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In Search for an Integrated Space Perception Framework in Human-Environment Interaction Studies

Esmat Paikan[a*]- Mojtaba Rafieian[b]

[a] Ph.D. Student of Urban Planning, Department of Art and Architecture, Tarbiat Modares University, Tehran, Iran (Corresponding Author).

[b] Associate Professor of Urban Planning, Department of Art and Architecture,Tarbiat Modares University, Tehran, Iran.

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ABSTRACT

The process of the environment perception and recognition sets the ground for the exhibition of behavior in space and paves the way for the human beings' experience of the place; resultantly, it is one of the most important and most essential dimensions that have to be carefully taken into account in designing environment. A descriptive review of the studies done in the area of urbanism shows that the space perception based on mental images has been so far assessed and in the following, the space syntax theory was helped. The present study seeks to use the qualitative content analysis of the studies performed in this area and achieve a comprehensive framework for environmental perceptions by the aid of the supplementary study domains. The results indicate firstly that although affective and emotional aspects of the environment are part of the perception process and dealt with in the area of aesthetics, they are not evaluated in the area of the spatial perceptions; secondly, although motivations, experiences, and familiarity with the environment are individual properties, they can be also envisioned as characteristics of the environment to be perceived and evaluated. Thus, the affective and motivational aspects of the environment can be added as a third domain to the researches on the spatial perception studies so as to apply the theories on the environmental preferences that constitute an index for motivational-emotional judgments of the environment in achieving an integrated framework for assessing the spatial perceptions in the area of urban studies. Comparison the proposed framework with the prior studies and researches based on the concentrated indices and by the assistance of evaluation matrix indicated that the framework takes advantage of three sets of properties, namely A) separate cognitive properties; B) spatial relational properties; and, C) emotional properties, to adopt an integrated approach towards all the environmental properties alongside the individual properties that can create a more comprehensive perception of the effect of urban environment on the users in urban studies.

Keywords: Perception, Spatial Cognition, Environmental Preferences.

* E_mail: paikan.esmat@gmail.com

1. INTRODUCTION

Environmental psychology investigates the relationship between the human being and environment in such a way that their values, attitudes, and needs are taken into account and deals with the subjects playing essential roles in the explication of the people's behaviors, like perception, recognition and spatial behaviors (Emamgholi, Ayvazian, Zadehmohammadi, & Esmaili, 2013, p. 26). Environmental perception influences the quality of the formation of activities in the space. In fact, the perception environment lies beyond the perceived environment. The human experiences and the manmade environment are enriched by human thoughts, concepts, and ideas. Therefore, the recognition of the relationship between the environment's elements and shape and their effects on the various behavioral, emotional and perceptional levels of the environment users is of great importance in designing the environment. The understanding of the relationship between the human and the environment has always been raising many questions regarding the quality of the mutual environment-human being effects and the interactional specifications between them. It is the spaces of an environment that are recognized and perceived by human beings based on their cultural and social aspects and the spatial behavior in interaction with the environment and human beings' spatial experience depends on such recognition. In other words, if the individuals' perception and recognition of the environment can be developed and more exactly assessed, then, more precise decisions and more exact designing can be made for an environment. Based thereon, the present paper tries to review the studies performed in the area of spatial recognition thereby to find an answer to the question as to how much are these studies comprehensive? And, how a comprehensive perception of the environment can be achieved by the assistance of the supplementary study areas? Therefore, the current paper seminally reviews the basic theories of perception in the area of environmental psychology and enters the area of urbanism to explore the evolution trend of the research perspectives and the studies carried out in relation to environmental perception. Then, the gap existing in the researches on space perception and the reasons for the need for a comprehensive approach are investigated and, by selecting the area of the environmental preferences as the supplementary domain, the criteria influencing the environment perception in this area will be extracted. The final product of the study is the codification of an integrated model of spatial perception that can be utilized in the cities' spatial perception researches.

2. STUDY METHOD

Since the present study's goal is accreditation or expansion of a theoretical framework, efforts have been accordingly made to use the proposed theories and performed studied for finding answers to the posited questions thereby to perform a mental and content-based interpretation of the data and systematic classification and designing of the pattern so as to accomplish the study goal. Therefore, use has been made of the qualitative content analysis method which is a guided approach. Also, the comparative method of subjects was used that is based on the studies and researches conducted in this area. The most resources used herein are books, papers, and specialized journals.

3. ENVIRONMENT PERCEPTION CONCEPT

Psychologically, perception is that mental or psychological process that accounts for the selection and organization of the sensory information and finally matching them with the mental meanings in an active manner (Carmona, Heath, Tiesdell, & Taner, 2010). Perception is the process of acquiring information from the peripheral environment; there is a point in which the recognition and reality meet (Lang, 2007). The perception phenomenon is a mental process in the course of which the sensory experiences become meaningful and it is in this way that the human beings discern the relationships between the affairs and meanings of the objects and things (Iravani & Khodapanahi, 2006, p. 25).

Spatial recognition, as well, is the awareness of the internal or cognitive representation of the structures, entities and spatial relations or, in other words, internalized reflection and reconstruction of space in the mind (Hart & Moore, 1973). Downs and Stea asserted that spatial recognition is the process in the realm of which an individual acquires, encodes, stores, recalls and decodes (reveals) the information about the relative position and specifications of the daily phenomena in a spatial environment (Downs & Stea, 1973). The discussions related to the environment perception account for a large part of the literature on the relationship between the human beings and environment and the knowledge of environmental psychology has been in between accepted and considered as an important instrument for linking the designers and users and it is expected to establish a harmonic balance between the physical and social environment through a society-oriented approach (Gifford, 1977, p. 381).

