

Full Length Research Paper

Application of access graphs and home culture: Examining factors relative to climate and privacy in Iranian houses

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In the recent past, access graphs have been applied as a space syntax technique to analyze the spatial configuration of buildings in correlation with the social concepts. The aim of this study is to show the deficiencies in the use of the space syntax method in the examining of spatial relation in traditional houses in Iran. Traditional Iranian houses consider climate and privacy as very important factors for generating a sound social relationship between individual house and its occupants. It examined these factors in the cities of Masouleh, Gilan, Yazd and Shiraz using access graphs. In order to understand the two factors namely; cultural and climatic factors affecting the spatial relations in Iranian traditional houses during the varied seasons, the findings in this study are shown in three graphs rather than just the one as in a usual space syntax approach. This study also shows the necessity for the application of two graphs to represent the winter and summer use of interior spaces, and the use of an overall triple graph to demonstrate the entire house based on the use of Iranian home culture with respect to distinguishing the various functions of the rooms.

Key words: Spatial configuration, access graph, social relation, privacy, seasonal movement.

INTRODUCTION

A large number of traditional buildings in Iran can be classified as vernacular buildings. By vernacular, we mean those buildings “belonging to the folk tradition which is much more closely related to the culture of the majority and life as it is really lived than is the grand design tradition...” (Rapoport, 1969: 1 to 4). Iranian vernacular buildings, especially houses and home culture, have not been studied in detail, and there are few printed publications about them.

Regarding the current condition of traditional dwellings, with recent social and cultural changes, these buildings have been subjected to extensive changes, alterations and in some case a considerable amount of damage. The National organisation to preserve traditional buildings

now ensures some measure of protection, but the focus is mainly on the larger public buildings (Meshkati, 1965). Some famous houses of the prosperous in particular, large ones with special architectural characteristics have been preserved. It seems inevitable that a great number of ordinary buildings, especially houses, will steadily disappear (Falamaki et al., 1986). Moreover, since a large amount of industrial investments have been dedicated to construction, especially housing, the rate of damage to the traditional dwelling units has increased. Not surprisingly, researches on the context of vernacular traditional houses of Iran seem practically reasonable. Since such consequential changes throughout the life of traditional dwellings have occurred, the way of Persian ancestral life, will not be easily understood.

Among different approaches such as typological (Memarian, 1993), climatic (Tavassoli, 1982), historical evolutionary (Rubini and Petruccioli, 2010), anthropological (Homayoon, 1976), formal, and

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conceptual (Diba et al., 2001) adopted to study Iranian houses, the climatic approach can be introduced as the main approach which in the past three decades has dominated research in this field of study and also in other related disciplines, for example energy efficiency (Heidari, and Sharples, 2002; Yaghoubi, 1991), while the historical and socio-cultural approaches are rarely applied in the examination of traditional houses.

In the land of Persia, Country of Iran, as a context of study, the quality of culture can be evaluated as a profound essence of the country. "Iran, more than anything else, like a spiritual-cultural reality, demonstrated throughout the life of people who constantly maintained the sequence of their cultural creativity and national identity" (Nasr, 2003: 457). Also the phenomenon of culture has been identified as the word "*far-hang*" that is the rising point for those people who have practically utilized their savings and learning to humanitarian attitude throughout their individual and social life (Falamaki, 1992: 138).

Here, as the main goal of the study, standing on the subject of culture is just the starting point of understanding home culture. Concerning the cultural effect on house form as a consequence of socio-cultural factors considered in their most general meaning while building a house is a cultural phenomenon in itself (Rapport, 1969: 47). As in an analytic research which is about social relations' factor, the whole meaning is with respect to home culture. With socio-cultural approach, there are several methods to understand home culture. For instance, the aspect of place meaning could be examined by a research method such as phenomenology which focuses on understanding lived-experience or proxemics which is another method focusing on social-interaction. If the methods are examined separately, the results may be supplemented or reversed. This paper does not aim to propose a justifying method for understanding home culture; instead, it concerns to test the space syntax method that claims to demonstrate a perfect image of spatial configurations of space, in order to examine its provability and faultlessness. Therefore, the space syntax method has been selected without the intention of ignoring other methods, but to aid understanding spatial configuration (Hillier and Hanson, 1984) based on social events.

In investigating home culture; social relation as a system of internal socio-cultural factor is clearly important. Given the importance of understanding home culture, the question of spatial configuration analysis system appears. Can space syntax of architecture, with the use of justified graphs indicate a perfect image of internal social relations of houses? The main goal of investigating home culture is to show that a justified graph is a proper tool to show spatial relationship but this study of Iranian house suggested the triple graphs that could make clearer demonstration of social events. Since some social events depend on other factors such as climate and

interaction with space, the life of inhabitants generates other phenomena of home culture those that the spatial configuration might not have expressed. Another major aim is to say that since the effective realms of spatial configuration play a role in correlation with each other, application of a justified graph might not adequately identify this fact. Here, two of the most impressive factors of social events, privacy and climate, were examined. Climatic forces attributed to human responses depend on their living and home culture. One of the apparent human responses to climatic conditions is seasonal movement, occurring between rooms. Seasonal movement happens as a range of social events in correlation with other socio-cultural aspects by which spatial relations are applied.

Islamic traditions and privacy

The concepts of privacy and hospitality have had a great impact on home culture and housing formation. These cultural traditions come from a fundamental Islamic tradition, the control of social interaction between the sexes (khatib-chahidi, 1993: 115). This issue had an organizing role play of important patterns: pattern of privacy and pattern of hospitality. Two kinds of arrangements have been developed according to these patterns. One is developed to separate the private and reception areas of the dwelling, which is a pattern of privacy; another provided a special area for guests (Memarian and Brown, 1996: 45). Reception area (*birouni*) is part of a house into which it is only acceptable for a male guest to enter. The women's world made up of a private realm is segregated from the men's world (Memarian and Brown, 2006: 26).

Not surprisingly, the arrangement of private and reception areas has been mentioned by a number of Islamic scientists in different periods. For instance, Nasser-i-din Tusi, in the 13th century noted that the men and women's areas should be partitioned (Nasir-i-din, 1985). Also, Mazumdar (1997: 185) claimed that the man's world and the woman's world should be separated, the public world and the private world, the street and the home. Consequently, the great emphasis of privacy on home culture and housing formation has had effects on social events such as the movement of the inhabitant's and the spatial relations.

Climate and seasonal movement

Climate has had a great impact on the spatial arrangement in Iranian houses. As well as, influencing the overall form of the house, it can also generate seasonal movement between different parts of the house (Beazly and Harverson, 1982: 64 to 69). Seasonal movement in a house is one of the features of domestic life in Iran, and some neighbouring Arab countries

(Memarian and Brown, 2006: 24). As an effective factor of inner social relations, it has both a socio-cultural and climatic basis. Additionally various ways of seasonal movements, to be discussed in the next paragraph, affect house formation in different regions of Iran, and are unified with socio-cultural factors of people's behaviour.

