowledge, it seems that two schools of thought predominate; psychological, and anthropological (Rapoport, 1977). Although both agree about the importance of cognition as a mediating mechanism between the individual and the environment, the psychological view tends to stress knowledge of the environment, while the anthropological takes the position "that there are different ways in which meaning can be given to the world". This view of environmental cognition shows that it is mostly about giving meaning to the world rather than knowing about it (P. 108). The latter perspective, simply, considers cultural cognitive habits to be a significant factor to understand the way in which the environment is conceived and structured by the individuals. Different studies in this field have emphasized the two views to the way in which people gain knowledge of the environment.

In this thesis, we discuss particularly, the studies that consider the cognition outcomes to be influenced not only by the physical layout of space (the way in which space is organized and structured) but rather, by the way in which people have different perspectives to the knowledge gained from a certain space layout, based on their cultural settings and background. Here, are some examples of studies in this regard. Searching for the image of the city, Kevin Lynch (1960) introduced two key terms: imageability and legibility. Imageability is how an easy understanding of the environment to form a clear mental image, while legibility is the capability of the object to be easily understood or recognized. In Stokols and Shumaker (1981), the cognition "is defined as the process of making sense of" and coping with the environment which includes not only the observable physical environment but also the many and varied social and cultural environments that impinge on our lives and behaviors. Also, the process of individual's cognitive mapping is considered in Golledge (1987) as a product of cultural filtration, it is the process that is culturally constrained, and results in the filtering of message from the environment in which we live in, considering the cognitive map to be an individual's model of the world.

Appleyard (1979) defined different cultural settings that work as filters and process the cognitive mapping outcomes, as he defines an essential part of the environmental cognition to be not only spatial knowledge, but is culturally coded in terms of symbolism, values, beliefs, and so on. This view of the environmental cognition has also been emphasized by Tuan (1977, cited in Golledge, 1987: 150). It implies that part of environmental meaning is symbolic. "I. e., that particular places can stand for an idea". Almost all these studies agreed on that there is an essential view needs to be taken into consideration while discussing spatial cognition. The view considers the human aspect which is variant across different environments and cultures, to have a significant influence on the product of spatial cognition alongside with the aspect of form and quality of space.

### **Cross Cultural Mental Representation**

The characteristic of environmental meaning from a cross-cultural perspective has been emphasized by Rapoport (1977) who suggested that the mental maps differ based on people's values believes, symbols, and other cultural significance of place. This means that the form of people's mental map about their local space might differ between two different environments according to the difference in the cultural background. In this regard, Rapoport (1977: 14-129) discusses and cites many studies that deals with the issue of a cross-cultural mental representation of space, and why the form of cognitive map is variant in different cultures or environments. For example, in Holland, the city image findings of Lynch (1960), (who suggested 5 elements most likely to be noticed by people: districts, edges, paths, nodes and landmarks), were confirmed. For map images, seem easiest to form where the street pattern is regular with a single dominant path, and where there are characteristic nodes and unique landmarks. In a different culture, Lebanon, there was general agreement once again but also greater differences, particularly the greater importance of socio-cultural associations relative to visual cues, i.e., both visual form and social significance were important in the construction of urban images. He argues that since cognitive maps are a product of the physical settings, cognitive style, and socio-cultural associations, that is why in Lebanon distinctive areas of quarters of the city are stressed rather than individual elements or paths (as it was the case in Holland). He, furthermore, suggests that this reflects the nature of the traditional Muslim city which is a cluster of special districts; ethnic, religious, trade or use.

According to Rapoport (1977) these cultural settings include worldviews (i.e., values, meanings, norms, standards, expectations, and rules), kinship relations,



family structure, and social networks. They can be considered a combination of values and beliefs that shape a world view or a way of life for a group of people. They are responsible of forming people's image of a proper environment. "These values tend to be embodied in images; whether of the good life, proper behavior or satisfactory and satisfying environment. All evaluation and design occur through matching against such images and the congruent acceptance or non-acceptance of behavior or environment" (P. 14). It can be summarized that cultural settings are a combination of values, beliefs, all rules and habits that create a lifestyle for a group of people, guide their world view and behavior to include their attitude toward the built environment. These values are also embodied in the individual's image of what is a satisfactory or an acceptable environment, and accordingly, affect the way people understand and get knowledge of the environment.

### **Form of mental Representation**

Literature in spatial cognition suggest that the mental representation of space is usually associated with some errors and differences from the real space, and do not represent the real world exactly, they also suggest that these errors are systematic and are tied to the mechanism and nature of cognitive processes. For example, Tversky (2003) relates this to the difference in the nature of and the rules that shape both spaces. In the same direction, (Taylor & Tversky, 1996, cited in Tversky, 2003: 72) state that directions and axes are not represented in mental space analogically or metrically in exact degrees or meters but rather somewhat categorically. They are schematized into elements and paths relative to reference frames that allow integration of fragments into a whole. However, these differences involve errors in the alignment of objects, differences in distances between objects in the mental map from those in the real world, and distortion in the cognitive map.

