



# Evaluating Giovanni-Climatic Comfort Zones Considering Four Human Temperaments in Four Different Climates Based on Traditional Medicine Proposing Four Models of Temperamental-Climatic Comfort

Maryam Salkhordeh<sup>1\*</sup>, Mahdi HamzehNezhad<sup>2</sup>

1- M.Sc. Architectural Engineering, Department of Architectural Engineering, Iran University of Science & Technology, Tehran, Iran

2- Assistant Professor, Department of Architectural Engineering, Iran University of Science & Technology, Tehran, Iran

\*salkhordehmaryam60@yahoo.com

Received: May 2021 Accepted: June 2021

## Abstract

While modern scientific developments in climatic design field determine rules and regulations for providing comfort in any region, they do not consider physical and temperamental differences among people residing in these different climates. This leads to the proposal of an identical comfort zone for all human beings in all the different climates. While in the traditional architecture, the climatic rules for each region were shaped by the deep relation between the human population and the environment of the region. The main objective of the current study is to compare the conditions of environmental comfort in modern and traditional architectures using the Giovanni comfort model and to propose four different temperamental models for adjusting climatic comfort based on different temperaments and humors. The current study uses an analytic-inferential method. In this study, at first we introduce and discuss the principles of traditional medicine about the temperamental comfort of human beings in four different temperamental and climatic regions and based on these discussions four different cities; namely, Amol, Bushehr, Ardebil, and Kashan, are chosen for the analysis. In these cities, Giovanni instructions for providing comfort are analyzed. Based on the findings and by analyzing the Giovanni charts and the temperamental characteristic chart it is concluded that based on the principles of the traditional medicine, in cold areas, the cold tolerance threshold is lower and in hot regions, hotness tolerance threshold is higher. This is because of the consistency and coordination between the individuals' temperaments which reinforces the temperamental ability of people in that region. Considering the provision of temperamental health temperature, four charts based on four climates are proposed.

**Keywords:** Climatic design, environmental comfort, modern and traditional architecture, temperamental health.

## 1- Introduction

One of the most important human issues is environmental comfort and since human beings have different physiological (temperamental), spiritual, mental, and social needs, they have to interact with their fellow human beings. Therefore, in order to create architecture suitable for human beings, it is necessary for the designer to pay attention to all these needs and requirements. Architecture must fulfil the human requirements in three fields including stability, comfort, and beauty [1]. Along with this agenda, maintaining human health must also be considered in order to reach a comprehensive architectural guideline [2].

Traditional architecture had at its core the internal and psychological desires of human beings in a way that different individuals in different regions considered their temperament and humors and based their architecture on these issues. They were also very keen on maintaining the comfort and health of human beings. However, with the advent of the industrial revolution and the growth and development of modern architecture, gradually the attention and the structural foundation of architecture shifted towards reaching beauty and prosperity, so humors, temperaments, and psychological and physical health were neglected. This lack of attention, which may be considered insignificant, in the long-term can have negative impacts on the temperaments as well as physical health of human beings. So, considering the four characteristics of aesthetics, stability, comfort, and health proposed by Razjouyan (Figure 1), it can be seen that modern architecture is more involved with aesthetics and stability and a little with comfort. Therefore, in this study, we are trying to consider comfort and health characteristics. Comfort can be generalized to include well-being which consists of mental, physiological, perceptive, protective, and environmental well-being.

There have been many efforts to determine the range of thermal comfort. One of the oldest and the most common indicators and measures of the thermal conditions is the “effective temperature” which was proposed in the second decade of the twentieth century by American Society of Plumbing Engineers. In order to develop this measure, a number of participants were asked to enter special chambers where the temperature, sunlight, humidity, and the air flow were highly controlled. They were asked to give their opinions on the thermal conditions of these chambers. Accordingly, the characteristics of dry and wet temperatures of the conditions which created highly similar experiences for the majority of participants were located and marked on psychrometric charts. By connecting the acquired points, “aligned comfort lines” were obtained. This measure was named “effective temperature” by the developers (Figure 2).

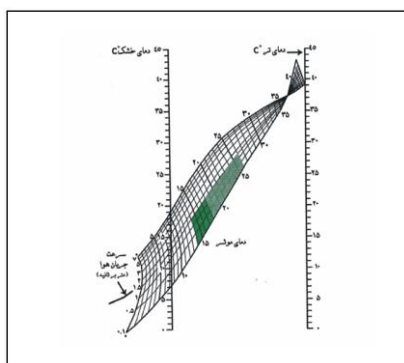


Figure 1- The Chart for Effective Temperature and winter and Summer Comfort Zones (Razjouyan, 2009)

At first, in order to develop the measure of effective temperature, the impact of the mean radiant temperature of the environment was not considered. This shortcoming was overcome after the completion of the spherical thermometer and the measure of “corrected effective temperature” or CET was established and implemented in 1932. The difference between the measures of “corrected effective temperature” and “effective temperature” is related to the information of the temperature curve. If we use the information related to the temperature of the dry air in a location in order to evaluate the thermal conditions of that location, the effective temperature will be obtained [3].

