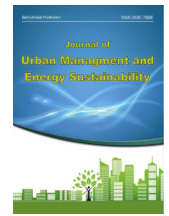


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## ORIGINAL RESEARCH PAPER

### Explaining the influential components of sociability with emphasis on space syntax factors in the middle areas of commercial complexes (Case studies: Persian Gulf and Zomorod commercial complexes)

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#### ABSTRACT

The decrease in the presence of people in public spaces such as commercial complexes is due to the lack of attention to the sociability factor. The purpose of this research is to explain the influencing factors of sociability on the space syntax factors in the middle areas of the Persian Gulf and Zomorod commercial complexes in Shiraz city. This research is defined in line with the doctoral thesis. The qualitative-quantitative research method was used in the qualitative part of the descriptive-analytical method, and in the quantitative method, the field observation and collection of maps of the collections was used, and the field findings were analyzed in the depth map software. In the analysis of the data, it was found that the possibility of meeting more people is in central common spaces, cafes and cinemas. In addition, the dispersion of interconnection, connection and depth diagrams indicates the less readability of communication paths from the collective space. The most sociability happens in lobbies and at the entrance of the ground floor, which shows the importance of these spaces in commercial complexes in influencing people's sociability. Spaces where the possibility of pausing and sitting are more, include the spaces adjacent to commercial units and the fountains and the spaces of cafes, which are the center of sociability. Therefore, the influencing factors of sociability on the space syntax factors of commercial complexes, the components, spatial structure, movement in space and recognition of the behavior pattern of users are among the indicators of sociability that affect the factors of connection, the depth and the coherence of space syntax. It has an effect.

Running Title: Sociability with emphasis on space syntax factors in the middle areas of commercial complexes



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## 1. INTRODUCTION

Intrinsic and internal human needs make it necessary for humans to have a social interaction and then sociability. Because man is a social being by nature and always seeks to establish social relations with others. Therefore, by being in public environments, this person uses every opportunity to establish interaction. Therefore, public environments and places such as markets and commercial complexes can have a great impact on his sociability. Public areas play an important role in people's sociability. These territories, which are closely related to people's spirit, in addition to their architectural characteristics such as geometric form, shape, etc., also affect people's sociability through their private territories. At the same time, the different characteristics of these territories create different levels of sociability due to the architecture used in their space, which improves people's social relations. Today, with the decrease in the attention of designers and architects to the sociability approach in public spaces such as commercial complexes, the amount of communication and social interaction of people in this place has been greatly reduced, which was very important in the traditional markets of Iran. This type of reduction in sociability and interaction and communication of people has been able to create problems at various individual and collective levels, which at the individual level can be referred to the lack of health and mental and physical improvement of people, and as a result, the reduction of belonging to social spaces. The general public witnessed such things as commercial complexes and markets, and at the collective level, it witnessed a decrease in social interactions, an increase in crime, a decrease in security and, over time, a decrease in social stability. The theory of arrangement or syntax of space allows researchers to analyze the relationship between spatial configurations and the social structure of space. In this theory, the visible field shows the characteristics of the complete images of a person from a given point of view in

the urban and architectural space, which is used for orientation or finding the way in the urban and architectural context. In general, in the method of space arrangement, the concept of depth and connection should be used to describe the distance of spaces from each other, and the concept of connectivity should be defined as the number of points where one point is directly connected to other points. Therefore, the use of this software to measure the sociability of public spaces such as commercial complexes can, in addition to knowing the degree of sociability of these complexes, explain the components to improve the performance of these complexes and improve social interaction as a result. To have a greater impact on people's sociability. Based on this, the main goal of the research is to explain the influencing factors of sociability on the factors of the spatial arrangement of commercial complexes in Shiraz, and this research seeks to find answers to the following two questions: 1. What is the influence of sociability on the spatial syntax factors of commercial complexes in Shiraz? 2. What are the influencing factors of sociability on the spatial syntax factors of Shiraz city complexes?

