



## Evaluation of the Criteria in the First Generation of CPTED Approach on Security of Public Space at Dehkade Farahzad of Tehran Based on ANP Model\*

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**ABSTRACT:** While different elements including social, economic and cultural elements play a vital role in the emergence of behavioral patterns in humans, one cannot ignore the influence of the physical and spatial characteristics of built environment as a back ground for occurrence of anomic behavior on committing crimes. Therefore, a series of approaches and theories such as “crime prevention through environmental design (CPTED)” were developed. The first objective of this research is to determine the most insecure public spaces using parameters of the first generation of CPTED approach. The other objective is to evaluate the role of each one of these parameters in providing the aspect of security. In order to achieve these objectives, Tehran’s Dehkade Farahzad was chosen due to existence of the evidences indicating urban insecurities. This study is an applied type of research and the methodology used for achieving the goals was to benefit from ANP model which specifies the level of insecurity of urban spaces by evaluating the parameters of the first generation of CPTED approach. The methodology was performed using documentary and field research methods and statistical population used included 5 urban experts. The analytical results of model indicate that Tabbarok Street is the most significant urban insecure space in the mentioned site. In addition, the results demonstrate that territory and control parameters at a value level, activity support, image/management and maintenance, access control and intensifying the target of crime are respectively significant in determining the site’s security level.

**Keywords:** First Generation of CPTED Approach, Security, Dehkade Farahzad, ANP Model.

### INTRODUCTION

The human ecological viewpoint believed that many social damages and antisocial behaviors can be directly routed in the morphology of the city (Stevenson, 2009, p. 61) and according to the opinion of majority, before being a deterministic phenomenon resulting from decisive and inconvertible factors of natural environment; the crime is a human made phenomenon influenced by the conditions

of built environment and place of crime (Kalantari, 2001, pp. 51-52). According to this, CPTED as a strategy for crime prevention was created as an independent approach and currently it is applied and increasingly prevalent worldwide (Cisneros, 1995). Since, environmental design has effective role in promotion of safety in general public spaces; the objective of this writing is to specify the role of each component in provision of safety in general

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public spaces and to choose the most unsafe urban space by investigating the criteria from the first generation of CPTED approach.

Thus, at the beginning some definitions from CPTED concept were provided and next, criteria and components of the first generation of CPTED approach were introduced. By considering these criteria from one side and selection of general public spaces of Farahzad village of Tehran as the selected case study on the other hand, actions were taken for detection of most unsafe spaces via ANP<sup>1</sup> model and data analysis was performed by Superdecisions<sup>2</sup> software.

### CPTED CONCEPT

Occurrence of crime which stands opposite safety is not the result of a certain cause, but a set of factors are involved in creation of this abnormal social behavior which are considered in micro and macro scales. In macro levels, diverse factors included of historical, economical, cultural and social are detected and in micro level different environmental and place factors were considered (Rezazadeh & Khabir, 2010, p. 58). Moreover, in safety provision, the role of environmental factors shall not be neglected. CPTED is an acronym for Crime Prevention through Environmental Design which emphasizes that appropriate design and effective use of structural environment can result in reduction of crime emergence and improvement of life quality (Crowe, 2000, p. 46). The main idea in CPTED is that the physical environment plays an important role in crime occurrence (Hopper & Droge, 2007, p. 23). According to this, the researchers of this field believe that the crime-prone condition of places positions can be decreased by detecting and performing amendments on spatial and physical factors (Salehi, 2008, p. 72).

### CRITERIA AND COMPONENTS OF THE FIRST GENERATION OF CPTED APPROACH

CPTED approach was developed during two steps: the first; based on the studies conducted after the middle of 20th century when the theoreticians of this period believed that we can be successful in reducing crimes via appropriate physical design and optimized application of built environment (Angel, 1968; Clarke & Mayhew, 1980; Coleman, 1985; Gardiner, 1978; Jacobs, 1961; Jeffery, 1971; Lynch, 1960; Newman, 1973 & Poyner, 1983). Nonetheless, the efforts taken by researchers, and policy makers for creation of a more precise and serious

method had a reasonable respond for the criticisms propounded on the first generation which has led to formation of the second generation of this approach at the end of 1990s (Saville & Cleveland, 1997). These efforts developed for inclusion of social factors beyond physical design. Today, the second generation of CPTED benefits from risk estimation, drawing social, economical and demographic elevation (Plaster Carter, 2002 & Saville, 1996), and also active social participation. Moffat (1983) after Newman (1973) suggests that the first generation of CPTED has six extended specifications; territoriality, surveillance (unofficial and official), access control, image/management, activity support and target hardening (Fig. 1).