Table 1. Basic Theories in Environmental Perception

Theory	Theorist	Approach
Gestalt Theory	Vertheimer, Koffka, & Kohler (1910)	Approaching the world not as an external and objective reality but as a thing made and processed by the human beings' perceptional processes (Torrans, 1999). A thing's whole is more than the sum of its components (Guberman, 2015, pp. 26-45). Simplification of the visual information in the mind is carried out by Gestalt's principles (similarity, adjacency, continuity, integration or completion, relations between form and background, common fate, overlap and principle of prognosis) (Behrens, 2004).

Probabilistic Functionalist Theory	Brunswik (1956)	Human beings' evaluation of the environment is probabilistic and depends on the people's perception of the physical clues and that is also dependent on the probabilities that have always been juxtaposed at the side of the environment's physical properties (Nasar, 2011). Based on the pattern of the lenses, perceptional processes receive the scattered sets of environmental stimuli, purge them and turn them perceptually regular and integrated (Wolf, 2005; Mac & Francis, 2008, p. 38).
Theory of Mutual Action	Ittelson (1960)	This theory emphasizes the experiential role of the perception and analyzes the dynamic relationship between the individual and the environment. In this theory, environment, observer, and perception are mutually dependent. Perception is a part of the life process by means of which each of us imagines a world for ourselves in which our needs are satisfied (Lang, 2007, p. 101).
Theory of Adaptation Level	Wohlwill & Kohn (1973)	The theory of adaptation level was offered by Wohlwill and Kohn in an article called "environment is not in the apex". Based on this theory, individuals adapt themselves to the most dominant stimuli. In crowded environments, individuals get accustomed to congestion but this adaptation is costly for them. The cost includes suffering stress especially if the stimuli are unpredictable and uncontrollable (Nassar, 2011).
Theory of the Environment's Competence	Gibson (1979)	Environment's competence is the thing offered by a place to a person (Coolen & Ozaki, 2004, p. 3). Although the needs of an observer may change, the competence of an object never changes (Kaymaz & Cakci, 2012, p. 259). Therefore, every element in an environment features its own specific performance as well as certain imagined competencies (Gibson, 1979). Environmental capabilities incorporate human grounds like culture and community, as well (Costall, p.467).

4. EVOLUTION TREND OF THE THEORIES AND STUDIES ON ENVIRONMENTAL PERCEPTION IN URBANISM FIELD

Researches on environmental perception were first conducted in a coherent manner by Kevin Lynch who paid a greater deal of attention amongst the favorable qualities to legibility and clarity of the urban landscapes. He states that human beings categorize the environmental factors and the order governing the relations between them in their minds in five groups of areas, routes, edges, nodes and signs and seeks assistance from the mental topics for recalling them (Lynch, 2008). Donald Appleyard uses the term of urban knowledge in the investigation of the idea as to how the individuals structuralize and recognize the urban elements in their minds. Three primary methods of establishing a relationship between the components include associative, topological, and position recognition methods (Pakzad, 2011, pp. 173-176). Michael Trip realizes the factors influencing the perception rate as being the observer's readiness for perception, perception capacity and environmental conditions of perception. In his definition, the mental image has a hierarchy encompassing from the overall image of a city to the detailed images of the city and finally the mental images of the spatial components (Ibid, pp. 136-139). Norberg-Schulz knows cognitive maps as being comprised of place, road, and territory. Places (points like Lynch's nodes and signs) are the loci of the important incidents' occurrence. Roads are continuous elements that shape the general structure of the city and territories (similar to Lynch's neighborhoods) play the role of the grounds of the roads and places (Ibid, pp. 105-106). Based on the Golledge's theory of anchor points, the formation of the mental view of every phenomenon is qualified for a hierarchical order by which firstly, the anchor points and secondly, the more ancillary elements in their periphery are perceived. The studies by Golledge have shown that the individuals seminally learn the places (Lynch's signs) and then their interrelationships (Lynch's roads) and eventually recognize the regions surrounding sets of places (Lynch's neighborhoods) (Golledge, 1978, p. 53). The studies performed in this regard are subsequently found concentrated on the nonenvironmental factors. Rappaport realizes prior experience and cultural-social background as the factors influencing the environmental perceptions (Kazemi & Behzadfar, 2013, p. 78); John Lang knows individual personality, prior experiences, motivations, and cultural environment as the factors influencing the environmental perception (Lang, 2007) and Carmona introduces social and cultural changes, personal experiences, values and personality differences as factors having a great deal of effect on environmental perception (Carmona, Heath, Tiesdell, & Taner, 2010). Brody et al. realize residence, distance, and adjacency in addition to social, economic and cultural indices amongst the factors playing a role in the individuals' perceptions of the environment (Brody, Highfield, and Alston, 2004). Vischer knows physical and physical factors of environment, interests, feelings, memories and expectations, social background and time (Vischer, 2008, pp. 231-240) amongst the factors influencing the mental images hence individual's perception of the environment and Santos et al. find physical and structural factors of environment, social indices, individual indices and housing properties as the factors influencing the mental images hence the individual's perception of the environment (Santos, 2009).

4.1. The Theory of Space Syntax and its Application in Environment Recognition Studies

The studies on the development of spatial recognition in human beings are most frequently rooted in Piaget's works. His most primary finding is the reality that space's representations are created essentially through performing actions in space and not solely by the perception of space. Put it another way, the individuals develop their cognitive maps via moving and performing an activity in space (Long & Baran, 2006, p. 17). The configuration not only is the propelling force for human activities in the urban environment but also the most precedent thing influencing the human beings' spatial recognition that is formed through moving in spaces (Didehban, Pourdeihimi, & Rismanchian, 2014, p. 41). "Space Syntax" speaks of a collection of theories and methods dealing with the study of the spatial configuration for perceiving the quality of the mutual effects between configuration structure, social organization and social behaviors (Hillier, 1998, p. 137). Space Syntax is basically rooted in the studies by individuals like Alexander and then Stedman with its theoretical ideas being first offered by Hillier and Hanson in the book "Social Logic of Space" (Hillier & Hanson, 1984). Hoq argues that Space Syntax is a useful theory for understanding the role of environmental form in terms of the topological relations in the study of environmental recognition and routing behavior of the human beings (Haq, 2001). The studies by Lee et al. (2005) demonstrated that the syntax-based description of the spatial configuration can be blended with the theoretical standpoints of the spatial recognition for actualizing the human spatial experience and that the spatial configuration's participation provides a particular essence for understanding the role of configuration in cognition and behavior (Didehban, Pourdeihimi, & Rismanchian, 2014, p. 42). Based thereon, the spatial configuration's application was gradually expanded in the spatial recognition studies performed inter alia by Kim and Penn (2004), Lang and Baran (2006), Turner (2007), Omer and Jiang (2008), Casglow and Onder (2011), Abdelbaseer (2012) and Chowdudry et al. (2013).

