Assessment of Walkability in Urban networks based on Space syntax (Case Study: 9th District municipality of Mashhad)

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Expanded Abstract

Introduction

Walkability is the capacity and suitability for walking, and in another word "the utility level of the urban built environment for presence, living, shopping, meeting, and passing the free times of the citizens in an urban area". Following the growing urbanization, developing multiple and broad consequences of economic, social and environmental aspects and using motor vehicles, recent approaches in urban planning is concentrated on restoring capability of walkability in cities to identify and create optimal routes for walking. In this regard, the Space Syntax technique is a new approach in anticipating the traffic of the pedestrian and driver passer that shows the results by mathematical and physical parameters. This is in addition to analyzing the connection of all urban areas with each other. These parameters can anticipate the operations and behavior of the citizens in urban areas. This method can anticipate the pedestrian crossing with radius integration. Experience has proven that the integration of a node is related to the use of that node so easily that the criterion is known as "potential move". Thus, the higher the integration of a street, the higher is its potential for pedestrian and more desirable space for users. Besides the concept of potential move, another concept called "natural move" expressed the relation between urban structure and located style of urban areas next to each other with pedestrian traffic density. To calculate intermediate integration, we can use intermediate radius. The radius in intermediate integration is the average depth of most integrated line at the macro-level integration. Therefore, the radius for different cities with different structures will change. For the city of Mashhad radius of 8, i.e., calculation of integration with eight direction change or eight connections is considered. Based on this approach, the aim of this research is to assess the walkability of the urban crossings of the 9th District municipality of Mashhad based on the 5 indices of walkability, environment safety, and facilities of the sidewalks, physical conditions, environment accessibility and utility. This study is to analyze its natural movement pattern by Space Syntax, by using the concept of Integration Value.

Methodology

The purpose of the research is application development and the research framework is analytical descriptive and conducted by survey method in 9th District of Mashhad municipality and its territories. The data have been collected by the library research and field works. Field methods

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are conducted as interview with authorities of 9th District municipality and Observation Method for Evaluation of the walkability in the passages of 9th District municipality. In different regulations, various criteria are provided to identify the passages which have the potential to become pedestrian crossings. However, depending on the possibility of various parameters estimation, some criteria can be added or removed. The criteria used in this article are considered by examining the diverse range of previous studies and the combination of environments qualitative criteria. In connection with walkability according to the specific circumstances of Mashhad city, we have used the recommendations of the Walking Facility Regulations. According to the preparatory zoning of development plans in Mashhad metropolis, 9th district of this city has become one of the entertainment and tourism poles for adjacent and pilgrims of Imam Reza (AS). This area have High functionality for design and planning of walking routes because of high population density, short distance trips within the region, located on smoothly slopes, age structure and young population. In recent years, high traffic in peak hours of urban journeys, overcrowding and congestion in service and trade centers convert the opportunity to an important challenge and degrade the quality of the environment, especially for pedestrians. Therefore, measuring the urban crossings walkability of this area is important and prediction of optimized routes for pedestrian and motorized traffic under the influence of physical intervention by using Space Syntax technique is the main purpose of this research.

Results and discussion

In the field of walkability, because of counterexamples, it is necessary to apply this method with cautious. In addition to the Space Syntax method to ensure the results of this research, Walkability indicators are also used to eliminate weaknesses of Space Syntax. This research obtained some results according to the scoring table of the walkability indices of the urban crossings of 9th District municipality. These results indicate that Kalantari highway, Malek Abad Blvd, Vakil Abad Blvd, Hashemieh Blvd, Kowsar Blvd and Piroozi Blvd (22-25 scores) are in the first priority, Sayyad Shirazi Blvd, Honarestan Blvd, Delavaran Blvd, Saremi Blvd, Fakoori Blvd and Haft Tir Blvd (18-21 scores) in the second priority, Ladan Blvd, Eghbal Lahoori Blvd, Hafez Blvd, Bahonar Blvd, Sarafrazan Blvd and Khaghani Blvd (14-17 scores) in the third priority and the routes like Namaz and Boronsi Blvd (10-13 scores) in the last priority of walkability. Also the results of this research in analysis of the mobility channels by Space Syntax method showed that tendency for walking in paths with high average integration value have more potential for walking and walkability. Therefore, Saremi Blvd, Hashemieh Blvd, Honarestan Blvd, Vakil Abad Blvd and Haft Tir Blvd with high average integration value (> 0/900) has the highest potential for walking and Eghbal Lahoori Blvd, Ladan Blvd, Sayyad Shirazi Blvd, Hafez Blvd, Bahonar Blvd, Namaz Blvd, Fakoori Blvd and Piroozi Blvd with low average integration value (< 0/700) are the last priority in terms of Syntax Space.

Conclusion

By studying both the Spatial Syntax and Walkability Indicators, according to focus of citizens' activities, site selection of important regional elements and attractive applications of backpacking trips, Traffic priority of backpacking trips will be on Vakil Abad Blvd and Hashemieh Blvd. Then, Saremi Blvd, Honarestan Blvd and Haft Tir Blvd, due to high demand of backpacking trips and weak system of pedestrian crossing facilities, are in the second priority of walkability; Kalantari highway, Malek Abad Blvd and Kowsar Blvd, due to low demand of backpacking trips and good system of pedestrian crossing facilities, are in the third priority; and at the end, Khaghani Blvd, Sarafrazav Blvd, Delavaran Blvd, due to low demand of backpacking trips and weak system of pedestrian crossing facilities, are in the last priority of walkability in 9th District municipality.

Keywords: Walkability, Space Syntax, Integration Value, 9th District municipality.

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