People in Iran have adapted their demands to the environmental properties and in correlation with the entire religious belief being applied by them to form their houses. Iranian life-environment correlation has been noticed by Nasr proved this fact by making note of people's survival, actions and behavior when passing through the inconsistent climate (Nasr, 2003; 462) and seasonal movement is one of those adaptations.

As a climatic response during history, the inhabitants of a house might exploit air circulation and solar radiation in the hot and cold seasons, respectively. In more primitive accommodations used by nomads, seasonal movement take place as a result of long-distance change in location from a hot region to a cold region, or vice versa. Seasonal movements vary widely according to the type of house. For example, in some types of block houses, seasonal movements take place vertically. When the ground floor is given over to storage, however, they are more likely to occur horizontally. In the courtyard house, seasonal movement takes place around the perimeter of the courtyard, though occupants may move to the basement or the first and second floors in the heat of the day to take advantage of cool winds or lower temperatures. In winter the inhabitants would stay mostly in rooms with few openings (Memarian and Brown, 2006: 24).

The frequency of applying any particular space may therefore be determined by the time of the year, not simply by the overall pattern of access and circulation. Furthermore, it is not easy to show seasonal movements on a justified graph. Seasonal movement that happens in the summer is a fact that has been completely ignored in some studies that deal with climatic conditions very close to those of Iran such as traditional Turkish houses (Orhun et al., 1995: 475 to 498). In the Turkish dwellings the seasonal movement happens among rooms, the south facing quarter in cold seasons and the north-facing quarter in hot seasons like a courtyard house type (Kucukerman, 1988: 39).

MATERIALS AND METHODS

Space syntax analytic method

Since the early 70's, an approach called space syntax has been used to analyse human environment- from houses in large cities. Space syntax is introduced as:

"... a set of techniques for representation and quantification of spatial patterns. The steps towards quantification can be achieved by considering the space pattern as a two-dimensional convex structure. (Orhun et al., 1995: 476)."

The access graph is undoubtedly a useful tool to analyse spatial relations. As Brown has observed:

"One of the great virtues of the access graph is its visual clarity: it translates the topological structure of the building plan into a simple and highly legible diagram. When drawn in justified format, with the exterior as root, it becomes especially easy to determine the number of alternative routes there are into and out of the building, and the consequent relationship that each internal space has with the outside: tree-like patterns may be distinguished at a glance from those with cycles or rings . . . (Brown FE, 1990: 94)."

An important aspect of this method is to examine the degree of circulation in or through each space. Spaces that connect more spaces are more integrated and those that have a minor relationship only, are more segregated. From this point of view, a central courtyard in an Iranian house will generally be a highly integrated space. Many of the rooms, however, such as the 'central room', the most important winter room- and the talar- the most important summer space are relatively segregated. Highly integrated spaces are identified as the most accessible or public and those spaces with a high degree of segregation can be considered to be more isolated or private spaces.

In this study, a justified graph is used to show its deficiencies in exploring social relations with respect to privacy and seasonal movement. Moreover, some solutions are suggested to show a better presentation of social relations.

The suggested study: The triple graph

According to Persian home culture, spatial relations in summers are different from those in winters; our suggestion is to use at least three graphs, namely; 1) General graph; 2) winter graph; 3) summer graph.

The first can be a general access graph: this will outline an overall picture of spatial relations in the house. The second graph can be used for cold seasons both in courtyard and block houses. The third is for hot seasons. However, it is possible that in each season further diurnal sub-movements take place. Subsequently, examples of the different house types of Iran that were studied are portrayed.

RESULTS

The result is divided into three parts: in the first part we examined two block houses in Northwest Iran in a humid zone, later on two courtyard houses, one with a single entrance will be seen in the city of Yazd and another with three entrances in Shiraz will be provided. To show the difference more clearly for each house, between the general access graph and those of seasonal graphs, first a general access graph is drawn and then in the seasonal graphs, the vertices are omitted.

Block houses: Masooleh and Masooleh-Roodkhan

Masooleh is a small town located in the North-west mountainous part of Iran. It has long, cold winters and temperate summers. Houses are built on slopes one

above another and are usually South-facing. Thus, the roof of the lower house is the courtyard of the upper house. The ground floor is normally used as a passageway (Memarian, 1991: 242 to 243), and store rooms are also placed on this level. Stairs connect the ground floor to the first floor where the summer and winter rooms are situated. In a large number of these houses the stairs lead to a small hall in the first floor called a 'cioghom', which gives way to the summer and winter rooms (Figure 1).

The access patterns are shown in three justified graphs. The first shows the access pattern without taking into consideration the seasonal movements (Figure 1a). The first four vertices form a linear sequence, which is repeated in both the winter and summer graphs: this shows the importance of the passageway, stairs and hall in the circulation of the house during all seasons. Figure 2b is a summer justified graph. The balcony or *talara-pish* is at depth 5. In the summer, this space is used for enjoying the forest panorama in front of the house. But here, the connection between the *cioghom* and the winter room is unused. The winter justified graph is four steps deep (Figure 1c), and the winter room or *soomeh* is the deepest space (occupied/ used) at this time of the year. As we see, the location of the deepest spaces, both in summer and winter are based on climatic effects and not on social relations. Figure 2 shows another house from the Ghilan Plains region. The seasonal movements are different from those in the previous house and the winter spaces are on the ground floor, with fewer openings so as to remain warm in the winter (Memarian, 1991: 187 to 188).

The summer spaces are on the first floor. In the summer, cool winds flow through the first floor spaces, making them comfortable for the inhabitants. The first access graph shows the access or permeable relations between all spaces (Figure 2a). The *dalan* or hall on the ground floor is the most important circulation element, both in the summer and winter. It also serves as a small covered courtyard in the winter. The summer justified graph has a depth of 5 (Figure 2b); the deepest space is the main room on the first floor. The *talar* or large veranda, at depth 4, is used during the day and serves as a reception area. The winter justified graph is a linear, simple sequence of three spaces. The winter room is at a depth 3. The ground floor does not have any relation to the first floor in the winter.

The aforementioned examples of some block type houses demonstrate how climate can influence the integration and segregation of different spaces in different seasons. During the summer, some spaces are more integrated while others are segregated, but during winter those segregated spaces may become integrated. At the same time, some spaces can be used both in the summer and winter, as we noted in Masooleh and Ghilan.

Another observation depicted in the examples earlier mentioned is the influence of climatic factors on the

justified graphs, which have been separately analysed. In more complex houses, like the multi-courtyard houses, the combination of climatic and privacy factors complicates the application of the justified graph. Each of these factors has its impact on spatial circulation. To confirm this observation a multi-courtyard house in Yazd will be examined to illustrate the complexity that arises when privacy, hospitality, and climatic factors all come into play simultaneously (Figure 3).

Courtyard houses: Yazd and Shiraz

Rasoolian house in Yazd

In the Rasoolian house, in the historic centre of Yazd, we may observe many characteristics apparent in other multi-courtyard houses in the City (Memarian, 1993: 357 to 482). The harsh climatic conditions of the city have had a high influence on the orientation and spatial organization of the house. Houses are commonly oriented north-east to south-west, with the winter spaces on the North-eastern and North-western sides of the courtyard. The summer area is characterised by the presence of large *talars* although, in practice the summer area is embraced by various kinds of rooms in the house.

