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### Original Research Article

## Extension and Dominant Visual Reading Direction in the Perception of Architectural Phenomena in Right-writer Societies Based on the Approach of Cognitive Sciences\*

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### Abstract

**Problem statement:** mental-visual perception and processing mainly take place in a certain direction of the vision field. Viewing and processing a visual field has start and end points, extension, and dominant direction. Most designers are not aware of the way the perceptual system of the mind works. This lack of knowledge causes the selection of forms and positions of visual elements not to be in accordance with the processing patterns of the mind. Analyzing and knowing how the mechanism of visual perception works makes it a more effective design of every element. This type of approach leads to more scientific reasons for descriptive and sometimes ambiguous aesthetic analyses.

**Research objective:** The purpose of this research is to find the desired extension and scope in the field of vision and also the direction of reading visual works of art and architecture in the cultural and linguistic context of the right-hand writing community in the cognitive sciences template.

**Research method:** This research is based on the theoretical research literature and content analysis of the findings in parallel with experimental tests in an analytical structure. Therefore, this research is considered descriptive-analytical research with a scientific interpretation of descriptive topics and findings.

**Conclusion:** Language habits and the direction of reading texts in different cultures, although they cannot be completely unaffected, but the range, orientation and desired visual direction are dependent on the mechanism of mental perception, and writing direction is not considered the main factor. Reading and processing along the horizontal line take place from left to right due to the spatial orientation of the mind in the left area of the visual field. This issue is independent of language teachings in orthographic cultures. The orientation of the mind in reading visual works is related to brain structure and perception mechanism, which is caused by the inherent asymmetry of the brain. This mental bias to left will lead to horizon preference. Different areas in a landscape are not perceived and valued equally. Therefore, the importance of each form in space depends on the position of the observer's visual field.

**Keywords:** *Extension and direction, Visual reading, Perception, Architecture, Cognitive science.*

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## Introduction and Problem Statement

Aesthetic experience and its nature are such that most are interpreted and explained with philosophical or psychological interpretations. Aesthetics is actually a kind of visual judgment that depends on the structure of people's mental perception. At the same time, teachings, cultural issues, personal taste, and many related criteria represent a multifaceted issue. Cognitive science tries to solve multi-dimensional problems by concentrating on different disciplines such as cognitive psychology, philosophy, neuroscience, etc. Aesthetics and concepts are related to a level of ambiguity and complexity that cannot be comprehensively analyzed and recognized with a one-dimensional view. With its multifaceted view, cognitive science can examine the scientific roots of some visual trends and aesthetic findings, which are sometimes intuitive, from theoretical and experimental aspects and provide valid reasons causes of visual trends.

The purpose of this research is to deal with the causal aspects and deepen the perception of visual space in the context of cognitive science. Considering the importance of the subject of visual reading, the reading way of the visual system and the tendency of the mind in different areas in the visual field have been taken into consideration. Because the way of reading a single phenomenon can evoke two completely different or even opposite concepts. Human vision mechanism does not understand the observed scene as a whole unit, rather due to the limitation in receiving information, it receives the image in small parts and then combines it as a whole unit. Getting step by step inevitably has a certain extension and direction therefore the regions of a visual field also have different degrees of importance. Most research does not refer to a definite standard in describing the nature of beauty and its perception of art and architecture. The reason for this subject is relying on interpretations and personal perception in phenomena analysis. When the ideas of Lucio Meyer and the writings of Kurt Grutter are put together, an obvious contradiction

in these theories. According to Meyer, oblique lines are stronger than horizontal or vertical components because oblique lines are associated with movement and are considered the basis of rotational movements (Meyer, 2020, 19). In return, Kurt Grutter in his book "Aesthetics of Architecture" says the opposite. In this context, horizontal and vertical lines have the advantage over oblique lines. This is because horizontal lines are easier to perceive and vertical lines are more interesting (Grutter, 2018, 227).

These contradictions can be seen in many writings and topics in the field of aesthetics and architectural perception. If these assumptions are tested in a more precise scientific field, the accuracy or correctness of the theories revealed and they come out of the ambiguity shadow. This research attempt to focus on proven concepts of perception by relying on perspectives of cognitive science with a multifaceted approach instead of general interpretations. In such a way that scientific evidence explains the quiddity of descriptive or general expressions.