## MATERIALS AND METHODS

### *Sociability and public space*

Researches related to sociability were initially based on Humphrey Esmond and Robert Sommer's (1957) definition of this term under the title "the quality of space that brings people together". (Elmi, Zahra; Hashimpour, Parisa; Madqalchi, Leila; 2019) Sociability in public space is based on people's need for a sense of social belonging and interaction with each other, and this is in a supportive social environment in addition to providing physiological comfort. It will be possible to claim territory, sense of ownership and receive justice in the space. (Preger, 2021) (Tab.1) Meetings take place in public sociable spaces, and these spaces are used by different groups and are directly accessible to the surrounding users, and therefore they are headquartered that

Theorist	Sociability criteria	Researchers	Sociability criteria
Preger 2021	Sense of belonging, interaction, physiological comfort, sense of ownership, Getting justice in the space	Salehniya and Memarian 2009	Perception of space, geographical background, co-construction, coexistence of psychological factors and social space Perception of space, geographical background, co-construction, coexistence of psychological factors and social space
Falahat 2016	Perception of environment, environment, communication, human	Jan Ghel	Facilities and services, physical framework, protection of the sense of comfort, the presence of active people
Walter 1990	Physical elements, environment, territory, geometry, feeling, perception of beauty	1987	Facilities and services, physical framework, protection of the sense of comfort, the presence of active people
Daneshgar Moghadam 2019	Activity, body, passion, emotion, social interactions	Carr	Protection, comfort, accessibility, comfort
Fergas 2000	Social interactions, ability to effectively participate in activities, environment	PSS 2000	Presence of people, activity, accessibility, comfort
Avil 2001	Territory, security, coherent structure, peace, environmental comfort, Solitude, social interactions	Lang 2005	Protection, presence of people, activity, access
Barker 1968	Activity, territory and environment, structure of environment and place, time period	White 1980	Facilities and services, external stimulus, physical and visual permeability, sense of comfort, presence of people
Alavi nasab and Bodaghpour 2019	Body, activity, social interactions, permeability, form and geometry Functional assessment of space	Up 1972	Facilities and services, external stimulus, physical and visual permeability, sense of comfort, presence of people Provision of territory, security, coherent structure, continuity, readability
Jackobs 2008	Lively space, presence of people, uses, activity Time, 24 hours		Comfort and environmental comfort, amount of information and excitement Environment, social interactions
Appelyard 1976	A sense of comfort, communication, enjoyment		Body, accessibility, geometry form, activity space organization
Hall 1982	Encouraging atmosphere, encouraging social interactions	Mohammadi and Ayotalahi Karim Dokht 2016	Problems and obstacles of user movements, performance evaluation The space, conditions and social characteristics of doing the activity A sense of belonging to a place, a sense of vitality, social interactions
Norberg-Schulz 1980	Social communication, various facilities, face-to-face presence, exchange of thoughts and feelings, activity Social communication, various facilities, face-to-face presence, exchange of thoughts and feelings, activity		
Tibaldes 2008	People-friendly quality, usability, activity	Deleram Shojaei 2015	Access and connectivity, comfort and mental image Sociable uses and activities
Noghrekar 2014	Physical environment, psychological background and behavioral personality Functional, semantic behavioral context	Esmond 1957	Companionship, gathering together

Table 1: Sociability criteria from the experts' point of view

belong to the collective identity. Architectural public spaces as a platform for improving communication and the growth of social interactions of people should be considered from the perspective of sociability. (Alami, Zahra; et al, 2019) Humans in the light of society, education and acquisition of social rules, values and norms that become a social being and acquire a human personality, socialization is a process that through That person acquires the necessary knowledge and skills for effective and active participation in group and social life. (Abadi & Bamanian, 2016) Most spaces only promote visual and auditory interactions (passive social interactions). It is not intended to promote the social interaction of the people of the society, but it is also for family gatherings and meeting friends. (Naghiloo & Sadegh Falahat, 2016) Among the effective factors in creating sociability, physical space is considered as the most effective factor in creating suitable environments for social interactions of users. (Jaafari, et al, 2018) in explaining the components and characteristics of successful public spaces, he considered a space that has components such as access, suitable body, landscape, a variety of activities, comprehensiveness, security, social interaction, sociability, comfort and convenience should be in proportion. The presence of these factors together can make a public space successful or unsuccessful. (Shojaei & Partoui, 2014) In table (1) you can see some criteria of sociability according to experts.

