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Evaluating the physical and psychological indicators effective on promotion of the pedestrian-based capacity of major urban spaces of Farahzad village of Tehran

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Abstract

There are many evident that people are more interested in walking in attractive urban spaces and inappropriate physical and psychological conditions can reduce their presence in a remarkable amount. The current research investigates the influence of physical design and psychological elements and their criteria on optional physical activity and specifically walking in urban public spaces. However there are some limitations in determining specifications of physical and psychological design which have effects on walking, meanwhile the urban planning elements, transportation and crime prevention via environmental design are developed strategies which have potentials for influencing the rate of pedestrian-oriented state of urban spaces. The research frameworks which are extracted from the complex of these elements include 5 functional criteria of safety, aesthetics, destination and (environmental) security which are specified by use of documents and library method. In this paper, the public general spaces of Farahzad village were selected and by help of questioning technique which it's statistical community included 12 urban planning experts, the mentioned criteria were analyzed by Analytic Network Process.

The results indicates that the quality of physical design and the psychological elements have major effects on pedestrian-oriented state of urban spaces and the importance degree of each factor in determining the rate of pedestrian-oriented state of urban spaces of Farahzad village included the aesthetics, security and functional indicators in a value level, destination and safety. Meanwhile, the most pedestrian-oriented spaces of Farahzad village were specified by considering the mentioned criteria and by the selected method (Analytic Network Process). Cognition of this issue will help the above-mentioned options to overcome their challenges which are creating attractive and dynamic urban space via improving the condition.

Keywords: *Physical and psychological indicators, Pedestrian-oriented, Urban major spaces, Analytic Network Process.*

1. Introduction

Over several decades, considering the physical and psychological specifications which encourages the residents to be present at urban public spaces is increasing. Most researches have concentrated on specifications of planning in adjacency levels (such as: street connectivity, landuse mix, residential density) [1], [2] & [3]. Also some studies are conducted in the field of physical structure which provides opportunities for physical activities (such as: footpaths, proximity of Parks) [4] & [5].

The evident indicates that people are more interested in walking in attractive urban spaces, the places that their environment is maintained as well and diverse and attractive existing buildings [4] & [6]. Besides, there are some studies indicating that visual negative signs which reduce the quality of neighboring unit will prevent residents from amusing physical activities [7], [8], [9] & [10].

Due to the investigations, walking has different effects on security [11], safety, social relations, environmental issues, public health [12] & [13]. Also reinforcement of sense of belongingness, identity and quality of urban spaces [14]; is created by pedestrian-oriented capacity in neighborhoods. Studying the rate of influence of physical and psychological design criteria is among the issues that detecting existing qualities and it will specify the capacities, weak points and insufficiencies and provide the possibility of more conscious design and planning to remove defections and promotion of pedestrian-oriented state along increasing the quality of urban spaces. The objective of this paper is to have experimental

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investigation on the role of physical design criterion and the psychological elements in the rate of pedestrian-oriented state of urban spaces in which walking is done for entertainment (optional) and not for performing a specific activities (essential).

In this way, in the first step, a definition of the notion of pedestrian-oriented capacity is provided and different activities of people in urban spaces are explained. Then, the indicators and criteria of pedestrian-oriented state are determined based on the similar researches. These criteria are studied by help of Analytic Network Process (ANP) in major urban spaces of Farahzad village of Tehran as selective samples. In order to evaluate the physical and psychological indicators of pedestrian-oriented state on urban spaces the opinions of experts familiar with the place were gathered via questionnaires. The data was analyzed in Super Decision software.

2. The Concept of Pedestrian-Oriented Capacity and Different Types of People Activities in Urban Public Spaces

Nosal (2009) expresses the pedestrian-oriented capacity as: the rate of desirability of built environment for people's presence, living, shopping, meeting, time passing and enjoying that in an area [15] narrated by: [16] Gehl has divided people's activity that each requires special specifications in the physical environment in public spaces in three following groups [17]: narrated by: [18].