To overcome these errors and differences, which are usually associated with the cognitive mapping process, this study adapts a new approach in order to accomplish the memory task. It includes asking a subject (the participants) to choose one correct map from among several other pre-established map forms, for each part (street) of the study area that is subject to investigation. This on site recall technique gives advantages over sketch mapping or map arrangement, since the latter is associated with above mentioned problems, besides, there are difficulties are often associated with both participant's performance of sketch map

and the translation of this map into the study analysis. More details of this procedure is shown within the section: Method and Procedures.

### **Studies in Syntax and Cognition**

Space syntax research suggests that places with certain configurational characteristics (i.e. higher integration) are used more frequently and by more people, are recalled more often by people, and are more accurately represented when recalled (Kim & Penn, 2004), (Haq & Zimring, 2003). Spatial cognition research suggests that people perform better on spatial judgment and memory tasks for places that can be accurately schematized and integrated with other spatial knowledge (Tversky, 2003). From these perspectives, researchers believe that there is an area of connection between the features of the built world (space configuration measured by space syntax) and spatial judgment and memory tasks (environmental cognition field). Suggesting that space syntax measures, such as integration, should predict performance on spatial cognition and human activities.

A study by Haq & Zimring (2003) is concerned with comparing the cognitive maps drawn by the participants and the connectivity values of the real maps. One of the strong research findings of this article was, the important relationship between syntactic configurational measurements of space and cognitive mapping products drawn by the participants, they found a significant correlation between the frequency with which certain paths (axial lines) appeared on cognitive maps or sketch maps drawn by the participants and the connectivity values of the axial lines of the real space.

Understanding the relationship between configuration, cognition, and behavior also was the subject of a research by (Kim & Penn, 2004). The study combined observations of spatial behavior, questionnaire interviews, including a sketch-mapping exercise, and space syntax analysis of the spatial configuration of the area as well as of the sketch maps. He found strong correlations between axial integration in residents' sketch maps and axial integration of the real map, finding that more integrated streets were drawn more frequently.

Another study by Abram (2006) investigated the relationship between environmental configuration and spatial cognition using space syntax tools and theories. The case study was the campus of Carleton College and a set of undergraduate volunteers. An axial map analysis of the campus was performed,

and the participants were asked to complete a set of spatial judgment and memory tasks. He found that participants remember the highly integrated locations more accurately than they do the less highly integrated locations.

In general, these studies suggest that there is a significant correlation between the syntactic features of the real space and features of the maps resulted from spatial cognition tests. However, they stress one view to the theory of spatial cognition that considers the quality and form of space to be the basic key for understanding and processing the knowledge of the environment, while say nothing about the view that considers the differences in people's values and background to be an effective aspect of this understanding. Based on the latter view, this study suggests that the more the environment settings are suitable to people (and, as a result, they are satisfied with it), the more they understand and accurately cognize the spatial properties.

### **Place Satisfaction**

The study considers two key aspects of place satisfaction in the process of investigation: First, as a multi-dimensional construct focusing on different aspects of place; spatial features, human features, and functional features (Bonaiuto, M. et al, 1999), and second, as an evaluation of features (Mesch & Manor, 1998, cited in Hur & Jones, 2008: 620). This means that people express their attitude toward place satisfaction based on the level of congruence between spatial and functional features of environment on one side, and their socio-cultural settings and requirements on the other side. The study prepares a place satisfaction scale articulated in different dimensions. It covers aspects of spatial, functional, and cultural features. The scale includes a set of specific items; each one addresses a single feature of the local environment.

### **Method & Procedures**

The main tools and procedures used include the following:

**Configurational analysis:** Space Syntax analysis was used to model the area of Brno center and Old Damascus. The spatial analysis was done by creating an isovist map based on a set of graph of lines of sight from different points within the space, and analyzing the resulting matrix for patterns of 'integration' with computer software (figure 1).



Figure 1: The Visibility Graph Analysis (VGA map) of the study area, points marked with the red colors refers to the most integration values, and the dark blue to the least, (left) area of Brno Center, (right) Old Damascus.

"The program allows a user to import a 2D layout in drawing exchange format (DXF), and to fill the open spaces within this layout with a grid of points. The user may then use the program to make a visibility graph representing the visible connections between those point locations. Once the graph has been constructed the user may perform various analyses of the graph" (Turner, 2001). A well integrated location is shallow (in terms of number of steps) to all other locations; that is, you do not have to turn often to get from the location to any other in the system. A poorly integrated location is deep with respect to other locations". Well integrated locations are colored red (or black), poorly integrated ones are colored blue (or light gray) (Turner, 2004).

