Interaction of Natural Light and Colored Glass toward Enhancing the Sense of Psychological Security by Parametric Design

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Abstract: Advances in science and technology have broadened the humanity’s perspective as to the even most fundamental elements of life. Light is one of these fundamental elements and have always been an interesting subject for conducting research and doing experiment. Humans’ emotions, spirit have always been deeply coupled with elements such as light, shade, and color, and they have used these elements to fulfill their need for emotional and psychological security and comfort. Today’s designers also need to use the same elements to engulf today’s insecurity filled physical spaces with the spirit of tradition, while also providing for modern needs and desires. Accomplishing this task through an adequate combination of tradition and modernity and giving due consideration to the ideas of today’s society are prerequisites to improving the quality of psychological security and sense of comfort. The question is how to improve the sense of “psychological security” with “combining form” as the coordinated body, with the present architecture and give a sense of belonging, of tradition in building spirit utilizing natural light and colored glasses. Besides, the hypothesis of this study is based on the assumption that the spaces imbued with colored lights designed by architectural principles lead to promote a sense of psychological security. In this study, Analytical-Descriptive (qualitative and quantitative) method was used with library and field methods (Survey Method). The results led to a multi-parametric design with purpose and approach of the research by the authors. The results confirmed research hypotheses and enjoying the aim of this study, we can reach to an acceptable level of qualitative improvement to maintain a sense of psychological security.

Keywords: Natural light, color, colored glasses, emotional security

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1 INTRODUCTION

Beauty, dullness, and other concepts of our world need to be seen before they could be understood. Our vision is entirely dependent on a phenomenon called light, which shapes our understanding about ourselves and the entire existence. The semantic-oriented nature of humans interprets the physical phenomenon that is connected to a metaphysical spectacle that engulfs and shapes human emotions. Traditional architects, especially those who worked in the context of Islamic architecture, used to exploit this element by inviting the light through colored glass via playful forms, guiding it through pre-designed points, and ultimately reflecting it to audience, filling them with the sense of spirituality, comfort, security and happiness.

In Islamic architecture, light is not the source of space, but somehow acts as a reference to Quranic verse “God is the light of heaven and earth”, and therefore provides the stone and brick-made heavy physic of space with a sense of soul and life; from this perspective, in Islamic architecture light is the symbol of existence and the use of light in Islamic architecture is a form of magic where architect reveals the sparkle and shine of the light in darks and cold nature of the stone and in doing so, shapes make countless spatial forms and their interactions. Light exposes the architectural forms and can put emphasis on a particular space that have no primacy over others, giving it a certain degree of preference (Bemanian and Alinasab 2012).

The fusion of tradition and modernity has been the subject of many articles, theses, and actual designs, and sometimes even included in the post-modern elements. This paper aims to establish a reasonable
relationship between tradition-embedded concepts and architectural elements and modern technology, culture, and concepts while paying due respect to the past traditions. Unfortunately, only a few works have been focused on merging the spirit of tradition with modern body only to reach a moral and material aspiration of attaining peace and not only comfort; as ultimate comfort is an unrealizable goal while relative peace can be achieved with some efforts.

Authors could not find any previous studies aligned with the mentioned objective, and other works in this field are either very generally discussed the fusion of tradition and modernity or merely focused on colored glass and have no application with regard to objectives of this study.

Throughout history, the necessity of using nature daylight has played a significant role in architectural designs and development of this profession. After the discovery of electricity and invention of light bulb, which allowed interiors to be illuminated artificially, the use of natural light started to be neglected. The experience of the last hundred years showed that physical and psychological needs of humans regarding daylight are much deeper and more profound to be satisfied by electric lighting; so the subject related to natural light and its applications became a major field of research. In this context, many national and international associations such as International Commission on Illumination (CIE), Illuminating Engineering Society of North America (IESNA), China Illuminating Engineering Society, Indian Society of Lighting Engineers and other scientific societies in Europe, Australia and Canada, have conducted valuable research on natural and artificial lighting and lighting standards. Over the last decade, some Iranian architecture students have shown interest in researching the subjects related to natural lighting, and this has led to a number of theoretical works on daylight calculations as well as field surveys on the extent of natural lighting in office and educational spaces. These works include the researches conducted by Talhaz (2004), Sanati (2006), Feizmand (2011), Kazem Zadeh (2011), etc.

The objective of this paper is to examine the interaction of natural light and colored glass in a design model that would incorporate tradition, modernity and attitude toward having a directed positive impact on the space and its audience, leading to affecting their conscious and unconscious behaviors, and accordingly improving their quality of life and psychological security. The mentioned effect of space on humans is a result of different forms of lighting and shades, which triggers a unique reaction to the audience. Vision is the most important human sense, and it is fully dependent on presence and quality of light. Colored lights have an effect on our vision, which in turn, stimulate our thoughts and feelings, and thereby controlling our behavior.

