

Utilization of the Art of Optical Illusion in the Design of Egyptian Glass Architecture

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Abstract:

In order to open new horizons for artistic creativity derived from the art of optical illusion and utilization of its techniques in the design of architectural facades, the research is conducting a study to clarify the most important criteria that should be taken into consideration when resorting to the use of optical illusion art and the criteria for its application in design by studying the art of optical illusion in terms of its origin, foundations and laws Which is based on it and how to employ this art in the development of the design thought of the designer, and to benefit from the theories of this art in the design of architectural glass facades.

The modern technological revolution and the many achievements it offered to humanity as a result of the rapid change of the data of science and the human mind have opened new horizons to bring about tangible modern progress in architecture and glass. There is an important fact that cannot be ignored: no matter how advanced technology is, it always needs the intervention of a creative designer who adapts his potential of thought, rationality and control in order to achieve the supreme goal of creativity. Therefore, the artists' perception and visual vision changed according to the change of thought and culture. They were interested in kinetics and optics, and they achieved this through color contrast, spacing of distances, organizing lines, reducing, and enlargement so that the general shape suggests movement, although in fact it is static. In this behalf, we try to take advantage of the elements of creativity available in optical illusion systems to innovate and develop the design of architectural glass mural facades based on this artistic trend to achieve deception with the element of movement, depth, and rhythm to achieve the phenomenon of anthropomorphism in the architectural facade.

RESEARCH ISSUE: The study issue is about how to reach creative design solutions by the utilization of the art of optical illusion and employing it in designing glass architecture.

RESEARCH OBJECTIVE: Studying the art of optical illusion and its standards, and to identify the role of the designer in taking advantage of it and how to employ it in designing glass architecture.

RESEARCH IMPORTANCE: The importance of the research lies in studying the art of optical illusion and taking advantage of it in the design of glass architecture.

Keywords:

Art of Optical Illusion, Glass ,Architecture

الملخص:

ومن أجل فتح آفاق جديدة للإبداع الفني المستمد من فن الخداع البصري والاستفادة من تقنياته في تصميم الواجهات المعمارية، يجري البحث دراسة لتوضيح أهم المعايير التي ينبغي مراعاتها عند اللجوء إلى الخداع البصري. استخدام فن الخداع البصري ومعايير تطبيقه في التصميم من خلال دراسة فن الخداع البصري من حيث نشأته وأساسه والقوانين التي يقوم عليها وكيفية توظيف هذا الفن في تطوير الفكر التصميمي للمصمم والاستفادة من نظريات هذا الفن في تصميم الواجهات الزجاجية المعمارية.

إن الثورة التكنولوجية الحديثة وما قدمته من إنجازات كثيرة للبشرية نتيجة التغير السريع في معطيات العلم والعقل البشري فتحت آفاقاً جديدة لإحداث تقدم حديث ملموس في العمارة والزجاج. هناك حقيقة مهمة لا يمكن تجاهلها: مهما بلغت التكنولوجيا من تقدم فإنها تحتاج دائماً إلى تدخل المصمم المبدع الذي يكيف إمكاناته في الفكر والعقلانية والسيطرة من أجل تحقيق الهدف الأسمى وهو الإبداع. ولذلك تغير إدراك الفنانين ورؤيتهم البصرية بتغير الفكر والثقافة. لقد اهتموا بالحركة والبصريّات، وحققوا ذلك من خلال تباين الألوان، وتباعد المسافات، وتنظيم الخطوط، والتصغير، والتكبير بحيث يوحى الشكل العام بالحركة، مع أنه في الحقيقة ثابت. ومن هذا المنطلق نحاول الاستفادة من عناصر الإبداع المتوفرة في أنظمة الوهم البصري لابتكار وتطوير تصميم الواجهات الجدارية الزجاجية المعمارية استناداً إلى هذا الاتجاه الفني لتحقيق الخداع مع عنصر الحركة والعمق والإيقاع لتحقيقه ظاهرة التجسيم في الواجهة المعمارية.

مشكلة البحث: تدور مشكلة الدراسة حول كيفية الوصول إلى حلول تصميمية إبداعية من خلال الاستفادة من فن الوهم البصري وتوظيفه في تصميم العمارة الزجاجية.

هدف البحث: دراسة فن الخداع البصري ومعاييرها، والتعرف على دور المصمم في الاستفادة منه وكيفية توظيفه في تصميم العمارة الزجاجية.

أهمية البحث: تكمن أهمية البحث في دراسة فن الوهم البصري والاستفادة منه في تصميم المعمار الزجاجي.