#### *Sociability of architectural space*

From the time when the idea of making an object came to the human mind, until the preparation of the plan and program, the collection of raw materials, how to make it, how to use it, creating a connection between that object with other artifacts and also with nature, and controlling its negative and positive effects and basically the purpose of its construction is to be aware of divine standards and to observe them. (Naghizadeh, 2013) The basic issue in the theory of the effect of architectural space on sociability is based on the effect of the body and environ-

ment on human behavior. Man influences the environment with his behavior which is caused by cultural, social, economic and personality aspects and transforms it in order to satisfy his physiological and social needs and organizes the space. Architectural space plays the role of a socializing institution and resource, considering that people deal with architectural and urban environments most of the time, therefore, architectural space should be considered as an important and effective institution in people's socialization. (Abadi & Bamanian, 2016). Architectural buildings can be called sociable or non-social according to the increase or decrease of social interaction opportunities. Sociable spaces, which are the source of everyday life, are multi-purpose spaces that provide many activities and are used by users and provide social harmony for users. (Adlifar & Faruzandeh, 2014) The sociability of the architectural space is achieved by the appropriate combination of the physical-spatial factors of the architecture and the psycho-social factors of the users. This sociability increases with high compatibility between body, space and interpersonal and transpersonal behaviors. Physical-spatial factors have an effect on sociability. (Abbasi et al., 2022) If there are some characteristics and criteria, the degree of sociability of the architectural space can be measured, some of these criteria are: the ability to establish the interactions between non-intimate people, the degree of desire to interact in the space, the amount of presence in the space and referring to it, duration Stopping in space and belonging to space (Mamarian & Salehian, 2008)

#### *Architecture and middle spaces*

One of the patterns of spatial organization called "intermediate space", this pattern has been used many times by Iranian architects in many Iranian buildings in the days before and after Islam. Among these buildings are a number of post-Islamic tombs. The pattern of organizing the middle space usually has nine spaces that are arranged in such a way that

the middle space is located among the spaces; And other spaces are arranged around it and in perpendicular directions (axes) and are usually arranged in pairs (symmetrically). (Ranjabr Kermani & Melki, 2016) The definition of the border or territory of the space in which a person lives is his natural characteristic. Space territory can usually be distinguished in two ways: private and public. The private space defines the border or private territory of one or more people, and the public space belongs to everyone, but the debatable issue is the boundary between these two spaces. (Tausli, Tehran) Different interpretations of the space located between two arenas outside and inside have been presented. One of the interpretations proposed in this regard is the middle space. This term has been used by researchers such as Habraken (1998) and Noredin (2002). (Sasani, Aini Far, & Zabihi, 2014)

#### Space syntax

In a word, the theory of “space syntax” is the visual and movement characteristics of humans in the architectural space, which shape the architectural and constructive space and also shape the social relations. (Felkian, Safari, & Kazemi, 2019) According to Liggett (2000), besides the graph theory, there are two other main methods for space placement design, the fulcrum of both methods is optimization techniques. In recent years, some researchers have turned to multi-objective optimization. (Hassibi & Andaji Garmaroudi, 2021) In the book, (Syntax of Architectural Space), based on a concept called space syntax, the architects tried to discover the rules that were obtained from examining different syntax patterns in different spaces. According to him, different spaces reflect their users, and by using the space syntax method, one can understand the cultural and social characteristics of its inhabitants, whose “different ways of life” influence the formation of different spatial patterns. (Mamarian, Syntax of Architectural Space, 2012) Combined features, which are usually considered to measure the spatial configuration of the calculated environment, include:

interconnectedness, permeability, transparency, diversity, readability, flexibility, scale, proportion and They are spatial unity. According to the mentioned contents and also the opinion of the experts, the factors affecting the syntax of the space are presented in table (2).

