Flexible Spatial Configuration in Traditional Houses, The Case of Sabzevar

Hassan Estaji

Faculty Member, Hakim Sabzevari University, Iran
PhD Researcher, Institute of Architecture, University of Applied Arts Vienna
Building Technology Department, 1010 Vienna, Austria, estaji@student.uni-ak.ac.at

Abstract

The “Ideal House” is a building that covers all the human needs. But the biggest problem is: the house users, their needs and the environment rapidly change during the time. Due to the building technology of traditional Iranian architecture, especially the use of thick and load bearing walls, rearranging the position of walls to make changes is impossible. But the traditional Iranian houses by changing in the relationship between spaces try to respond to the changes. In this paper, “Space Syntax theory” is applied in analyzing the relationship between spaces of traditional houses in Sabzevar (northeast of Iran). This research indicates that nested space, multiple entrances for each space, selective connectability and disconnectability enable the houses to create a wide variety of spatial configuration. The flexible spatial configuration lets Iranian traditional houses to adapt themselves to changes.

1. Introduction

Living in an ecosystem- with predictable and unpredictable variables- needs a flexible and changeable Organism. From the beginning of Earth’s life, those species have been preserved, which were better adapted to changing conditions. The adaptation and flexibility deal with three main changeable issues: system, environment and user (Figure 1). In general, Flexibility is the system’s ability in changing to meet the needs of users (or coming users) in response to the physical and cultural environment and user changes.

Before addressing the issue of the flexibility and adaptability in housing, the basic question is: What needs must be met by a house for the occupants? In other words; what do people expect from a house?

1.1. Needs theory

The first comprehensive study of human needs was “Maslow's hierarchy of needs theory”. Maslow, Abraham Harold [1] in his theory in psychology believed that there are five levels of needs in every human being that when a need is fairly well satisfied, the next
prepotent (‘higher’) need emerges. Maslow divided these five levels of needs into the basic and being needs. (Figure 2).

The basic needs:

1- The ‘physiological’ needs: These physiological needs are human essential requirements such as: Air, Water, Food, Rest/Sleep, Clothing, Shelter, Warmth, Sex, etc. without one of them survival is impossible. These survivals needs form the base of Maslow’s pyramid. In case of any shortage of the physiological needs the body warns biologically and automatically, warnings such as feeling thirsty, hungry and tired. These alarms motivate men to eliminate the need as soon as possible. This stage of needs is similar to the animals’ needs.

2- The ‘safety’ needs (Comfort): Once the physiological needs are mostly fulfilled, human try to control and stabilize the condition they want to be assured that their survival needs will be provided in the future and they will be protected from diseases, neighbours and environment. In the case of sense of security and defending against danger, it does not matter the threat is real or unreal, it is important to feel safe and secure.

3- The ‘love and belongingness’ needs: When physiological and safety needs are largely satisfied, the first category of social need will emerge, the love and affection and belongingness needs [1]. People like to be a member of a group or a family; this desire to belong to a group helps them to feel safer and more secure. Being accepted by the group gives self confidence to the members and helps them to feel they are more powerful than before.

4- The ‘esteem’ needs: This stage of needs is divided into two categories; self respect or self-esteem, and other-esteeem.

The being needs:

5- If all four previous human requirements are met the final stage of Maslow’s hierarchy of needs, ‘Self-Actualization’, will emerge. The ultimate goal of human is to achieve their maximum personal potential; “What a man can be, he must be.”[1] All humans have the same basic needs, but the wishes and personal potential are very different from person to person. Maslow in his book, Toward a psychology of being, called it B-cognition. “B-cognition (B=being) is in contrast to D-cognition (D=deficiency-need-motivation) or human-centered and self-centered cognition.”[2]

Clayton Alderfer [3] reorganized and redefined the Maslow hierarchy in ‘ERG theory’. In Alderfer’s ERG motivation theory, the human needs are summarized and classified in three categories, (Figure 2):

- **Existence needs**: physiological and physical safety needs
- **Relatedness needs**: social relationships and external esteem
- **Growth needs**: self-esteem and self-actualization

ERG Theory is based on Maslow theory, but contrary to it states that the human needs are not hierarchical and one by one, they may emerge at one time. Instead of

![Figure 2. Maslow's hierarchy of needs and Alderfer's ERG theory, data source [1, 3]](image-url)
Maslow’s hierarchical logic, there are three mechanisms between the categories: satisfaction-progression, frustration-regression and satisfaction-strengthening.