الكلمات الدالة:

فن الخداع البصري، الزجاج، العمارة

In order to attain the objective and solve the research issue, the following studies should be done:

FIRST: Studying the art of optical illusion and its standards

SECOND: An analysis of some architectural facades inspired by the art of optical illusion

THIRD: Presenting design ideas for architectural facades inspired by the art of optical illusion

FIRST: Studying the art of optical illusion and its standards:**Definition of Optical Illusion:**

The Cambridge Dictionary defines optical illusion as “*something that tricks your eyes and makes you think you see something that is not really there, or see it differently from how it really is.*”

Visual art is “an art that deals with space with the aim of achieving aesthetic visual effects in two-dimensional works to transform them perceptually by the recipient’s eye into three-dimensional or moving works with an oscillating or vibrating movement...that is, visual art whose first goal was to deceive the eye.” It takes into consideration the sensitivity of the eye in receiving the external world's visuals. Visual art takes upon itself the testing of our various means of receiving and accepting lines and colors.

Visual deception is a name we give to our seeing something with our eyes so it appears to us in a way that we know is not the truth.” It is a “dynamic property that gives a sense of movement to the recipient, and it is a light phenomenon that results in objects not appearing as they are before the eye as a result of the presence of sensory or light that precede or surround vision.

Visual deception is achieved as a result of the tightness of the geometric organization, which depends, in some of its aspects, on the sensory perspective, when some geometric shapes become smaller in a gradation, while the opposite is regulated in reverse, and the result of this regulation, in addition to the distribution of phalanx and light, generates a general sense of movement.

The art of optical illusion "is the art of visual excitement and irritation. The viewer of the artwork sees the elements in a state of struggle, which causes eye tension." Visual deception is done as a result of the shape taking properties from the ground, just as the ground takes properties from the shape.

Optical illusion is defined as a deceptive or misleading vision, which presents the viewer with visuals that are not what they are. The eye perceives the image or the object in contrast to the truth, as a result of the wrong processing of the brain. The art of optical illusion relies, mostly, on a set of mathematical and physical laws to form paintings that deceive the human brain, and give the beholder a set of impressions that are different from the truth. The most important thing is that most of the optical tricks that are taking place are the installation of images next to each other in a deliberate manner so as to give the desired results.

We conclude from the definitions of optical illusion that the art of optical illusion is the result of the research and experimentation of optical illusion artists, so their artworks stemmed from their experiences and study of optical phenomena and their physiological effects on the eye. This artistic movement of the art of photography took new dimensions based on scientific theories. Optical illusion artists borrowed from experimental psychology some of the tricks that have an impact on the perception of the eye, and derived their research from them.

The Beginning of The Art of Optical Illusion:

The art of optical illusion first appeared in the mid-twenties of the last century, when a group of architects belonging to the German “Bauhaus” school - which was seeking to create harmony between form and nature - designed a group of shapes that could easily deceive the beholder depending on the laws of optics and the angles of light fall.

In the modern era, since 1930, when painters used abstract arts in interior and architectural designs and combined them together, so the old forms differed from the new, and another concept emerged by manipulating them to give a certain body or shape and increase the space, and this trend became one of the most prominent artistic trends known for both short and long terms historically, in the mid-1930s, graffiti artist Victor Vasrelli created the first work

classified as a color of optical illusion. He designed a painting consisting of black and white wavy lines, and placed inside it a zebra that is difficult to notice without examination.



Figure (1) One of the Bauhaus School Posters



Figure (2) Victor Vasarely Painting

Types of Optical Illusions:

Of the types of optical illusions are the illusions related to colors, and illusions related to geometric shapes. This type of illusion depends on geometric shapes and is called the “Roger Banrose” trick. There are tricks related to the process of moving images, such as the three-dimensional trick of the moving image, and finally there are tricks related to sizes and measurements, and these tricks are called “Miller Lyar”. The types of optical illusions can be divided into *three* types:

1. **Literal Optical Illusions:** These illusions create images that are different from the images or smaller objects that you make.

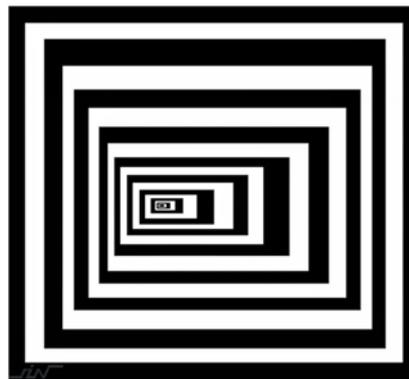


Figure (3) Literal Optical Illusion

2. **Physiological Optical Illusions:** This type of illusion depends on affecting the functions of the brain and the eye by using some visual elements such as brightness, size, color, angle, and movement as well as exposure to these elements for a certain period of time in order to see things differently from their reality, and examples of this are the spots of lighting that you see after exposure to strong light. We find the optical illusion of drawing: it is divided into several illusions:

- *Arrow Illusion*: This phenomenon is formed by using lines or pieces of art of different lengths and opposite directions, which are equal and parallel, but appear to the spectator's eye as if they are tilted and not parallel, and to obtain this deception in a distinctive way, the contrast between black and white is used.
- *Parallel Lines*: This trick is done by drawing a strip in a rail, and draw parallel lines inward and outward at different sizes to appear as if they are moving inward.
- *Perspective Illusion*: Perspective is headed by one basic rule, which is everything that is close to the eye is large, and everything that is far from the eye is small, so you can create many optical illusions art by manipulating the positions of shapes in the image and designers can shape and modify the visual experience of the spaces designed by manipulating the perceptual role of illumination to facilitate visual tasks and define visual boundaries.