**Cognitive Mapping Task:** A multi selection pre- arranged map is prepared for each street subject to the respondents selection, the road is depicted in five different forms from which the respondent is asked to pick the correct one. In order to exhibit five different selections before the respondents, the street is divided into four areas (cut offs). In each selection (except one which is considered the correct illustration, remains without change) one or more of these division areas (cut offs) are replaced with another form in order to add an error ratio to each of the four selections. This makes them have 1, 2, 3, or 4 incorrect parts. An example is shown in figure (2).

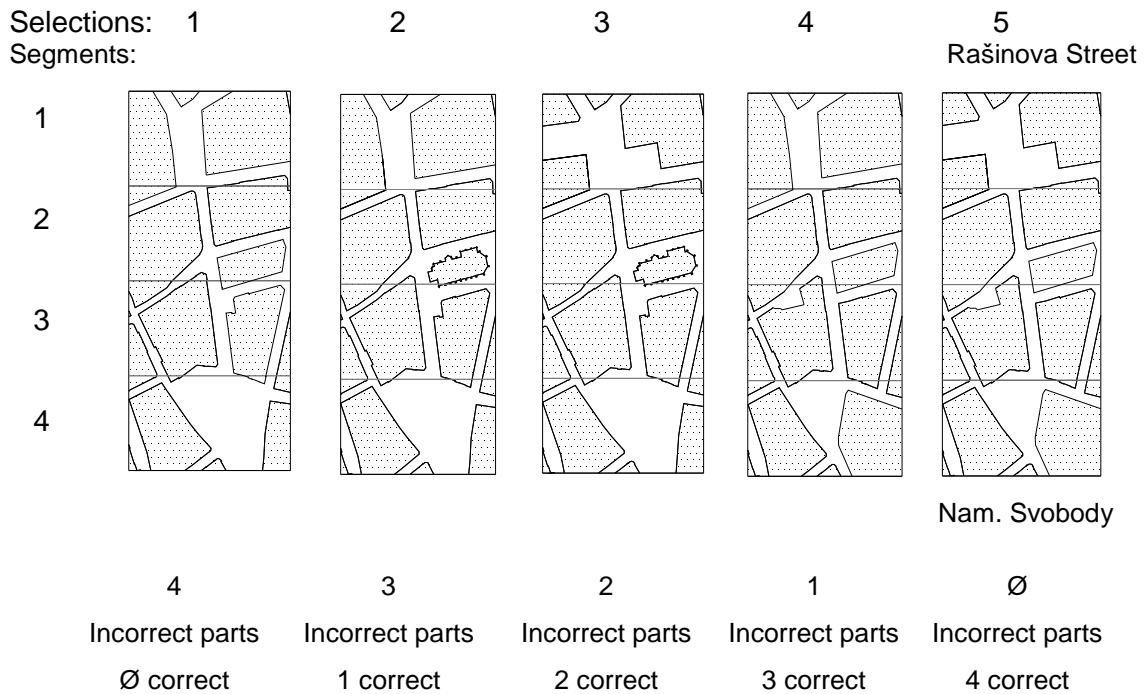


Figure 2: An example of a street map which is prepared with different ratio errors within the segments of each selection, the spatial cognition task is performed by asking the respondent to pick up the most correct map for the street subject to question, based on which of the maps he selects, a numerical value ranging from 0-4 (as shown below the map) are given as a rate for the respondent's spatial cognition (on- site recalling) task.

The respondent is asked; which is the best correct map for the specific road? Based on his answer, a value of ∅ or 1 is counted for each of the four cut offs, for example, if he chooses No. 1 (which all four parts are wrong), each cut off will be given the value (∅). On the contrary, if he chooses No. 5 (which all four parts are wrong), each part will be given the value (1).

This on- site recall has an advantage over sketch mapping. Since there are problems associated with sketch mapping procedure, these are: First, the assumption that the subject- whether child, adult, or retarded person- understand the abstract notion of a model and its relation to the real world and second, the initial difficulty of translating cognized spatial information from large to small scale (Golledge 1987: 157). In addition to these difficulties, literature in spatial cognition suggest that the mental representation of space is usually associated with some errors and differences from the real space, and do not represent the real world exactly.

**Place Satisfaction:** The questionnaire used in this study is a modified scale from Stedman (2002) includes using a 4-point Likert-type scale ranging from 'extremely dissatisfied' to 'extremely satisfied'. Respondents rate their satisfaction with (eight) different elements or characteristics of their local environment. The following aspects are involved in the satisfaction questions:

How would you rate the following elements of your environment?