In sum, the review of the studies performed in this regard shows that the majority of these studies have investigated the spatial perception based on mental images with some of them being more impressed by Gestalt theory and some others by the Interaction Theory of Perception. However, it was with the proposition of the space syntax theory and its application in the spatial recognition studies that the future researches were conducted through combining the methods influenced by mental images and methods based on the space syntax.

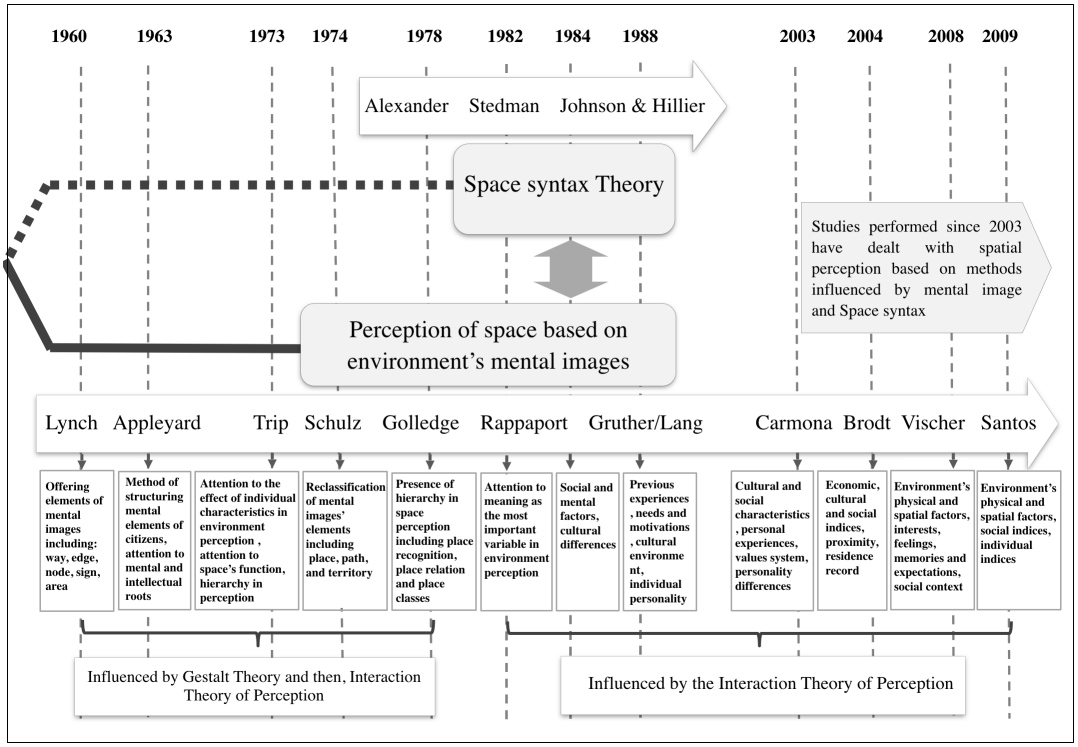

Fig. 1. Chronology Diagram of the Studies Performed on Spatial Recognition and Perception in the Urbanism Area

5. THE REASONS OF THE NEED FOR A COMPREHENSIVE APPROACH TO THE EVALUATION OF SPATIAL PERCEPTION

In urban environments, the perceptions are substantially beyond things seen and sensed. For example, Ittleson introduces four perception aspects under the titles of cognitive, affective, interpretative and appraisal aspects. The cognitive aspect includes organizing and keeping information obtained from the senses and thinking. The affective aspect encompasses the feelings that influence the quality of the environment's perception the same way that the environment's perception influences the individual's feelings. The interpretative aspect, as well, embraces the meaning or association obtained from the contact with the environment and, finally, the appraisal aspect is the valuation aspect incorporating the values and preferences constructing the goods and the bads (Carmona, Heath, Tiesdell, & Taner, 2010).

In offering the essence of the environmental reactions, Jack Nassar (1998) realizes behavior as the result of two primary factors: A) cognitive appraisal and B) sensory reactions that are the products of the environmental properties' recognition and perception, respectively. In his mind, recognition entails classification, remembering and offering our experiences of the environment. An individual identifies the environment, sees a structure or pattern in it and infers meanings from it. Legibility is the result of recognizing the environment and it is related to the environment's identity and structure. On the other hand, perception of the environmental properties leads to the emotional reactions that include individuals' effective reactions to the place; emotional reactions and cognitive appraisal can together influence the behavior (Nassar, 2011, p.163). Gifford (2007), as well, enumerates cognition and affection as interlaced subjects stemming from the environment in the model he offers for the psychological realm of environment and states that behaviors in certain environments are influenced by them (Gifford, Steg, & Reser, 2011, p. 441).