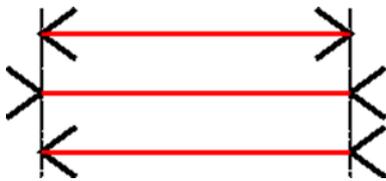


Figure (4-A) Arrow Illusion

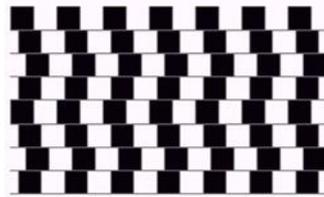


Figure (4-B) Parallel Lines

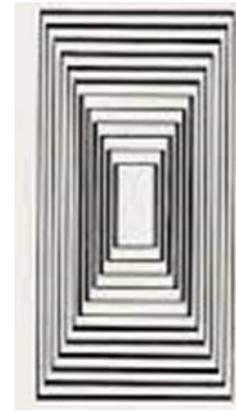


Figure (4-C) Perspective Illusion

Figure (4) Physiological Optical Illusions

3. **Perceptual Optical Illusion**: This type of illusion depends on the way we think and perceive things. It means that a person builds his view of things on fixed ideas in his mind since childhood and on what he is accustomed to seeing throughout his life and not on what is actually in front of him, which leads him to imagine things that do not exist and see things in a different way from what they are. Perceptual illusion is based on many principles, such as ambiguity, confusion, contradiction, and imagination. Among its examples:

- *Brightness and Contrast Illusion*: It is the combination of the two extremes. Nature and life combine a thing and its opposite. With light there is darkness, and with shortness it is length, which is a sudden and rapid transition from one state to its opposite.
- *Trick Illusion*: Great effects can be achieved by incorporating knowledge and perception, and visual knowledge and illusions.
- *Color illusions*: Color and light are the main element in all types and methods of optical illusion of design. Colors help to address spaces by adding a sense of spaciousness and spaciousness or narrowness. The use of color in design should be based on knowledge of color perception and knowledge of the effect of color on humans.
- *Relative Movement Illusion*: The kinetic optical illusion is achieved by the wavy lines in the floor coverings, resulting in a sense of movement and a sense of walking on the sea waves.
- *Expression Illusions*: Expression-based optical illusion designs that give a sense of depth with change in scale.



Figure (5-A) Brightness and Contrast Illusion



Figure (5-B) Trick Illusion



Figure (5-C) Color Illusion

Figure (5) Perceptual Optical Illusion

The visual illusion occurs as a result of:

1. *Previous Visual Experiences:* It may become clear if we give this example, if you look at a person behind him, you see the back surface of his head, but you do not see his face, and yet your brain concludes that this person has a face, we can deduce to this extent, because if that person turns around and we do not find a face for him, we will be surprised.
2. *Physiological Reasons* associated with the optic cells of the eye.
3. *Psychological Reasons* associated with visual perception and factors of visual perception: deception, sensory or perceptual illusion in a psychosomatic sense; an error in sensation or perception. Perception is that process that receives and organizes the information that reaches it through the sense organs represented by the five known senses.

Illusion or deception occurs when there is an obvious contradiction between what the brain perceives and what is actually present in reality in terms of characteristics or characteristics of the things and stimuli around us, and illusion occurs for all members of human sense, including hearing, sight, touch, smell and taste. With the development in the field of psychology and the development in identifying the means of vision that allow the perception of subconscious systems that did not exist before, the artists of optical illusions took advantage of this to turn the errors of sight into aesthetic optical illusions that affect the eye. During the interaction of the viewer's eye with the static forms formulated according to perceptual laws that confirm that the stability of the form does not mean the stability of the perceiver.

SECOND: An analysis of some architectural facades inspired by the art of optical illusion:

The Use of Optical Illusions in Architecture:

The use of optical illusion in architecture has many advantages; as architects rely on it to convey a certain idea or feeling. The elements and space of the void can be controlled by optical illusion, which makes you feel spacious and free in narrow places and other examples that clearly affect architecture.