Hypothesis of this study is based on the assumption in which the spaces imbued with colored lights are designed in line with architectural principles inducing a sense of psychological security. The question this paper is seeking to answer is this: “How can we use a combination of natural light and colored glass to improve the sense of psychological security by infusing the form of modern architecture into tradition-induced sense of belonging?”

2 RESEARCH METHOD

In this paper, the results of an analytical-descriptive (qualitative and quantitative) study performed through library and field methods (survey method) were used to develop a parametric multi-purpose design according to stated objective. This research was conducted in separate phases including the study of Nasir al-Mulk Mosque, assessment of light and lighting, qualitative analysis using the available data, the use of a modified version of the questionnaire provided by Qaedrahmati and Hadianpour (2015) for the Nasir al-Mulk Mosque, and ultimately compiling the results in the context of a research on the basis of the sense of psychological security. Ultimately, the results were used for a parametric design and the final product, a multi-purpose complex, was presented.

3 VARIABLES

3.1 Light

Visibility of all beings is undoubtedly dependent on presence of light. Light comes from different sources, of which the most important is the sun, and each field of science interpret and analyze the light according to its own context and interests. The architecture is also fully involved in the presence and application of light. An architect must be able to incorporate the light into the design and form different combinations of light, shade and colors in both interiors and exteriors. The light reflected from the face of each material has its own color, which triggers material and mental response. The color of reflected light is a representation of material upon which it is reflected, and human mind subconsciously analyze this reflection and develops a strong connection with this light. As previously mentioned, hypothesis of this study is based on the assumption in which the spaces imbued with colored lights inducing a sense of psychological security, and thus when used correctly this phenomenon can be used to enhance the psychological security. When exposed to visible colored glass, the physical order upon which invisible light is formed leads to the emergence of a harmonic and uniform visible effect, which provides in addition to significant aesthetic aspects, a sense of belonging, peace of mind, and confidence in space, thereby inducing a sense of psychological security.

Light, as a fundamental physical phenomenon, plays an important role in the quality of life. Combining of light and shade is as much important in industry, medicine, and astronomy as it is in art. Humans have constant interaction with light, but sometimes they exhibit different reactions to this phenomenon. In addition, light is a major stimulant for emergence of human emotions (Goudarzi and Saremi 2015).

Throughout human history, light and darkness have
acted as the symbol of a contrast between knowledge and ignorance, and from this perspective, quantity and quality of diffusion of natural light not only have played a significant role in meeting the basic needs of human life but also acted as a symbol to enlighten and understand the world. Architects still emphasize on the significance of natural light and its advantages as an efficient source of lighting during the day, but one cannot ignore the efforts of the last half century in the field of illumination technology and more precisely “artificial lighting”, which have improved the quality of spaces, especially the public spaces, during night (Monshizadeh 2013).

Light is the most significant input that a newborn infant captures and registers and is often the last thing anyone perceives before the death. Light and its reflections allow us to observe people, objects, places, architecture and everything that surrounds us, and without light, we cannot even comprehend the darkness. Every day, people interact with two inseparable elements that are light and shade. Light can be categorized into two classes: natural light and artificial light. Obviously, the first is created by sun and other stars while the second one is made by human-made devices. Rasmussen stated that: “daylight is constantly changing. All architectural elements can be accurately determined, but the only variable that cannot be controlled is daylight”. It is hard to believe that anyone can reject this statement. Daylight, in its local definition, is a natural phenomenon that undergoes constant change as a result of rotation of Earth around the sun. Light controls the days, seasons and the time itself and all humans simply submit to this natural phenomenon. Architects also need to be adapted to this element and incorporate it into their design. A general aspect of architecture is the artful use of light in the urban planning, landscaping, large buildings, small buildings and other designs, and all other parameters variables, and elements would be judged according to this one factor (Jansen 2012).

Considerating the importance of physical and psychological responses of humans when interacting with any phenomenon, here we discuss the application of light and its physical and psychological impacts on reaching the stated objectives. To do so, we first need to know the internal system of a typical human and to analyze the physical and mental structure of a normal person.

Many of our body functions that are essential for our survival are controlled by the hypothalamus, which is a portion of the brain located below the thalamus. The hypothalamus is responsible for a number of metabolic processes and autonomic activities such as energy balance, fluid balance, fetal growth and maturation, blood circulation, breathing, emotional balance, reproduction, thermal regulation, and circadian rhythms. When needed, this organ links the nervous system to the endocrine system by synthesis and secretion of neuro-hormones, and this in turn is a mean to control the hormone of the anterior pituitary gland (Boubekri 2008). Therefore, exposure to light and how it is absorbed and affects our physical and mental structure is of utmost importance.

To achieve our objectives, we must mold the light that is generally irradiated through all directions to our desired form, and a more productive approach would be to use the examples of successful applications of light in those spaces and buildings that are part of our heritage, and use those ideas and techniques in our current and future designs.