Architects including Olgay, Giovanni, Mahani, Evans, and Pen Warden used Fencer and Humphrey as well as the applied aspects of architectural design to develop tables and charts prepared based on the measures and indices of thermal comfort. An important characteristic of these charts and tables is that the accurate extraction of principles of climatic design using them is very easy and straightforward. Using these criteria as well as meteorological data we can determine the climatic requirements and complications as well as the design strategies [3].

The health indicator can be sought after in the traditional medicine and humoristic rules of that tradition can be followed. In this medicine, the coordination between an individual's humors or temperaments and the environment will improve and reinforce human temperament.

While there have been many developments on the issue of determining the comfort zone and many physiological factors are considered in these charts, the charts which are currently a reference for modern architectural designers are faced with some problems: (1) these charts consider comfort as an absolute phenomenon, (2) they do not consider the physical or temperamental differences of human beings residing in each climate, (3) an identical comfort level has been assigned for all the climates.

The main objective of the current study is to determine the comfort level more accurately by considering temperaments and humors as well as physiological variations. Moreover, it has been tried to design charts and curves which consider relative comfort as well as the humors and temperaments and the health of human beings.

## 2- Research Literature

Since centuries ago, there have been many studies regarding the climatic comfort of the human habitats. For instance, Nazari (2004: 18) in his book called "the Scientific History of Geography" argues that, "Aristotle divided the earth into several climatic regions and designated these areas as habitable and uninhabitable based on their climatic characteristics" [4].

The scientific and accurate investigation of climatic conditions and comfort of human beings started during the 1950s and 1960s. In these years, scholars started trying to estimate the human comfort conditions using mathematical equations, statistics, curves and charts, as well as climatic parameters such as temperature, humidity, wind speed, and so on [4].

Determining the range of thermal comfort in the dry conditions of Yazd City was performed and using the Olgay model and correcting the boundaries of thermal comfort in this model based on latitude, climate data and field observations, the thermal comfort zone was calculated for the hot and cold seasons of the year [5].

A research study of the physical, mental, and environmental effects of environmental factors on thermal comfort in different climates was carried out using coupon classification. These studies are about the adaptability of human beings in different regions located in Bangladesh, Brazil, Cuba, India, Nigeria, and so on and they determined a comfort zone for each country. The ability of each individual to withstand thermal changes and the environmental temperature and the level of human beings' adaptability can affect the determination of the comfort zone and help save energy [6].

Moreover, a study in Brazil under the hot and humid climatic conditions was carried out that considered the air flow which is a very important factor in hot and humid regions. Based on the questionnaires gathered in this study, human comfort requires higher air flows and they defined a minimum temperature of the comfort zone which was higher than the standard level [7].

These studies define a comfort zone for each climate.

## 3- Methodology

The current study uses an analytical-inferential method. The study first discusses the foundations of traditional medicine. Then, it considers temperamental comfort and its measures and characteristics. Next, four cities in four different climates are analyzed using the Giovanni chart and the temperamental characteristic curve will be plotted based on hotness, coldness, dryness, and wetness. The temperature of 10 degrees and the humidity of 50 percent are considered as the origin of coordinates and the humidity range of 30 to 60 percent and the temperature range of 15 to 20

percent based on Mahani chart are used as the general comfort zone. This will be compared to the temperamental characteristic curve and finally, four curves and charts with a wider comfort zone will be proposed.

#### **4- Principles of Traditional Medicine**

##### **4-1- General Principles of Humors and Temperaments in Traditional Medicine**

###### **4-1-1- The Definition of Humor and Temperament**

Temperament or humor is a quality created by the mutual reaction of two or more elements. In other words, from the mutual reaction of the particles of contradicting materials, a homogeneous quality is created which is called a humor or a temperament. For instance, if water and soil are mixed with equal proportions, the cold humor will be created, which is close to equilibrium regarding the state of being wet and dry. Since all the creation consists of only these four principal elements, all the material and spiritual realities will have humors or temperaments [8].

People who get acnes and a warm body after eating sweet and hot foods such as dates have a hot humor. For each object, state, or situation we can consider a humor [8].