Necessary activities: in fact, the compulsory and daily activities of people such as going to school or work or shopping, etc. which are done more by walking and since they are performed at any circumstances, it takes the least influence from the material environment and the public space.

Optional activities: if the condition of the exterior environment is desirable and the time and place is appropriate, in case of intention of individual that activity will take place such as walking for entertainment and enjoying the environment, etc and if the quality of exterior environment is not appropriate, people will just have essential activities. But inversely they might prefer walking than quick pass by car.

Social activities: usually happen automatically and require people's presence at public spaces such as children's play, people's passive contacts or their meeting with each other and etc that in case of improving the environment's quality, the possibility of visiting people and being present for such activities by walking will increase.

3. Pedestrian-Oriented Indicators and Components

In Canada, Hawthorne (1989) has determined the physical and psychological elements effective in pedestrian-oriented state of urban spaces: trees, parks, open and landscaped spaces, existence of shade in warm and sunny days, existence of benches and places for sitting and resting, existence of streets and walking and calm paths, existence of adjacencies and historical buildings and sense of security. Meanwhile, the non-attractive elements from his point of view included: air pollution, existence of trash, risk-full passage, traffic noise, weak maintenance of footpaths and in total, he emphasized on the importance of greenness, cleanness, security in walking environments [19]. In the same way, the National Consumer Council of Britain reports that a pedestrian-oriented environment shall be clean, it should be attractive visually, without having conflicts with threats of vehicles and side effects of traffic such as noise and pollution, it should be comfortable, suitable and safe [20]. Based on the studies performed by Untermann (1984), Burden et al. (1999) the rate of walking satisfaction in the environment was emphasized by subjective and objective criteria. From their point of view, a desired environment for walking is relatively calm, it is landscaped, it is kept as well and has good lighting [21] & [22]. By the opinion of Appleyard et al. (1976), Jacobs (1993) and Untermann (1984), elements such as trees, bushes and gardens and existence of a range of view to buildings' design, good maintenance of regions and existence of short blocks allow people to change their view and this will increase their satisfaction [23], [24] & [22]. In another study, Borst et al. (2008) have investigated more issues which encourage walking and they have specified criteria such as structure of pedestrian ways, environment's aesthetical quality, diverse land-uses, maintaining the environment, nature and the green spaces [25]. By taking into account the studies conducted, critical criteria and indicators including aesthetics (parks, trees and shading), safety (lighting and traffic) and easy access to facilities (stores and schools). Moreover, the urban planning studies, transportation and environmental safety are trying day by day to add criteria which can influence the physical activity models. In relation to the subject, the knowledge of urban design and planning is concentrated on creation and development of healthy and livable communities. While, the transportation section is interested in displacing goods, traffic management and recently it has considered the issue of creating separate paths for walking [26]. The security promotion approach by making the crime objectives difficult will provide opportunities for reducing the crime and encouraging people to be present in urban spaces by emphasizing on the territory, provides supervision, access control, supporting the activity, management [27] and by considering the subject of research, these are added to the criteria of table No. 1.

Table 1 Physical and psychological criteria for measuring the pedestrian-oriented capacity

physical and psychological criteria for measuring the pedestrian-oriented capacity		
criteria	**Sub-criteria**	**Abbreviations**
Functional	Footpath level (type of path, type of surface, maintenance, connectivity)	F_1
	Streets (width)	F_2
	Traffic (volume, speed, traffic control tools)	F_3
	Penetrability (designing the street, junction, designing the junction, distance, other accesses)	F_4
Safety	Personal (lighting, supervision)	Sa_1
	Passage (existence of special places special for pedestrians, existence or non-existence of speed limits, width of edges)	Sa_2
Aesthetics	Street view (trees, gardens, maintenance, cleanness, pollution, parks)	A_1
	Views (signs, architecture)	A_2
Destination	Facilities (parks, stores)	D
Security	Territory	Se_1
	Supervision	Se_2
	Access control	Se_3
	Supporting the activity	Se_4
	Image/management	Se_5
	Lowering the crime objectives	Se_6