- It reflects my identity and values: I am 'extremely satisfied' – 'satisfied' – 'dissatisfied' – 'extremely dissatisfied.'
- A Place for social relations:
- Accessibility of roads between center and surroundings:
- It has symbols that reflect my cultural orientation:
- A place that I have nice memories with:
- A good place to visit and walk around:
- Good place with regard to privacy and communality:
- How do you feel about the overall area?

## **Findings, Analysis & Discussion**

**Spatial Cognition and Place Satisfaction:** In this section, we investigate two of the research questions: First, whether there is a link between spatial cognition and people's satisfaction about their local place. Second, which values or aspects are most associated with the findings of spatial cognition? Table (1) shows that there is a considerable correlation between the two factors; spatial cognition and place satisfaction in the city of Brno, (with a value of  $R= 0.481$ ), although it is insignificant. This may be due to the small number of cases;  $n= 8$ . The statistical test here was based on the findings within the streets. The table also shows almost a close result of correlation between the same aspects in the city of Damascus. The diagrams in the figures (3 & 4) show the pattern of distribution for this relationship and the association between the two aspects for the different streets that were subject to survey. The diagram shows that, in Damascus, there is a less regularity of relationship than in Brno.

Correlations				Correlations			
		Cognition	Satisfaction			Cognition	Satisfaction
Cognition	Pearson Correlation	1	.481	Cognition	Pearson Correlation	1	.413
	Sig. (2-tailed)		.227		Sig. (2-tailed)		.309
	N	8	8		N	8	8
Satisfaction	Pearson Correlation	.481	1	Satisfaction	Pearson Correlation	.413	1
	Sig. (2-tailed)	.227			Sig. (2-tailed)	.309	
	N	8	8		N	8	8

Table 1: Correlation coefficient between spatial cognition and place satisfaction, (left) city of Brno, (right) old Damascus.

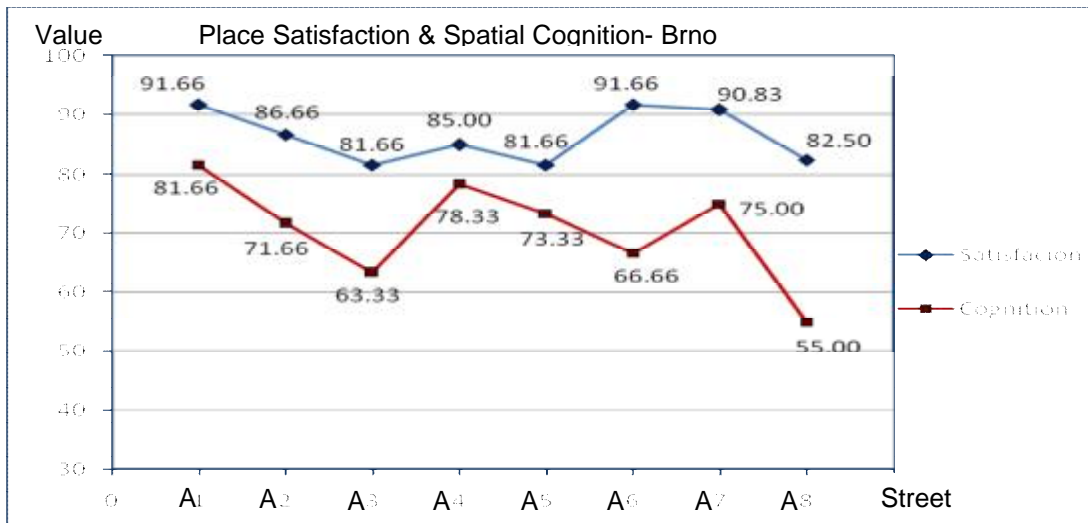


Figure 3: The association between spatial cognition and place satisfaction, city of Brno.