In this paper, we merged the lighting patterns used in Nasir al-Mulk Mosque with the principles of application of colored light in space, to provide a number of procedures to incorporate this technique into modern architectural designs. The aim of this effort is to transfer realistic positive senses of beauty, spiritual serenity and psychological security from traditional architecture to a modern design.

Humans comprehend the beauty of architectural spaces from the perspective of contrast between light and shades. The combination of light and shades also stimulate the emotion of frightening and uncomfortable feelings, and thereby reducing the level of anxiety and stress. An architectural space that uses an adequate mixture of light and shades allows the audience to move from darkness to light, transmitting a sense of motion but also stability. This arrangement radiates the hope of light beyond darkness, and this hope automatically creates a sense of spiritual serenity (Goudarzi and Saremi 2015).

Light is the most basic universal element that plays a tangible role in the quality of life. Contrast and combination of light and shade have numerous applications in industry, medicine, astronomy, and art. Although all humans have constant interaction with light, some may exhibit different reactions to this phenomenon. In addition, light is a major stimulant for emergence of human emotions, as it is the main factor in the use of visual sense (sight). Light defines the beauty and enormity of universe and the meaning of life and existence, as all living things depend on this light to exist and survive (Ibid).

Humans have always lived, moved, and progressed alongside and in harmony with nature. Those humans who remain consistent and interacted with nature gain a comprehensive material and spiritual understanding and arrange the variables of life with that priority in mind. An architectural design that is developed in coordination and interaction with nature and natural elements such as light will have the potential to exhibit the supreme forms of human art, offer comprehensive and all-including benefits, and provide a meaning and substance for life.

In our opinion, the most important factors in reducing stress and increasing sense of psychological security is the provision of a sense of awareness about colliding space through a direct relation with environment, which can be achieved very well by the use of light, because light is the most fundamental factor in each process of recognition including the recognition of space. The sense that is carried by light looms over the entire space and the thoughts of audience and can therefore act as a vessel or medium for a targeted design.

Historic buildings have a natural connection with
Light which is mostly defined by status and movement of the sun; but today’s advances in technology and illumination techniques have provided the means and platforms for better display and exhibition of these buildings. Moreover, the use of modern illumination techniques in these buildings can be focused on expressing the relation of original architect with his fellow humans and his natural and historical environment. Architectural monuments of Iran often point toward special attention of architect to the effects and applications of daylight. Common expressions of this attention can be found in transparent surfaces, light-wells and openings, fixed and variable penumbra created by the sun, mirror walls and ceilings, stained glass and gilding (Bakrany and Meh dizadeh Seraj 2013).

Light has a significant effect on spatial value, and has always been used in Islamic architecture as the most significant non-material natural element. In Islamic architecture practiced in Iran, sometimes light is not meant to fully illuminate the space, but rather to be created on a mystical and sacred expression by affecting and sometimes emphasizing other elements (color and texture). In Islamic architecture, rhythm of lighting plays a significant role in definition of evolution and sequence of space. In this type of architecture, light defines the functional role of spatial sequence through three means: pause, motion and emphasis. Thus it can be stated that definition of spatial sequence with light is considered as a core element of Islamic art, and this degree of importance signifies the extraordinary position of this element in the structure of Islamic intellect (Bemanian and Alinasab 2012).

Light by itself only emits consistence and uniformity over the space, but its value becomes more evident when it is combined with other elements such as shades, forms and colors. This combination simplifies another incomprehensible vastness of the space solely formed by light and aids the audience to gain a better understanding about the space.

A quick review of Iranian examples of Islamic architecture built in different periods illuminates the fact that architects of these works always sought to establish an order in the elements, components, spaces, or even the entire building, and they used different elements and components, including light to achieve this objective. The use of light in these works; however, is often focused on implying a meaning or a sense of spirituality allowing the audience to experience a metaphysical tranquility (Bemanian 2007).

Light exposes the architectural forms and can put emphasis on spaces that otherwise have no primacy over other spaces, giving them a certain degree of preference. Emphasized expression of these elements can be found in the architecture of Islamic mosques. The primary feature of Islamic architecture is its visual characteristics, but once audience enters the building, he/she starts to experience diverse spaces and gradually is exposed to emotional features; so that this type of architectural design starts with challenging visual habits and then transforms to induce a new feeling (Haeri 1999).

Light has always played a significant role in Iranians beliefs, and this role is reflected in the emphasis of Iranians ancient religion on the sanctity and importance of daylight, an emphasis which became even more evident in the Islamic era (Mahdavinejad and Motavvar 2012).