4. Investigating the Background of Research

Based on the existing studies, the researchers assume that the built environment influences selection of the type of transportation (walking, using private transportation and public vehicles) [28]. A large number of researches have considered the relations between the built environment and the behavior of pedestrians. Cervero and Duncan (2003) realized that mixed uses will definitely affect selection of walking [30]. Kitamura et al. (1997) based on the research which performed in San Francisco emphasize that selection of the type of transportation is dependent to the land-use [33]. Hess et al. (1999) found that integration of footpath has a positive relation with the walking volume [34]. In a research has done by Ellaway et al. (2005), the influence of positive and negative qualities of neighboring units in physical activity are indicated. In these studies, the residents of neighboring units with high levels of disorder had the less physical activity than residents of regions with vegetation and greener coverage [35].

Craig et al. (2002) investigated the streets with subjects of a)security and crime, b)crime rising potentials and their relations on walking to the work place. Based on this study, the crime is dependent to elements such as light, front traces, escape paths, assets' management, wall writing, vandalism, destruction and presence of strangers [11]. The subjects related to personal security such as fearing from others and animals in neighboring units, sufficient light, improvement of sidewalk surfaces and urban design which provide natural supervision on streets via house residents and other buildings were also investigated by Burden (1999), Worpole et al. (1992).

Corti (1998) studied the behavior of pedestrians by considering the economic and social condition of residents of rich and poor regions. He suggests that the physical environments in which people live might affect the rate of their intention for walking [38] & [39].

By taking into account the above items, many studies are conducted in relation to the role of each physical and psychological criterion on the rate of walking performed necessarily and optionally. However, none of them have investigated the influence of the value of each mentioned criterion on the rate of walking which is performed for entertainment. The current research investigates this issue in the selected case of Farahzad village.

5. Method of Evaluating Physical and Psychological Criteria on the Rate of Pedestrian-Oriented State of Urban Spaces

Many and essential efforts are conducted for perception and measurement of pedestrian-oriented capacity, moreover these studies are related to various working fields and the scales of these studies are different. However, all of these researches can be summarized in two groups of "objective measurement" and "subjective measurement". The objective measures include tools and techniques that experimentally in an expert way quantitatively survey the cases based on the determined components. In return, the subjective measures include tools and techniques that survey subjective perceptions of exploiters and residents of the environment. Some of the studies have integrated with these two methods. The study of McGinn et al. (2007) indicated that the subjective measurements are more important than the objective measurements in determining the rate of physical activity and including walking [40] & [16].

Therefore, the current research uses subjective measurement as the control variables and since many of the elements in the current issue are the quantitative criteria and the aspects of this issue cannot be detected precisely and their priority in forming and influencing the issue cannot be transformed quantitatively, thus there is a need to a computing process which is analytical; including the most important one of these processes we can mention to analytical network process in which the relative scales are distributed by use of matrix of paired comparisons between qualitative factors.

Case study

Farahzad is a neighborhood and village located in northwest of Tehran that has been settled as a village along the road to Imamzadeh Davood and during the time pass and as a result of development of the capital it has become a neighborhood in Tehran. Farahzad is from the environs of Shemiranat and is a part of district 2 of Tehran municipality. Due to its fresh air, this neighborhood is known with this name. Farahzad is the summer promenade for Tehran citizens and in summer it welcomes the citizens with its fruitful mulberry trees [41].