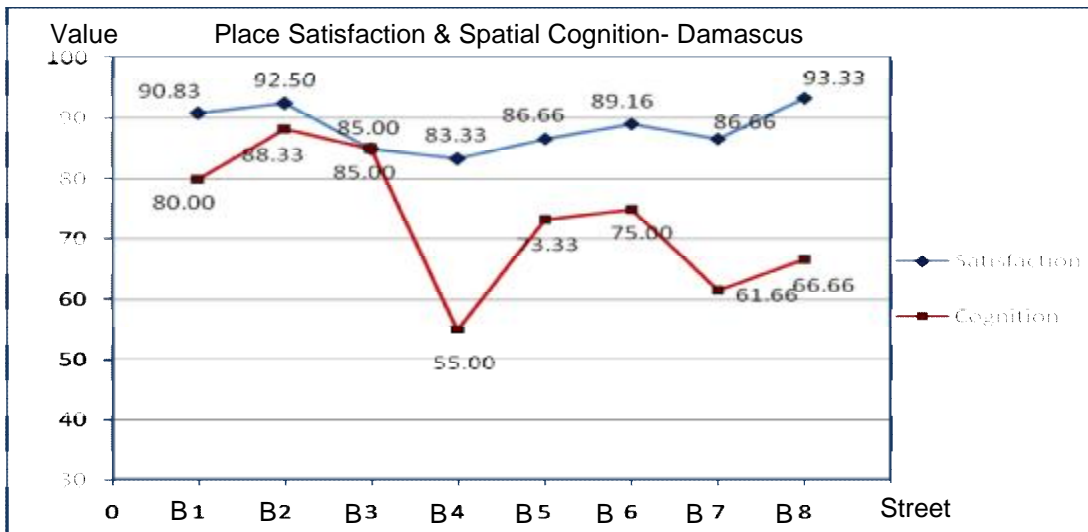


Figure 4: The association between spatial cognition and place satisfaction, old Damascus.

Another statistical test to investigate the link between cognition and satisfaction is done based on the answers of the sample of (120) respondents in each study area. The results shown in the table (2) indicate almost little low but significant correlation values. However, although the correlation is not strong enough, but it still gives an evidence for a pattern of association between these two aspects, suggesting that there is a potential influence of the way in which people are satisfied with their place on how accurately they can recall and form a mental representation of space. The possibility of this association is also supported by the overall results of cognition and satisfaction findings, as shown in the table (3), it can be suggested that cognitive mapping task is performed more accurately in Damascus than in Brno due to better sense of satisfaction that people have in Damascus.

		Cognition	Satisfaction
Cognition	Pearson Correlation	1	,316**
	Sig. (2-tailed)		,000
	N	120	120
Satisfaction	Pearson Correlation	,316**	1
	Sig. (2-tailed)	,000	
	N	120	120

		Cognition	Satisfaction
Cognition	Pearson Correlation	1	,398**
	Sig. (2-tailed)		,000
	N	120	120
Satisfaction	Pearson Correlation	,398**	1
	Sig. (2-tailed)	,000	
	N	120	120

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Table 2: Correlation coefficient between cognition and satisfaction, N=120, (left) city of Brno, (right) old Damascus.

City	Place Satisfaction (total)	Spatial Cognition (total)
Brno	86.46%	70.62%
Damascus	88.44%	73.13%

Table 3: The total percentage values for spatial cognition and place satisfaction in Brno and Damascus.

To identify which of the elements has the most effect on spatial cognition, a statistical test was done to investigate the association between cognition and different elements of the questionnaire, the correlation results are shown in the following table.



Elements/ Brno	Correlation (2-tailed) N=120	Cognition	Cognition	Correlation (2-tailed) N=120	Elements/ Damascus
1. Good place to visit		.252**	.354**		Cultural orientation
	Sig.	.006	.000	Sig.	
2. Cultural orientation		.229*	.267**		Social relations
	Sig.	.012	.003	Sig.	
3. Accessibility of roads		.175	.191*		Identity & values
		.056	.037	Sig.	
4. Social relations		.168	.164		Feeling about all
		.066	.073		
5. Privacy & communality		.133	.144		Place to visit
		.147	.118		
6. Identity & values		.113	.134		Having memories
		.219	.144		
7. Having memories		.102	.097		Accessibility of roads
		.266	.290		
8. Feeling about all		.001	.071		Privacy & communality
		.991	.439		

Table 4: Correlation coefficient between cognition and different elements of satisfaction questionnaire in both study areas.

Table (4) shows a clear difference between the elements that are most associated with the findings of spatial cognition in the two areas of study. In the city of Brno (left side), the question of whether the area of study is considered to be a good place to visit has the highest correlation value, ( $R = 0.252$ ,  $P < 0.01$ ), followed by the question about the cultural orientation as the second associated aspect ( $R = 0.229$ ,  $P < 0.05$ ), then the accessibility of road as the third, with insignificant correlation, and so on. While the results from Damascus (right side) show a different order for the most associated elements. The question of whether the place has symbols that reflect the individual's cultural orientation came with the highest correlation value among the two groups, ( $R = 0.354$ ,  $P < 0.01$ ), followed by the question about the social relations with the second correlation value ( $R = 0.267$ ,  $P < 0.01$ ). Then the question of whether the place reflects the individual's identity and values as the third, ( $R = 0.191$ ,  $P < 0.05$ ), and the aspect of feeling about all as the fourth.