Four cycles can be drawn in the Rasoolian house reflecting the summer movements within the dwelling: 1) in the morning, activities take place in the eastern *ivans* or small verandas; 2) the late morning movement is toward the basement where the inhabitants stay all morning and afternoon; 3) the late afternoon and evening activities are concentrated in the *talars* and the courtyard, and 4) the roofs are used as a cool place for the night (Beazly and Harverson, 1982: 64 to 66).

Another relevant characteristic of this house is the separation of private and reception areas. The larger zone is the private area, while the smaller is the reception area. Seasonal movements occur in the reception area as well. Both areas have the same entrance and the two domains are linked by a vestibule with stairs leading to the roof. In order to accurately convey the spatial relationship of these four circulation cycles; a series of four justified graphs are needed.

The access pattern of this house can be shown by four justified graphs, the first being a general justified graph without taking into consideration seasonal movements (Figure 4a). In addition, both the reception and the private areas are treated as being fully active. This graph consists of 64 vertices. The courtyards and vestibules connect a number of spaces, which may be considered the most active circulatory elements in all seasons.

The second justified graph shows the spatial relation without taking into consideration the reception area (Figure 4b). In practice, this area is not used all of the time, but occupied for limited periods only; usually on Iranian weekends, Thursday or Friday afternoons. Again,

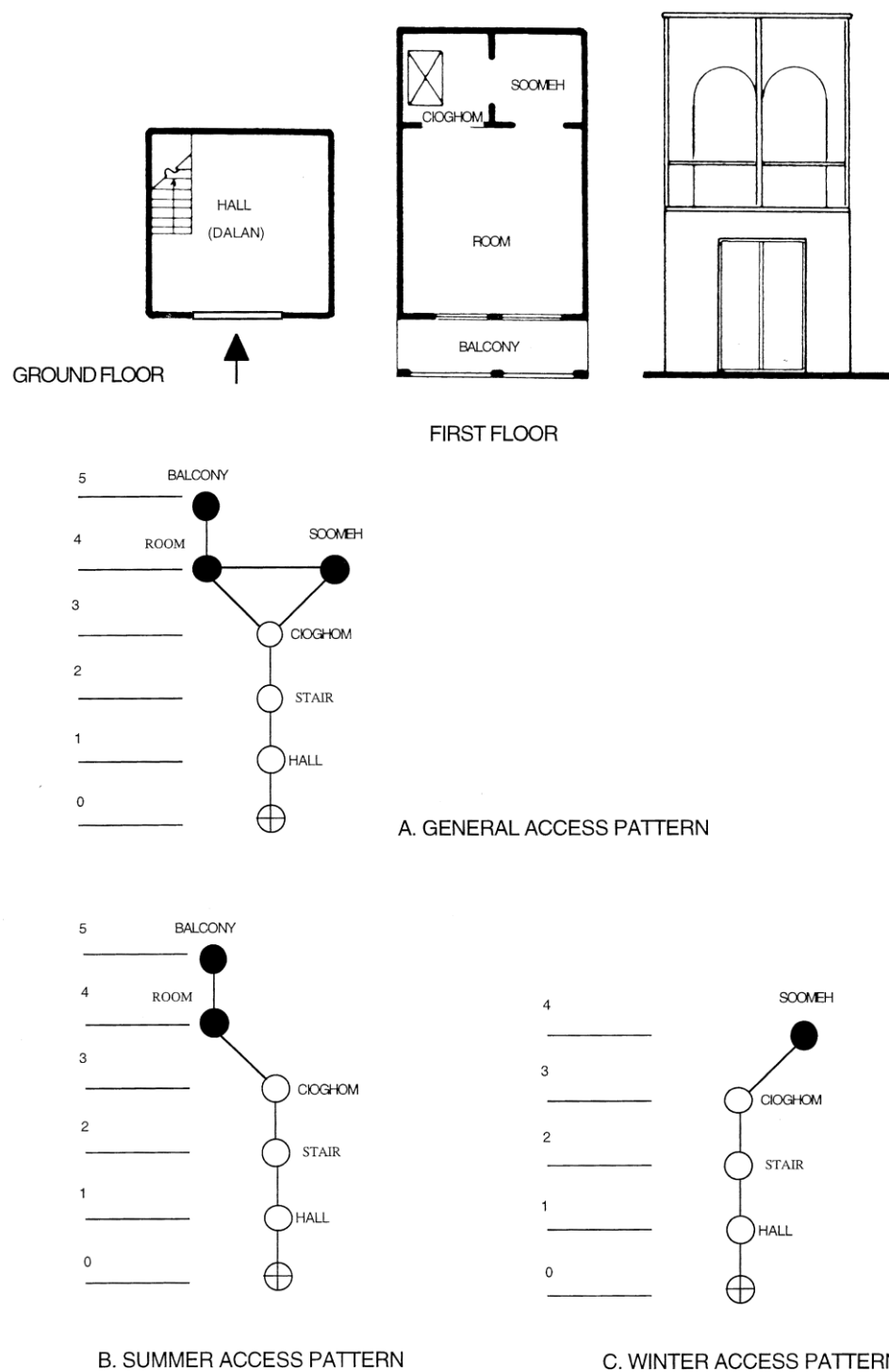


Figure 1. Masooleh, Access patterns in different season.

it demonstrates how time is an important factor which can influence the degree of segregation and integration. A similar situation also occurs in modern houses, with the reception room remaining idle when there are no guests.

The seasonal justified graph demonstrates some notable facts. The winter graph comprises those spatial relations that take place between autumn and early spring; the summer graph represents the spatial pattern