Although the area of Farahzad has great touristic capacity in the city of Tehran [42], it is severely affected by social problems (existence of immigrants with different tribes), incompatibility of pathways with the roadway, low quality of pathways, lack of servicing places and appropriate behavioral stations (low state of social interactions), shortage in appropriate public spaces, drug trafficking, deterioration of neighborhood fabrics and environmental pollution which in its place have caused secluding of some parts of village and creation of pitiable housing condition and poor and inappropriate street environments. Detection and evaluation of the main physical and psychological criteria in determination of pedestrian-oriented capacity of major urban spaces will essentially help to determine design and planning priorities in this area. The current paper has found Farahzad village appropriate for investigating the subject.

Figure 1 indicates the location of area studied Farahzad in Tehran and district 2 of Tehran municipality.

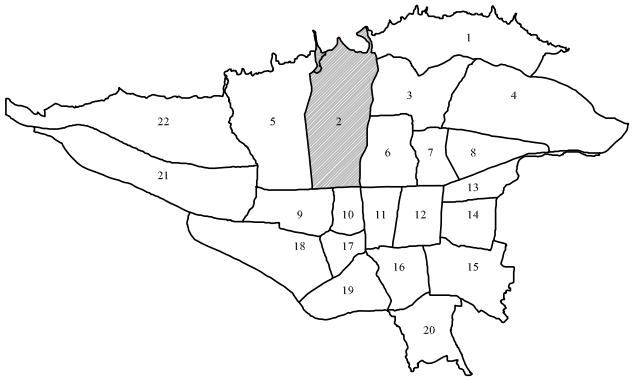

Fig. 1 The location of selected site in Tehran and district 2 of Tehran municipality, Resource: [41]

In order to perform this research, in the first step, it was essential to specify the most important urban public spaces of Farahzad village. For this, the field studies were conducted in the site. The elements which were considered in this investigation were: settlement location, size and rate of aggregation of urban spaces. At the end, the results were specified as follow (figure 2):

1. Farahzadi St. (between Yadegare Imam to Farahzad Sq.)
2. Farahzadi St. (between Farahzad Sq. to intersection with Imamzadeh Davood St.)
3. Tabarok St.
4. Imamzadeh Davood St.
5. Golpad St.

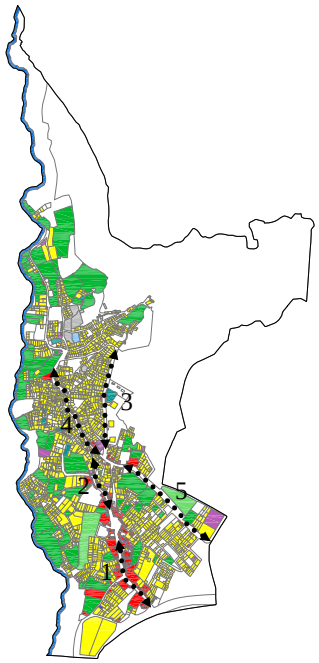

Fig. 2 The settlement location of public spaces of Farahzad village discussion and findings

6. Discussion and Findings

The data gathered in previous section is analyzed in this part. In this study, 5 physical and psychological criteria were determined and based on them, 5 major urban spaces of Farahzad village are investigated by use of analytical network process. The ANP model as a multi-criterion measurement theory was introduced by Saaty (2001). In this method, the paired comparisons are performed and this process is resulting from personal judgments and the relative dependences between the elements of a system which are resulting from dependence and inter-series feedback [43]. The proposed model makes the researcher able to analyze the complicated and combined relations of pedestrian-oriented indicators in urban public spaces. In this sample, ANP applies a structural procedure to extract and combine theories and for selecting the best option, the relations between model parts are defined as a comprehensive totality. The analysis steps are as follow:

7. Model Construction

The first step is creation of a network model which is designed based on the needs. The network model allows connection between one element with other elements directly and indirectly [44]. Model construction in this section is including four steps. The first part, (which is the objective of research) is the determination of decision making problem and it is specified as evaluating physical and psychological indicators effective in promotion of pedestrian-oriented capacity of major urban spaces. The second part concludes determining the role of actors affecting prioritization of options. This step contains two groups of professional experts (related to the municipality of Tehran) and university experts. These people play the critical role in decision making and they might have different viewpoints regarding various criteria which will have great influence in selection of the best option. In fact, ANP is a technique that helps to conclude these theories by combining the role and measuring different interests [45]. The thirds part is determining the criteria and sub-criteria; which were determined based on library study and review of first hand foreign and domestic resources. In this research, these criteria are divided to five major parts: functional, safety, aesthetics, destination and security (environmental) aspects. The final step includes determining the options which are evaluated based on a set of criteria and sub-criteria. In this model, the options include the most important urban spaces of Farahzad village of Tehran. Table (2) indicates the model parts and figure (3) displays the conceptual framework of the model for the research problem.

Table 2 Description of model parts

Evaluating physical and psychological indicator effective in pedestrian-oriented capacity of major urban spaces					**Problem objective**
Security	Destination	Aesthetics	Safety	Functional	**Criteria**
$Se_{1...6}$	D	A_1 & A_2	Sa_1 & Sa_2	$F_{1...4}$	**Sub-criteria**
Golpad St.	Imamzadeh Davood St.	Tabarok St.	Farahzadi St. (between Farahzad Sq. to intersection with Imamzadeh Davood St.)	Farahzadi St. (between Yadegare Imam to Farahzad Sq.)	**Options**
Al_5	Al_4	Al_3	Al_2	Al_1	

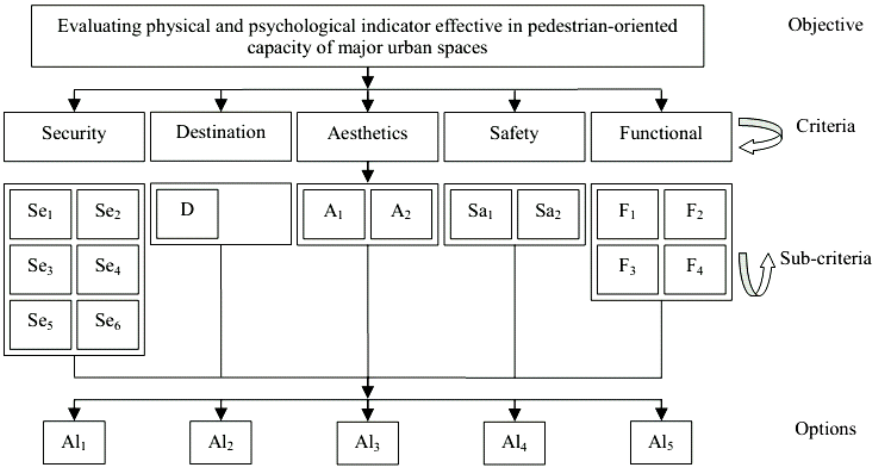

Fig. 3 Model of research problem

8. Performing Paired Comparisons and Estimating the Priority

In this step, the judgments are performed based on the research objective in order to estimate the priorities between options (the major urban spaces of Farahzad village) and criteria (pedestrian-oriented indicators). The participants are asked to perform paired comparisons between elements. The elements or components are compared which have effects on each other [43].

The respond to the questions of paired comparisons has a likert scale (arranged between 1 to 9) [46]. The figure 1 is indicative of equal importance of two elements and figure 9 is indicative of great value of an element proportioned to the other compared element [47]. It should be mentioned that in order to have inverse comparisons, the mutual value is considered automatically by the Super Decision software.

Since for the mentioned method the researchers have distinguished that 5 to 9 experts are sufficient [48], [49] and [50]; in order to develop matrix of paired comparisons, questionnaires were distributed between two groups of participants. At first, these questionnaires were distributed between 21 probable participants. At last, 12 persons from these two groups specified their opinions regarding the problem. The 12 participants included 4 persons from the municipality and 8 persons from university. The questionnaire which was given to each participant included paired comparisons between criteria, sub-criteria and different options. After gathering the questionnaires, the final value for each paired comparison was determined based on geometric progression. It should be noted that after entering the data to the software, in order to have acceptable judgments, the compatibility rate shall be less than 0.1. This value is a control criterion which was proposed by Saaty. Otherwise, repeated study of problem and revising the paired comparisons shall be conducted. In the current research, the compatibility rate for the provided responses is 0.03.