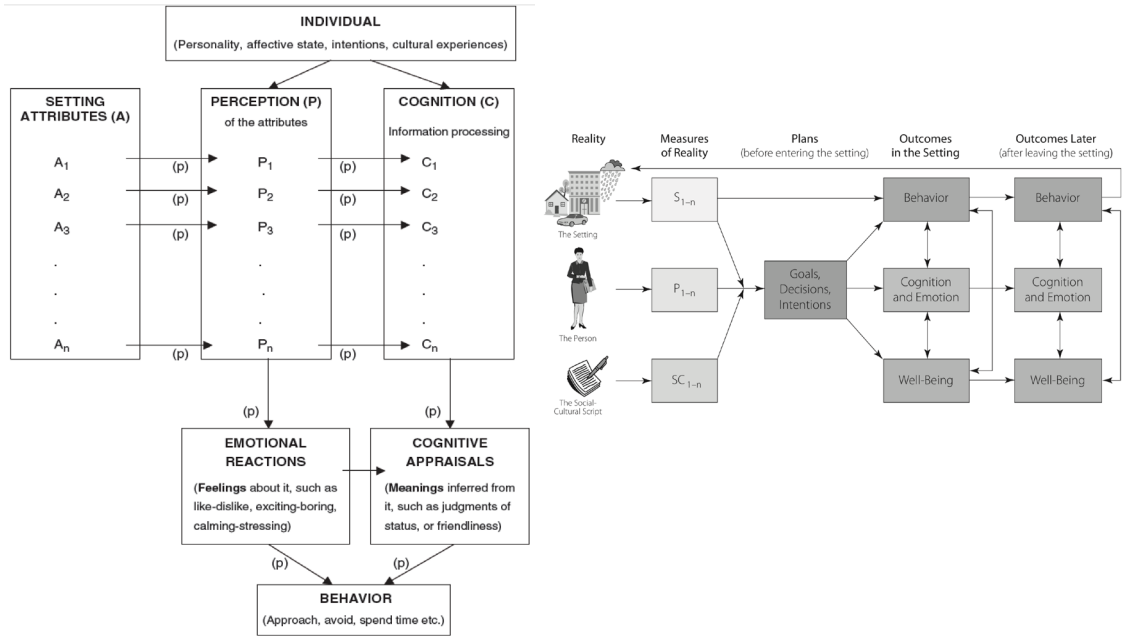

Fig. 2. The Model of Gifford Environment's Psychological Goals (Right); the Framework of Nasar's Environmental Responses (Left)

(Nasar, 2011, p. 166; Gifford, Steg, & Reser, 2011, p .422)

In an integrated framework offered for the environment-individual interactions, Debek (2014) realizes individual, environment, and behavior as being engaged in bilateral and mutual interactions that are dependent on the special mental moods. Some of the environmental factors like activities, social environment, sensory stimulation, symbolic sign, physical coherence and efficiency in conjunction with individual factors like health, individual excitements, cultural effects, personality, knowledge, lifestyle, values, and motivations encompass the cognition and feeling or emotions of the individuals and eventually cause various behaviors like performing or not performing a task in a given environment (Debek, 2014, p. 10).

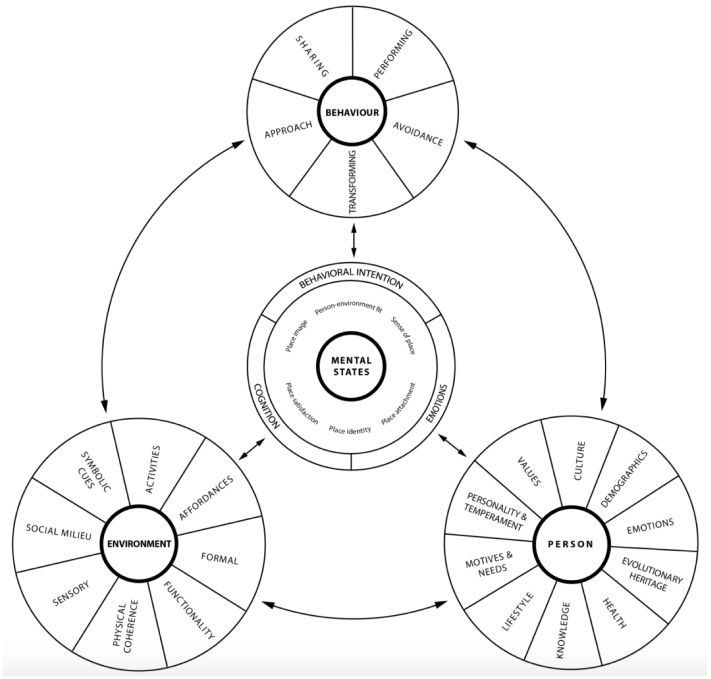

Fig. 3. Integrated Framework of the Individual-environment Interactions

(Debek, 2014, p. 10)

From the perspective of Neisser, since perception is a purposive process and depends on the culture, attitudes, and values governing the thoughts of the perceivers, it is always accompanied by human beings' recognition of the environment. In fact, environmental perception comes about by the interaction between the sensory perceptions and recognition experienced in the human mind (Neisser, 2003, p. 276). Affection is interconnected with feelings and deals with likes and dislikes. Affection includes the perception of the values and formation of attitudes. Perceiving the process of affection formation can play an important role in the perception of the environment's beauties and people's choice in using the environment's elements (Lang, 2007, p. 92).

In a nutshell, the investigation of the various theories and studies is indicative of the idea that the perception is multi-foundational. The individuals' style of attitudes followed by their behaviors in the environment is based on the spatial recognition, on the one hand, and based on the affective appraisal of the environment, on the other hand, and there is doubt in this assumption that perception is thoroughly determined through cognitive properties. This is while a descriptive-historical approach to the studies and researches performed on the assessment of spatial perception in the urbanism field is reflective of the idea that these studies evaluate and assess spatial perception from two perspectives: A) mental images of the environment that can be extracted from the cognitive maps and B) the effect of spatial configuration factors on environmental perception. Although attentions have been paid in the studies on the environmental designing to the emotional and affective aspect of the environment and through a lot of researches has been conducted on the aesthetics and preferences of the environment, the studies on perception are missing hence in case of wishing to have a comprehensive perception of the urban environment, it is necessary to investigate both the environment recognition and its affective appraisal aspects.