The beginning of optical illusion was in the **Greek Era**; as they excelled in many forms of optical illusion, and what they aspired to reach was to build sloping roofs in a way that appears straight, as well as projecting the poles to the outside so that they appear to be lined up behind each other in a straight way from far.



Figure (6) Optical Illusion in Greek Architecture

The presence of optical illusion was not limited to the Roman and Greek civilizations only, but extended to reach the **Islamic Civilization**, where this artistic style appeared in Islamic architecture as well by extracting overlapping decorations that the beholder cannot distinguish their beginnings or ends as a kind of barrier called “Mashrabiya” and depends on the colors of glass and shades in its formations.



Figure (7) Optical Illusion in Islamic Architecture

The art of architecture constitutes one of the main and important pillars in the formulation of the civilized scene of any society. Architecture is a functional formation that fulfills life requirements and is subject to civilized and social influences. Engaging in new experiences, by constructing a building on a naturally inclined land, or constructing it on a flat land almost in a semi-circle on the basis of a self-contained building that has its own distinctive external walls so that its stage opens to the public without any walls or barriers between them, such as the Roman theater, or the concept of buildings With steel structures or glass facades and many other examples.

The Use of Optical Illusion Art in Interior Architecture:

Interior design is defined as the study of spaces, developing appropriate solutions for its constituent elements and preparing them to perform their function efficiently by using different materials and choosing appropriate colors at appropriate costs. It is the art through which the functional problems that face us in the field of movement in space are addressed and solved, so that it is easy to use the components contained in this space.

Although the interior design of space and furniture can be dealt with in more than one way, the optical illusion method is one of the most important methods that work functionally and successfully in solving problems in addition to the artistic aesthetic view as well. It is interesting that these changes can change the interior spaces skillfully and boldly depending on how it is styled into the space, giving you control over the feel of the room. It is good to know that there are ways to do this by adding square patterns or realizing a different mood.

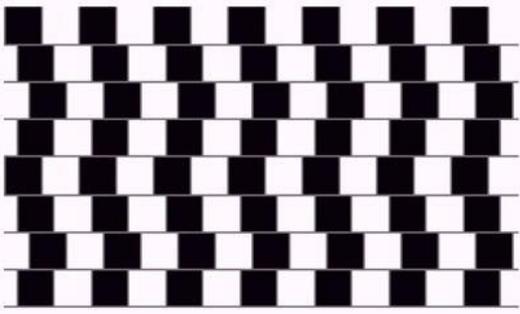
Criteria For Using Optical Illusions in Interior Design:

1. The static form does not mean that the perceptible is also stationary, in the sense that the visible objects are in motion despite their immutability.
2. Optical illusion depends on vertical, horizontal and wavy lines, or color spaces, whether opposite colors or contrasting colors, or cubes.
3. Optical illusion is a dynamic visual art based on sensory optical illusions for the process of human visual mental perception to sense movement.
4. Optical illusion is based on deception of the mind by means of the eye as the only means of communication between the human mind and the visual body.
5. Optical illusion depends on two main components, namely, abstract shapes and mathematics, to submit those abstract shapes to mathematical calculations while preserving the aesthetic and innovative aspects, which may give a sense of depth with a change of judgment.
6. Optical illusion uses the color element in particular with the unit of shape to obtain a unit resulting from the interaction of colors and different degrees of one color, or the interaction of color and its opposite, or the interaction of several interconnected colors together.
7. Optical illusion follows the methodology of the Gestalt school, which found the relationship between the part and the whole in visual perception, where the whole is perceived before the parts are perceived.



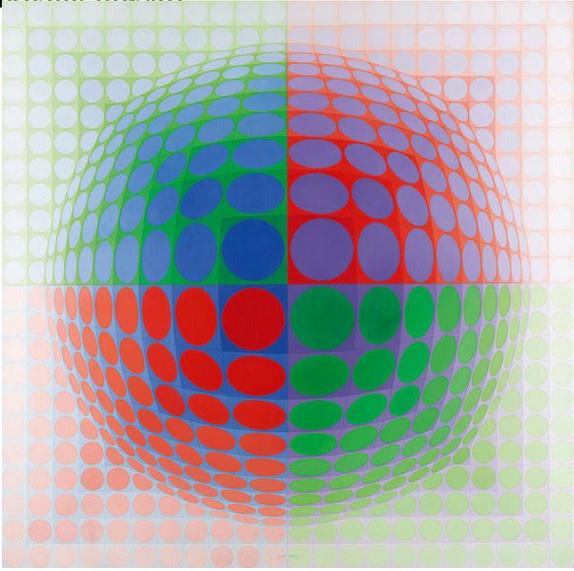
Figure (8) Optical Illusion in Interior Design

An analysis of some architectural facades based on the art of optical illusion:**THE FIRST MODEL: Analysis of the Australian Customs Service Building:**