It can be concluded that the findings of spatial cognition in Damascus are mostly associated with the socio-cultural aspects. As we can see from the table, the first four elements with the highest correlation values are falling within this category. While in the city of Brno, the first four most associated elements tend to represent different aspects of space; good place to visit as a functional, cultural orientation and social relations as a socio-cultural, and accessibility of roads as

a spatial aspect. In the next section, we test the relationship between cognition and configuration in the light of the results of this section.

**Spatial Cognition and Space Configuration:** As it was explained in the literature review, researches in this field have suggested a considerable association between spatial cognition and space configuration, particularly, the correlation between spatial cognition and visual integration. In this section, we will investigate this theory within two culturally different environments. The research hypothesis suggests that spatial cognition does not depend solely on space configuration (the form and quality of space layout) but rather on how the space is structured by individuals. This proposition is based on the theory that considers the process of cognitive mapping to be culturally constrained. This has been tested by calculating the association between the cognitive mapping outcomes for (32) segments of the streets maps and the correspondent maximum integration values within these segments in each study area. The resulting correlation is shown in the table (5); the relationship is also plotted in the scattergram shown in the figure (5).

Correlations			
		Cognition	Integration
Cognition	Pearson Correlation	1	.347
	Sig. (2-tailed)		.051
	N	32	32
Integration	Pearson Correlation	.347	1
	Sig. (2-tailed)	.051	
	N	32	32

Correlations			
		Cognition	Integration
Cognition	Pearson Correlation	1	.512**
	Sig. (2-tailed)		.003
	N	32	32
Integration	Pearson Correlation	.512**	1
	Sig. (2-tailed)	.003	
	N	32	32

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Table 5: Correlation coefficient between the frequency of spatial cognition values and the syntactic integration values of space, (left) city of Brno, (right) old Damascus

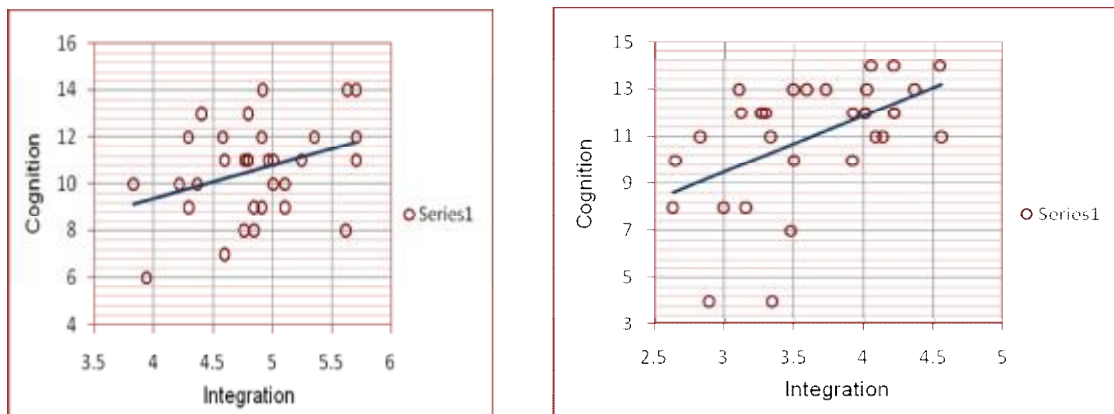


Figure 5: Scattergram between spatial cognition and spatial integration, (left) city of Brno, (right) old Damascus.

Table (5) shows an insignificant correlation between spatial cognition and space integration in the case of Brno city, ( $R = 0.347$ ,  $P > 0.05$ ), while in the case of Damascus, quite a stronger and significant correlation can be found, ( $R = 0.512$ ,  $P < 0.01$ ). The pattern of the association between the two variables in the figure (5) confirms this correlation result. The distribution is messy in the case of Brno city, but it is more organized in the case of Damascus.

This means; First, the association between cognition and configuration is not always significant, since we have different correlation outcomes from these two study areas. Second, if we arguably consider that there is always a strong association between cognition and configuration (which imply that places with higher integration values are more frequently depicted in sketch maps and more accurately cognised or mentally represented), then, we would expect to have higher results for the cognitive mapping in Brno than in Damascus, since the syntactic properties of space in Brno (figure 1) have reflected higher integration values. Quite contrary to this, the results of spatial cognition in Brno were less than those in Damascus, (as shown in table 5).

This indicates a possibility that the results of spatial cognition, as well as, the difference in the correlation between space configuration and spatial cognition within the two environments were affected by the aspect of people satisfaction about their place, although it is difficult to make an assertion about this possibility due to the small margin in the overall results of cognition and satisfaction between the two cities. However, the considerable correlation between the cognition and satisfaction, both in Brno and Damascus, (as found in the previous section) indicates a pattern of association between these two aspects, and supports the possibility of the effect mentioned above. It suggests that the relationship between spatial cognition and space configuration is variant between environments with different cultural backgrounds. This is due to the difference between people in the way they understand the meaning, conceive, and structure the space. Therefore, it can be concluded that the spatial cognition tends to be affected not only by the form and quality of space but also by people's cultural constraints and values.