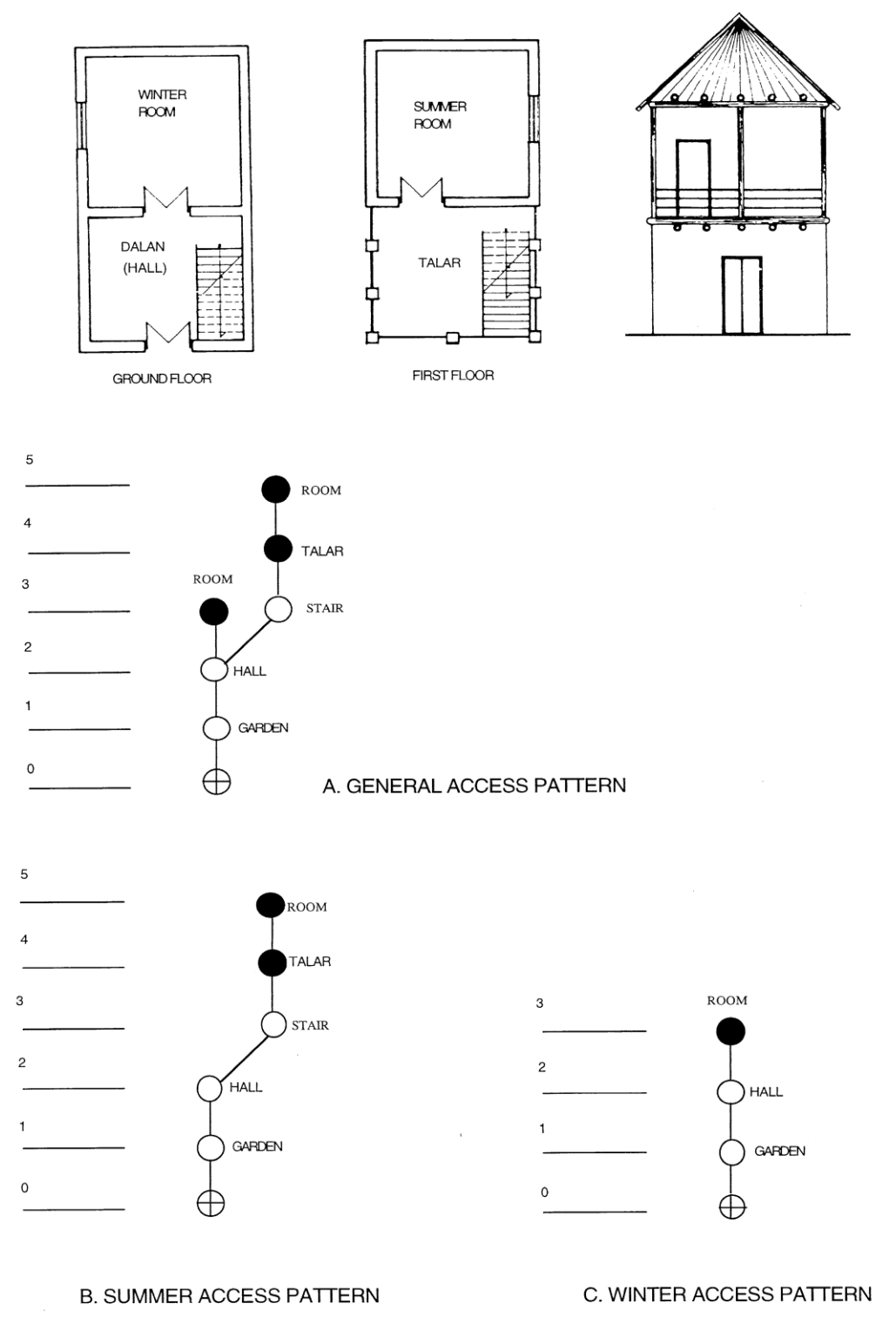


Figure 2. Ghilan, Masooleh-Roodkhan, access patterns in different seasons.

from the end of April until early autumn. The summer justified graph shows that a large number of rooms on the

ground floor are not in use in this season (Figure 4c), including the large sash-window rooms (otaghe orsi) in

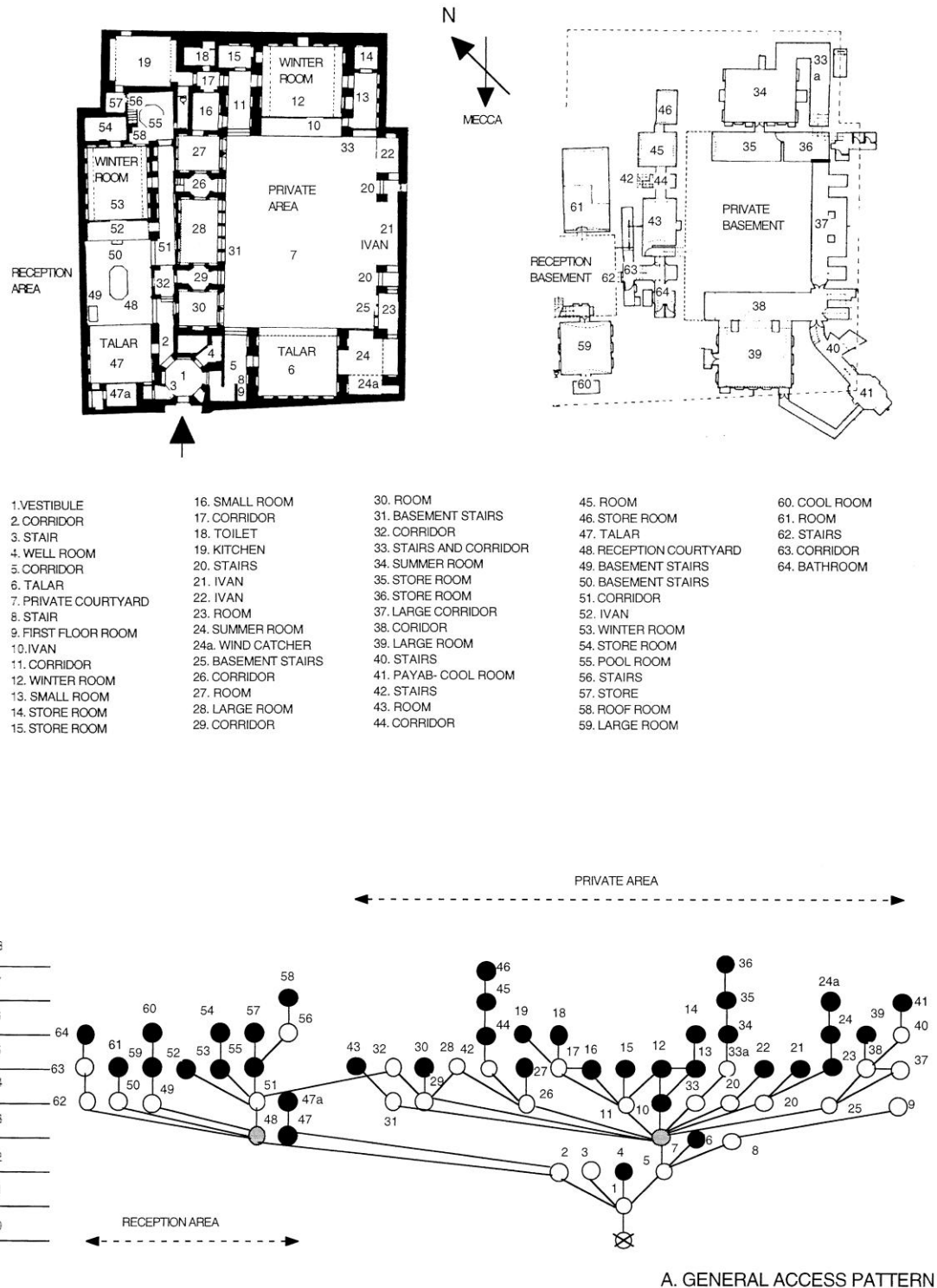


Figure 3. Yazd, Rasoolian house, access patterns.

the private and reception areas, and the rooms on the west side of the private courtyard. However, all the spaces on the southern side and the basement are used.