Space Syntax	Influential components
	Connection
	Permeability
	Legibility
	Flexibility
	Scale
	Transparency
	Variety
	Spatial Unity
	Linkage
	Control
	Depth

Table 2: Components influencing the syntax of the space

#### The theory of space syntax

The theory of space syntax, explained by Hiller and Hanson (1984), is a non-geometric way of analyzing space, which helps to understand the type of function of space and recognize the internal or inherent characteristics of space. This method has the ability to measure the type of spatial integration in relation to other adjacent spaces and even in spaces located in a complex. (Heidari & Farhadi, 2017) Considering the concreteness of the theory of space syntax, this theory and its development in the field of related software and computers are considered to be valuable theories of urban planning and architecture. It should be noted that space syntax can calculate the spatial configuration of the built environment and compare it with socio-economic data. Therefore, space syntax is a set of modeling methods and techniques to analyze and analyze the spatial configuration, which is usually based on the basic concepts of

human behavior, such as movement in space, density and visual perception, and directly links the physical body with becomes human the relationship between function and configuration that exists in the syntax of space, makes this model to be used to evaluate and study spaces with objective-subjective dimensions. (Sultan Qaraei, Mansouri, & Singari, 2021) according to the theory of space syntax, free spaces using topological relationship indicators, including 1. Convex space parameters 2. Isovist field (analysis of the visible area at a specific point in space) and 3. Axial lines are divided into convex space regions, then axial lines are drawn and a graphic map is obtained. These graphic maps (two-dimensional maps of convex space, linear axial map, field map) are used (to draw a configuration diagram (graph)). A spatial unit is used to other spaces in a system. In the configuration graph, by connecting each line to a node that represents a spatial order, a topological network (geometry without angles and distances) can be obtained. (hegazi, el-alfi, 2022) while you can draw a binary matrix for this graph and obtain its corresponding algorithms. The output of the depth map software using this algorithm, the spatial indicators of "connection", "control", They are "depth" and "connectivity" (Fladd, 2017)

#### *Methodology*

Descriptive analytical method is used in this study. In this method, first, using the method of collecting information in the form of a library, scientific articles were dealt with and they were scanned, then the maps of Shiraz Persian Gulf commercial complexes and the Zomorod commercial complex were taken and observations were made. After that, the space syntax technique and depth map software were used to analyze the sociability of the selected complexes, and at this stage, by preparing axial maps and importing these maps into the software, the graphs were analyzed and the amount Connectivity, depth and connectivity were analyzed and analyzed.

#### **DISSCOUSION AND FINDINGS**

Shiraz Persian Gulf commercial complex with about 450,000 square meters under construction is located in a peripheral position to Shiraz city and next to satellite towns such as Golestan-Sadra. It is located on the main urban highway - Sepidan Road and Sadra Road. This complex includes parts such as a five-star hotel, cinema, amusement park, and 2,500 shops, sports hall, swimming pool, sauna, Jacuzzi, reception hall, as well as the Zumard Shiraz commercial office complex at the intersection. Two Qaani Streets, Sibuyeh Boulevard in the central part of Shiraz, left over from the Al-Buyeh period, which was one of the main old gates of the city (Kazron Gate) and the entrance to the Seng Siah Pass in the southwest of the old city of Shiraz. The project area is equal to 4123 square meters including two underground floors and ground and first floors with commercial use, this complex includes departments such as coffee shops, restaurants and nearly 100 active commercial shops. The systematicity of the core of the theory of space syntax is based on the division of space into graphic themes, which are classified into two categories: graphs and maps. In this theory, the maps are taken from the principle of convex space and the theory of natural motion and are easily drawn in the form of a simple graph, and the analysis of graphs is based on the knowledge of the theory of space syntax along with basic graphics concepts such as connection, depth, distance. The length of the axial lines, the connection is obtained. In order to measure the influence of sociability in these complexes, the space syntax technique was used. In the initial step, the maps of both the desired complexes were prepared based on the axial and segmental map, and the communication routes such as corridors, rows and communication ways in the interior space were determined. In the following, the amount of overlap, depth and spatial relationship were checked in the depth map software. The analysis of the axial maps on the ground floor of the Zomorod commercial complex and the Persian Gulf commercial