## Thesis Summary

This epilogue takes the conclusions of the thesis chapters and discusses them in the light of the empirical findings. The thesis begins by addressing what was probably its predominant question. The question that was first posed in the Introduction; what is the pattern of the relationship between space configuration and spatial cognition in the sense of different cultural environments? The question springs from the efforts of previous studies that focused on bringing together two fields of study; psychology, and architectural and urban design. More specifically, the investigation of the relationship between spatial cognition and space configuration, probably, the triggering incentive for such studies was the development of the tools and theories of space syntax, over the past two decades, as a promising computational language for representing and translating the properties of space into mathematical based measurements, and thus, providing the ability to compare between different patterns of building spaces or city forms and many aspects of human activities, in order to determine the impact of spatial layout structure on activities such as pedestrian traffic, and way-finding.

Interestingly, many researchers in this field confirmed significant statistical relationship between configurational properties of space and people's cognitive mapping, the ability to recall and form a map of space. However, these studies proceed from a view that considers the quality and form of space as a key base for people's cognitive mapping, and say nothing about the view that considers the cognitive mapping as a process that is culturally constrained. The latter view, basically, suggests that cognitive mapping is a process that is filtered and constrained in terms of individual and group's values, beliefs, ideas, rules, worldviews. All these are embodied in a form of images that result in different cognitive mappings across cultures and give the understanding of what is a satisfactory place or an acceptable environment. The question posed by the thesis of whether the outcomes of cognitive mapping process differ in terms of different cultural values takes the perspective of this view.

Two basic questions have arisen from this perspective; the first is whether there is a link between spatial cognition and people's satisfaction about their local place, and the second is whether place satisfaction affects the association between space configuration and spatial cognition. The reason why place satisfaction is a critical aspect to the thesis concern about the association between configuration and cognition within cross-cultural environments is to

determine whether the issue of cultural values is a point of concern to people's judgment about what makes a certain space layout or urban form an acceptable environment. If these two aspects, satisfaction and cognition, can be regarded as being correlated, then it may be inferred that the compatibility between people's values and the form of space is an influential factor for the cognitive mapping outcomes and should be taken into consideration alongside the factor of form and quality of space. The fact that the thesis found that there is a difference in the patterns of relationship between space configuration and spatial cognition (within cross-cultural environments) was interesting since many researchers in this field assumed that this relationship could be taken for granted.

Literature in cognition and behavior showed some constraints and difficulties that are usually associated with the cognitive mapping process; such as errors in the alignment of objects, differences in the distances between objects in the mental map from those in the real world, and the ability of the respondents to translate the real model into a sketch map. To overcome these constraints, the study has adapted an on-site recall technique to accomplish the memory task, based on exhibiting different selections of maps (for parts of space subject to questions) from which the respondent can easily choose. This procedure has also solved the problem that is usually associated with the difficulty of how to translate the sketch maps into an analytical scale, by assigning numerical values based on the accurateness of the maps chosen by the respondents. A place satisfaction scale with several human, functional and spatial dimensions has been prepared in order to examine the compatibility between people's values and the form of space, and to examine the association of these values with the process of cognitive mapping as well.

A historical review of the cultural dimensions of Muslim and western urban form in chapters 4 & 5 has shown a difference in the cultural perspective to values and considerations that are associated with the understanding and meaning of the form of space between the two environments. These can be summarized into two essential aspects; First, the effect of the cultural and religious values on the formation of the Western city during the post Renaissance had become less than before. The rising power of the secular state and the emerging age of reason caused city spaces to be more open, furthermore attention was paid to the display of the public spaces. While in the Muslim cities, the concentration was on the private space which led to what is called the 'inside-out' city form, with a clear separation of public and private due to the rule of

woman (social traditions concerning woman's life style). Second, in the Muslim environment, more attention was paid to the social structure; kinship, tribe, or ethnicity and its effect on the organization of blocks or neighborhoods. The question posed by the thesis in this sense, whether the cultural values remained a point of concern regarding the formation of urban space. The findings of the statistical analysis between spatial cognition and the elements of place satisfaction have confirmed the aforementioned suggestion of the theoretical review; the findings of spatial cognition in Damascus were mostly associated with the socio-cultural aspects, while in the city of Brno, the most cognitive associated values represented different: socio- cultural, functional, and spatial aspects of space.

