SPACE AND FEAR OF CRIME RELATION IN URBAN GREEN AREAS CASE STUDY:
Maçka Demokrasi Park

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Abstract

The aim of this study is to discuss the relation between space configuration and fear of crime in urban green areas. The study focused on landscape's visual properties based on graph metrics in order to define fearsome and safe spaces in urban park areas. Visibility graph analysis, which provides the opportunity for exploration of visibility patterns of a space, is chosen as the analytic tool of the study. Arc GIS program viewshed application is used to develop the visual pattern of the case area, Maçka Demokrasi Park located in Istanbul.

Theoretical Framework

Crime has a wide range from theft to street violence and it relates to a certain situation or material, whereas fear of crime depends on the perception of the environment. It is defined as a reaction to the attributes of the space and is more common than the crime itself (Hutchings 1994). Fear of crime is an important social problem which destroys the social relations and affects the quality of life. The silent-isolated streets, subways and park areas are defined as urban spaces where fear of crime is highly perceived (Colquhoun 2004). It should be emphasized that urban parks of which positive psychological effects on humans proved by many researches, are defined as not-to-go places due to the fear of crime. Numerous studies investigating the relation between fear of crime and space share the conclusion that fear is more related to the spatial configurations than the crime itself. Feeling safe depends on the knowledge of the environment which needs the awareness of where you are in the space and time (Lang, 1994). Thus, it is considered that spatial knowledge is crucial to evaluate feeling of safety.

Analytic Tool: Visibility Graph Analysis

118-02 Space syntax method's theoretical background which relates the spatial knowledge and human behaviors is thought to be the appropriate approach for the purpose of this study. However, axial line application of the technique gives rise to a problem. Based on the literature survey about the technique, it is noted that axial map applications defines the areas where a visibility develops through visually limited spaces between the built environments of urban pattern. However in this study, an open area of 22 hectare with very little built space is the subject under discussion. On the other hand visibility graph analysis, which is developed from space syntax theory, gives the opportunity to define a space with a set of nodes. Visibility graph analysis was developed from the architectural theory of space syntax by Turner et al (2001), and is applied through construction of a visibility graph within the open space of a plan. In his studies, Jiang (2002) defines the visibility graph analysis as an alternative model of space for the application of space syntax principles.

Case Study: Maçka Demokrasi Park

Maçka Demokrasi Park is located in the central area of İstanbul and surrounded by many social and cultural activity centers. It is the third greatest park and fifth in size as a green area. Beside its location and size, the reported crime facts of the park area have been the criteria for the selection of the case study. 153 reported crime facts took place in the park area in 7 years time period from 2000 to the end of 2006. According to the records, the types of the crimes are as; grab, thievery, laceration, unauthorized possession of arm, sexual harassment, rape, drugs, damaging common property.

Analysis

Two sub-sections have been identified in the study area as the eastern and western sides corresponding to the road which divides the park area.

Constructing Visibility Graph

In order to model the park area as a visibility graph, first 20 m regular grid nodes have been applied to both subsection of the park area. The open air theatre area in the western side of the park has been excluded in the grid application process because of the walls which encloses the area and makes it isolated in terms of visibility. As a result of node defining process, 255 nodes for eastern side and 156 nodes for western side have been applied to the park area. Visibility areas for each node have been calculated with Arc GIS program viewshed applications. The neighborhood nodes which are located in the visibility area of each node have been calculated separately for the sub sections of the park area. Neighbor nodes inside the visible area of each node have been determined and a matrix per subsection has been established where 1 indicates the mutually visible situation between two nodes and 0 for all other situations. According to the matrixes, visibility graph analysis centrality model measures, centrality degree and closeness measures have been calculated for both sub-sections of the park. For the illustration of the analysis results Arc GIS program applications have been used.

Questionnaire

A questionnaire analysis has also been applied in the study area to examine the places which have been defined as fearsome and safe by the participants. Participants have been asked to define the fearsome and safe places on the park plan, which was developed with graphic illustrations to increase its illegibility. The participants have been assisted by explaining the graphic features on the map. 50 participants have defined 50 safe places and 50 fearsome places on the park area. The results have been applied on the park plan with red points defining fearsome places and green ones for safe places. Arc GIS program applications have been used for the illustration of questionnaire results.