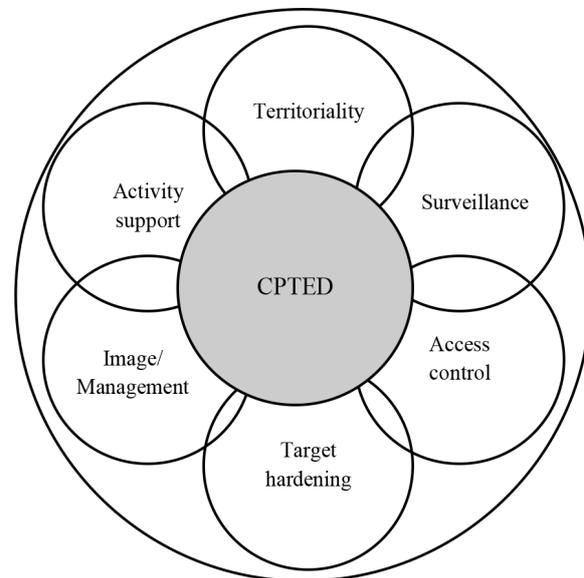


Fig. 1. CPTED Components, (Moffat, 1983, p. 23)

#### *Territoriality*

Investigation on the territoriality has indicated that this criterion is the most effective factor in environmental design level (Brown & Altman, 1983; Ratcliffe, 2003 & Taylor, 1988). In CPTED strategies, determining the ownership territory has an axial role. People protect their properties by the sense of ownership they have for them. Putting wall, fence, panel, caution signs are appropriate physical frontages specifying limits of ownership and as a result limits of access. Thus, by determining the personal ownerships some obstacles can be created for criminals' access (Kalantari, 2001, p. 87).



However, the boundaries specifying a place have both spatial form and narrative form (Stevenson, 2009, p. 121). In fact, Merry (1981) indicates that how the territory is different among cultures, neighborhoods and individual groups. In total, advanced levels of territoriality are connected to reduced levels of crime and fear from crime; however the issue is still controversial (Brown, 2001; Brown, 1987; Brown & Perkins, 1992; Perkins & Taylor, 1996; Perkins et al., 1992; Ratcliffe, 2003 & Taylor et al., 1985).

### ***Surveillance***

Physical design has the upgradeability of opportunities for unofficial or ordinary surveillance for residents and their observers and surveillance is a part of appropriate protection (Painter & Tilley, 1999). By considering the increase of probability of intervening, arresting and prosecution, in case the criminals feel that they might be seen (even if they don't), perhaps they less tend to break the law. Diverse surveillance strategies are included of natural strategies (like surveillance of the residents via windows), official or organized (like police patrol) and mechanical strategies (such as lighting the street and CCTV) (Cozens et al., 2005, p. 331).

#### ***Unofficial/Natural Surveillance***

Unofficial or natural surveillance is in fact facilitating site's observation by the good residents of the neighborhood in order to prevent crime and increase in probability of arrest by authorities. This act is done by several ways including creating good visual access to all parts of the site from street and inside buildings (Hopper & Droge, 2007, pp. 23-24).

Moreover, existence of possibility of surveillance in the environment does not necessarily mean that surveillance is conducted permanently or by direct action (such as objection, reporting or direct intervening) by the citizens is guaranteed (Barr & Pease, 1992). In fact, this is one of the reasons for presenting the second generation of CPTED which seeks creation of positive social activities for supporting places along dedication of owners and maximum use of natural surveillance.

#### ***Official or Organized Surveillance***

Official or organized surveillance is provided by local shareholders (shop owners and security guards). This method is applied for a long time to reduce crimes (Hannan, 1982) and it is indicated that this solution coupled with using protective buffers has prevented bank robberies (Grandjean, 1990). Patrol of mobile security guards called "Guardian Angels" at American Rail Road

Stations (Kenney, 1986) or London subway in Britain (Webb & Laycock, 1992) has reduced the rate of crimes. Increase in the number of ticket agents in a passenger boat terminal in Canada has reduced hiding from giving tickets to 20% (Deschamps et al., 1992), while in a Dutch initiative, by application of over 1000 unemployed youths for surveillance on giving tickets, a remarkable reduction in hit and run recorded reports has been observed (Van Andel, 1986). In Iranian traditional cities in the past, the existence of night guards and sheriffs have been essential that currently they are seen in the structure of neighborhoods in some cities (Pourjafar et al., 2008, p. 79). Poyner (1991) propounds this issue that in fact what the protectors do can be important as their physical presence.