complex shows more interconnections at the junction of the rows than in the corridors, while in other floors of the Persian Gulf complex and on the first floor of the Zomorodcomplex, less interconnection is observed. In this survey, the red lines represent the highest level of overlap (cohesion), spatial connection and the amount of people's choice to travel on those routes, and the blue lines show the lowest value (Figs. 1 and 2). In fact, it seems that the syntax of rows in the Persian Gulf complex is similar on the ground to fourth floors and is defined axially, it increases the possibility of people interacting with each other at the beginning and end points such as cinemas and stores, and strengthens communication and The sociability of people becomes more, in the Zomorodbusiness complex, it seems that the arrangement of rows on the ground floor around a central space increases the possibility of people interacting with each other in these rows and strengthens communication and sociability of people. But on the first floor of this complex where the lines and communication ways are the same, this social interaction event for people and their confrontation with each other is less. It is necessary to keep in mind that the number of commercial units on the ground floor is more than on the first floor. But the principle of providing sociability for the clients, who are facing problems due to the reduction of communication channels and business units on the first floor, reduces possible encounters between people and communication between them.

#### *Findings from the graphs*

##### *Persian Gulf Commercial complex*

In the Persian Gulf commercial complex, the graphs show that the connection has been formed in the main corridors and the space around the lobbies and peripheral commercial units on the negative first floor, the ground floor and the first floor. On the ground floor, there is the highest amount of connection in the main lane on the left. The distance between the center of the complex is where the plan change is

clearly defined and this change has caused more sociability and communication between the spaces. Also, a limited sitting space is considered around them, based on field observations, people talk to each other in this space, and most of the time, communication and interactions take place in this direction.

The centers adjacent to the business units on the ground floor are very interconnected. Also, according to the observations and charts in this collection, cafes, restaurants, book cafes, store sales counters, game halls, and game sites have a higher level of integration than other public spaces in this collection. The focal spaces are located in the middle of the lobbies on the first, second, and third floors, which are more interconnected than other spaces defined in this complex with more openness and Max space around the shops. And the connection is variable in the communication ways of this collection. This readability has the highest rating in the collective spaces and the lowest in the corridors and side paths. Also, based on the findings and observations in the Persian Gulf complex, as the spatial depth increases, we see less correlation compared to the main centers. In the collection of metric depth or the distance between two nodes, there is an inverse relationship with the connection. As the metric depth in the collection increases, the amount of connection is lower. Based on the authors' observation, we see little connection in the points with high depth, which can reduce the prosperity of the points with High depth lead. This incident in the third and fourth floors has led to a decrease in the prosperity of the axes with great depth, as it was observed that there are many unused shops in these places. The length of the axes has a direct relationship with the connection, if the length of the axis increases, more connection will occur. Which is clearly visible on the left axis of the complex, if there are elements and sitting spaces in this path, the connection is formed better. In the Persian Gulf complex, this discussion can be seen in the presence of the long axes of connection, Figure (3).