History of architecture is the history of relationship between humans and sunlight. Architects often use light as a metaphor, a vessel to induce a feeling, or a carrier of some meaning. Works created by the past and present master architects are all evidence of this central role. Many of these works are hailed as the examples of adequate linkage between structure, form and light. The chapel of Notre Dame du Haut (in Ronchamp, France) by Le Corbusier is a free-form structure with a bold expression, wherein the symbolic connection between form and natural light defines the basis of structure and turns it into the main element of the design concept. Beam of light trickling in during the day give the audience another opportunity to communicate with the outside world. Light affects our body in two ways. When light collides with the retina of our eyes, it affects our visual system, and by proxy, our metabolic and endocrine systems and hormones. Light can also interact with our skin and trigger the production of vitamin D through photosynthesis (Boubekri 2008).

3.2 Color

At the beginning of time when early humans were living in caves, daylight acted as the sign of start of another cycle of life. As human dwelling became more complex, doors and windows were added to walls to let in more light. These openings needed to be equipped with some means to adjust the extent of effects they were letting in. At first, humans used materials such as thin pieces of marble, sheets of mica (mineral glass) or wax paper for this purpose, but development of glass revolutionized this concept (Phillips 2004). Windows of all architectural styles are much about aesthetic and artistic aspects as they are about functionality and provision of relative comfort. Like most other styles, traditional Iranian architecture considers window as a main architectural element that can be designed using different standards.

Windows have always acted as means of innovation and this is evident in stained glass windows of medieval cathedrals, carved in high walls supported by flying buttresses. Windows also have military applications in fortified buildings. The splayed sides of these windows have a desirable effect of reducing the contrast between the brightness of the window and the interior wall surface (Phillips 2004).

Window is an interface between inside and outside space and must act as a gateway for natural light. This task is the main factor behind the creative use of light, something that past Iranian architects needed to have a full grasp as they used colored glass to form the interiors and excite poetic emotions.

Color of daylight varies from morning to evening, but it always acts as the reference according to which color is judged. Daylight always performs as a real color.
In early stores, such as Harrods, architect started to open some voids in the roof to expose the sales areas to daylight, whereas this method was disregarded for several years. The reason for this disregard was that, at that time, artificial light was being considered as more suitable for displaying the products. This led to disregard for environmental advantages of daylight and natural color. But now large shopping centers recognize these advantages and use natural light for brightening the entire store and locally focused artificial light on displaying single products. Using an environmental light that provides natural color may obsolete the concept of “taking something to the light”, which refers to daylight, but from the perspective of shop workers who remain all day in the store, the advantage of natural light will be completely clear (Phillips 2004).

Colored light having a pre-designed spectrum should envelope the space such that sense of space remain unchanged over time which can lead to a sense of belonging and allow the desired effect, whether beauty, functionality, or in this case psychological security to be realized. Colored glass gives the window such ability while the development of technology minimizes the negative factors existed in the traditional structure of this type of windows.

Precise and principled placement and angle of the glasses is essential for improving the quality of light collision and achieving the desired colored light. Although traditional architectural has its own shortcomings, one cannot simply disregard the knowledge accumulated by experience throughout history. Needless to say, it needs to be adjusted to attitude, culture and concerns of today’s humans. It must be iterated such that incorporates the colored glass of traditional architecture into present and future designs after gaining adequate understanding about their advantages and flaws; although this method have worked very well for past generations, one cannot be fully optimistic about its ability to meet all needs and assuage all concerns of today’s humans, and as such, this may highlight the importance of conscious pursuit of one goal such as psychological security.

Human brain analyzes colored lights differently in a side range of regions, so each color can incite a particular feeling; this phenomenon can be used to give each space a desired effect, function, or performance. When exposed to signs of past visual and conceptual experiences, our mind tends to remember memories that induces a sense of belonging and ownership in the observer. One of the visual experiences that induces this sense of belonging in most Iranians is the sight of a room with colored windows where space is filled with a particular order of colored light.

Colored glasses are part of decorations of building constructed in Qajar era, and in addition their aesthetic aspects, are known to induce a feeling of relaxation and relief from environmental stressors. The use of colored glass in design allows us to employ natural and artificial light to differently create colored spaces in different times. In the past, colored glass used to play a significant role in Iranian architecture not only in monuments but also in common buildings; but now it seems to have little if no use in today’s architecture, which is a waste of its aesthetic and functional potentials. Red, yellow, green and blue colored glasses are the most widely used variety of colored glasses in building constructed in Qajar era. An example of artful use of these four colors can be seen in sash windows of Nasir al-Mulk Mosque (in Shiraz), which is one of the architectural masterpieces of the Qajar era (Qaedrahmati and Hadianpour 2015).

It should be noted that studies have proven that each color has a particular physiological effect on the human brain, which can be positive or negative. Here, we describe some of the effects of the colors used in the design of multi-purpose complex. Note that these colors alone may have some disadvantages, but their composition with other colors may even have the opposite effects, and an absolute conclusion is not possible at this stage. It has been reported that the color red increases the heart rate and blood pressure and cause people to act quicker but with less precision; the color blue is a widely-liked color, it is associated with relaxation, peace, hope and knowledge and induce a sense of nobility, which is emphasized upon when used next to white color; the color yellow is associated with the sense of shame, focus, concentration, and silence, and because of its complex analysis process in human brain, it has been claimed to cause distress, anger and low spirit.