Australian Customs Service Building			
Building Info	Architectural Site	Melbourne, Australia	
	Type of Work	Government Building	
	Dimensions	8 Floors Height	
	Work Completion Date	23 Dec. 2006	
Sources of Design Thought and Optical Illusions Used			
Types of Illusions Used	Parallel Lines Illusion	It is a physiological optical illusion, in which parallel lines are drawn inward and outward at different sizes to appear as if they are	

	<p>Explanation of Artwork</p>	<p>The work relies on a clear approach with the visual artwork in formulating the significance of the aesthetic method through a group of horizontally parallel lines and vertically parallel lines grouped in a rectangle representing the space containing it, with a focus on the circle that intersects with all horizontal and vertical extensions to give the impression of widening the distance between the horizontal lines the more we move away from the center point, due to the similarity of the distance between the lines, but the disparity that occurs between the dark or light areas one above the other in the vertical axis gives a sense of the delusional movement, the breadth, and the lack of parallelism of the horizontal lines. Visual by achieving color contrast, so that the space between the horizontal lines looks like a dancing space of spaces and dark and light-colored lines, and the addition of the circle with its curved lines achieved diversity in the sight paths of the group of straight lines distributed on the edges of the main facade of the building, and it is noted that these lines increase the distance whenever we turned outward, which suggests the delusional movement resulting from the smoothness of the curved lines of the circle and its thinness, as well as the fact that the vertical lines connecting the circle and the horizontal lines give elongation and then dominate the horizontal lines, which increased the interdependence of these units with each other and gave them more strength. The rectangular shapes separated from each other by a parallel distance of orange lines give a different impression and a sense of kinetic swaying dancing.</p>
Optical Properties		
	Color	Using the white and black colors
	Transparency	The building is dark with windows for ventilation
Technology Used to Implement the Interface		
		Each floor of the building is of the same height and is executed in black and white ceramic glazing technology.

THE SECOND MODEL: Analysis of the Super Trading Center Building:

Super Trading Center Building			
Building Info	Architectural Site	London, United Kingdom	
	Type of Work	Shopping Mall	
	Dimensions	14 Floors Height	
Sources of Design Thought and Optical Illusions Used			
Types of Illusions Used	Parallel Lines Illusion	<p>It is a physiological optical illusion, in which parallel lines are drawn inward and outward at different sizes to appear as if they are moving inward</p>	

	<p>Explanation of Artwork</p>	<p>It is implemented using the style of modern architecture that relies on metal structures for speed and ease of construction, as well as the flexibility of formation and design, which gives the designer greater freedom of creativity. It included a set of straight horizontal and vertical lines intersecting with each other and suggesting inclination at the sides of the painting. The figure here began as a ball protruding from a flat surface. The work of color contrasts between the cold and hot colors contributed to the achievement of optical illusion by achieving the mental blending color of the tones in the recipient's eye through their convergence with each other, so that the converging areas appear farther than it is in the larger areas. The approach of optical illusion in the building, the research sample, came through the use of the artist designer glass in achieving spatial emptying of the property of transparency, meaning that you can cover a certain area and give you a transparent color while maintaining the basic shape of the building, and without affecting the colors used as it is in contemporary designs that use metal structures to make the building. Here was the structural, architectural and aesthetic value desired by the designer by achieving the intended shape of the building through the metal structure, which shows the extent of the aesthetic approach and the intention to achieve the optical illusion that the glass contributed to through the color reflections of the sky that dyes it, whatever the atmosphere is, it is blue with the blue of the sky clear and reddish With Moroccan red. All these chromatic properties that were for the transparency of the glass, and the illusion of blending to preserve the optical illusion, things are not as they are in reality, but as they appear to the eye of the beholder.</p>
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Presentation of some architectural models based on optical illusion in their interior design:

THE FIRST MODEL: The Interior Design of Cafe Logomo

The interior design of Cafe Logomo in Turku, Finland is based on an optical illusion experience through graphics employed throughout the space with its vertical and horizontal surfaces in addition to the furniture units of tables and chairs. Designed by German artist Tobias Rehberger, the general style of the design is an intersection between continuous black lines on a white background on the floor, walls, and furniture with a touch of orange passing through the center of the space as smoothly as the rest of the lines.



Figure (9) Cafe Logomo

THE SECOND MODEL: The Reception Hall in a Hotel:

The interior design depends on the geometric lines and its creative use in the interior treatments through the 2D design, which creates a 3D experience using black and white colors. The designs have been done as shown in the Figure (10) on the entire walls, ceiling, and floor in addition to the tables and the main service reception unit.