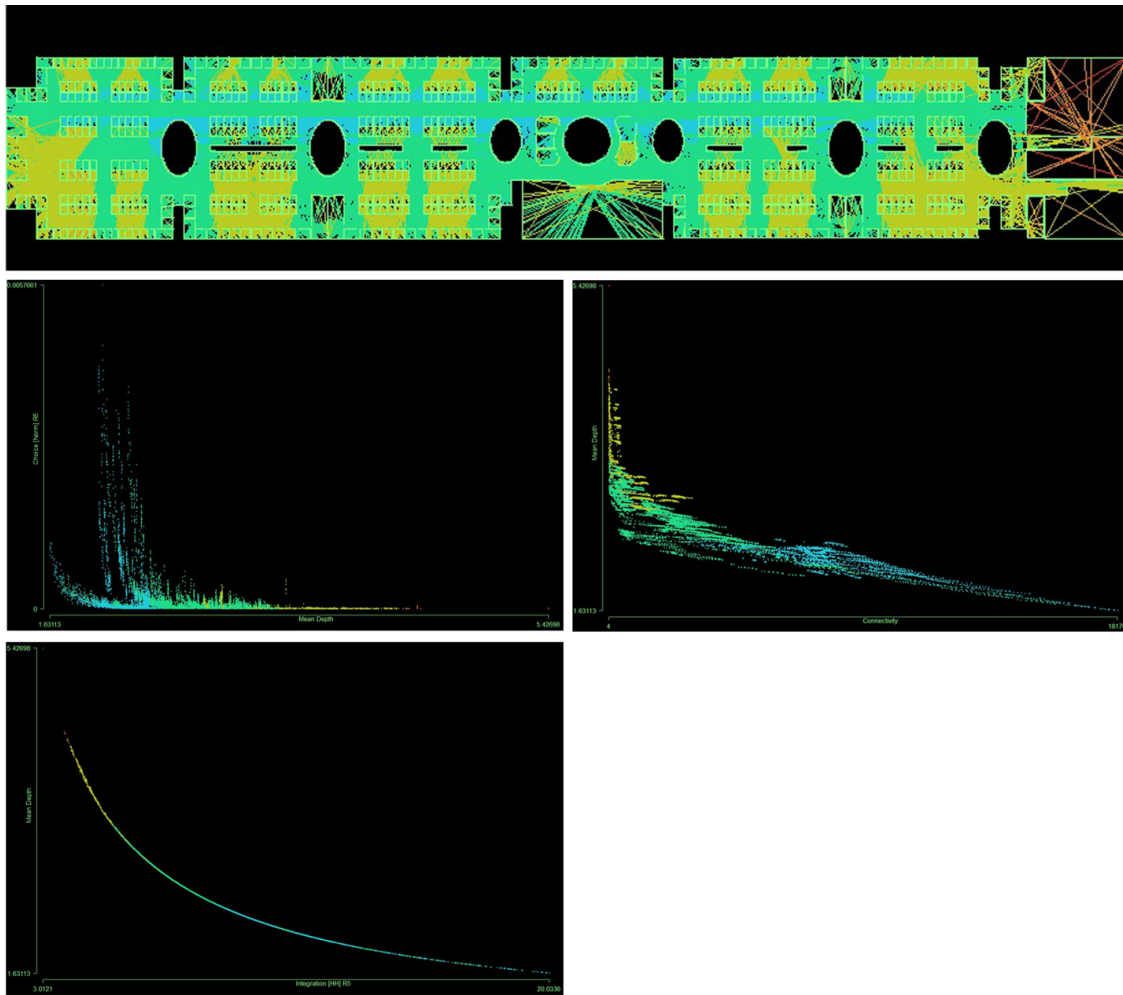


Figure 1: The connection graph of the Persian Gulf complex and the connection, depth and communication graphs

#### *Commercial complex*

#### *Zomorod commercial complex*

The findings from the graphs of Zomorod commercial complex show that the interconnections in the corridors and middle spaces around the commercial units on the ground floor and first floor are formed on the first floor. Browsing people is considered. There is also the limited seating space around them. Based on the field observations, people rarely talk to each other in this space and most of the time, communication and interactions do not take place in this direction. There are other public spaces in this complex. The focal spaces are located

in the middle of the lobbies on the first floor, which is more connected than the other spaces defined in this complex with more openness and defined Max space around it and shops. The degree of readability, which means the ratio of interconnection and connection, has been varied in the communication ways of this collection, this readability has the highest rank in collective spaces and the lowest in corridors and side paths. In the set, metric depth or the distance between two nodes with Correlation is a reciprocal relationship that as the metric depth in the set increases, the degree of correlation decreases. Based on the authors' observation, we