In a survey conducted to determine the inner emotions and feelings of people visiting the interior sections of Nasir al-Mulk Mosque, which is decorated with colored glass, most visitors stated that they felt relaxed and believed that the space significantly reduced their stress, anxiety, and mental confusion; these visitors also felt particularly pleased with the presence and the effects of colored glasses on the environment of this shrine (Qaedrahmati and Hadianpour 2015).

Lighting is the most important factor for injecting dynamicty and life into the design space, as all materials and forms are involved in it, and more importantly, bringing a tremendous impact on almost everything. Lights with different colors induce different feelings in their audiences and can be used to provide a sense of peace and comfort, to display and emphasize other objects and elements, or to create a homogeneous interior space. Light shapes the form and spaces wherein we must live and work, and the higher quality of light and its color can enhance the precision, speed, comfort, and joy in both aspects. Light has the extraordinary power of transforming and recreating spaces to make them tailored to our needs and desires.

4 PARAMETRIC DESIGN

Parametric design has an arithmetic nature, so it would be very difficult to mix it with element of human emotion to achieve an objective such as the one defined for this paper. This is because parametric design is dominated by logic rather than emotion and to achieve a feeling such as
psychological security one should define and use suitable variables. In this paper, we use two parameters, natural light and colored glasses, as the variables inducing the desired emotional response.

In the past decade, the expertise-oriented attitude toward architecture as a profession has led to a loss of identity and decline in Iranian architecture. The excessive and blind imitation of western culture and architecture has led to the emergence of buildings devoid of any Iranian identity elements. These buildings have irrelevant and non-native designs, which are mere imitation of convenient international styles and often fail to inspire the slightest sense of belonging, and this failure fuels the general disappointment in architecture community because of their inability to address local and national identity expectations (Qods and Asgharzadeh 2013).

The growing influence of Western cultural-architectural trends, which was started in Qajar era, continued during Pahlavi era, and reached its peak after the Islamic Revolution, has led to day by day loss of domestic architectural values, most notably the use of ancient local patterns and elements. The passage of time has only exacerbated this trend and has led to almost complete loss of the arts that used to be practiced by master architects, and this in turn has contributed to misplaced identity of this profession in Iranian society. As a result, Western and international architectural patterns now have an inextricable bond with society; a bond that cannot be broken unless with consistent effort of architecture community to replace it with high-quality native designs (Qods and Asgharzadeh 2013).

In recent decades, various design methods have been proposed to create a multilateral relation between design factors. Based on the circumstances, each of these methods use its own specific approach to design process. However, it should be checked that whether the resultant method has been able to provide a comprehensive approach to the design process, or just adopted a unidirectional approach without considering the effects induced by all positive and negative factors (Qods and Asgharzadeh 2013).

Unfortunately, the functionalist architectural designs often fail to pay attention to humans and their emotions; in these designs, it is buildings that define the human character and people themselves play a marginal role. This causes a sharp decline in inhabitants’ spiritual emotions and feelings, which in turn, can have ground for psychological problems.

Fusion of functionalist and modern design elements led to the advent of international style of architecture, and introduced the minimalist “Mies van der Rohe” as the champion of this style. This style mostly focuses on functionalist paradigms, ignores local-native characteristics and almost all other qualitative indices, and downgrades the design to an industrial instrument, which is the same in all societies and nations (Qobadian 2007).

This style provides almost identical solutions for most architectural problems that may arise in different geographical locations. This method minimizes and almost eliminates the effect of different inspirational and qualitative factors on the design (Qods and Asgharzadeh 2013).

There seems to be a new trend among architects to use new methods of architectural design for provision of smart environments that would respond to physical and aesthetic needs of humans based on local and native elements. One of these methods is parametric design which works via management of evident and latent data and variables. This method can assess a group of disparate and independent parameters and provide a variety of (often geometric) paradigms according to the selected meta-system (Yurmaka 2012).

Multilateral approach provided by this design method is well-suited to principled development of interactions between data and visual mapping of layers and qualitative and quantitative cognitive models (Qods and Asgharzadeh 2013).

To develop our desired design, we assess all quantitative or qualitative parameters such as religion, customs, culture, proverbs, type of climate and geography, sounds and noise pollution, views, gender, population, minimum and maximum age of population, the ruling ideas, terrain, traffic within the scope of the study area; we then turn qualitative and quantitative parameters to distinct number and use mathematic relations to merge them with our design concept and obtain a basic form. We then develop this basic form in line with our objective to obtain a design consistent with the opinion of local people.