Figure (10)

THIRD: Presenting design ideas for architectural facades inspired by optical illusions:**Employing optical illusions in the design of architectural facades:**

The interest of the art of optical illusions in the sciences of movement and optics is the structural basis for all the paintings of this trend of modern art. The beginning was through the use of black and white colors, due to the severity of the impact on the viewer of his vision of opposite or overlapping spaces that made him feel humiliated, and his eyes were constantly humiliated. Cold colors appear to be regressing, while hot colors appear to be advanced. The movement of the elements is perceived by the viewer through the sense of sight, and that is the result of fluctuating vision by disrupting the fixed system by creating the delusional movement through convergence and divergence between distances, color contrast, and the repetition of shapes, lines and colors, as well as the difference in sizes, whether by increasing or decreasing or both, then the scope of these visual attempts expanded, so that the accumulation of geometric construction and the juxtaposition of lines and the distribution of flat colors and varying depths led to various phenomena such as glitter or ripple, color glow, spread, overlap, contraction and extension, and what results from contrasted with simultaneous and successive variations. As a result of the visual blending, the comprehensive confusion, and the permanent fluctuation of the plastic elements, the retina becomes irritated and convulsed, so that the viewer becomes a partner in the painting. It is done by the human brain after recording the elements on the retina. The brain may lead to perceiving the plastic elements in a certain position, which leads to a certain meaning, then we perceive them in another position and with a different meaning, even though these elements are the same and have not changed due to the change in the angle of vision.

Movement and Color in the Arts of Optical Illusions:

The movement in the visual arts is one of the goals that should be achieved, but when we talk about the art of optical illusion, the movement is what achieves success of the artwork in the process of attracting the viewer's attention. It is what arouses his interest and pushes him to examine the artwork in sequential, sequential steps, characterized by continuity, thus achieving success for the artwork, but the movement is based on the chromatic structure that has the greatest impact on arousing the eye and thus the occurrence of the process of visual illusion by suggesting the movement that comes to the viewer mentally through his eyes and his imagination. The movement here has variations, it is permissible to say that it cannot be determined, but it is at its minimum represented in:

1. Movement in and out
2. Internal axial movement
3. Connected and discrete movements
4. Single or multidirectional movements
5. The gravitational movement towards the inside and the opposite movement towards the outside
6. Movement toward the center or outside the circumference
7. Movement in an upward or downward direction
8. Movement forward or backward

These are the primary qualities of specific types of movement that can be illusioned by the multiple building elements, and the color comes at the forefront, and has the ability to provoke them through its structural systems.

Design Strategy:

The designer should choose a clearly defined strategy in the field of creativity in order to link production or service techniques with the nature of the development in technology on the one hand and market requirements on the other hand, and to know who will direct this design and what are the user's goals. This information is usually provided to him by the person studying the users. The designer then assesses the goals and develops a design strategy, either independently, or with the help of others which leads to the formation of a common understanding about the interactions that should occur to achieve the goals of the user. There are six types of strategies for technical design creativity, namely:

- Creative Offensive Strategy
- Defensive Creativity Strategy
- Creative Imitation Strategy
- The Approved Creativity Strategy
- The Traditional Creativity Strategy
- Opportunity Creativity Strategy

Structural Layout Design:

After the designer demonstrates a good idea of the strategy that drives him to design, he can begin to plan the different interfaces and interactive architectural elements that will facilitate basic interactions. The way to do this varies by designer.