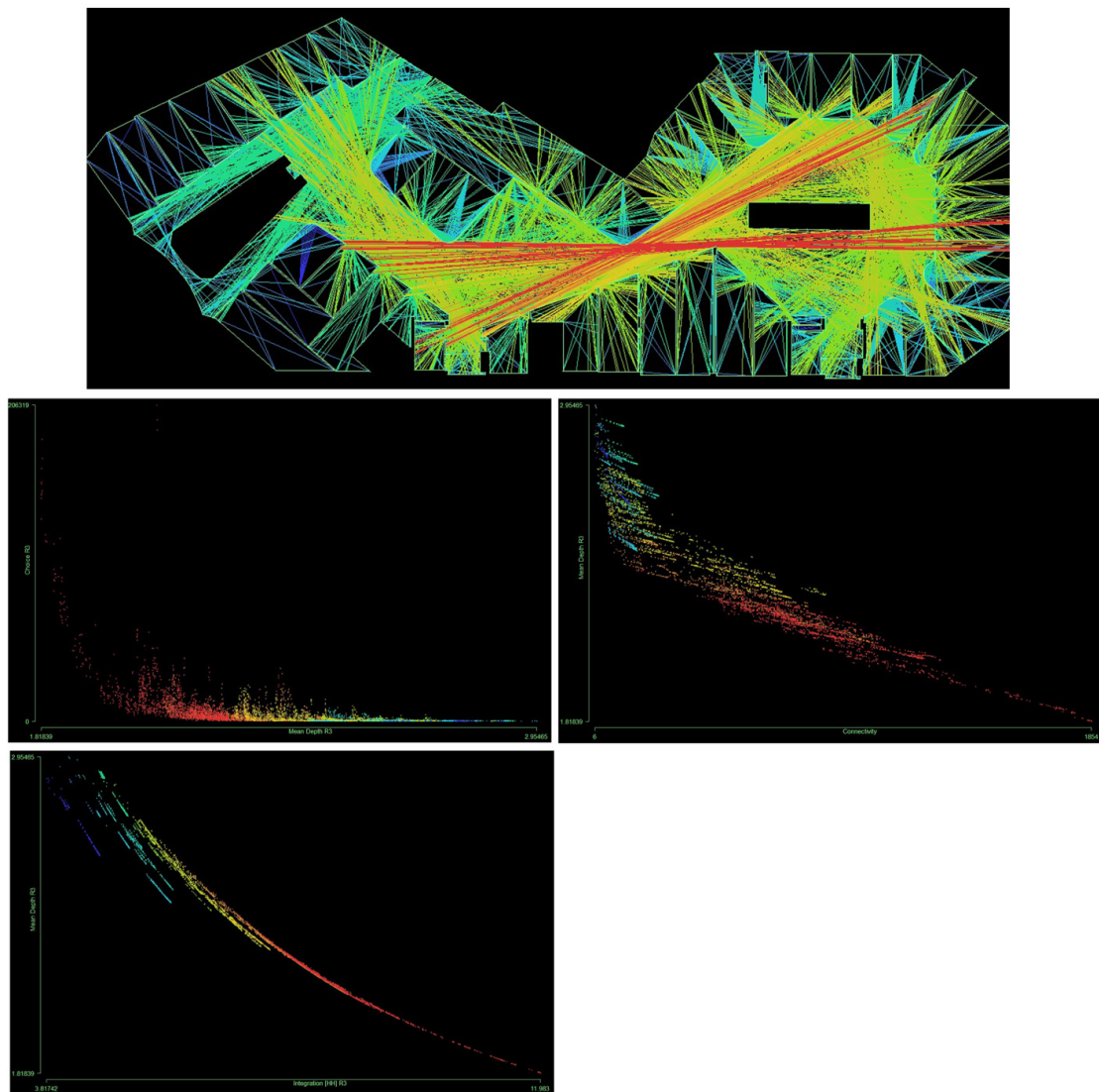


Figure 2: Connection graph of Zomorod complex and connection, depth and communication graphs

see little correlation in points with high depth, which can lead to a decrease in the prosperity of points with high depth. The length of the axis has a direct relationship with the connection, if the length of the axis increases, more connection will occur, in this case, the presence of elements and sitting spaces in this way will form a better connection. In the Zomorod complex, this discussion is one of the factors of reducing the connection by reducing the length of the axes, Figure (4).

The findings from the graphs in both sets show that:

- The main rows and corridors around the commercial units on the ground and first floors are more interconnected than the secondary connecting paths of these floors, and the effect of spatial depth is less visible. These corridors and paths are mostly reserved for the passage of people and between them, sitting and pausing spaces are embedded, based on the observations of the authors, people talk to each other

in these floors and spaces, and most of the time, communication and social interactions take place in these spaces.