This method uses basic parameters such as length, direction and height in conjunction with mathematical calculations and complex algorithms to develop an abstract set of design elements and obtain a series of forms called parametric design layers. The extracted design layers must be then analyzed by design tool, namely the computer. In the next step, the algorithms again merge these layers with each other and then with the architect’s ideas and produce the output or final design. In an alternative approach, architect himself can control and guide all the above steps with the help of a meta-system, and then obtain the result without the use of advanced algorithms. This approach will ensure the direct and decisive influence of architect and his cognitive map in the design process (Qods and Asgharzadeh 2013).

Architects cannot impose the style and flavor of the past on today’s design, because the past designs have been consistent with people and ideas of their time and are not guaranteed to connect the same way with the ideas of our time. On the other hand, complete transformation of architecture means simply ignoring thousands of years of experience, so the best approach will be to improve upon this valuable asset.

Indifference toward past values has become the plague of today’s Iranian architecture. The convenience of imported architectural styles has made major contribution to this trend of indifference and has side-tracked this profession from its rightful course (Qods and Asgharzadeh 2013).

Creativity and diversity always amuse people’s minds and can inspire certain line of thoughts to achieve
specific objectives. When used to combine tradition and modernity, parametric design can leave extreme impacts on formation and development of desired architecture, because it can help the design to exhibit intellectual creativity and formal diversity next to thousand years old culture, philosophy and tradition.

People often misinterpret concepts and terms such as tradition, modernism and modernization, and confuse their true meanings. For example some people may define modernization as a synonym of modernism or antonym of tradition. The nature of these terms and different aspects of their relationships in Iranian and Islamic language, customs, and intellect is an extensively studied subject, and more information in this regard can be found in Islamic Art and Spirituality (Nasr 2010).

5 SENSE OF PSYCHOLOGICAL SECURITY

The term “Security” is derived from Latin securitas which means lack of fear and concern. Literally, security means being free from danger, threat, vulnerability, anxiety, panic, fear, concern or being calm, assured, comfortable, reliable, provided, and guaranteed (Almasifar and Ansari 2010).

Psychological security is a fundamental element in controlling negative variables of society and enhancing the quality of physical and spiritual life. Sense of psychological security is not something that could be created by eliminating just one negative issue or adding just one positive element because it encompasses a wide range of different factors; however the collective effect of small positive factors could not be ignored. Here, we assess one of the factors that can induce this sense and that is the presence of space immersed in colored light created by a combination of colored glass and natural daylight. Sense of psychological security has not the same meaning for all people. Many designs and theories have sought to achieve this goal, but sometimes this effect just happen to emerge from the design, even from some that are not particularly focused on this concept, and sometimes, despite meticulous planning, the developed design just fails to induce this feeling, or even radiates the opposite effect.

Improving the quality of the urban environment requires active participation of people, and this continued presence of individuals and groups of citizens requires people to feel safe and secure (Hoseiniun 2006).

In urban environments, people’s sense of place and sense of belonging have a two-way relationship with sense of security. Enhanced sense of security in cities is associated with benefits such as improved identity, vitality, performance, beauty, and of course economy.

The goal of the present design is to affect human thoughts and emotions through vision in order to bring about senses of belonging and ownership over space; this goal is pursued by using the space imbued with colored light to guide the observer toward a sense of memorabilia allowing him to see himself in a familiar environment with traditional life and thoughts of his ancestors, causing him to experience a sense of belonging, which lead to an unconscious feeling of psychological security.

What a designer can do from the perspective of sense of security is to encourage or discourage a series of social behaviors in the design space. People often need to get a feeling of dependence or belonging to a greater whole, so providing a sense of social security, which entails a sense of peace, can contribute to fulfillment of other needs of individuals, including their need for self-esteem, a sense of belonging and self-confidence. Sense of security can be divided into two categories: static security and dynamic security. Static security means minimizing individual factors and avoiding the spaces where violation of security is more likely; but here designer seeks to improve the spatial quality by providing dynamic security, according to which people feel safe when attend the spaces having this quality (Hoseiniun 2006).

Having a sense of place is associated with social status and social role and helps people to develop a sense of identity which plays a major role in fulfillment of their metal needs. It also leads to development of a sense of ownership and a robust identity, which gets stronger by the increase of sense of place and can have positive impacts on character of both individual and community. Considering the above, designer can create a sense of place by forming memorable spaces to which people ascribe a positive judgment when attending.

Today we are witnessing the deterioration of our architectural identity; in addition to diminishing our architectural heritage, quality of life and people’s aesthetic taste, incorrect imitation is now affecting the affaires pertaining to our culture, mind-set and identity. Over time, this will lead to emergence of fundamental unconscious alterations in behaviors of our communities, and the negative effects that will appear in people’s sense of security will be followed by consolidation of behaviors such as violence, anger and aggression as new norms. Solutions such as the one proposed in this study are aimed at assuaging these issues, however none of these solutions are guaranteed to reach their desired effect, and the one presented here can only be evaluated by trial and error.