#### ***Mechanical Surveillance (CCTV<sup>3</sup>)***

Evaluating the efficiency of CCTV is troubling and despite rapid expansion in its use, especially in Britain, Armitage (2002, p. 1) believes that: there is not much true evident indicating CCTV is always effective. However, some studies report positive findings. Webb and Laycock (1992) found that installing CCTV in London Subway Stations compared to sample groups have decreased robberies and also it was specified that CCTV in parking has reduced crimes related to vehicles (Poyner, 1991 & Tilley, 1993). Brown (1995) reported three cases of evaluating CCTV in Britain which has led to reduction in robberies, car theft, and theft from vehicles. Also, some studies indicated that CCTV can remarkable decrease fear from crime in the society (Chatterton & Frenz, 1994; Mahalingham, 1996 & Sarno, 1996).

Armitage (2000, p. 5) concludes that apparently CCTV has no effect on violent crimes; however it has eye-catching effect on car crimes, especially when it is used in parking. Via advertising, he indicates how the effect of CCTV starts before applying the cameras (Brown, 1995). Meanwhile, Wilson and Sutton (2003) concluded that efficiency of CCTV shall be proved in "place and condition".

#### ***Mechanical Surveillance (Lighting)***

Following darkness, surveillance opportunities under lighting is increased and many investigations are conducted in this regard (Cozens et al., 2003). In a study performed on urban brown-field in Nematabad neighborhood of district 19 of Tehran, it was specified that the points which have been intensively dark at night create places out of sight and out of public observation. This fact is indicative of this theory that "darkness creates crime" (Asgari Tafreshi et al., 2010, p. 47). A



study conducted by Painter and Farrington who have used sample ad trial districts indicated reduction in crime and increase in using the street by pedestrians. They concluded that after amendment of street lighting remarkable reduction in emergence of different types of crimes occurred (Painter & Farrington, 1997, p. 221). A number of studies performed in Britain and US indicate that presumably the effect of streets lighting (more than amending opportunities for environment surveillance) is accompanied by increase of self-confident in the society and unofficial social access (Farrington & Welsh, 2002).

### ***Access Control***

The studies conducted by Newman (1973, 1980 & 1996) and others (Coleman, 1985; Poyner, 1983 & Poyner & Webb, 1991) all are indicative of relation between design specifications and the rate of crimes; especially specifications providing the possibility of unlimited movement for pedestrians in residential complexes. According to the opinion of Eck (1997), more crimes happen in places with uncontrolled access than places having street structure with more limited access (Beavon et al., 1994 & White, 1990). Nevertheless, some researchers realized that more crowded streets with pedestrian movement are effective on reduction of crime rates (Hillier & Shu, 2000a, 2000b). Schneider and Kitchen (2002, p. 225) concluded that this issue is related to selection and although here contradiction of ideas is clearly observable, it does not mean that they cannot exist close to each other.

### ***Image/Management***

Importance of physical condition and image of structural environment and the influence they can have on crime and fear from crime has already been confirmed (Lynch, 1960) and currently a vast spectrum of researches are conducted in this regard. In fact, from the view of Taylor (1991, p. 970), the environmental image that the criminals have from a place is related to the rate of harassment there. Therefore, creation of a positive image from structural environment guarantees that the physical environment is acting effectively and is sending positive signals to all users (Cozens et al., 2005, p. 337).

Although physical design and structure of areas are essentially important, management and maintenance are also considered among factors creating safe places (Lewelyn Davies, 2010, p. 35). The studies indicate that permanent maintenance of urban environment helps reduction in crime to great extents (Cozens et al., 2001; Kraut, 1999; Ross & Jang, 2000; Ross & Mirowsky, 1999 & Wilson & Kelling, 1982). Ross and Mirowsky

(1999) believe based on investigations that existence of indecency in places leads to increase of fear.

### ***Activity Support***

Safe activities act like a magnet for ordinary citizens which might help limiting presence of criminals. Crowe (2000) by reasoning explains the way of creation and support of activities in order to increase unsafe jobs (such as money transactions) in safe places (such as places with high activity levels or possibility of surveillance). Meanwhile, increasing investigations are conducted related to places with variable land-uses in which the possibility for crime occurrence is decreased due to increase in the range of activities in terms of place and time (Pettersson, 1997 & Poyner & Webb, 1991). Nonetheless, increase in the number of activities cause increase in insecurity and opportunity for committing other crimes such as picking and anti-social behaviors. Making decision on the type and level of appropriate activity requires considering the texture and local context (Lewelyn Davies, 2010, p. 30).