###### **4-1-2- Different Humors**

###### **Location Humor**

Location temperament is in agreement with human temperament and by studying location temperament, the human temperament is also studied. In other words, by observing the four physical elements in the surrounding environment we can understand the behavioral and ethical characteristics of human beings related to that same elements. For instance, humidity and water do not have a determined shape and they change shape based on their container and by changing the container, they change shape quickly. This element implies a human being who has a temperament close to humidity, he or she understands perceptions quickly and forgets them quickly, too. Or a hard object which requires a lot of effort to be shaped requires a lot of effort to change shape again, much like human behavioral and ethical characteristics which are very stagnant. These people take a lot of time to understand something, but when they understand, they will never forget. As humidity causes flexibility, heat causes movement, dynamic nature and kinetics in objects and phenomena. In other words, intensity and extreme nature are caused by a hot temperament and climate. In contrast, coldness reduces movement and the dynamic nature and causes humans and other animals with this temperament to become slow and stagnant. Therefore, human temperamental characteristics are in agreement with the natural environment [9].

###### **An Individual's Humor in Different Seasons**

The earth, much like human beings, consists of each and every humor. Avicenna discusses human nature in different seasons as follows:

In the spring, human beings have a blood temperament which lasts for three months at the beginning of the year. The second season, summer, has a yellow bile temperament. In fall, human temperament tends towards black bile temperament. And in the last season or winter, the humor turns towards phlegm [8].

###### **Humor in Day and Night**

During the first three hours of the morning, the humor is blood. The next three hours during the day is yellow bile, three hours of noon, it is black bile. And the three hours near the sunset, it is phlegm. The night will be much like this till the morning. Moreover, he believes that the earth has a cold and dry humor, the fire has a hot and dry humor, water has a cold and wet humor, and the air has a hot and wet humor.

###### **The humors of the wind are also four humors as follows:**

Saba (zephyr) wind, south wind, north wind, and Dabour wind.

Saba wind which starts from the east is hot and dry (yellow bile).

South wind is hot and wet (blood).

The north winds are cold and dry (black bile).  
Dabour wind is cold and wet (phlegm) [8].

#### **Humor of House and Residency**

Where we live and spend our free time, some rays will affect the body and create an effect of coldness or warmness (hotness) in our bodies. These coldness or warmness must be consistent with the geographical location of the house construction and in order to create this coordination and consistency we have to build the house and our residencies by using materials which adjust the geographical location temperament. For instance, in order to build a house in a cold and humid geographical location such as northern regions, the house must be made out of wood. While, if we use cement and plaster, since these materials are very cold, an individual residing in that house will suffer from intense cold and this coldness will cause diseases such as rheumatism, extremity pain, and fatigue. However, when constructing a building in a tropical region (hot and dry), we have to use materials such as cement and plaster in order to adjust the hot climate of that geographical location. Using metals and polished materials in the building will cause the building to start absorbing different rays and these rays will be absorbed into the body, so they change the mental conditions of human beings [10].

#### **Humors of Colors**

Colors also have humors and faces and expressions have energy, their humors have been defined and there is no doubt they have positive and negative impacts on human life.

Individuals must put themselves only in front of suitable colors and avoid looking at unsuitable colors and faces which are not consistent with their nature. If we abide by this rule, much like when eating bad food makes us sick, looking at inappropriate colors will also lead to diseases.

The blue color of the sky is the color of balance and it is in agreement with the humors of all human beings and the majority of animals love the blue color of the sky. The green color is also a mild color which tends towards hotness, a calming hotness. When you are around disappointed people you must wear green clothes and depressed people must go to green places and look at green landscapes.

White is a cold color and reflects and reinforces coldness in the soul, the psyche, as well as the body itself.

Black is also a cold color. The coldness of black is more than the coldness of white. Hence, it can be said that black is cold and dry while white is cold and wet. Looking at these colors for a long period of time will cause thoughts to become stagnant and it will bring despair and sadness.

Red is a hot color, an exciting hotness. Looking at flowers with a red color will make you warm and energized and happy. This creates a lot of hotness and excitement and causes rebelliousness and explosion of hotness and energy, which is dangerous for people with a hot humor.

Yellow, light yellow, and orange induce happiness. Brick colors, earth color, the color of wheat, light or dark, are color of balance and calmness.

Based on the humor and temperamental conditions of patients, physicians must exert them to different colors and constant looking at special colors must be prescribed or looking at some colors must be prohibited [10].

#### **Humors of Materials**

Materials and construction resources also have humors and the humor of each type of material is consistent with the humor of the region. For instance, bricks have a hot humor and are used in hot and dry regions while the humor of stone is cold and it is used in cold areas. Wood has a wet humor and thatch is hot and wet [11].

#### **4-2- Different Humors in Human Beings and in Nature**

Nature has four elements; namely, earth, water, fire, and air. Much like the nature, human body has four temperaments and humors ranked from the lightest to the heaviest as follows:

1. Yellow bile which is like fire and hot and dry.

2. Blood which is like air and wet and hot.
3. Phlegm which is like water and cold and wet.
4. Black bile which is like earth and cold and dry [9].