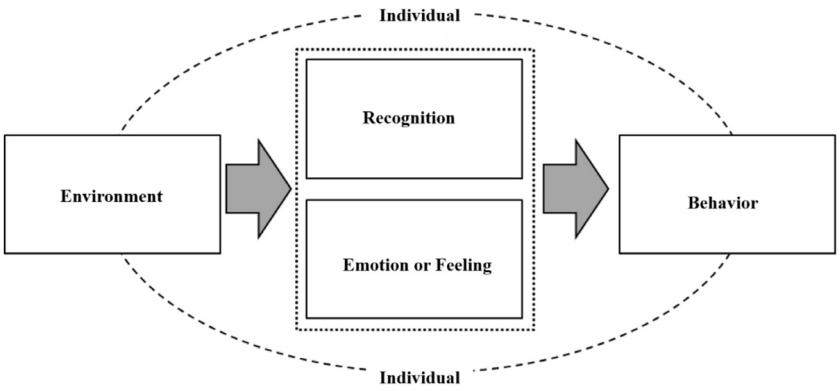

Fig. 4. The Role of Emotions in the Environment-individual Interactions

On the other hand, a glance at the studies performed on the environmental perceptions in the area of urbanism, it can be understood that the factors influencing the perception that are evaluated in the studies can be classified into several sets:

A) Environmental properties that per se include two sets of environmental elements and physical properties and form the mental images, on the one hand, and the spatial configuration that plays a role therein, on the other hand.

B) Individual properties that can be also divided into two sets: the first set includes the personality differences of the individuals like age, gender, education level, and others and the second set pertains to the social and cultural differences between the individuals of a society or a certain group. Meanwhile, there is a third set that includes the needs, motivations, prior experiences and history of familiarity with the environment. In other words, according to the fact that the perception has this important point within that the world seen by the individuals is not the pure reality of the environment rather it is constructed based on their cognitive limitations (Johnson, 2009, p. 95). Therefore, the assessment of the credibility of the images and its interpretation and rendering necessarily requires the motivation, existence of prior experiences and adaptation of the findings with the previous knowledge. The first and the second sets include individual and social factors for the investigation of which the individuals or the society using the environment should be assessed. But, the third set of factors can be realized as being different from the other two sets. Although the amount of familiarity with the environment and experiencing the environment are individual factors, they are vastly influenced by the environmental needs and motivations and the feeling that is created by the environment in the individuals; these factors incorporate effects received by the individuals from the environment. In other words, they constitute the method of environmental motivations hence they are the products of the interaction between the individual and the environment and not solely a series of separate individual properties. Thus, the factors from the third set can be received from the environment properties and assessed. Motivation is the force leading the perception hence the behavior. These factors that influence the individuals' motivations are emotional factors or environmental preferences.

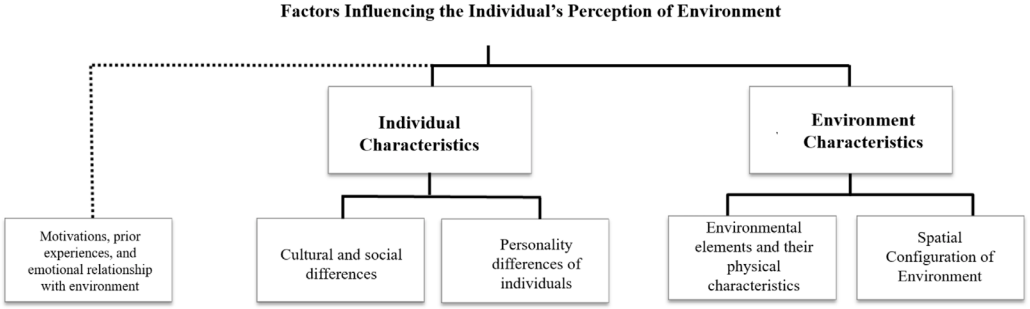

Fig. 5. Factors Influencing the Environmental Perception

In general, it is necessary to have a glance at the perception process, feelings, and behavior, on the one hand, and perception of motivation based on the environmental properties, on the other hand. In the researches on the urban space perception, the two areas of mental images and spatial configuration can be added and investigated in addition to a third area so as to offer a more comprehensive perception of the environment. The evaluation of a place is the personal judgment of its emotional qualities like the extent to which they are found attractive (Nassar, 2011, p. 166). Resultantly, preferring a place to another is the result of the place's strong sense as well as its relationship and interaction with that place. Preferences are enumerated amongst the indices for making emotional judgments of an environment in a complex process that is related to the perception of it and reaction to it in terms of its usefulness (Bell, Greene, Fisher, & Baum, 2001). Therefore, in completing the researches on environmental perceptions, theories on "environmental preferences" can be used as an area that deals with both the emotional relationship with space and the effect of spatial motivations and experiences on the individuals.

6. THEORIES AND STUDIES RELATED TO ENVIRONMENTAL PREFERENCES

The studies on the environmental preferences aim at investigating the quality and the reason of an environment's preference over the other environments by the people who judge their peripheral environments and give appropriate responses accordingly thereto. The studies show that there is a collective consensus regarding environmental preferences (Kaplan & Kaplan, 1989; Nasar, 1998). The meta-analysis performed herein includes the investigation of 40 studies out of 432 case studies in 21 different countries and it was proved that there is an agreement between the entire various ethnicity, gender and cultural

groups on the visual preferences. The general public's environmental preferences remain fixed in the course of time hence their future can be predicted with high precision (Stamps, 1999). Furthermore, liking or preferring an environment is more related to the spatial specifications than to the individual properties so designers should focus on the integration of various elements of the environment (Nasar, 1998).