### ***Target Hardening***

Target hardening increases the efforts the criminals take to commit a crime. This issue is a traditional and old method for preventing crime. This method focuses on preventing or limiting access to a target via using physical obstacles such as fences, doors, locks, electronic alarms and security patrols. Substantially, excessive use of target hardening methods can have negative effect on the appearance and perception of the place and cause loss of safe and sustainable communities. Some of these provisions included of grids windows, barbed wires are usually unattractive and cause fear from crime due to inducing an insecure environment (Ibid, p. 28). Meanwhile, the findings of a study related to robbery in Britain, US and The Netherlands (Tseloni et al., 2004) indicate that "security criteria at home" are among the four variables effective on controlling violation rates in all three countries. The success of criteria for immunizing the target in decreasing the robbery in international level has been proved.



## INVESTIGATING PRACTICAL EXPERIENCES OF CPTED APPROACH

CPTED interferences can be observed all over US and Canada, although the reports for practical findings are limited, from 1971 to 1973, the Ministry of Judiciary of US applied the first CPTED test in the neighborhood level by an urban planner, Richard Gardiner. Anti-crime investigation in Hartford neighborhood, analyzed the results of urban structure and the possibility for formation of crimes in Asylum Hill Hartford Connecticut neighborhood. After three years of gathering vast data, this was the first comprehensive study in large scale which specified that there is a direct relation between crime and design structure of neighborhood and that appropriate urban design form can help reduction in possibility of crime (Gardiner, 1978). The results of the studies of Hartford resulted in development of a central plan all over the country for performing and analyzing CPTED strategies in a number of American cities.

Schneider and Kitchen (2002, p. 158) believe that The Five Oaks project in Ohio is one of the best documentary files which have indicated 26% decrease in recorded crimes after CPTED interferences. These researchers also report about diverse CPTED projects in residential districts such as Harbordale in Florida where CPTED provisions have led to increase in the properties' value to 5.5% and remarkable reduction in the crime rate. Although intervening variables have complicated the issue, there is no doubt that the residents understand that it is because of CPTED provisions in that the crimes have decreased and the life quality has increased (Schneider & Kitchen, 2002, p. 163).

Besides these studies, evaluations in other fields also bring evident of the efficiency of this method. In the study of Ministry of Judiciary of US on over 100 problem solving projects conducted by police offices, 57% of successful projects had used CPTED strategies (Scott, 2000). In fact, beyond traditional criminal strategies for solving problems in neighborhoods, Scott (2000, p. 162) realized that the most prevalent reaction for reduction in crime has been the change in physical environment. In these actions, in order to solve a problem, the police have indicated intention and ability to amend environments where the problems take place as an effective method in changing the criminals and victims' behavior.

The results of diverse investigations indicates that CPTED is effective in reduction in crimes, fear of crime, increase in property value and investment in different districts and efficiency of comprehensive plans of this approach in trial samples is clearly observable. Eck (2002, p. 241) claims that there are many evident and documents

implying crime prevention via environmental design and standardization of CPTED concepts in design process can help to avoid repeating failures of the non-durable design of the past which can have share in the form of general public spaces (Cozens, 2002).

## METHOD OF EVALUATING CPTED APPROACH CRITERIA BASED ON ANP MODEL

The studies conducted in the field of CPTED are supporting its increasing efficiency (Casteel & Peek Asa, 2000; Eck, 2002; Eck, 1997; Feins et al., 1997 & Poyner, 1993). And this trust exists that proper application of the criteria from the first generation of CPTED approach have considerable role in reducing urban crimes. Since evaluation of the importance of these criteria in urban spaces is a complicated issue, in such circumstance, what is needed is not a complicated way of thinking, thus the issues shall be observed in an organized, but complicated framework, in a way that it provides the field for mutual influence among the elements of the issue and therefore making the human mind able to think about them in a simple and integrated way (Mohammadi Lord, 2009, p. 9). This new method of thinking is performed in the format of AHP<sup>4</sup> and ANP processes. Comparative investigation of these two models indicates that AHP model always has the hierarchy condition and only hierarchical levels have the possibility of one-way relation, while in ANP model, non-adjacent levels can also connect in one-way or two-way relations (Saaty, 2001; Saaty, 1996 & Sarkis, 1998). In this study, based on this fact that one of the objectives is to evaluate mutual relation of elements inside criteria cluster, ANP model is prioritized to AHP model. This model applies complicated mathematical formulations for combining the results of paired comparison, thus in order to facilitate performing mathematical computations, Superdecision software is used.