The combination of these humors to a certain proportion will lead to balance and if one is dominant over the other, diseases or bad humor may present themselves. The Iranian traditional medicine has some recommendations for each one of the humors. For instance, we can mention the four main humors of hot and wet, hot and dry, cold and wet, and cold and dry and in order to maintain humor health during the different seasons of the year, we have to consider different plans. In order to maintain health, we must use items which are consistent with the humors since based on the principles of traditional medicine, when the humors of human beings and the humors of the environment are in agreement, the capability and temperament of human beings will be reinforced and improved [10].

#### 4-3- The Rule for Reinforcing and Curing Humors

Human temperaments are divided into outside the body and inside the body groups. Outside the body temperaments must be against the human temperament and inside body humors must be consistent with the human temperament. For instance, in the winter, an individual with cold temperament must breathe in the cold air (inside the body) but he or she must wear warm clothes (outside the body). Therefore, an individual must not act against his or her natural temperament just because of thermal comfort since this will cause risks to his or her health. Therefore, striking a balance is required [11].

### 5- Analysis

#### 5-1- Analyzing the Giovanni Chart and Humor Charts in Four Different Climates

##### 5-1-1- Giovanni Bio-Climatic Construction Criterion

Giovanni proposed the construction bio-climatic criterion in the 60s based on the following principles:

- a) In some climates, reaching thermal comfort is possible using some meteorological phenomena. For instance, in a hot and humid climate, the air flow, and in a hot and dry environment, the temperature fluctuations between days and nights can play an important role in creating desirable conditions inside the house.
- b) The type and the extent of the impact of the building on factors influencing feeling of comfort are obvious and computable. By considering the maximum efficiency of the building in turning an undesirable condition into a desirable one, if the meteorological conditions for turning an undesirable situation into a desirable one are plotted in a psychrometric chart, the a bio-climatic construction chart can be obtained [2].

Compared to other charts and tables proposed by other architects for providing a solution for architectural design, the Giovanni's bio-climatic construction chart has some benefits:

- 1) This chart is prepared on a psychrometric chart and so by having each one of the meteorological factors such as temperature, relative humidity, mixed humidity, wet temperature, and air pressure and so on, we can use this chart. In this chart, the relationship among these factors is easily depicted.
- 2) Besides the comfort zone of an individual resting with light clothes on in a shadow, which is called thermal comfort zone (without the influence of other factors), on this chart we have other zones which represent the effects of a number of corrective factors and the range of their impact. These factors include, the effective range of the sunlight in cold days, the effective range of air flow in hot days, the effective range of evaporative cooling in hot and dry days, and the effective range of the thermal mass of the building's wall made out of earth construction materials.
- 3) The overlapping of the corrective factors of the thermal state in some ranges indicates the possibility of using them instead of each other if necessary. For instance, under hot conditions, if the thermal state is located in the range of a number of corrective factors, we can obtain the thermal comfort level inside the building using the thermal mass of the building's walls, or the air flow, or the evaporative cooling of water. This is very important in design and it allows the designer to

consider environmental and design limitations and facilities to use those factors which are more suitable and more cost-effective.

Considering the fact that in using the Giovanni's bio-climatic construction chart there is no limitations regarding geographical latitude or longitude, we can use this chart in any climatic condition. On the other hand, since the chart is on a psychrometric background, it is sufficient to have an information pair such as temperature and humidity to plot the thermal conditions of the location of the chart. Giovanni corrected this chart twice; he corrected the cold days range in 1989 and the hot days range in 1998 using the information about thermal comfort [3].

However, this chart considers an absolute comfort zone for all the climatic conditions.

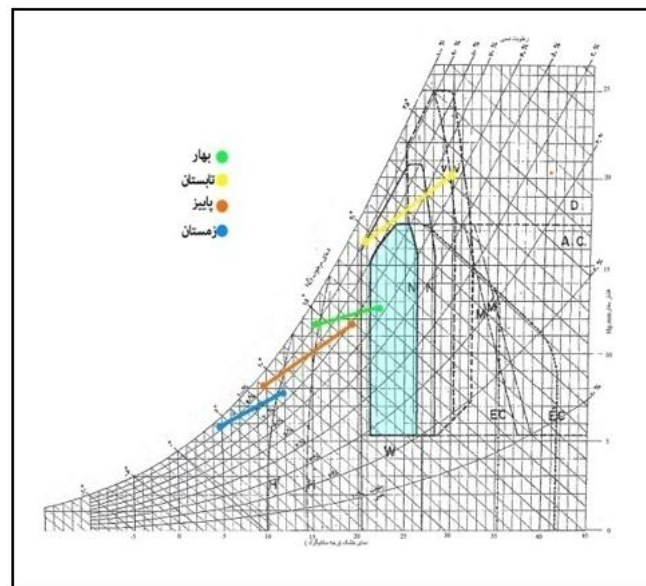
### 5-2- Analyzing the Giovanni Chart in Four Different Climates

The average minimum and maximum temperatures as well as the maximum and minimum humidity levels in each season are considered and the charts have been plotted based on these tables.