The study has uncovered some underlying results with respect to the two essential research questions mentioned earlier; First, a considerable relationship with close values of correlation (but insignificant) in both study areas was found between the spatial cognition and place satisfaction. The accurate selections of streets maps were considerably correlated with the findings of place satisfaction within the same streets. Another test based on the sample of (120) respondents' answers in each study area has revealed less but significant correlations between the two aspects, and the relationship between the overall results of cognition and satisfaction were related as well. All these supported the possibility of a pattern of association between the two aspects, and the suggestion that spatial cognition tends not to be affected only by the form and quality of space but also by the people's cultural constraints and values.

Second, different patterns of relationship between spatial cognition and space configuration were found within the two environments. A significant relationship was found between spatial cognition and space configuration in the city of old Damascus, while in Brno the correlation was less and insignificant, despite the fact that spatial configuration in the city of Brno has shown stronger integration values than in old Damascus. It suggests that the relationship between spatial cognition and space configuration is variant between environments with different cultural backgrounds, and that spatial cognition tends to be affected not only by the structure of the space but also by the way in which people understand and give meaning to space, due to their cultural values and considerations.

Finally, these findings have implications for the investigation of the relationship between man and the built environment, particularly, the view that considers spatial organization to be a result of the interaction between cultural

constraints and the cognitive processes of individuals and groups. Having considered cultural values and habits as an important factor by which people conceive and structure the environment, the study provides a perspective to recognize and search for the urban characteristics that are compatible with individuals' cognitive behaviors and the space forms that meet the needs of a group of people with certain cultural values, habits, or views. The study also shows how an investigation of syntactic properties, cognition, and the theoretical view about man-environment relationship can help understand the interaction between space and people's view and activities.

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## Abstrakt

Studium syntaxi a poznání ukázaly statistický vztah mezi vlastnostmi prostoru a prostorového poznání (schopnost jednotlivců připomenout a představit mapu pro prostor). Nicméně, tato studie zdůrazňuje aspekt prostorových poznání, která je založena na (podobě a kvalitě) z prostředí, a říkat nic o názoru, že domnívá se, poznávací mapování jako proces je kulturně omezený. Jeho výsledky jsou filtrovány z prostředí v němž lidé žijí. To znamená, že můžeme mít různé poznávací mapování a výsledky založené na lidských hodnotách. Pokud by se prokázalo, že poznávací mapování procesu je ovlivněno hodnotami lidí a jinými kulturními návyky pak to znamená, že (podoba a kvalita) není jediným faktorem který tvoří individuální mentální reprezentaci prostoru, ale tam je také další faktor. To zahrnuje aspekty, které pomáhají jednotlivcům získat zvláštní smysli pro to, co je správné prostředí, na základě jejich vlastní zvláštní perspektivě. Cílem této práce je prozkoumat tuto předpověď zkoumáním vztahu mezi vlastnostmi prostoru a prostorovém poznání, a tím osvětlit, že rozdíl v kultuře lidí ovlivňuje tento vztah. V této práci jsou zodpovězeny dvě klíčové otázky: První je, zda existuje souvislost mezi prostorovém poznání a satisfakce lidí o jejich životní prostředí, a druhým je zda spokojenost ovlivňuje vztah mezi prostorovém uspořádání a prostorovém poznání. Další otázka z analýzy: Které z kulturní hodnoty jsou spojeny s procesem prostorového poznání? Mezi hlavní nástroje a používané postupy patří: prostor syntax software, proanalyzovat vlastnosti prostoru v rámci dvou studijních oblastí; Brno centrum města (Česká Republika) a staré Město Damašek (Sýrie), dotazníkem přezkoumat spokojenost lidí, provést test prostorového mapování, a pozorování chodců. Z analýzy vyplývá: Za prvé, existuje vztah mezi prostorovým poznáním a uspokojením, za druhé, prostorové poznání má tendenci být ovlivněno nejen strukturou prostoru, ale také způsobem, jakým ho lidé pochopili a dávají smysl prostoru. Práce také vrhá trochu světla na výsledky předchozí studie, z hlediska toho jak prostorové konfigurace ovlivňují aspekty vztahu mezi lidmi a prostorem, zvláště vztah mezi konfigurací a počtem lidí v chůzi.



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- § Engineering Consulting Office, (preparing building plans of Al-Ambar University), Ramady, Iraq, February 17, 2003 - March.17, 2003.
- § Engineering Office for Construction, (Designing & tracing out plans for Buildings), Baghdad, Iraq, May 1, 2001 – October 30, 2001.
- § Field Engineer, Al-Bilal Construction Company, Mosul Bureau, November 1, 1996 – January 31, 1999.
- § Military Engineering Maintenance & Reconstruction Office, (designing and tracing out building Plans during the military service), Al- Gazlani Military Base, Mosul, Iraq, February 1, 1993 - June 30, 1993.

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