Results

Comparison of Centrality Degree and Closeness Centrality Measures

Before making the comparison with the visibility graph analysis and the questionnaire results, two centrality model analysis results have been compared with each other. Graduated symbols for which size defines high values have been used to illustrate the analysis results and same scale is used for both subsections to form data integrity. The illustrations of two analysis results have been overlapped by Arc GIS applications for comparison. The illustrations indicated a strong relation between two analysis results. This situation indicates the similar results in the comparison of two analyses with questionnaire results.

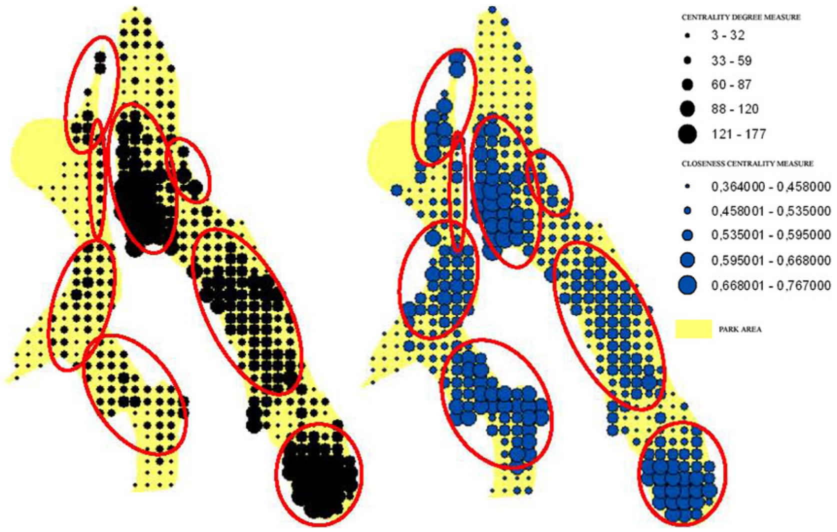

Figure 1:

Centrality Measures (Left) and Closeness Centrality Measures

Regression between Centrality Model Measures and Questionnaire Results

Regression between centrality model measures and questionnaire results are calculated for a statistically significant comparison between two analysis result. Numerical values of 1 and 2 are assigned to green and red points of questionnaire for regression analysis. Results indicate no relation between centrality model measures and questionnaire.

R	R Square	Adjusted R Square	Std. Error of the Estimate
,070	,005	-,005	30,372

Regression between centrality degree and questionnaire results

R	R Square	Adjusted R Square	Std. Error of the Estimate
,138	,019	,009	,079271

Regression between closeness centrality measure and questionnaire results

Comparison of Centrality Degree Results With Green Points Of The Questionnaire

The comparison of centrality degree analysis with green points of questionnaire results indicates a partial overlap sense. The three exceptions noted on figure 1 have been considered as follows:

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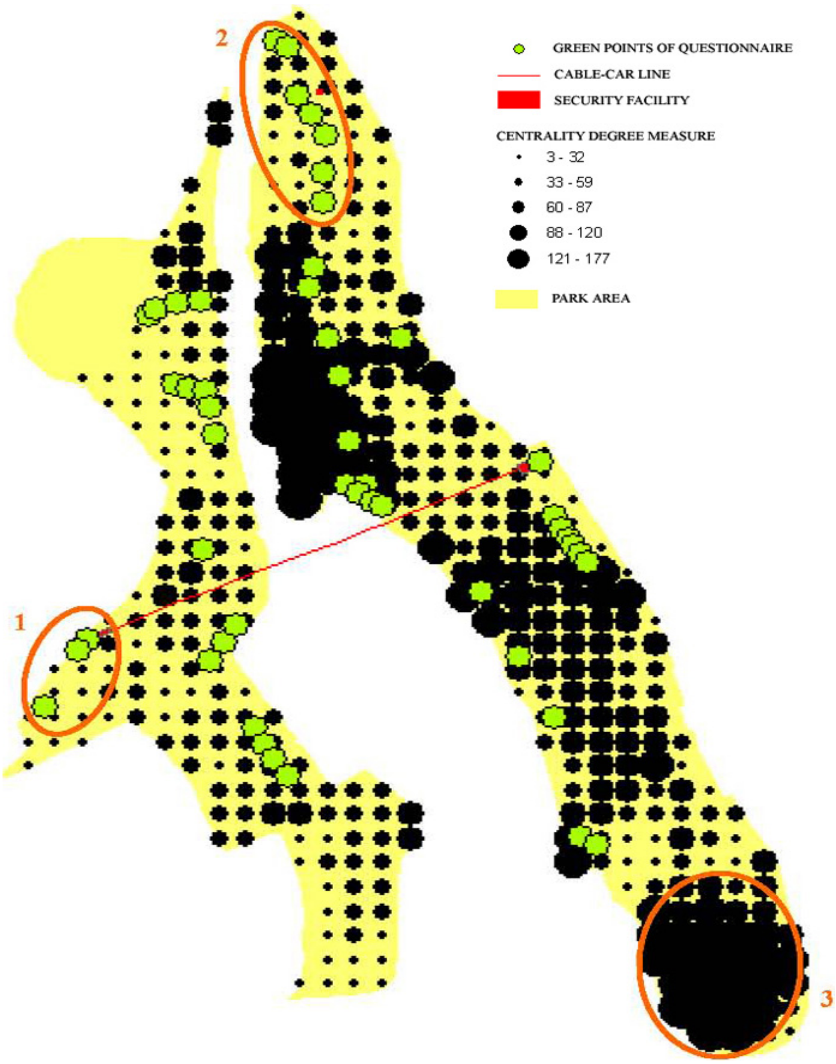
1. In spite of the low values for centrality degree, 3 green (positive) points have been defined for the area according to the questionnaire results. This situation is considered as the attraction of cable-car facility which is located close to the pointed area. It is considered that the users of the facility form a pedestrian movement through the area which affects the feeling of safety.
2. It is considered that the security building which is close to the pointed area has positive affects on the feeling of safety just similar to the first case. Also, the questionnaire participants' oral statements have supported this consideration.
3. In contrast to the first two cases, this area indicates high values of centrality degree with none positive points. It is considered that, the trees and high bushes existed in the area effects visibility effects in negative ways. Also because of the lack of functioning facilities in this section of the park area may decrease the interest of the users.

Similar results with centrality-green comparison have been indicated for the comparison of closeness centrality measures and green points. The exceptional areas and comments are the same with previous analysis results.

Figure 2:

Comparison of centrality degree results with grey points



Comparison of Centrality Degree Results with Red Points of the Questionnaire

The results indicate no overlap for centrality degree measures and red points. The areas with high values of centrality measures have been defined with red points instead of green ones which would be accepted as a supporting result for the forecasting of the study.