The graph shows the relationship between these spaces: talar, ivan, all rooms in the basement, the stairs to the roof, courtyard, and a pool house on the north side of the

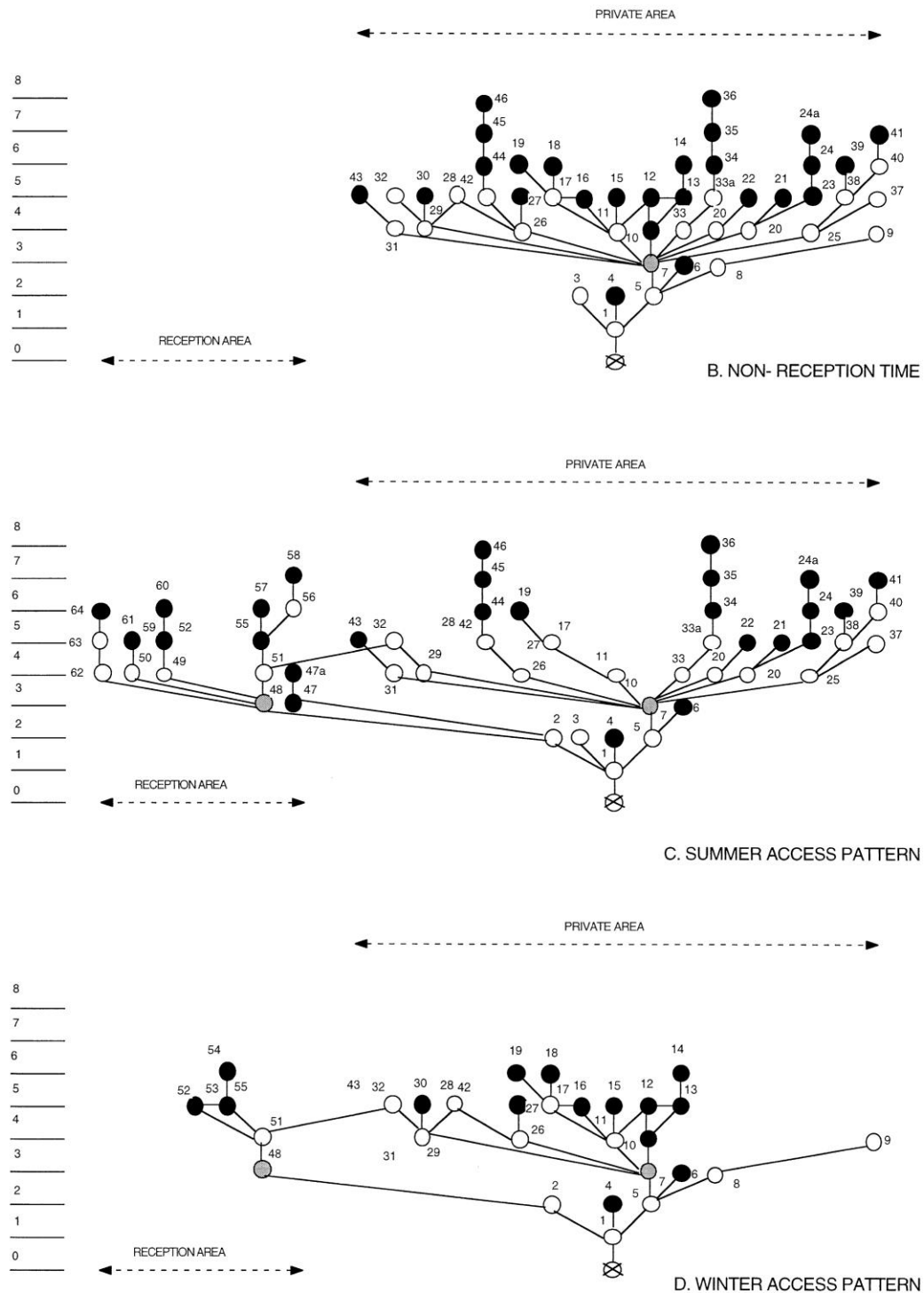


Figure 4. Yazd Rasoolian house, access patterns.

reception area.

The summer justified graph has 8 levels in the reception area and 9 in the private area. The deepest element in the reception area is the staircase that leads

to the roof from the pool house (No. 58). The deepest space in the private area is a room in the basement. The two deepest points in the private and reception areas are therefore related to the climatic conditions of the house:

one reflects access to the roof for night use, and the other to a cool space in the basement for summer use.

In the case of the winter graph, all those summer spaces on the south side and in the basement are ignored. Neither the large talars nor the lvans are in use in this season. The pool room that was previously included in the reception area is not shown in this graph (No. 55). The winter justified graph has 7 levels in the private area and 7 in the reception area. In the deepest spaces are store-rooms adjacent to the pool room. It is used as a cool room in the summer, probably for male visitors, which are not considered, here, as the most private spaces. As noted, in each season a number of spaces are completely segregated and others have varying degrees of integration. Seasonal movements, especially diurnal movements, cause some difficulties in calculating the precise degree of segregation and integration. A spatial pattern of this complexity can only be properly interpreted by a very precise knowledge of the spatial functions for each season and time.

A courtyard house with three entrances: Forugh-al-Molk House

In Figure 5, the alternative access graphs are presented for a house in Shiraz. The example is the Forugh-al-Molk house which has three courtyards, each independently accessible. This kind of access is recorded in some other houses - the Argh-i- Karim Khani, Basiri, Salehi, and Qavam-al Molk- in Shiraz, with separate entrances, of which two- The Qavam- al Molk and the Argh-i- Karim Khani- have disconnected courtyards (Figure 7). This analysis does not include a detailed picture of seasonal movement such as those seen in the Rasoolian house, which includes a basement and roof.

For each area of the house a separate graph is given, showing the characteristics of each, however, the interrelation between the three areas is not shown and only indicated by arrows. The graph has three separate roots, representing the external access points on three sides of the building. In Figure 5 at the bottom of the page, the general access pattern is shown. To highlight more clearly the importance of the courtyards, these are shown as grey vertices. It will be noted that the graph is slightly different from those which were presented for the Rasoolian house (Figure 3). There, the graphs had a common root which branched from a shared vestibule. Whereas here there is no common root; the entrances are on opposite sides.

From the general justified graph (Figure 5) one can conclude that the steps to reach the courtyards are not similar. While access to the private area at the courtyard requires several steps, the reception and staff areas require only one.

Although, most of the rooms are comparatively 'shallow' in relation to the courtyard, there are exceptions

to the rule. It is clear that corner rooms will have to be at least two steps deep, since they have no walls exposed to the courtyard. This leads to certain environmental consequences; they are poorly lit, but well-insulated; making these rooms well suited as bedrooms, especially in wintry nights, store rooms, and so on. Rooms No. 12 are the deepest spaces at depth 8. These small rooms are attached to the large winter room No. 7, and probably serve as pastoo or store- rooms. These winter rooms, which are the deepest spaces, do not provide any social definition.