1.2. Ideal hypothetical house, based on the needs theory

The “Ideal House” is a building that covers all of the human needs. Based on the amount and type of met needs by a building, we can evaluate the house. Human needs can be divided into two main groups; objective and subjective needs. For example the shelter is a building that only meets very limited physiological objective needs. But the biggest problem is: the environment, the house users and their needs and their wishes change rapidly during the time. The house requires a flexible spatial configuration to respond to the changes, changes such as seasonal climatic changes (physical flexibility) and changing in family size and family structure (social flexibility) and changing in wishes (cultural flexibility). There is no clear boundary between social and cultural issues because the beliefs, religion and personal and social wishes can affect relationships between members of a family or a group, (Figure 3).

2. Why is the flexibility in housing more important than other types of building?

If we divide the human life into twelve steps, the house as a place for living from birth to the end of life must cover all of these phases of human development, while other kinds of building deal with a small number of the phases, for example kindergarten and working places only deal with three phases (Figure 4). A flexible spatial configuration can cover all the phases in the entire life.

A house is a place for human activities during days and nights in all years. The wide variety of human activities as well as a wide range of times spent in the house emphasis on the necessity of flexibility in housing design, (Figure 5).

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**Figure 3. Levels of the house based on the needs theory**

**Figure 4. Comparing the coverage of human development phases by different buildings**
Any changes in the house users affect the space requirements, but the problem is we cannot predict and control the changes, for example the family size and family structure change during the time without any fixed patterns.

“As an architect you design for the present, with an awareness of the past, for a future which is essentially unknown.” Norman Foster [4]

In Figure 6 the characteristics of house users and their activities are classified. Most of them are changeable,
only a few of them are fixed e.g. gender. A house is not necessary to cover all these users’ needs at the same time, but it must be ready for any changes.

3. Research methodology

“Buildings and cities exist for us in two ways: as the physical forms that we build and see, and as the spaces that we use and move through.” Bill Hillier [5]

The first approach deals with physical form, but the next way is concerned with relationship between spatial layout and users. In this paper, in addition to the qualitative analysis of traditional Iranian houses from a morphological point of view, the quantitative analysis with space syntax method is also applied.

4. Spatial configuration in traditional Iranian houses

Climatic conditions and Privacy are two main factors that affect the form and the spatial configuration of traditional Iranian houses.

The traditional Iranian houses in hot and dry regions were designed based on the a simple climatic principle; avoiding the sun on hot days and taking maximum advantage of solar heat in cold days, for this purpose the traditional houses provide a flexible spatial configuration to let the user move between spaces. These movements can be performed in two ways: daily and seasonally, and from spatial point of view: vertically and horizontally, (Figure 7).

Privacy in Iranian houses is originated from the Iranian culture and Islamic beliefs. The house manages the social interaction between family members and guests by separating the private and reception areas.

4.1. Ideal hypothetical house

If we want to design an ideal hypothetical house according to climate and privacy based on Iranian traditional architecture we need four spaces, two spaces for responding to the climatic conditions and two spaces for separating the family and guest zones, (Figure 8).

Figure 8. Ideal hypothetical house based on Iranian traditional architecture

Figure 9. *Moslem* house in Sabzevar

*Moslem* house in Sabzevar was designed based on this concept in the last years of Qajar era (before 1925). In *Moslem* house, vertical-seasonal movement was applied in response to climatic changes during the year (Figure 9).

5. The main question

Is it possible to use this ideal concept for contemporary houses? In other words; is it a sustainable solution currently?

To answer this question, another ideal hypothetical house is assumed based on maximum spatial flexibility.