### CASE STUDY

In order to have a precise measurement from the most unsafe general public space and evaluating the effect of each criterion from the first generation of CPTED approach in security provision, this study aims to investigate urban districts of Tehran to find the area which is assumed a crime-prone sample in terms of safety. Based on the investigations conducted by Poorahmad et al. (2003), some parts of the margin of

north city which are used as recreation and for passing leisure time by Tehran citizens are detected appropriate to commit crime by some offenders. Among these areas we can mention Farahzad village (Poorahmad et al., 2003, p. 90). The studying area of Farahzad is with an area of 128 hectares located at North-west of Tehran, in region 9 of district 2 and adjacent to district 5 of Tehran municipality (Saravand, 2005). Figure (2) displays the position of studying area of Farahzad in Tehran.

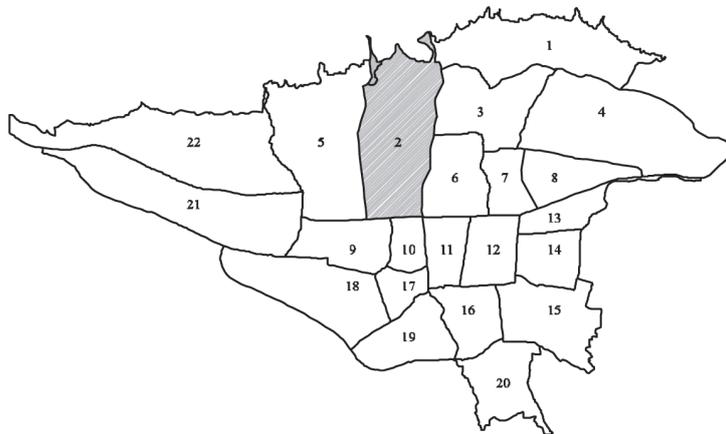


Fig. 2. Position of Selected Site in Tehran and District 2 (Saravand, 2005)

Among the reasons for selecting Farahzad village, we can mention a large number of abandoned spaces which most of their deeds are contract or handwritten. Meanwhile, marginalized levels at South-west and North-east of the area are observable. The major surveillance of police is as temporary patrol or in case of request of the residents and continuous police surveillance at site is not provided. Lack of appropriate lighting in a vast part of the area has created out of site places at night. The land lots are divided in small plots and the access system is difficult and inharmonious, in a way that the major part of access network is with the width less than 8 m and as sloped alleys or alleys with stairs due to the topography of the area. The issues related to trash disposal, ground level waters and sewerage have contaminated the environment and components related to image/management and maintenance look pale. The same condition besides residence of immigrants have made Farahzad exposed to social problems and urban crimes, especially addiction to drug which sometimes result in death of a number of residents. Most new residents of neighborhoods are immigrants with rural-urban identity. Although they have great religious beliefs, their living environment

is crime-prone, while the new residents' demands are different from the local and old residents of the site. For this group of residents, Farahzad is a dormitory and they have no sense of belonging to that the site. The sum of these problems has added to crime-prone potentials of Farahzad and has turned it to a proper case for the current research.

In order to perform this research, it was critical to specify the important general public spaces of Farahzad village. For this, field studies were performed at site. The elements which were considered in this study were included of settlement position, size and rate of accumulation of urban spaces. At the end, the locations were specified as follow (Fig. 3):

1. Farhzadi Street (the area between Yadegare Imam highway to Farahzad Square)
2. Farahzad Square
3. Farhzadi Street (the area between Farahzad Square to the intersection with Imamzadeh Davood Street)
4. Tabarok Street (from the intersection with Imamzadeh Davood Street to Tavasol Street)
5. Imamzadeh Davood Pathway (the area of intersection of Tabarok Street to Famararzi Alley)
6. Golpad Street