9. Formation of Super Matrix and Performing the Analysis

A priority vector resulting from paired comparisons is indicative of the certain effect of a set of elements in relation to other elements in a system [44]. A network includes the most complicated relations between decision taking elements. In other words, the relations between elements are not limited to direct effects and there might be indirect relations between them. For specifying the relations of all elements in the network and obtaining the priorities containing all components, Saaty (2001) proposed the super matrix approach. The portioned super matrix displays the influence of an element at the left side of matrix on the elements of the upper side of matrix [43]. In this way, the issue is provided as an integrated framework [51]. The non-weighed super matrix of the current research is indicated in table No. (3).

In continue, the composed super matrix is transformed to weighed matrix by normalizing all of its columns and then in order to gain the final weight vector, the weighted super matrix shall be multiplied in itself regularly and this process continues by then in an acceptable interval the matrix is transformed to static matrix and this matrix is called Limited Super Matrix (table No. 4) [43].

Table 3. The non-weighed super matrix

Non-weighed super matrix		Goal	Options	Security						Safety		Aesthetics		Destination	Functional			
		G	$Al_{1...5}$	Se_5	Se_4	Se_1	Se_2	Se_6	Se_3	Sa_1	Sa_2	A_2	A_1	D	F_3	F_2	F_1	F_4
Goal	G	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Options	Al_3	0.000	0.000	0.039	0.039	0.052	0.045	0.123	0.108	0.052	0.239	0.328	0.139	0.047	0.150	0.361	0.196	0.159
	Al_1	0.000	0.000	0.557	0.538	0.489	0.496	0.296	0.363	0.514	0.134	0.109	0.234	0.352	0.127	0.207	0.183	0.280
	Al_2	0.000	0.000	0.065	0.135	0.105	0.084	0.153	0.324	0.088	0.104	0.144	0.069	0.080	0.478	0.085	0.066	0.074
	Al_5	0.000	0.000	0.182	0.076	0.105	0.132	0.238	0.108	0.166	0.435	0.091	0.491	0.352	0.186	0.280	0.498	0.406
	Al_4	0.000	0.000	0.157	0.211	0.250	0.243	0.191	0.098	0.179	0.087	0.328	0.069	0.168	0.058	0.068	0.057	0.081
Security	Se_5	0.409	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.181	0.083	0.380	0.393	0.169	0.095	0.099	0.203	0.142
	Se_4	0.311	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.255	0.333	0.221	0.127	0.365	0.175	0.232	0.242	0.268
	Se_1	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.072	0.191	0.143	0.262	0.105	0.192	0.157	0.356	0.086
	Se_2	0.132	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.299	0.081	0.108	0.108	0.062	0.049	0.049	0.086	0.050
	Se_6	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	0.043	0.055	0.055	0.043	0.025	0.034	0.042	0.035
	Se_3	0.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.132	0.268	0.092	0.055	0.256	0.464	0.429	0.070	0.420
Safety	Sa_1	0.500	0.000	0.500	0.500	0.250	0.750	0.750	0.250	0.000	0.000	0.750	0.500	0.500	0.167	0.167	0.250	0.167
	Sa_2	0.500	0.000	0.500	0.500	0.750	0.250	0.250	0.750	0.000	0.000	0.250	0.500	0.500	0.833	0.833	0.750	0.833
Aesthetics	A_2	0.250	0.000	0.250	0.250	0.250	0.250	0.250	0.500	0.500	0.500	0.000	0.000	0.250	0.500	0.167	0.500	0.500
	A_1	0.750	0.000	0.750	0.750	0.750	0.750	0.750	0.500	0.500	0.500	0.000	0.000	0.750	0.500	0.833	0.500	0.500
Destination	D	1.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000	1.000	1.000	1.000	1.000
Functional	F_3	0.096	0.000	0.096	0.130	0.178	0.127	0.107	0.158	0.096	0.075	0.081	0.074	0.127	0.000	0.000	0.000	0.000
	F_2	0.169	0.000	0.368	0.178	0.130	0.223	0.210	0.210	0.394	0.151	0.360	0.248	0.223	0.000	0.000	0.000	0.000
	F_1	0.368	0.000	0.368	0.303	0.303	0.162	0.158	0.107	0.287	0.508	0.399	0.549	0.162	0.000	0.000	0.000	0.000
	F_4	0.368	0.000	0.169	0.389	0.389	0.487	0.526	0.526	0.223	0.265	0.159	0.129	0.487	0.000	0.000	0.000	0.000