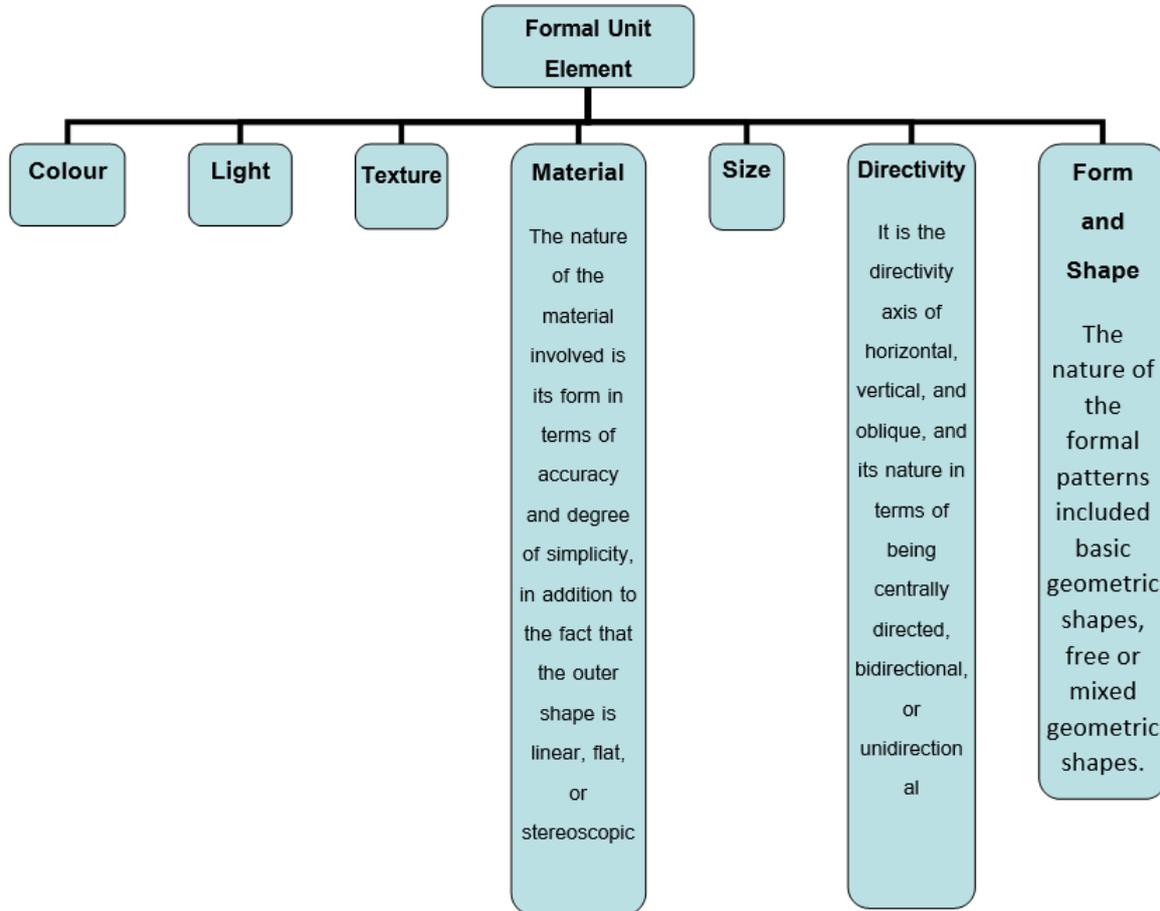
The Role of Architectural Thought in the Design Process:

The architectural design process is a creative process; it cuts out of the silent infinite void through lines, realistic surfaces, and lifelike forms. As a result, internal and external blocks and spaces are formed that are necessary for the material and cultural needs of the human being, in which the senses, artistic sensations and thought are stirred. The designer of architecture and glass, in order to start in the stage of creativity, should define the new and unique line of thought to achieve his first professional goal in the material, scientific, utilitarian, and constructional contents of the work of an interactive design with realistic positives for electronic technologies and networks. Hence, the role of architectural thought becomes clear:

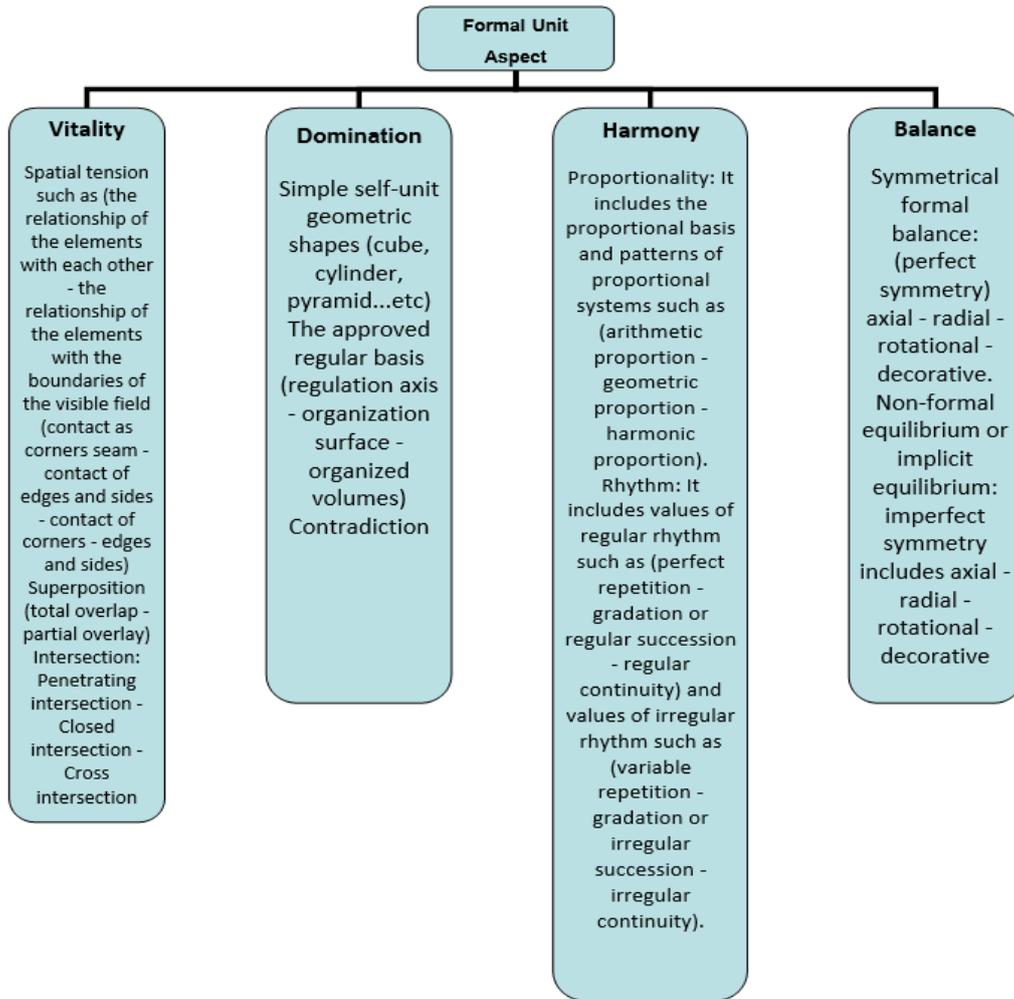
- Contemporary thought of architecture is the first driver on which the modern and innovative design mechanism is based.
- The design of any architectural building or architectural facade is based on the status of this building as one of the features of contemporary thought for it, which is the challenge undertaken by the architectural designer.