There are extensive researches and numerous theories regarding environmental preferences. The theory of "prospect-refuge" by Appleton is based on the existence of the need for hunting the same way that hunter needs to see (prospect) the prey while remaining hidden (refuge). To Appleton, satisfaction with the landscape is a spontaneous reaction to the landscape as the habitat (Porteous, 1996, p.25; Bourassa, 1991).

Berlyne (1970) realizes environmental perception as the process constituted of the exploratory behavior motivated by the struggle in and uncertainty of the environment (Kaymaz & Cakci, 2012). He calls adaptive environmental variables such indicators as complexity, novelty, incongruence, and marvellousness that incite a sense of pleasure and happiness, reward, fascination and positive feedback in the observers. In sum, people want environments to enjoy an intermediate level of environmental information and leave pleasant effects on them (Akbar, Mustafa Kamal, Maulan, & Davoodi, 2011; Kaymaz & Cakci, 2012, p. 257; Porteous, 1996, p.120).

Wohlwill (1976) introduced the optimal level of environmental stimulation. In the "butterfly arch" model, he expresses that the individuals get accustomed to a given degree of environmental motivation which is termed adaptation level. The trivial reduction or increase in the stimulations brings about positive changes in the impact levels of the preferences but the larger changes cause fluctuations and shifts towards negative impacts (Kaymaz & Cakci, 2012). According to the theory by Russel and Snodgrass (1987), human beings' appraisal of the environment and their feelings of the presence therein possesses three index characteristics of pleasantness, excitement and tranquility. Exciting places are more pleasant and stirring than the boring places and the calm places are perceived as being most pleasant; the stressing places are less exciting (Russel & Snodgrass, 1987).

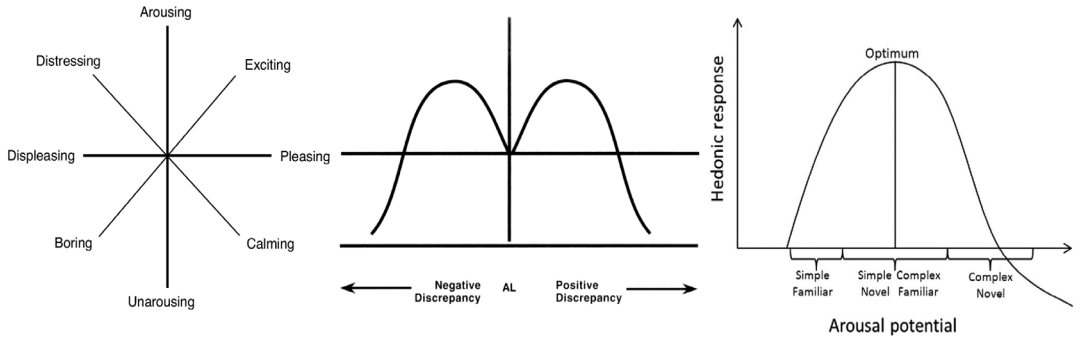

Fig. 6. Diagram Showing Berlyne's Emotional Judgment, Wohlwill's Butterfly Curve, and Environmental Appraisal Aspects of Russel and Perrat

(Nasser, 2011, p. 166; Berlyne, 1974, p. 91; Berlyne, 1974, p. 193)

The information processing theory by Rachel and Stephen Kaplan (1989) is based on a cognitive model recounting the human beings as the information processors (Akbar, Mustafa Kamal, Maulan, & Davoodi, 2011). Preferences are not just liking an environment in contrast to another rather they lead the behaviors (Porteous, 1996, p. 120). In sum, there are two factors influencing the environmental preferences: A) environmental contents and elements and B) the way these elements are interrelated. Kaplan realizes four information factors as being effective in visual preferences: coherence and legibility that are related to the ease with which an environment is perceived and felt with the functional aspects of environment playing an important role therein (clarity level). Complexity and mysteriousness that point to the extents of the stimulations and motivations created by an environment and determine the attractiveness and notability thereof (engagement level) (Kaplan, 1979, p. 245). In the theory of Biophilia, Wilson (1984) shows that the natural environment's preferences are laid on the biological essences and result from the human beings' perfection process. Since human beings have spent their evolutionary past more as hunters in natural environments, they are inherently inclined towards creating an emotional bond with nature (Beatley, 2011). Following the theory of Biophilia, Ulrich (1991) expresses that people prefer the intact and natural landscapes to the ones created subjected to human interventions. He believes that the congruent background texture, presence of a turning point and an amount of mystery leads to a high level of preference in the natural landscapes (Ulrich, Simons, Losito, & Fiorito, 1991, pp. 201-230). In the

book, "environment-assessing mental image", Nassar (1998), as well, coins the expression "likeability" and realizes five factors as being effective in liking a place: being natural, proper preservation, open spaces, historical importance and order (Nassar, 1998, p. 28). Bell (2004), as well, divides the scales of environmental preferences into three sets: diversity and complexity that cause stimulation of senses, curiosity, and imagination, feeling of desire and pleasure; configuration that is amongst the factors of the beautiful shapes' emergence both in the nature and artworks and ambiguity which is one of the perceptional properties that causes taste-based motivations and diversification of the affections (Bell, 2004, pp. 70-72). Falk and Balling (2009) know complexity and naturalness as being involved in people's preferences in certain environments. In their opinion, the natural scenes predominantly are those wherein artificial elements are generally absent but the absence of the human management over them may not be necessarily required. For instance, national parks and forests are considered as natural scenes (Falk & Balling, 2009, pp. 5-28).

7. INTEGRATED CONCEPTUAL MODEL OF SPACE PERCEPTION

Based on the proposed discussions, the comprehensive perception of the space is obtained from a combination of spatial recognition and environmental evaluation. Resultantly, the integrated perception of the space should be recognized as necessitating the investigation of three sets of factors: A) separate cognitive properties of the environment; B) relational properties, and C) emotional properties influenced by the environmental preferences.