#### 5-2-1- Comfort Zone for Amol Based on Giovanni Chart

**Table1- Bio-Climatic Construction Table for Amol-1 (Author, 2014)**

Seasons	Average Air Temperature		Average Relative Humidity	
	Average Maximum	Average Minimum	At 6 o'clock	At 3 o'clock
Spring	22.6	15.3	90	69
Summer	29.1	20.7	91	67
Fall	18.3	9.5	94	72.3
Winter	12	4.9	92.3	74.6



**Figure 2- In this chart, spring is in the comfort zone while summer is also relatively in the comfort zone with tolerable comfort levels. However, winter and some of the months in summer are outside the comfort zone.**

#### 5-2-2- Comfort Zone for Bushehr Based on Giovanni Chart

**Table 2- Bio-Climatic Construction Table for Bushehr-1 (Author, 2014)**

Seasons	Average Air Temperature		Average Relative Humidity	
	Average Maximum	Average Minimum	At 6 o'clock	At 3 o'clock
Spring	29.7	22	70.6	44.6
Summer	37.4	26.3	76	49.1
Fall	26.6	15.3	80.6	52.6
Winter	21.1	11.5	78.8	58.1



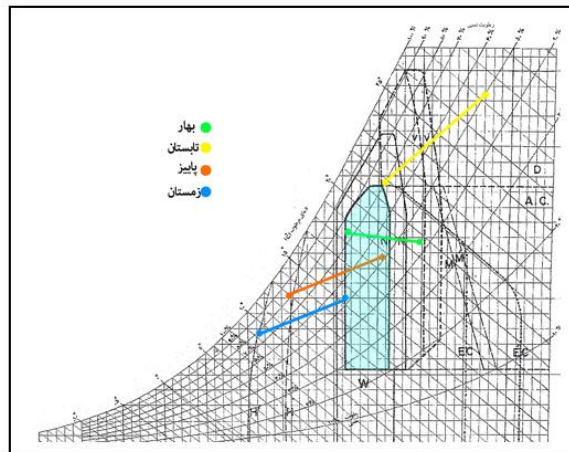


Figure 3- In this chart, spring and fall are in the comfort zone. Furthermore, using the effects of materials, winter is also in the comfort zone. However, spring is outside the comfort zone.

### 5-2-3- Comfort Zone for Ardebil Based on Giovanni Chart

Table 3- Bio-Climatic Construction Table for Ardebil (Author, 2014)

Seasons	Average Air Temperature		Average Relative Humidity	
	Average Maximum	Average Minimum	At 6 o'clock	At 3 o'clock
Spring	23.3	7.3	64	37
Summer	32.1	12.5	48	21.5
Fall	13.4	-2.6	73.1	46.6
Winter	6.5	-5.1	79.6	59.6

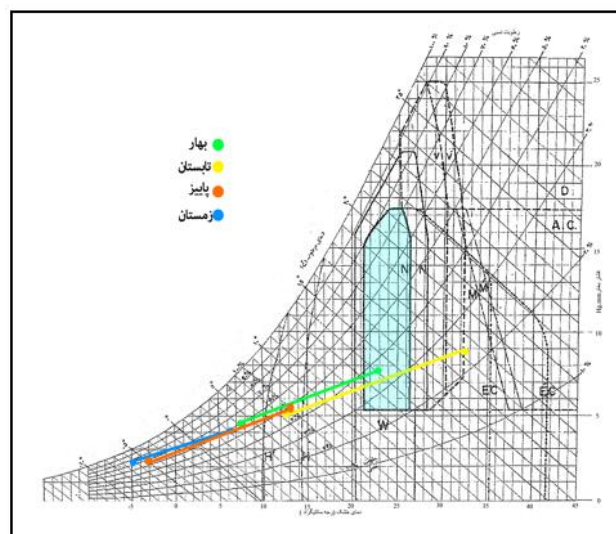


Figure 4- In this city, summer is in the comfort zone and using mechanical tools, spring will also be in the comfort zone. However, fall and winter are outside the comfort zone.