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6. Golpad Street

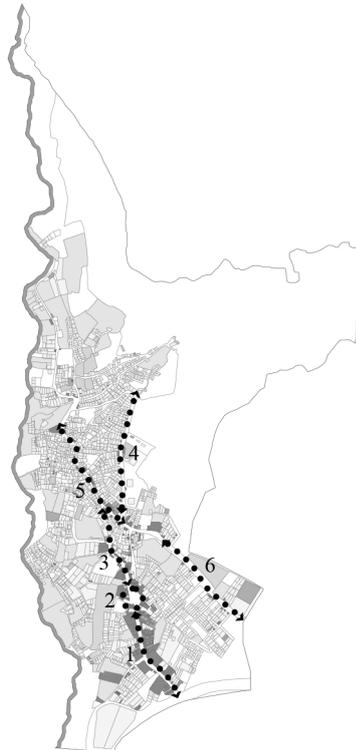


Fig. 3. Settlement Position of General Public Spaces of Farahzad Village

## RESEARCH METHOD AND PROCEDURE

The current paper is a descriptive-analytical study. For investigating theoretical basics descriptive methods are used based on library method and reviewing up-to-date foreign and Iranian references. In the next step, for detecting the most unsafe public space, statistical data analysis and field study was adopted. As it was previously mentioned, after detecting the criteria the software techniques were applied in order to fulfill research objectives. Investigation of applicable techniques were indicative of priority of ANP model than AHP model for the subject of current paper, because ANP model has helped the researcher in analyzing different qualitative normative of urban environment such as safety and provides this possibility that by simultaneous combination of qualitative and quantitative criteria via paired comparison a structure can be provided to organize diverse criteria and to evaluate the importance and priority for each of them proportioned to the options (Cheng & Li, 2005).

The ANP model is conducted in 4 steps (Meade & Sarkis, 1998; Saaty, 2001): in the first step, the studying issue is decomposed to a network structure. Each network is composed of a set of clusters and each cluster is included of a set of elements (Bottero & Mondini, 2008, p. 646). In the second step, the elements of research issue in each cluster is compared in pairs proportioned to its importance to a control agent, also the clusters are compared proportioned to their importance in meeting the objective (Saaty, 1994 & Saaty, 1980). In the third step, Super Matrix is composed, which is a separated matrix and each part of that is indicative of the relation between two clusters in the system (Meade & Sarkis, 1998 & Saaty, 1996). In fourth step, in case the Super Matrix composed in step three covers the whole network, priority weighs of options are found in the column for options at normal Super Matrix. In other words, in case the Super Matrix has only compared the clusters having interior relations, more computations shall be conducted for gaining general priorities of options. At the end in this step, the option with the highest final weight is selected



and it is the option gained via computations and matrix operations (Saaty, 1996).

The criteria studied in this research, have been the criteria from the first generation of CPTED and selected option of general public spaces is Farahzad village. Multi-criteria decision taking methods is used in relation to professionals who are predominantly involved in the issues of urbanization and are experienced university professors in the field of urban studies. The researchers have found 5 to 9 experts adequate (Delbecq et al., 1975; Hsu, 2010 & Saaty, 1980). The statistical community of this research is included of 5 master students of urban development of Iran University of Science and Technology who have performed one of their workshop projects at the site and therefore they are familiar with the site. In order to achieve the data, survey questionnaire was applied. In order to integrate the gathered data and to be able to enter them in the software for analysis, they were computed as geometric mean. In other words, geometric mean of the opinions of these 5 persons was provided

and the final numbers were considered. According to the above-mentioned cases, the issue of research is complied in the format of following steps:

**Construction of the Model**

The network investigated in this research has three clusters: first cluster is the issue of research and is determined as “determining the most unsafe general public spaces in Farahzad village by environmental design approach”. This step is introduced in the first level of model and is applied as a control criterion in construction of the model. The second cluster is presenting criteria and includes of the criteria from the first generation of CPTED approach. Since in this model the importance level of each component in security provision is considered; internal relations of these criteria are also investigated within the cluster of criteria. At the end the third cluster, is composes of the selected options. The elements of model are described in table 1 and the model of research issue is indicated in Fig. 4.

**Table 1. Describing Elements of the Model**

<b>Issue objective</b>	<b>Determining the Most Unsafe General Public Spaces in Farahzad Village by Environmental Design Approach</b>	<b>G</b>
Criteria	Image/Management	C1
	Activity support	C2
	Target hardening	C3
	Territoriality	C4
	Surveillance (unofficial and official)	C5
	Access control	C6
Options	Tabarok Street (from the intersection with Imamzadeh Davood Street to Tavasol Street)	D1
	Farhzadi Street (the area between Yadegare Imam highway to Farahzad Square)	D2
	Farhzadi Street (the area between Farahzad Square to the intersection with Imamzadeh Davood Street)	D3
	Golpad Street	D4
	Imamzadeh Davood Pathway (the area of intersection of Tabarok Street to Faramarzi Alley)	D5
	Farahzad Square	D6