7.1. Separate Cognitive Properties

The people's spatial recognition of the artificial environment can be actualized by means of the representation of the cognitive maps. The cognitive mapping process is the very instrument of structuralizing, interpreting and managing complex systems of information existent in various environments. Lynch introduced five imaginable elements of which the cognitive maps of the artificial urban environment are made and many of the studies after it applied these same elements occasionally through exerting change in the significance of the elements with respect to the study goals (Abdelbaseer, 2012, p. 2). Paths, nodes, signs, edges and areas are altogether cognitive representations of the artificial environment in the form of a mental appraisal that can be called "separate features".

7.2. Relational Properties of the Space

The studies demonstrated that how configuration plays a role in spatial cognition. Combined properties that are normally considered for assessing the spatial configuration of an environment include "integration", "connectivity", "clarity" and "part-whole relationship" (Long, 2007, p. 6). Integration is the most primary concept in space syntax. The integration of every space is the mean number of intermediary spaces by which the other spaces can be reached (Abbaszadegan, 2002, p. 36). Evidence has shown that spaces with higher integration value absorb a higher density of movement in the urban environments hence they are better perceived and recognized (Hillier & Hanson, 1985). Connectivity defines the relationships between a space and its immediate adjacent spaces. The axes with higher connectivity value would be accessible from various directions and they are constantly used by more people. In this regard, it can be assumed that the physical elements of these spaces leave more accentuated images in people's cognitive maps. The statistical correlation between the integration and connectivity defines the clarity degree of a configuration's organization. This parameter is an interpretation of the combined quantitative parameters of the environment based on the value of which it can be predicted how much an environment is discernable for its users. The part-whole relationship, as well, is determined based on the statistical correlation between "global integration" and "local integration". In fact, this index is another sort of clarity that is taken into consideration according to the motion radius and shows the relationship between the overall and local construct very well (Didehban, Pourdeihimi, & Rismanchian, 2014, p. 44). In general, these combined properties that can be calculated through the use of space's syntax method provide proper conditions for objective assessment of the environment's spatial configuration. This property features a quantitative nature and is recognized as the "relational properties" of the artificial environment.

7.3. Emotional Properties

As was mentioned, not only the spatial recognition but also the emotional evaluation of the environment plays a considerable role in the comprehensive perception of the environment with the latter being assessable by the assistance of the environmental preferences area. For the time being, there is no powerful theory that can provide a full-scale framework for the understanding and prediction of environmental preferences. But, a vast spectrum of the theories can be found that have dealt with the explication of its various aspects (Lothian, 2014, p. 30). Therefore, in order to achieve recordable criteria in this study for investigating the environmental preferences, the most important theories and studies related to this area have been used as references following which the most important criteria of space playing roles in the environmental preferences have been extracted:

Table 2. The Most Primary Criteria of Environmental Preferences Extracted from the Present Theories

Proposed Theories and Performed Studies	Most Primary Criteria of Environmental Preferences
Prospect-refuge Theory by Appleton (1970)	Seeing while not being seen
Berlyne Theory (1974)	Complexity, novelty, inconsistency, and marvellousness
Wohlwill Theory (1976)	Incongruence
Baiophilia Theory by Willson (1984)	Naturalness
Russel Theory (1987)	Provocation and tranquility
Kaplan's Theory of Information Processing (1989)	Integration, legibility, complexity, and mysteriousness
Studies by Ulrich in Supplementation of Biophilia Theory (1991)	Naturalness, mysteriousness, and presence of a turning point
Mental-appraisal Landscape Theory by Nassar (1998)	Naturalness, proper preservation, openness, historical importance, and complexity
Bell's Studies (2004)	Diversity and complexity, good composition and ambiguity
Falk and Balling's Studies (2010)	Complexity and naturalness

The performed studies in this regard have offered a diverse spectrum of the criteria based on their objectives and fields of study. Based on the present study's objective, i.e. emotional evaluation of environment for achieving a conceptual model for assessing the environmental perceptions, several primary criteria can be selected as the most important assessable criteria and other criteria like historical importance that feature lower frequency can be overlooked. Some of the criteria, as well, enjoy a shared conceptual load. As an example, factors like ambiguity, mysteriousness, and secretiveness can fall into one set. Criteria like coherence, good composition and legibility are amongst the criteria that can be somehow assessed on the section related to separate properties and relational attributes of the environment. Based thereon, the most important assessable scales are embedded in five primary sets and evaluated under the title "emotional properties" for assessing the environmental perception by the aid of the appropriate methods.

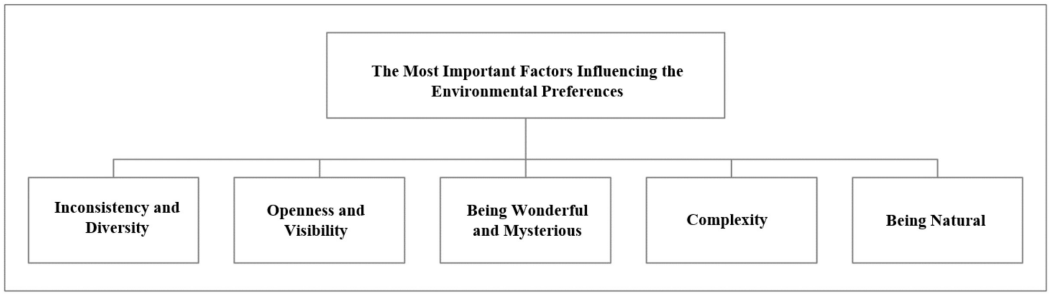

Fig. 7. The Most Important Factors Influencing the Environmental Preferences

8. DISCUSSION AND CONCLUSION

Meanwhile performing a descriptive review of the studies on the spatial perception and environmental preferences in the area of urbanism, it was endeavored in the current article to codify an integrated framework for assessing the spatial perceptions. The proposed model realizes the spatial perception as being suspended over the assessment of the spatial recognition and environmental evaluation because the perception of a place is obtained through combining the cognitive and emotional indicators (Luque-Martinez, Del-Barrio, Ibáñez-Zapata, & Rodriguez-Molina, 2007). In spatial recognition, the separate properties and the relational characteristics should be assessed. The separate properties are quintet elements as investigated in the studied by Lynch and others; then, these properties can be extracted from the cognitive maps. The most important relational properties of the environment, as well, include four indicators of integration, connectivity, clarity, and part-whole relationship, as explained above; these can be calculated and assessed by means of the space syntax techniques.