The graph in Figure 5 shows the crucial function of the courtyards as the main points of distribution and access in the spatial arrangement of the houses; the depth of the courtyard from the outside, and the fact that the courtyard is overwhelmingly the most important distribution space in the complex. It points to strong control over the uninvited accessibility of strangers into the complex and the internal management of the interaction between the inhabitants (proving that the courtyard is the focus of activity and has a variety of uses). As for single-courtyard houses, the justified graphs show the importance of the corridors -to access the various rooms. The corridors are commonly located around the courtyard, adjacent to, or between the main rooms, to which they provide access.

The grouping of rooms can be read from the graphs. One of the striking features of the access pattern is that most are trees and the majority of spaces are only one or two steps deep from the courtyard (reflecting the fact that they are directly accessible via some sort of another space, usually a corridor). Thus, in terms of access there is very little difference between most spaces: they are apparently homogeneous and interchangeable. This is congruent with what we know of space-use in Iranian houses; that is, the rooms are multi-functional and indeed, to a certain extent, interchangeable. The areas for men and women, for example, are not spatially articulated. There is, however, an important aspect of domestic space use that has not been taken into account here, and that is the shifting patterns of movement with the seasons. As is shown in the figures, this is not something that can be read from the access graphs.

Cycles in the graphs show connections between different elements: in the summer graph of the private area, for example, the cycle formed by vertices 4, 5, and 8 is a frequent cycle found in houses from Shiraz and Yazd provinces. The pattern of the central room with a corridor on each side also occurs in single courtyard houses. The same analysis has been done in the case of multi-courtyard houses. The pool-room, No 11 (Figure 5), has a seasonal function as well as being a circulatory element. This large room is located between the winter reception spaces (Nos. 15 and 16) and a number of private rooms (Nos. 7 and 8). It is the apparent focus of circulation, relying on several cycles. Superficially, this highly connected room with its octagonal plan appears very similar to the vestibule in other buildings. However, it

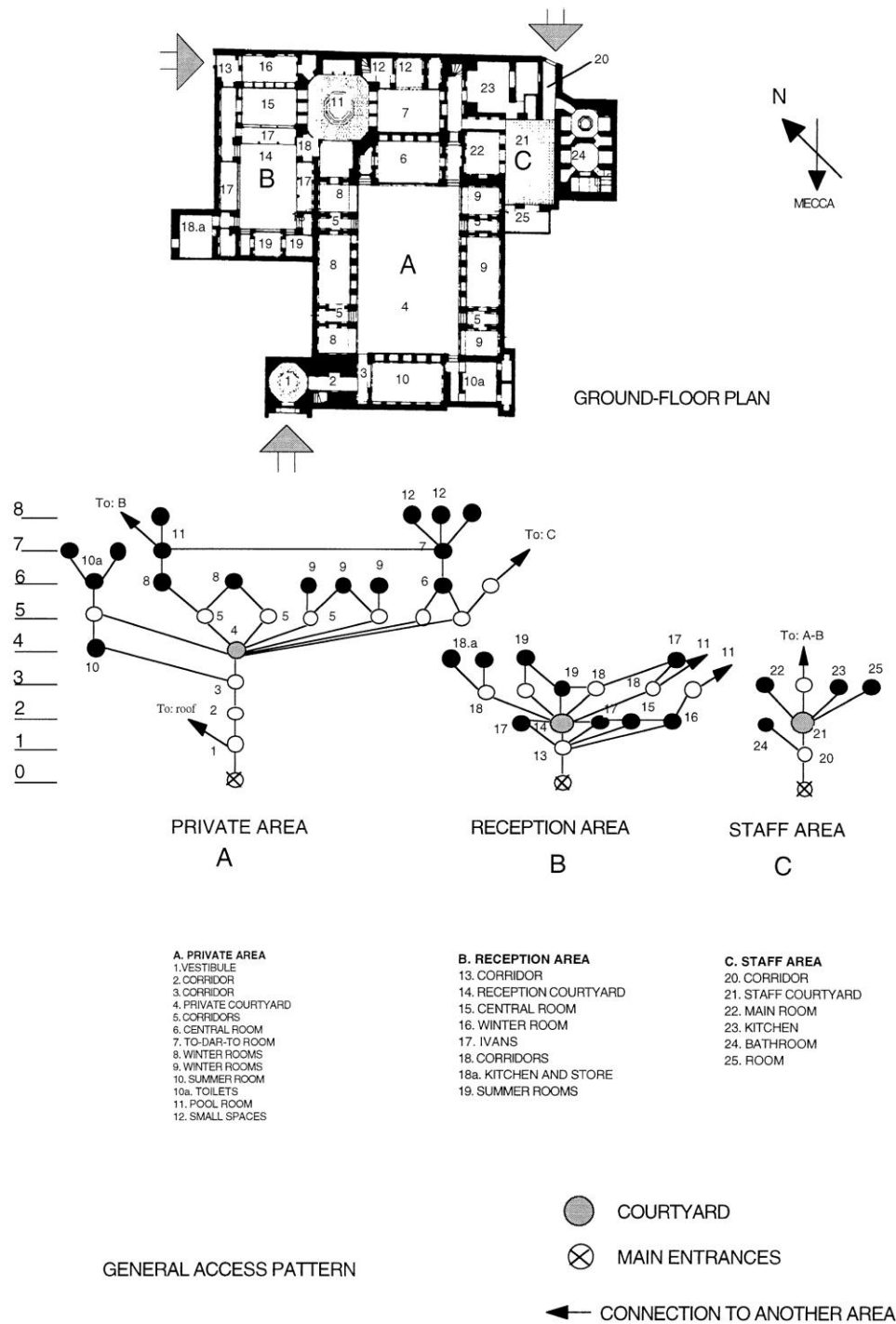
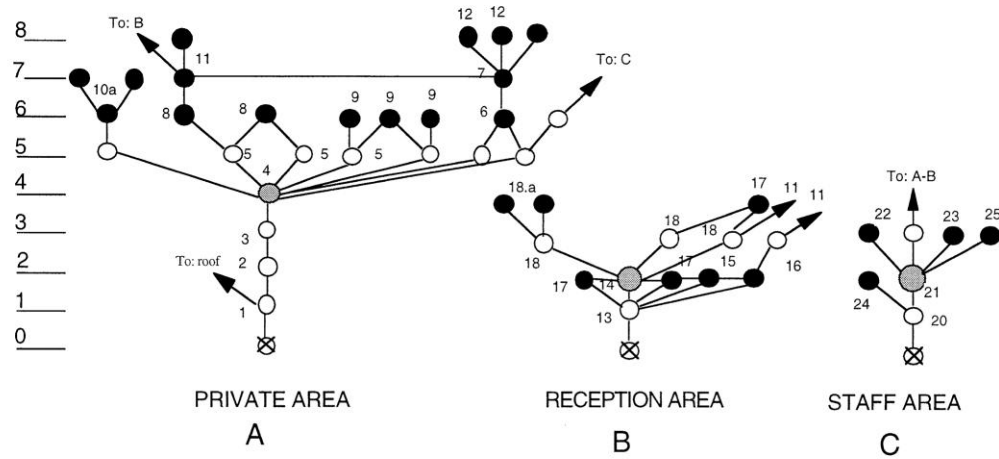


Figure 5. Shiraz, Forugh-al-Molk house, Access patterns without consideration of seasonal movements.