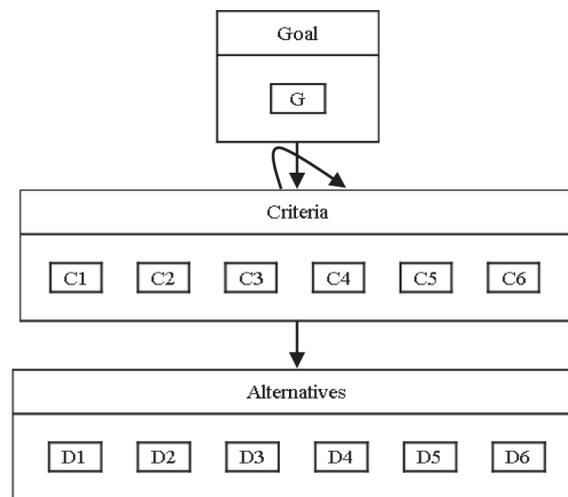


Fig. 4. Research Issue Model

### ***Performing Paired Comparisons and Extracting Relative Weight Vectors***

The strategic and critical part is formed in this step. In this part, the paired comparisons are conducted. In comparing the elements inside clusters, since these elements have internal dependence, they can indirectly affect the issue objective, therefore in paired comparisons of the elements inside clusters a series of paired comparisons which are indicative of these types of relations shall be included (Saaty, 1980). One of the questions for comparing criteria is: "in order to determine the most unsafe public spaces in Farahzad village by environmental design approach, by taking in to account image/management and maintenance criterion, what is the importance degree of the criteria for activity support in proportion to the criteria for image/management and maintenance?". By considering the point that there are six criteria in this cluster and each of these criteria itself are considered as controller, 6 paired comparisons matrixes of  $5 \times 5$  are available. Thus, in proportion to each criterion, 15 questions are propounded by software. It should be mentioned that this section was conducted in order to evaluate and prioritize the components from the first generation of CPTED approach in Farahzad village. Since in this model, there is only one criterion cluster for investigation, therefore the comparison of clusters was not considered in this step; however the comparisons between elements inside clusters and options are performed. Therefore, the main two questions of the research are as follows: "in order to determine the most unsafe general

public spaces in Farahzad village by environmental design approach, what is the importance degree of the criteria for image/management and maintenance in proportion to the criteria for activity support?" and the second question propounded between elements of criteria and options clusters is: "by considering image/management and maintenance criterion, which of the options of Tabarok Street and Farakzadi Street are more unsafe from the viewpoint of environmental design?". The number of comparisons in this step depends to the number of issue criteria. Since six main criteria are defined for investigating this issue and the number of available options is also six, this, 6 paired comparisons matrixes of  $5 \times 5$  are available in this part.

### ***Formation of Super Matrix***

After performing paired comparisons and determination of the weight for each element, the specified priorities are saved directly in non-weighted Super Matrix (table 2) and in the last step; inharmonious Super Matrix is given as much exponents in Super decision software that the difference between elements in Super Matrix is no longer  $k$  and  $K+1$ . In this way, the limited Super Matrix is extracted. As it is observed in table (3), in the extracted Super Matrix, the numbers in all rows are equal (Saaty, 1996). In this Super Matrix, superior priority was gained for Tabarok Street from the intersection of Imamzadeh Davood to Tavasol Street by the numeric value of 0.180.



**Table 2. Non-Weighed Super Matrix**

Non Weighted Super Matrix		Goal	Criteria						Alternatives					
		G	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6
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
Criteria	C1	0.117	0.110	0.085	0.115	0.094	0.069	0.123	0.000	0.000	0.000	0.000	0.000	0.000
	C2	0.171	0.265	0.241	0.191	0.341	0.296	0.207	0.000	0.000	0.000	0.000	0.000	0.000
	C3	0.037	0.034	0.035	0.045	0.031	0.033	0.032	0.000	0.000	0.000	0.000	0.000	0.000
	C4	0.307	0.374	0.305	0.366	0.278	0.264	0.314	0.000	0.000	0.000	0.000	0.000	0.000
	C5	0.307	0.160	0.125	0.205	0.053	0.140	0.240	0.000	0.000	0.000	0.000	0.000	0.000
	C6	0.061	0.058	0.209	0.078	0.203	0.199	0.084	0.000	0.000	0.000	0.000	0.000	0.000
Alternatives	D1	0.000	0.379	0.395	0.412	0.416	0.436	0.114	0.000	0.000	0.000	0.000	0.000	0.000
	D2	0.000	0.040	0.039	0.040	0.036	0.032	0.055	0.000	0.000	0.000	0.000	0.000	0.000
	D3	0.000	0.218	0.177	0.206	0.218	0.111	0.330	0.000	0.000	0.000	0.000	0.000	0.000
	D4	0.000	0.112	0.260	0.087	0.153	0.273	0.060	0.000	0.000	0.000	0.000	0.000	0.000
	D5	0.000	0.206	0.094	0.218	0.145	0.115	0.347	0.000	0.000	0.000	0.000	0.000	0.000
	D6	0.000	0.044	0.035	0.038	0.032	0.031	0.093	0.000	0.000	0.000	0.000	0.000	0.000