Table 4. The limited super matrix

Limited super matrix		Goal	Options	Security						Safety		Aesthetics		Destination	Functional			
		G	$Al_{1...5}$	Se_5	Se_4	Se_1	Se_2	Se_6	Se_3	Sa_1	Sa_2	A_2	A_1	D	F_3	F_2	F_1	F_4
Goal	G	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Options	Al_3	0.005	0.000	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Al_1	0.011	0.000	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
	Al_2	0.004	0.000	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
	Al_5	0.010	0.000	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
	Al_4	0.005	0.000	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Security	Se_5	0.040	0.000	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
	Se_4	0.072	0.000	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
	Se_1	0.041	0.000	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
	Se_2	0.022	0.000	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022
	Se_6	0.011	0.000	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011	0.011
	Se_3	0.072	0.000	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
Safety	Sa_1	0.048	0.000	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.048
	Sa_2	0.071	0.000	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071
Aesthetics	A_2	0.038	0.000	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
	A_1	0.070	0.000	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
Destination	D	0.216	0.000	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216	0.216
Functional	F_3	0.031	0.000	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
	F_2	0.061	0.000	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
	F_1	0.070	0.000	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070	0.070
	F_4	0.101	0.000	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101

10. Computing the weight of final vector

If the super matrix gained in the previous step covers the whole network, the weighs of options and sub-criteria can be found in the columns related to Limited Super Matrix and if the super matrix does not cover the whole network and it just includes the interior relations between clusters, the same computations shall continue so that the final priority vector of options is extracted [52] narrated by: [53].