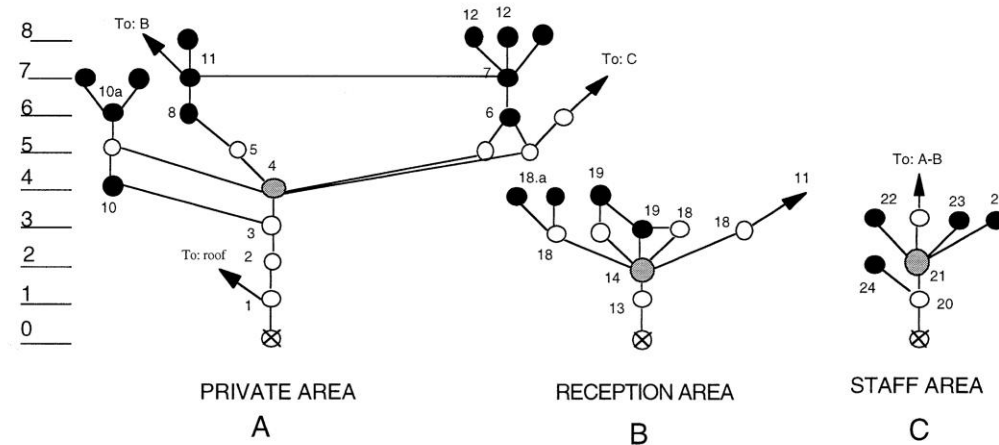
is configurationally very different from the pool room in the Rasoolian house, which was very segregated. In fact, it could be used as a large corridor or vestibule, but this was probably confined to the winter period. In summer, it would be used as a cool room by the inhabitants, but not

by visitors who had their own room within the reception area.

Figure 6 on the top shows the seasonal justified graphs. As in the Rasoolian house, the summer and winter graphs include those spatial movements that take



ACCESS PATTERN IN THE WINTER



ACCESS PATTERN IN THE SUMMER

A. PRIVATE AREA

1. VESTIBULE
2. CORRIDOR
3. CORRIDOR
4. PRIVATE COURTYARD
5. CORRIDORS
6. CENTRAL ROOM
7. TO-DAR-TO ROOM
8. WINTER ROOMS
9. WINTER ROOMS
10. SUMMER ROOM
- 10a. TOILETS
11. POOL ROOM
12. SMALL SPACES

B. RECEPTION AREA

13. CORRIDOR
14. RECEPTION COURTYARD
15. CENTRAL ROOM
16. WINTER ROOM
17. IVANS
18. CORRIDORS
- 18a. KITCHEN AND STORE
19. SUMMER ROOMS

C. STAFF AREA

20. CORRIDOR
21. STAFF COURTYARD
22. MAIN ROOM
23. KITCHEN
24. BATHROOM
25. ROOM

Figure 6. Shiraz, Forugh-al-Molk house, Access patterns with consideration of seasonal movements.

place during these seasons. The winter graph (top) shows the access pattern for winter spaces. As we see, there are two depths for the reception and private areas.

The graph for the reception area is at a depth of 4. The entrance corridor connects these rooms without having to enter the courtyard. The graph for the private area is 9

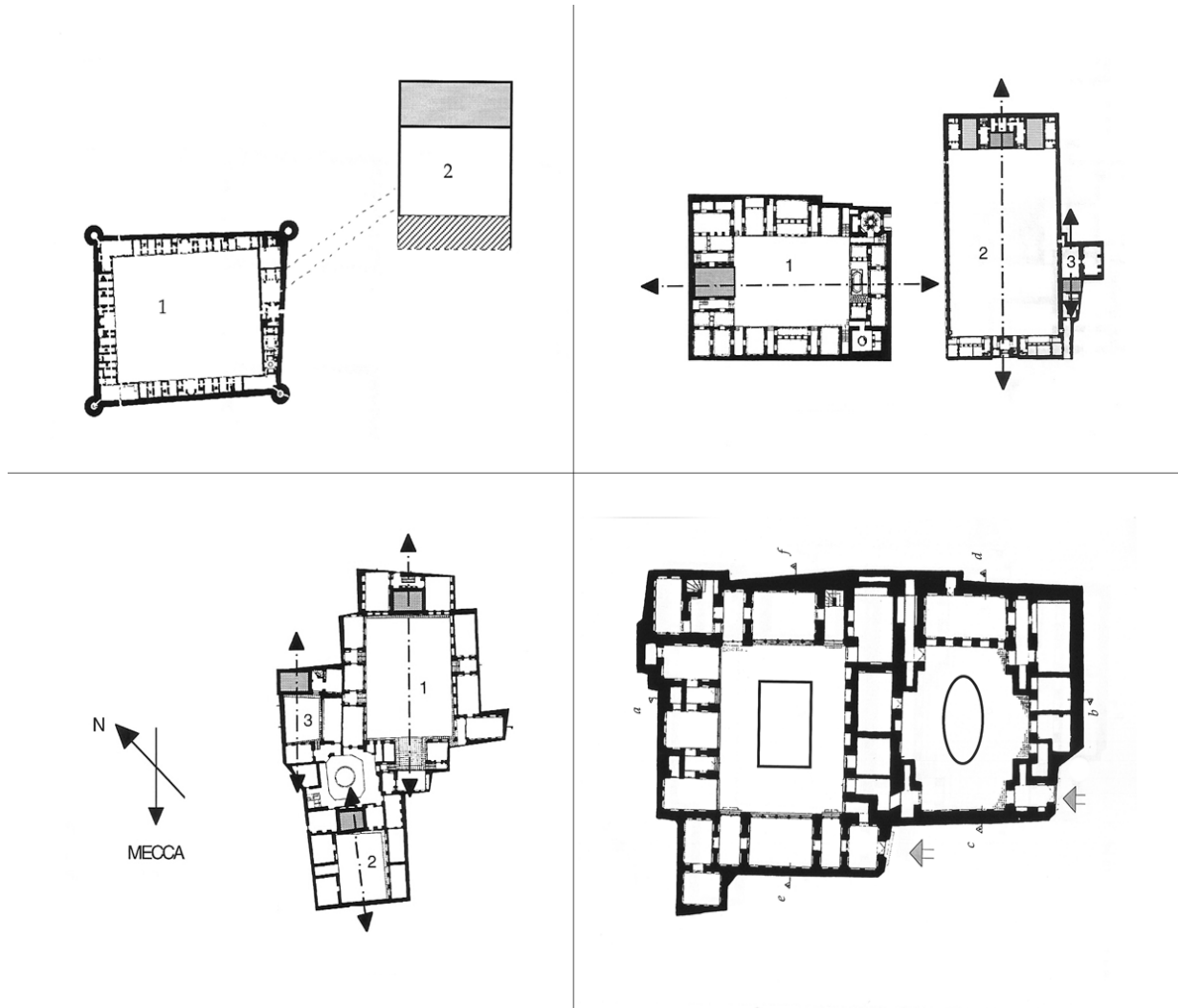


Figure 7. Top left: the Argh-i-Karim Khani, top right: Qavam-al Molk house, bottom left: Basiri house, bottom right: Salehi house.

levels deep. The linear form of the graph, as far as the courtyard, is due to the use of a vestibule and two corridors. The deepest points are a large winter room behind the central room and three small additional spaces which are connected to the winter room. This room could be used in summer afternoons, being linked with the adjacent pool-room or houz-khaneh.