**Table 3. Limited Super Matrix**

Limited Super Matrix		Goal	Criteria						Alternatives					
		G	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6
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
Criteria	C1	0.048	0.048	0.048	0.048	0.048	0.048	0.048	0.000	0.000	0.000	0.000	0.000	0.000
	C2	0.137	0.137	0.137	0.137	0.137	0.137	0.137	0.000	0.000	0.000	0.000	0.000	0.000
	C3	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.000	0.000	0.000	0.000	0.000	0.000
	C4	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.000	0.000	0.000	0.000	0.000	0.000
	C5	0.065	0.065	0.065	0.065	0.065	0.065	0.065	0.000	0.000	0.000	0.000	0.000	0.000
	C6	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.000	0.000	0.000	0.000	0.000	0.000
Alternatives	D1	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.000	0.000	0.000	0.000	0.000	0.000
	D2	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.000	0.000	0.000	0.000	0.000	0.000
	D3	0.106	0.106	0.106	0.106	0.106	0.106	0.106	0.000	0.000	0.000	0.000	0.000	0.000
	D4	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.000	0.000	0.000	0.000	0.000	0.000
	D5	0.084	0.084	0.084	0.084	0.084	0.084	0.084	0.000	0.000	0.000	0.000	0.000	0.000
	D6	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.000	0.000	0.000	0.000	0.000	0.000



**Selection of the Best Option**

By considering the numbers appeared in weighed Super Matrix, the superior options can be specified. However, Superdecision software provides the user with the possibility of observing evaluation results graphically (table 4). This model is a simple network with several clusters and their mutual dependence with backup system and since it lacks a sub-network and all clusters are in one window, it is assumed a simple model. By taking to account above-mentioned issues, at first the network model is created and then the relation of elements was performed and after dedicating judgments, the priority of each criterion is determined. The results of these steps,

is the respond that software specifies for determining the most unsafe general public space in Farahzad village by environmental design approach. Besides that, detection and application of this method in measuring norms such as safety in urban spaces makes the researcher able to detect and determined the most important criteria in qualitative evaluation of a space. As it is observed in table (5), criteria of territory and surveillance have higher importance in determining the rate of safety in general public spaces of Farahzad village. In fact, the mentioned model tends to prioritize the criteria specified for an urban quality and then by evaluating these criteria in relation to available options, provide the possibility of selecting the superior option.

**Table 4. Ranking Options**

Name	Graphic	Ideals	Normals	Raw
D1		1.000	0.359	0.180
D2		0.112	0.040	0.020
D3		0.588	0.211	0.106
D4		0.491	0.176	0.088
D5		0.470	0.169	0.084
D6		0.123	0.044	0.022

**Table 5. Results of Paired Comparisons of Criteria**

The inconsistency index is 0.065. It is desirable to have a value of less than 0.1		
C1		0.117
C2		0.171
C3		0.037
C4		0.307
C5		0.307
C6		0.061



## CONCLUSION

In this paper, ANP model was applied for evaluating the role of each of the criteria from the first generation of CPTED approach in security provision and determination of the most unsafe general public space. The results of analysis indicated that the criteria for territoriality, surveillance, access control, image/management, activity support and target hardening in the order mentioned, have a more important role in promoting the safety via environmental design in Farahzad village of Tehran. This point is significant, since detection of priority of each criterion provides the urban planner and urban designer with the possibility to include each of the criteria during planning and designing process.

On the other hand, by taking to account the selection of Tabarok Street as the most unsafe general public space in Farahzad village of Tehran, we can conclude that the urban spaces in which the environmental design criteria are less observed; encourages more offenders to commit crimes. Undoubtedly, this cognition leads to provision of strategies for reducing negative effects and benefiting from advantages of such approaches in urban spaces; which its result is creation of opportunities for increasing human interactions, recreation and enjoying the environment.



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## ENDNOTES

1- Analytic Network Process

2- The help and file download for this software is available in this link: [www.superdecisions.com/download.php3](http://www.superdecisions.com/download.php3)

3-Closed Circuit Television

4- Analytical Hierarchy Process