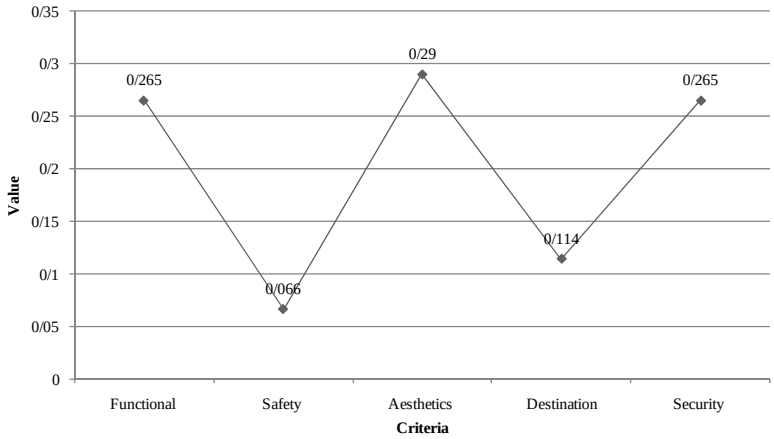

Chart 1. Ranking the criteria

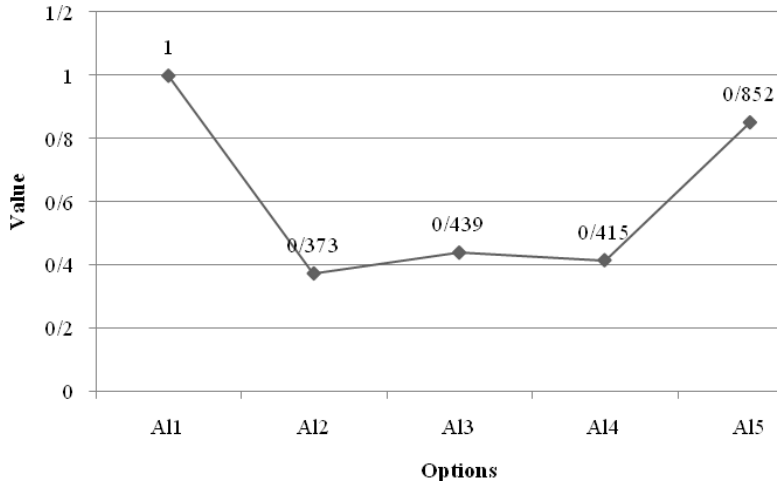

Chart 2. Ranking the options

The comparison between criteria of the model had two critical results: the first, was determining the priority of each criterion which has an essential role in determining design and planning priorities which will make the urban designer and planner able to have a more appropriate selection for the future decisions by taking into account the rate of importance of each option. The aesthetics criterion was specified as the most important element in pedestrian-oriented state of urban spaces of Farahzad village of Tehran. The criteria of security and functional with the same value degree had the next importance from the view of actors and the indicators of destination and safety stayed in the next levels (chart 1). This result is indicating that the environmental qualities (natural and artificial) play essential role in desirability of walking.

The second result was determination of the most pedestrian-oriented major urban spaces of Farahzad village by considering the mentioned criteria that in the order they were specified as Farahzadi street (betwwn Yadegare Imam to Farahzad Sq.), Golpad, Tabarok, Imamzadeh Davood and Farahzadi (between Farahzad Sq. to the intersection with Imamzadeh Davood street) (chart 2). The study of this issue would help the above options to overcome their challenges which are creating attractive and dynamic urban space by improving the application condition of pedestrians.

11. Conclusion

Considering the investigations conducted, improvement of physical and psychological condition is effective in the pedestrian-oriented rate of urban spaces. Along this, some cases shall be considered: regarding the aesthetics indicator, the simplicity in architecture, high-quality materials and high level of repair and maintenance would increase people's intention to use urban spaces, in a way that the materials used in the street view and footpaths' pavement, trees, lighting and people's sitting spaces shall be prioritized. Meanwhile, designing the perspective of urban spaces can help creation of observable organizing structure and also sense of human scale and the public spaces shall be designed in a way to provide unhindered perspectives. Visibility and continual control and monitoring of urban spaces are critical for creating the security. Activity and presence of sellers are among essential factors in increasing sense of security of pedestrians in urban spaces and activity in the public spaces especially at the ending hours of the night shall be supported and encouraged.

The appropriate width and pavement of footpaths, existence of shade, sitting places and sense of protection against vehicular traffic is essential for the pedestrians. The volume of vehicular traffic in the urban spaces with high volume of pedestrians shall be minimized. Meanwhile, creation of attractive and dynamic centers, application of welfare facilities and creation of centers providing touristic services beside the relation defined between parking and mentioned centers have great importance. Also, taking advantage of an integrated structure connecting the footpaths is required to confront the safety problem.

Without any doubt, the final model which is achieved in this study is applicable in other studies. The literature review presents the different criteria influencing on the measure of walking in neighborhoods areas, and examining these factors in case study, scrutinize the final factors. So in order to increasing the walkability, considering the results are inevitable. But the proprietary and the degree of importance of these criteria are different in each case. For finding their preferences and defining the most important factors, a questionnaire survey should be done in each neighborhood.

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