### 5-2-4- Comfort Zone for Kashan Based on Giovanni Chart

Table 4- Bio-Climatic Table for Kashan (Author, 2014)

Seasons	Average Air Temperature		Average Relative Humidity	
	Average Maximum	Average Minimum	At 6 o'clock	At 3 o'clock
Spring	31.4	18	64	37
Summer	38.1	22.2	48	21.5
Fall	19	5.9	73.1	46.6
Winter	13.3	2.1	79.6	59.6



In this chart, spring is in the comfort zone and using the effects of materials, fall will also be in the comfort zone. However, winter and summer are outside the comfort zone.

### 5-3- Chart Analysis Based on Temperamental Characteristic

#### 5-3-1- Temperamental Chart

A chart based on four humors of dryness, wetness, hotness, and coldness was plotted in which 50 percent humidity and the temperature of 10 degrees were set as the origin of the coordinates.

Under normal conditions inside the building, the relative humidity of 30 to 60 percent is appropriate. The Mahani table represents the status of different climates based on average annual temperature. Based on this table, regions with annual average temperature lower than  $15^{\circ}\text{C}$  are considered cold and areas with average of more than  $20^{\circ}\text{C}$  are considered hot (Tabbaz, Mansoureh, Climatic Knowledge, 2013).

So, in this chart, a comfort zone was determined and the average temperature and humidity of three cities in each climate were obtained and plotted on the chart.

#### 5-3-2-Temperamental Characteristic Chart for Mild and Humid Region

Average temperature in this climate is  $16.5^{\circ}\text{C}$  and the average relative humidity is 81.25 percent. The average temperature is in the comfort zone, but the humidity is 20.25 percent more than the comfort zone level.

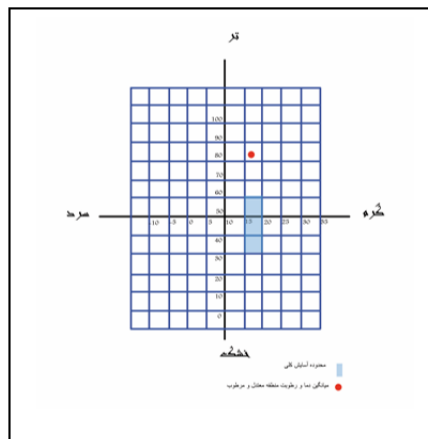


Figure 5-Temperamental Characteristic Chart for Mild and Humid Region (Author, 2014)

#### 5-3-3- Temperamental Characteristic Chart for Hot and Humid Region

Average temperature in this climate is  $24.18^{\circ}\text{C}$  and the average relative humidity is 63.4 percent. The average temperature is  $4.18^{\circ}\text{C}$  more than the comfort zone level and the humidity is 13.4 percent more than the comfort zone level.

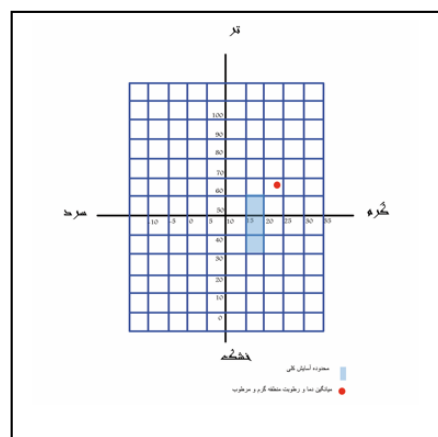


Figure 6- Temperamental Characteristic Chart for Hot and Humid Region (Author, 2014)

5-3-4- Temperamental Characteristic Chart for Cold and Dry Region

Average temperature in this climate is 11.25°C and the average relative humidity is 53.70 percent. The average temperature is 3.75°C lower than the comfort level. However, the relative humidity is in the comfort zone.

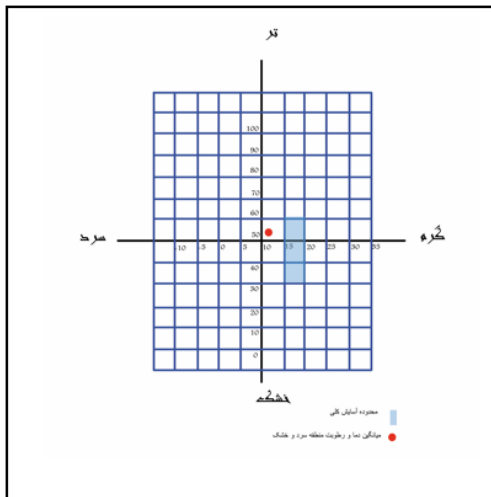


Figure 7- Temperamental Characteristic Chart for Cold and Dry Region (Author, 2014)

5-3-5- Temperamental Characteristic Chart for Hot and Dry Region

Average temperature in this climate is 22.2°C and the average relative humidity is 44.62 percent. The average temperature is 2.2°C higher than the comfort level. However, the relative humidity is in the comfort zone.