This model is formed according to the following sustainable strategies:

- maximum land use
- compact living
- mixed land uses
- using land efficiently
- multifunctional spaces
- minimum resource and material use
- minimum need for Energy and water
- minimum circulation

In this model all functional areas are located on each other (maximum overlap), (Figure 10 Right).

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1 Sabzevar is located in the Northeast of Iran, south of Sabzevar mountain range on the outer edge of the Central Plateau of Iran.
The lack of land and energy resources, the sharp rise in the costs of construction and maintenance, technology development and above of all changing in lifestyle and family structure limit the using of single-purpose spaces in contemporary housing design. In the other hand, the highest level of space use (second idea) belongs to the “Solitary confinement”! It is clear; nobody likes to live in a box for all of its needs. Flexibility is the key of this challenge. A flexible spatial configuration can provide variable space according to the current and coming needs. In second part of this paper the necessity of flexibility in housing was mentioned.

6. Flexible spatial configuration

Space syntax is a theory and a set of methods about space that according to the Hiller [5] is based on two ideas:

1- Space is not a background to activity, but an intrinsic aspect of it. Which is done in three ways: moving through space, interacting with other people in space and seeing space from a point in it.

2- Human space is not about one space, but about the inter-relations between the many spaces that make up a whole system. Hiller called it the “configuration of space”.

The house is a spatial system to meet the user’s needs and provide space for the family activities, at the same time it must facilitate interaction and communication with other family members, guests and neighbours. Any changes in users and their lifestyle require a new spatial configuration.

Due to the building technology of traditional Iranian architecture, especially the use of thick and load bearing walls, unlike Japanese traditional architecture rearranging the position of walls to make changes is impossible. But the traditional Iranian houses by changing in the relationships between spaces respond to the changes.

For a more detailed study the first floor of Aldaqi house (end of Qajar era around 1925) as a case study is analyzed by space syntax methods. The ground floor was used for summer time and hot days, the service area such as kitchen and stores are located in the ground floor too, (Figure 11).

The first floor of Aldaqi house has a columned portico four rooms and a connected room. Due to the large number of access doors to each room, this house is able to change its spatial configuration according to the changes, some of these alternatives are presented in Figure 12 (left).

At first look, all of them are similar together but from a spatial configuration point of view they are very deferent. The justified graph of these alternatives reveals these major differences, (Figure 13).
Figure 11. Aldaqi house in Sabzevar, convex break-ups spaces and justified graph

Figure 12. Possible plans and metric step shortest-path length maps

Figure 13. Justified graph maps for different plans
In Figure 12 (Right) a metric step shortest-path length of alternatives is calculated by UCL Dephtmap\(^2\) software. The alternative F has the maximum step path length; it can provide the maximum privacy for this layout in comparison to other choices. The calculation of integration\(^3\) value shows the diversity of special configuration clearly, (Figure 14).

These alternatives can respond to different probable scenarios:

A: each room is dedicated to one of the family members or guests.

B: by opening all doors and connecting to the portico a large communal space is ready for guests at summer.

C: communal space for guests at winter.

D, E: the house sub-divided to create two independent living units.

F: an extended family spends a hard winter, they chose compact living.

7. Conclusion

Iranian traditional architecture spite of rigid physical structure has been able to respond to changes. Nested spaces, multiple entrances for each space, selective connectability and disconnectability, and above all multifunctionality enable houses to create a wide variety of spatial configuration. This flexible spatial configuration lets Iranian traditional houses to rearrange themselves according to changes without changing the main structure and form of the house. The diversity of spatial configuration enables houses to cover predictable and unpredictable scenarios.

Acknowledgement

This paper is a part of my PhD thesis which I am still working on it. I would like to thank my supervisor Prof. Karin Raith, University of Applied Arts Vienna, Building Technology Department, for her comments.

References


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\(^2\) UCL Depthmap is an Open Source application developed at UCL for spatial analysis and performing visibility analysis of architectural and urban systems.

\(^3\) The integration of a unit space describes how closely (or distantly) the unit is topologically accessible from all other units. For more details about the integration definition and calculation methods see ‘The social logic of space’ [6].