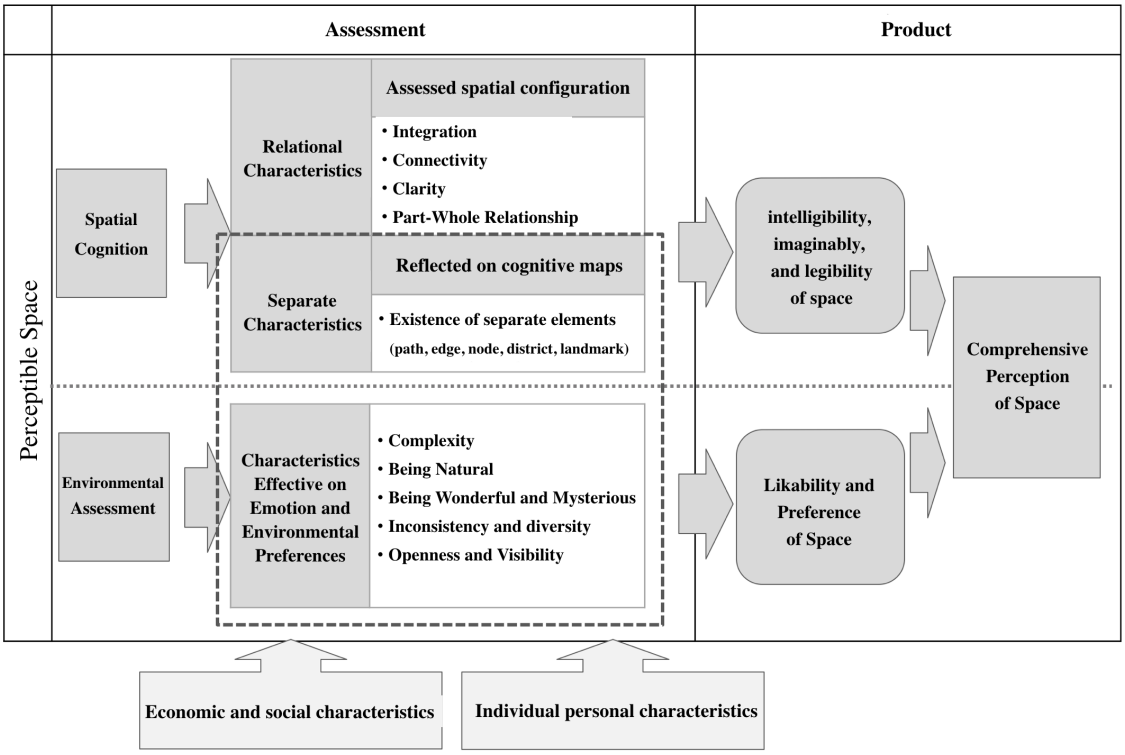

Fig. 8. Integrated Framework of the Spatial Perception's Assessment in the Urban Environment

The final product of spatial recognition is the legibility, intelligibility, and imageability of the space. On the other hand, as it was explained since the environmental evaluation is the center of perception and reaction to the environment and considering the role of emotion and affection, the imageability of the space alone does not lead to the spatial perception (Deniz Topcu & Mehm, 2012, p. 577). Resultantly, environmental evaluation forms the third set of the assessable scales. In this section, the scales like complexity, naturalness, marvellousness, and mysteriousness, inconsistency and diversity and openness and visibility should be assessed. The final product of this section, as well, determines likeability and the number of visual preferences that influence the spatial perception. The comparison of the obtained comprehensive framework has been carried out in the various studies and prior researches based on the evaluation matrix. Based on this framework, Table (3) shows that all of the environmental properties, including the cognitive and emotional aspects as well as the individual properties, have been evaluated based on the extracted indices hence provide a more comprehensive perception of the effect of the urban environment on the users. Since the optimal designing of the environment depends on the comprehensive and favorable recognition and evaluation thereof, the results of this study can be utilized in recognizing and evaluating the environmental perception as one of the aspects assessed in the urban design.

Table 3. Matrix of the Proposed Framework's Comparison with the Prior Studies and Researches Based on the Indices Focused on in the Studies

Indices Influencing the Spatial Perception / Results of the Studies Performed in Environmental Perception	Environmental Properties				Individual Properties	
	Cognitive Aspects		Emotional Aspects			
	Space's relational properties	Separate cognitive properties	Environmental motivations	Affective-emotional relationship with the environment	Personality differences	Social-cultural differences
Studies performed by Lynch, Appleyard, Schulz, Trip, Golledge and others		■			■	
Studies by Rappaport, Lang, Gruther, Carmona and others			■		■	■
Studies by Brody, Santos and others		■	■		■	■
Studies by Berlyne, Wolhwill, Wilson, Russel, Kaplan, Nassar, Bell, Falk and others			■	■	■	
Studies by Kim and Penn, Lang and Bern, Turner, Omer and Jiang, Casglow and Onder, Chowdhury and others	■	■				
Integrated space perception framework (based on the set of spatial recognition and environmental evaluation indices)	■	■	■	■	■	■

END NOTE

1. Chowdhury, Bafna, Heo, Hendrich and Chow

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