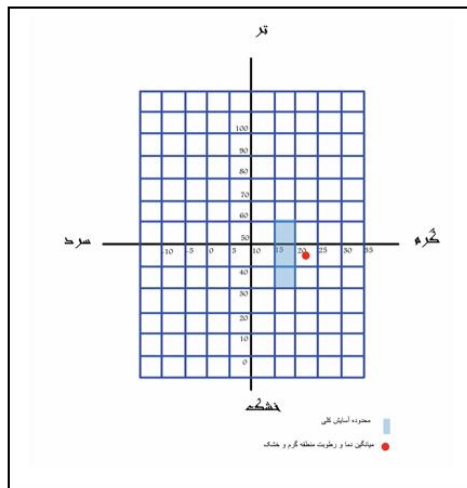


Figure8-Temperamental Characteristic Chart for Hot and Dry Region (Author, 2014)

6- Summary

One of the most important factors affecting residential construction for human beings is the environmental comfort. In order to reach this comfort zone, understanding climate is of utmost importance.

In this study, we investigated four cities in four different climates using the Giovanni chart and after analyzing these charts it was evident that only a few seasons are in the comfort zone and the number of seasons requiring mechanical tools to reach the comfort zone is higher.

**Table 5- Evaluating the Comfort Zone of Cities in Four Climates**

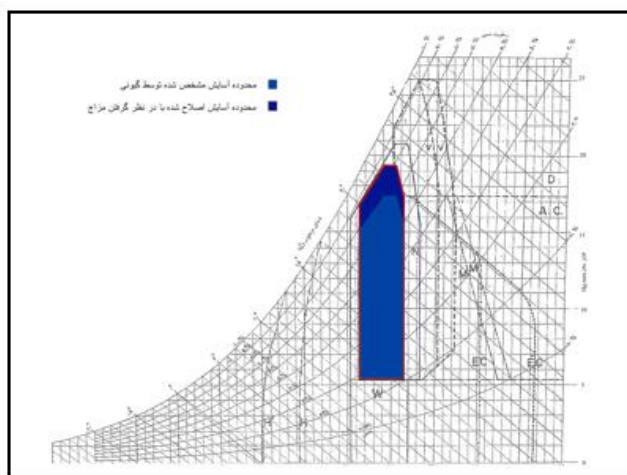
	Outside the comfort zone	Comfort zone	Using mechanical tools to reach the comfort zone
Amol	Winter	Spring	Fall and winter
Bushehr	Spring and summer	Fall and spring	Winter
Ardebil	Winter	Summer	Spring and fall
Kashan	Summer and winter	Spring	fall

While based on the principles of traditional medicine, striking coordination between the human temperament and the environmental temperament will reinforce and improve the human temperament and capabilities. So, this is very important for temperamental health which is one of the four main characteristics of architecture.

After evaluating and comparing traditional architecture with modern architecture and analyzing the Giovanni charts and comparing to the temperamental characteristic charts, four charts are proposed for the four different climates which have a wider range of comfort zone compared to the original charts, which saves energy and considers the health characteristic based on traditional medicine.

**6-1- Giovanni Chart Considering the Temperament (Mild and Humid Region)**

Considering the temperamental characteristic chart for the mild and humid climate, it is evident that the temperature is in the temperamental comfort zone while we have to add 21 percent to the humidity.



**Figure 9-Temperamental Comfort Zone and Relative Comfort (Author, 2014)**

**6-2- Giovanni Chart Considering the Temperament (Hot and Humid Region)**

Considering the temperamental characteristic chart for the hot and humid climate, it is evident that the temperature must be increased four degrees while we have to add 13 percent to the humidity in order to reach the temperamental comfort zone.

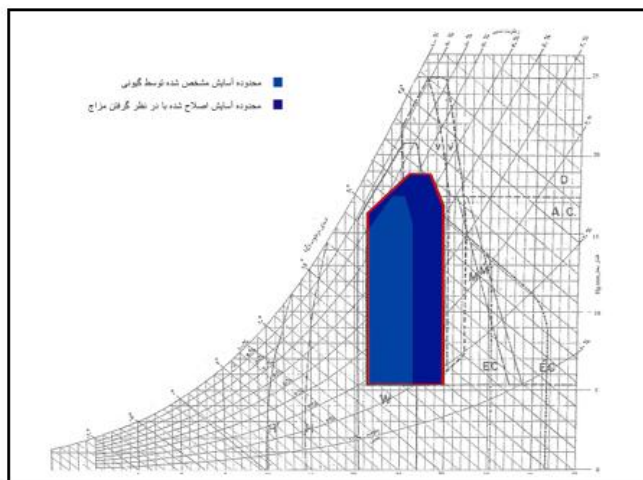


Figure 10- Temperamental Comfort Zone and Relative Comfort (Author, 2014)

## 6-3- Giovanni Chart Considering the Temperament (Cold and Dry Region)

Considering the temperamental characteristic chart for the cold and dry climate, it is evident that the temperature must be increased about 3 to 5 degrees. However, humidity is in the temperamental comfort zone.