The summer graph (Figure 6) shows that a large number of rooms in the private area, and a small number of rooms in the reception area, are unused in this season. The staff area has the same access pattern in both seasons, since the small size of this part does not allow complete seasonal movement. The summer justified graph has depth 8 in the private area and 4 in the reception area. The pool-room (houz-khaneh) is at depth 7. This space is connected to the room behind the central room. It is a shady room and could be used in the summer, as well as for winter nights, to get good

insulation.

DISCUSSION

Comparative analysis

Four houses have been analysed and three graphs indicate the different numbers of deepest points and spatial configurations for each one. Table 1 includes the comparisons of triple justified graphs indicated by the black bullets for each house. Black bullets are sign of spaces such as rooms, talars and other similar parts. For courtyard houses from Shiraz and Yazd, which belonged to prosperous families, the plenty of spaces resulted in various depths and the numbers of black bullets are considerably higher than those bullets in block houses. The block houses are not as big as courtyard houses and

Table 1. Number of black bullets of triple graphs in 4 cases.

House	City	Numbers of black bullet in general graph			Numbers of black bullet in summer graph			Numbers of black bullet in winter graph		
Masouleh	masouleh	3			2			1		
Masouleh-Roodkhan	Gillan	3			2			1		
Rasoolian	Yazd	38			26			15		
Forugh- al- Molk	Shiraz	*RA	*PA	*SA	*RA	*PA	*SA	*RA	*PA	*SA
		9	16	4	4	12	4	7	15	4

*Guide Map: RA = reception area; PA = private area; SA = staff area.

Table 2. Number of bullets of triple graphs in 4 cases.

House	City	Numbers of bullets in the general graph			Numbers of bullets in the summer graph			Numbers of bullets in the winter graph		
Masouleh	Masouleh	6			5			4		
Masouleh-Roodkhan	Gilan	6			5			3		
Rasoolian	Yazd	38			26			15		
Forugh- al- Molk	Shiraz	*RA	*PA	*SA	*RA	*PA	*SA	*RA	*PA	*SA
		16	29	7	10	21	7	13	27	7

*Guide Map: RA = reception area; PA = private area; SA = staff area.

their interior spaces are less than the selected courtyard houses. Although this comparison reveals particular differences among two types of selected houses, nonetheless this analysis was not the main goal of the study, further research of homogenous houses, in relatively similar size and status, is imperative. Consequently the more varied spaces a house has the more black bullets each access graph may have.

Focusing on climatic areas the numbers of black bullets (Table 1) and bullets (Table 2) in both block houses and courtyard houses of the cases are raised in summer. The main reason is seasonal daily movement in within the spaces inside the houses. For Block houses throughout hot summer days, a semi-open space called 'talar' is provided in order to obtain passive cooling by the local wind. This space is a contribution to other rooms that is also used in the winter. Particularly in the Rasoolian house, the number of rooms that people live-in during a 24 hr day period in the summers' is more than those used in the winters. In summer from sunrise to sunset residents move from one room to another; in different living sectors, semi-open, open and close spaces such as cisterns, talar, Ivan and basements.

On the other hand in winter, they rarely move from sunspaces such as the north *talar* and *Orsi*. However, this aspect is a bit different in the Forugh- al- Molk house because the city of Shiraz has got a unique climate. In the winters people from Shiraz need more closed spaces and the amount of precipitation is considerably more than in arid zones like Yazd. Since the micro-climate of Shiraz is not the same as Yazd, the spatial configuration relating

to climatic factors are shown differently. In spite of the raise in numbers of black bullet in summer graphs in the Forugh- al- Molk house the number of bullets in the summer graph of both the sectors; namely the private and reception areas, show a decline in the numbers (Tables 1 and 2) which emphatically demonstrates another intriguing means of core environmental effects on spatial configuration. Although these 4 houses explicitly show the importance of domestic daily seasonal movement, however, keeping in mind that open spaces (Semi-open and open spaces are main part of Iranian Houses that are not attended during winter use) such as 'roofs' were not studied here, a supplementary study is essential to determine the real function of social relations inside the Persian houses.

Furthermore, more than specific representation by way of block bullets, integrations and segregations of spaces indicated in justified graphs attributing to spatial configuration are varied in the summer and winter. Referring back to Figures 1 to 6 in winter, the whole summer sectors of houses are entirely segregated and in summer the winter area is in total segregation. This distinction defines a subtle understanding of integration and segregation that partially reverse the alternative definition by general graphs. This is of much concern not only to conceive the concept of home culture, but also to the space syntax method in that; complicated social relations of Iranian houses is a crucial notion of such analytical studies which inadvertently neglect the abundant space syntax researches.

A comparison also needs to be made not only between

the graphs of the whole complex but also between the various sub-graphs, especially those associated with seasonal use. The form of the entrance can have a major influence on justified graphs. As discussed in the paper, houses may have a common entrance, or separated entrances. This can increase or decrease the depth of the access pattern, which will vary according to the presence of vestibules and entrance corridors.

Conclusion

In this paper, the application of justified graphs is tested with home culture in the aspect of climatic and socio-cultural factors. It has shown that although, the architectural space syntaxes claim to explore home culture; it may have deficiencies, specifically when demonstrating the internal social relations of a house in an acceptable way. A possible solution is triple justified graphs: a general, a winter, and a summer graph.

It may be concluded that triple graphs themselves could be influenced by climatic and socio-cultural factors. Attributing to home culture; seasonal movement and privacy are the two main points of the study, contributing to justified graph's deficiencies to show a clear spatial relation. It also reveals that an analysis of spatial relations with the use of justified graphs may lead to the ignorance of other elements of vernacular architecture. In order to conceive a clear spatial configuration of multi-courtyard houses, based on social relations, a similar decomposition of the access graphs will be needed for each block house and multi-courtyard house. The influence of different factors can be presented separately on the justified graphs. But as the study shows in the more complex houses, like the multi-courtyard houses, the combination of these factors complicates the application of the justified graph. As far as, the comparative approach is concerned, further research on the study of block houses and courtyard ones in various sizes followed by a comparative analysis of different types of multi courtyard houses is suggested.

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NOTES: ¹The Figures of this paper were extracted from the Unpublished PhD Thesis of the first author, Gh. Memarian at the University of Manchester 1998. Semi-open and open spaces are main part of Iranian Houses that are not attended during winter use.

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