Designed environment must be transparent and comprehensible, and must be responsive to physical and emotions needs of its visitors. Most people who have an adequate understanding about an environment and its norms act in accordance with the rules and conditions, and this in addition to resultant mental and behavioral consistence over the environment can provide physical and psychological security. Factors affecting the people’s knowledge and experience regarding the environment include: 1) feelings, 2) needs, 3) desires, and 4) aesthetic sense. The following factors can act as stressors and leave a negative impact on a person’s experience of the environment: 1) overcrowded space, 2) violence in local community, 3) sense of lack of control, including the lack of privacy and lack of intimacy, and 4) sense of being undervalued as a member of community (Qalatti et al. 2014).

Sense of security is one of the basic needs of human beings and strengthens people’s willingness to be present
in a particular place. Factors affecting the sense of security include: 1) provision of a comprehensible space, i.e. allowing visitors to know where they are; 2) provision of sufficient information for visitors to understand the adjacent spaces; 3) provision of a condition that would allow visitors to see their neighboring individuals and identify the friendly or unfriendly nature of their relationships with those persons; 4) visitors should be able to identify possible activities of each section, and subsequently environment should induce a clear message in this regard (Qalatti et al. 2014).

Visual features provide the humans with the spaces for outdoor activities. All outdoor spaces consist of a hierarchy of spaces with different characteristics (Dines and Brown 1998).

Factor that must control the human feeling and make room for mental relaxation and psychological security has a feature that limits physical activity, because controlling physical activity allows mental activity to grow, reduces physical factors such as violence, conflicts, etc., and encourages the minds to get involved in qualities of space and environment. This is the moment when design influences the minds and guided people’s unconsciousness towards the desired goals. So in line with research objectives, we use the design to reduce the physical activity, encouraging the visitors’ minds to get involved in the space, and accordingly, inducing the desired goal into their minds.

Population growth, increasing number of vehicles, higher speed of transportation, ambiguousness and lack of transparency in spaces, and extensive construction activities in cities each can be considered as a factor contributing to growing violence and insecurity, which creates a sense of fear and stress in society. Lack of adequate attention to local culture and excessive use of imported architectural styles and elements, such as tall building, and the sense of superiority radiated by urban spaces also reinforce these factors (Saremi and Khorsheidvand 2015).

With the progress of civilization, security has become a more important issue, and now encompasses all physical, social, economical and psychological aspects of human life. These developments have solved or improved many minor elements were all contributing to provision of peace and psychological security.

It seems that sense of peace is to be free from anxiety, worry, concern and stress, so someone who feels peaceful can be expected to have a good mental state (Qaedrahmati and Hadianpour 2015).

To gather the required primary data, we developed a questionnaire based on the one proposed by Qaedrahmati and Hadianpour (2015), and distributed it to visitors of Nasir al-Mulk Mosque. Our results, which are slightly different from the one mentioned above, are presented in Table 1.

6 MULTIPURPOSE COMPLEX

This complex was designed based on the idea of incorporating several functions and mini-spaces into a coherent and monolithic structure. The aim of this design was to achieve the objectives of traditional architecture, i.e. lack-of-redundancy, inward-oriented plan, human-centered scale, structural integrity, and self-sufficiency, in the form of modern architecture, construction and technology such that it would possess a modern physic and a traditional spirit. To achieve the form of modernity, this design was developed with due consideration given to several successful designs built across the world. Nonetheless, design principles were followed based on the guidelines provided by the traditional architecture. For example, in the process of parametric design, presence of colored glass in the walls was selected as the core element of model.

The design of this complex is based on three sets of principles:

1. principles of traditional Iranian architecture
2. principles of modern architecture (Le Corbusier)
3. principles of digital architectural (parametric)

<table>
<thead>
<tr>
<th>Table 1. Results of modified questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sense of security inside the building of Nasir al-Mulk Mosque (in Shiraz)</td>
</tr>
<tr>
<td>Agreement or disagreement with the use of colored glass in modern buildings</td>
</tr>
<tr>
<td>Knowledge of properties of colored glass in buildings</td>
</tr>
<tr>
<td>Sense of security outside the building</td>
</tr>
<tr>
<td>Tolerated time to remain inside the building with colored glass</td>
</tr>
<tr>
<td>Variation of mood and mental state of visitors inside the building</td>
</tr>
</tbody>
</table>

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However, this classification should not be confused with discrete application of principles, as all of them were used in conjunction with one another, and shaped the work within the same format. An overview of the result clearly displays the presence of all three sets of principles (Figure 1).