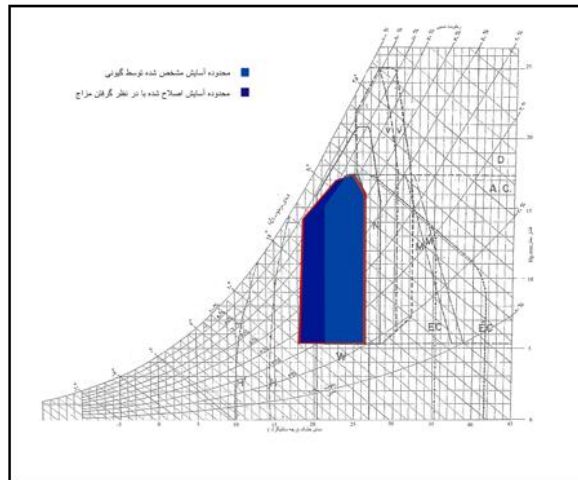


Figure 11- Temperamental Comfort Zone and Relative Comfort (Author, 2014)

## 6-4- Giovanni Chart Considering the Temperament (Hot and Dry Region)

Considering the temperamental characteristic chart for the hot and dry climate, it is evident that the temperature must be increased about 2.5 degrees. However, humidity is in the temperamental comfort zone.

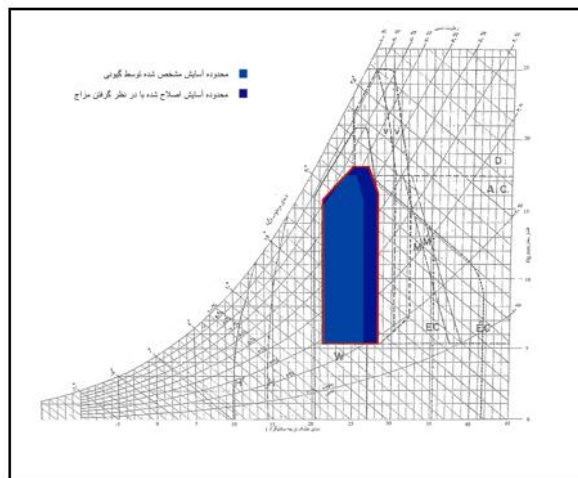


Figure 12- Temperamental Comfort Zone and Relative Comfort (Author, 2014)

## 7- Conclusions

Since in the Giovanni chart, an identical comfort zone is considered for all the climates and the humors and nature of human beings are neglected and it considers the range of human temperaments a restricted phenomenon and as mentioned before, based on the principles of traditional medicine, each individual has its own unique temperaments and humors and based on the temperament of the person, that person will be able to withstand the same temperament and will have more consistency with the environment which has that same humor. For instance, an individual living in a mild and humid region, can tolerate more humidity and those who live in a hot region, can tolerate higher levels of heat compared to those who live in a cold environment and vice versa. A person with a humor will temporarily feel comfortable in an environment with another temperament. However, this will not last long and it is not appropriate for the mental and physical

health of human beings. By investigating the Giovanni chart and comparing it with the temperamental chart, it is evident that the comfort zone determined by Giovanni can be lower or higher than the comfort level. Therefore, four charts were prepared and each one represented a unique climate; in this way, more months are located in the acceptable range, which saves energy and considers the health characteristic. It is worth mentioning that we can use architectural elements for reaching thermal comfort and these elements are obtained through four elements which create a human being; namely, water, earth, air, and fire. By appropriate utilization of these elements in architecture, we can reach acceptable conditions for comfort.

### 8-References

1. Vitrovious, Ten Books of Architecture, 1960
2. Razjouyan, Mahmoud (2009), Comfort in Architectural Consistency with the Climate
3. Tahbaz, Mansoureh; (2013) Climatic Knowledge of Architectural Design
4. Sarraf, Behrouz; Husseini Sadr, Atefeh, 2010
5. Sadeghi, Mohammad Hassan; Tabatabaee, Sayed Mahdi; 2007
6. 2013, Astikumar, Mishra, Maddati, Ramgopal
7. 2009, C. Candido, R.J. dedeors, L. Bittencocert
8. M. Heydarian, Understanding Humors and Temperaments, 2010
9. Avicenna, Hussein Ibn Abdollah (1988); Canon of Medicine, Translated by Abdolrahman Sharafkandi
10. Kheirandish, Hussein (2009), Different Humors
11. Kheirandish, Hussein (2014), Interview