- The centers adjacent to business units and the main communication routes in the Zomorod complex have less connection than the Persian Gulf commercial complex. Cafes and food courts, playgrounds and stores in the Persian Gulf complex have a high degree of integration compared to other public spaces in this complex. While the focal space, which is located in the middle of the main path of the complex, next to the spaces on the ground and first floors, is defined by the opening and pause spaces around it and commercial units, it has a significant connection compared to other public spaces in this complex.
- The readability, which means the ratio of connection and connection, is variable in the communication ways of the Zomorod complex, and this readability has the highest rank in the collective spaces and the lowest in the corridors of the secondary communication routes. According to the field observations, the public spaces of both Zomorod and Persian Gulf complexes include centers adjacent to commercial units, cafes, public spaces such as cinema, restaurant and play space, and communication paths and ways. Analyzing and examining the sociability of these spaces under the influence of their architectural features and their sociability with a quantitative approach and space arrangement technique shows that the probability of meeting more people is in the central common space and lobbies and cafes. In addition, the dispersion of interconnection, connection and depth diagrams indicates less readability of communication paths from the collective space. In general, the connection in both complexes happens mostly in the spaces of cafes, cinemas, and lounges, and mostly at the entrance of the ground floor, which shows the importance and attention to these spaces in commercial complexes in influencing people's sociability. In general, in both collections, it can be seen that the spaces in which the possibility

of pausing (sitting and stopping) is more, include the spaces adjacent to commercial units, the spaces of cafes, and the spaces adjacent to the fountain, which are the centers of sociability in these collections.

These spaces have 1 to 3 people working every hour. These data have been estimated in 15-minute intervals between 18:00 and 20:00 when there is the highest probability of socialization. As can be seen, the population density in the centers near the cafe There are a lot of halls and lobbies that are located in the middle of people's walkways and corridors in the complex. It should be noted that the furniture and sitting spaces in the communal spaces adjacent to the commercial units and focal points leading to the pedestrian communication routes are the same in all floors of these complexes due to the floor plan and more furniture can only be located in the vicinity of the cafes. And more communication takes place in this space, this is important because of the physical quality of this space and its scope, such as dimensions, materials, geometry and landscape.

## **CONCLUSION AND RESULTS**

According to the studies conducted and the analysis of space syntax graphs, it was determined that in the commercial complexes of the Persian Gulf and Zomorod commercial complexes of Shiraz, socialization factors such as movement in space, depth, length of the axis and spaces for pause and sitting and changes in syntax along the axis of the space According to the presence of people in communication spaces such as cafes, corridors and rows of this market, which is divided into two main and secondary categories. Collective spaces such as movie theaters, food courts, game complexes, and cafes, which have the highest hours of gathering of people, have a high level of connectivity, the spaces of rows and side corridors, which were the only places for people to pass through, have a much lower level of connectivity. By examining the depth in these collections, it was found that in the upper floors spatial depth has a greater effect on the connection and we see less

connection in the higher floors with a similar plan. The collections differ from each other in the type of geometry processing and follow the centripetal and axial geometry. If they follow the centripetal geometry, the sociability of the space will have a greater impact, at the same time, the desirable visual corridors, especially in the center of the commercial complex of the Persian Gulf and the routes leading to the commercial units and cafes on the upper floors, are not suitable, and the visual and It has less connection than the ground floor, but if these routes had central parts, it could increase their sociability and improve their communication in addition to the gathering of people, and lead to more connection and connection of spatial arrangement factors. According to the studies done, in general, the influencing factors of sociability on the factors of spatial arrangement in diagram (1) in the commercial complexes of the Persian Gulf and Zomorod commercial complexes of Shiraz city, factors such as spatial structures and movement in space and cognition Behavioral patterns of users are among the sociability indicators that affect the factors of spatial configuration, the amount of depth and the coherence of space syntax, Table No. (3).

Signs of increased interactions in the collection	Sociability	Index variable	Index variable	Amount
	Space syntax	Linkage	Linkage	15 %
	Human to Human Relationship		Control	5 %
			Permeability	5 %
			Legibility	5 %
			Depth	15 %
	Human and Space Relationship	Depth	Scale	10 %
	Continuous relationship of different actions		Transparency	10 %
		Connection	Variety	10 %
			Flexibility	10 %
				Connection

Table 3: factors and indicators affecting sociability

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