Designers always try to plan spaces for maximum comprehensibility, sense of belonging, diversity and minimum repeatability. Today, the last two goals can be achieved by a change in the placement of furniture or decorations, or a change in color, but in the past, architects used light in combination with multiple colored pieces of glass to provide a continuously changing and refreshing atmosphere and induce a unique sense of belonging. It is obvious that such atmosphere can act as a good medium to inspire senses of peace, love, memorability, and health, and consequently, a sense of psychological security, which seems to be desperately needed in today’s society, can be developed. The integration of the aforementioned principles may carry some degrees of risk, as such, unlike the past designs, where small portions of the openings used to be covered with colored glass, here we seek to attribute fluidity and transparency to the entire space by covering the majority of walls with colored glass and normal glazing and using the walls as the frame of this texture. This ensures that the slightest change in the angle of the sun will trigger significant changes in the space and its atmosphere, which in turn, will allow the visitors to be amused for hours by the unique dance of light and color, and this amusement will allow them to come out of their negative feelings and embrace a positive perception of their existence (Figure 2).

Now these questions are raised; is it practicable to create a sense of psychological security by being confined in a closed space and exposed to colorful light. Shouldn’t the design also induce this sense to surrounding environment? How can we shift the emotions of a closed space to its surroundings? In this design, we use three elements of colored walls, expansive transparent windows displaying the interior, and an inviting form realized by an enormous elevated console guiding the visitors inside to reflect the feelings of interior space to exterior. The wall colored with parametric density awakes a sense of belonging, the expansive transparent windows act as a frame to exhibit the dance of light inside, and gentleness of this enormous form radiates a sense of invitation, all
Figure 3. Reflection of emotions from inside to outside

Figure 4. Interior space of Nasir al-Mulk Mosque (Courtesy of Shiraz. Mohammad Qaedrahmati)

Figure 5. A view of designed multipurpose complex
Figure 6. The color scheme used in the interior space

Figure 7. The color scheme used in the interior space

Figure 8. The color scheme used in the interior space
with the aim of inducing a sense of psychological security to exterior audience (Figure 3).

As (Figure 4) illustrates, in Nasir al-Mulk Mosque, a thick-walled heavy space is softened and fluidized by an atmosphere of colored lights. In this mosque, only one wall, whose geometry was a perfect Euclidean, has been decorated by colored glass. The majority of extensive research conducted on this mosque focused on its positive design aspects, especially the colored lights, and the consequent positive mental effects. Interior of this mosque has an encompassing spirit and the patterns painted by colored lights inspire simple beauty. But can these effects be felt from the outside? The answer is surely no, because the boundary of psychological feelings has been limited to interior, and design fails to expand these effects to outside surroundings, and this failure can be pointed out as a weakness of tradition.

In the design of complex, forms and scales are aimed to avoid dominance of material mass on visitors and the created sense of inferiority. This aim is realized by using a combination of light, shadow and colored and normal glasses to break the heavy atmosphere, and allow the audiences to experience numerous diverse details stemming from the interaction between traditional, modern, and digital architectural principles while enjoying visual dominance over the entire complex. This approach is aimed to induce a sense of respect for human character and spirit followed by an enhanced sense of psychological security (Figure 5).

Designing a color scheme requires a specific knowledge and skill, and becomes even harder when color should be exhibited through lighting. The colored glass should be used in accordance with psychological effects of colors, because these colors move along with motion of the sun and are also affected by varying intensity of daylight during the day, most notably near sunrise and sunset. The above-mentioned objective could be achieved by two approaches, either taking the risk of designing for every angle, or using the expanse, as we did in this design, to minimize the defects. Furthermore, the choice of color is of utmost importance and here we tried to act in consistence with the color scheme of traditional Iranian architecture (Figure 6).

As can be seen from Figures 7 and 8, the defined lighting scheme and all openings and light walls are formed through a fully parametric approach to achieve the desired light in terms of both quantity and quality. The open form is designed to allow shades appear in desired points and create better contrast.

7 CONCLUSION

The art of architecture has always had a close association with elements and concepts of creativity. All architectural designs are combinations of common elements such as walls, openings, glass and light, but a successful design should be based on a fundamental objective or concept as its cornerstone. Theoretical objectives can influence a wide range of audience, but can only be achieved through proper and principled use of easily accessible elements. The light so readily available across the globe can be utilized to enhance the quality of human life, but this requires simultaneous use of past experience and today’s technology in the medium of modern ideas. The present study evaluated several independent and dependent architectural variables in line with design objectives, and used them to develop a design in accordance with these findings. It was found that the light passed through color filters affects the human subconscious and comprehension, and that parametric design can be used to capitalize on this effect. The mentioned effect guides the mind toward a common direction, which in this particular design is the provision of sense of belonging through visual and sensual means and is followed by enhanced sense of psychological security. This approach allows the audience to use the diverse moments of presence in this space as a way to forget their negative emotions and experiences consciously and unconsciously, and as a result, a sense of security can be brought about. This argument and the resultant positive (and negative) effects naturally cannot be proved unless by trial and error. There are certainly some flaws that can be identified in experimentation or implementation, and will need to be addressed in future works.

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