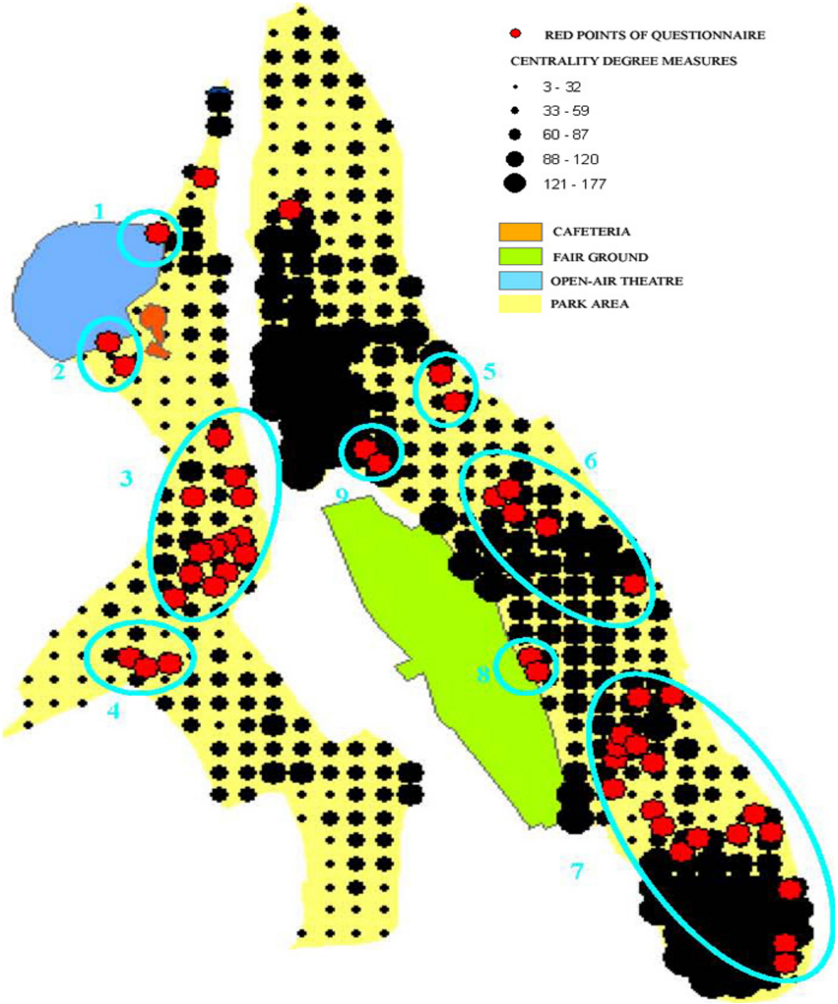


Figure 3:

Comparison of centrality degree results with grey points

9 areas are numbered for further explanation:

1 ve 2- The two areas are located on the right and left side of the open-air theatre's enclosing walls. The effects of the walls on the visibility relation of the nearby points and vegetation (trees, high bushes existing in the area) are considered to decrease the visibility properties of the area.

3, 4, 5, 6, 7 – All of these areas are on the slope of the valley with dense vegetation which is considered to cause limitation to the visibility properties of the area. Participants have generally defined these areas as "desolate".

8- This area is defined as fearsome by the participants because of the fair ground close to the area.

9- Although this area is located on the main pedestrian axle which is defined as safe for most of the participants, two male participants indicated this area as fearsome because of the football fans meeting at this area especially on match days.

Similar results with centrality-red comparison have been indicated for the comparison of closeness centrality measures and red points.

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Conclusion

In this study, high values of centrality degree and closeness centrality measures are predicted to refer areas which are defined as safe and vice versa. Yet, although a partial overlap is observed for green points, a significant relation has not been defined between the analysis and questionnaire results. Comparison results are tried to be paraphrased in the concept of the study and two items are considered to be important;

- Vegetation especially trees and high bushes which have affects on the visibility relation of the areas should be taken into consideration for a better definition of the park area. It is considered that this will lead a better overlap between analysis results and feeling of safety. On the other hand, the calculation of the vegetation affect on visibility relations is considered as an extensive subject, which needs a detailed work by itself. Not only the location and size of the vegetation, but also seasonal changes and the changes of visual limitation degree according to the parts of the vegetation (body, brunches) should be taken into consideration.

- Enclosing walls of the open-air theatre is the other important item for the results of the study. It is considered that defining the limitation affect of the walls on the visibility relations of the nearby points will be useful for a better understanding of the study area.

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Centrality Model Measures

Degree Centrality Measure:

$$m_i = \sum_{k=1}^{n} r(v_i, v_k)$$

$r(v_i,v_k)$ = 1 if v_i and v_k mutually visible

0 for all other situations

Closeness Centrality Measure:

$$CC_i = \frac{n-1}{\sum_{k=1}^{n} d(v_i, v_k)}$$

$d\ (v_i,\ v_k)$ = shortest path between vi and vk