A study of the vocabulary that expresses the concept of formal unity in architecture as a system, which is:

FIRST: Formal Unit Elements: which include different aspects of the shape such as shape, directionality, size, material, texture, light, and color, as this study dealt with those aspects in terms of their impact on architectural design.



SECOND: Formal Unit Aspects: it includes balance, harmony, dominance, and vitality, that is, what can be considered aspects of design principles.



Applied and Design Study:

FIRST DESIGN IDEA:



Figure (11) Virtual Hotel Design

The design idea is based on achieving the contrast in the engineering illusion in a literal optical way through the use of geometric lines that move parallel movements within the design with Arabic fonts of different light and dark tones that move in a direction perpendicular to the geometric lines in the design, which makes us feel fluctuating in the design vision.

It gives a sense of illusion related to the process of moving images, such as the three-dimensional trick of the moving image, and also tricks related to sizes and measurements.

SECOND DESIGN IDEA:



Figure (12) Virtual Design of an Aquarium

The design idea depends on the colors illusion, where color and light are the main element in adding a sense of spaciousness, spaciousness or narrowness, and it included a set of parallel circular lines, which were formulated on lines and spatial emptying of spaces to show these lines in a circular manner and create spaces between them, which helped to achieve the delusional movement This is based on the color contrast between the apparent shape and the ground. The work of color contrasts between cold and hot colors, as well as between white and black lines, contributed to achieving optical deception by achieving color and mental mixing of tones in the recipient's eye.

Applied Study:

Some design ideas have been applied in the form of glass pendants serving the interior architecture, implemented through digital printing techniques on glass, and heat-treated glass.

FIRST APLLIED IDEA**Figure (13) First Applied Idea**

Achieving the idea of optical illusion through the interrelationship between the shape and the floor, the diversity and contrast in the directions of movement of the element represented in the portrait with its hot colors and the intersections of the geometric lines in the floor with its neutral colors, as well as the method of deletion and addition of the element, as it considers them to be the phenomena of optical illusions. The vertical lines are parallel and appear indented to Inward or outward, according to the effect of the background lines on it, the vertical lines appear dented, which leads to a change in its shape, causing fluctuation in vision, complete contrast between the colors, which leads to the illusion of movement.

SECOND APLLIED IDEA**Figure (14) Second Applied Idea**

The use of hot colors and the way they are installed in the portrait is an effective tool that has been combined with geometric lines of convergent and divergent shapes and the method of stacking them in different directions in order to draw attention to what they want the eye of the beholder to see, so the eye of the beholder is illusion to reflect the reality of the item he sees.

Results and Recommendations

RESULTS

1. Optical illusion has several criteria. The designer should not start using it without his full awareness of them so as not to spoil the design, and to start using his patterns in deliberate ways according to specific rules.
2. The designer can reach the degree of design creativity through the applications of optical illusions.
3. Identifying the most important methods and tricks used in achieving optical illusions in artworks
4. Achieving a successful design should be based on a systematic study of the basic elements in building and shaping the design and the structural dimension of the design.
5. It was possible to reach a design methodology through which designs for architectural glass facades can be made, by adapting technology and taking advantage of the art of optical illusion to meet the functional and aesthetic needs in design ideas.

RECOMMENDATIONS:

1. The necessity of developing the design awareness of the glass designer by studying the technological methods used to apply the different designs, especially those inspired by the optical illusion arts of the glass of architectural facades
2. The necessity of developing more advanced experimental techniques in the art of optical illusion

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