One of the important topics in this regard is how to receive visual data and process it in mind. For example, in each visual field, the viewer shows a greater preference for the lower left area. This issue is probably related to the direction of reading and writing, because, in western culture, reading is from left to right. Generally left side of the view field, is more important (Dondis, 2019, 56). Therefore, expected in a right-handed society that they write and read from right to left, visual reading direction should be right to left. Because if this is the case, right-handed and left-handed communities will have different and sometimes conflicting perceptions of the same visual phenomenon. Visual space is not a homogeneous space and the structure of the brain is such that it does not evaluate vision equally in different areas. Therefore, each part of a landscape has a unique visual value. This situation causes the audience's attention to have a certain strain and direction. Therefore proposed the extension and dominant direction in the perception of architectural and artistic whatever is placed in the left field of

view from one point of view will be different from other regions in terms of importance and subjective valuation. The mind receives more important information about aesthetics in the left area of the visual field. If an architectural and landscape designer is aware of the perception mechanism, will not consider two sides of a visual work as equivalent. For this reason, many master artists of the past had intuitively discovered the importance of the left visual area and most of them put the main object in the left third of the painting. This research seeks to find out whether this orientation of vision in our society, which is right writing, is affected by teachings or is it independent of cultural influences and dependent on the mental mechanism. If the mental focus is on a certain area more than other areas as a result of prioritization and perception step by step, a directional axis will be obtained for visual perceptions and mental processes in this research assumed that moving priority from left to right is in relative compliance with the horizontal axis. This research has tried to obtain the desired answer with minimal statistical and quantitative analysis and instead of dealing with numbers, qualitative and content analysis should be given more attention.

### Research Question

Is the theory of extension and spatial directional bias in relation to the direction of visual reading also true in the right-handed community?

### Research Hypothesis

The direction and extension of visual reading depend on brain processes way and has no significant relationship with the teaching of written direction.

### Research Background

One of the old studies in visual perception is “Art and visual perception” (1965) book written by Rudolf Arnheim. Arnheim’s writings are based on psychological thoughts. He was deeply influenced by Gestalt psychology, and for this reason, he considers that the mind has a holistic nature towards

phenomena. Therefore, he tries to describe the phenomena and believes that art does not just a sensory description, Rather, it is about the expression of mental meanings. Arnheim has not paid attention to specific architectural aesthetics. Rather, art in a general sense. Kurt Grutter specifically examines architectural aesthetics in the book “Aesthetics of Architecture” (Grutter, 2018). He believes that although architectural components are presented in a measured and quantifiable form product resulting affects the audience in the form of an emotional quality that cannot be measured. probably it is possible to convert some of the emotional and perceptual reactions into numbers and grades but it is not possible to express everything about feelings and mentality in the form of formulas and criteria. The same emotional format can be seen in the writings of Christopher Alexander Including the book “The timeless way of building “ in this book, the conception of beauty and sensory perception of the architectural space has been drawn to a transcendental and far-reaching extent, which has been named the nameless quality (Alexander, 2011). audience mind is very complex and fluid in the phenomena perception and the clause is variable, which cannot be imagined as a comprehensive and general sentence. At the same time, looking way to subject is also very important. For example, Jon Lang in his book “Creating architectural theory“ has examined the issue mainly from a behavioral reactions viewpoint (Lang, 2017). The impact of environmental psychology and behavioral sciences can also be seen in the book “Environed in environment “written by Shahcheraghi and Bandar Abad (2016) (Shahcheraghi & Bandarabad, 2016). Generally, neuroscience-related topics and cognitive science in architecture have been addressed to a limited extent, such as in the book “Neurology in architecture” written by Mahmoodinezhad (Mahmoodinezhad, 2019). Or articles such as “Neuroesthetics and its challenges” (Baskabadi, Afhami & Farboud, 2013) the dominance of behavioral psychology and environmental

psychology can be seen in many architectural texts. Whereas cognitive science pays more attention to the internal structure and mechanism by using disciplines such as cognitive psychology, neuroscience, and psychoanalysis instead of focusing on behavioral results. Based on this, the nature of the findings is very different from the findings of behavioral psychology. Considering that the analysis of perception mechanisms in architecture requires a multi-faceted approach, it will be necessary to study in the field of sciences outside of the architecture field. The book “Cognitive science, an introduction to the study of mind” written by Jay Friedenberg and Gordon Silverman is one of them (Friedenberg & Silverman, 2020). It has a pure approach to cognitive science, but its findings can be applied in the architecture field. The orientation of visual perception theory in the vision field is one of the subjects studied in cognitive science. Part of the visual reading theory is latent in the thoughts of Dondis (2019). In his book “A Primer of visual literacy”, he puts forward significant ideas in the visual literacy field. He believes that images are the most primitive and original human written language for expressing ideas and concepts. When language and script were not yet invented, people used images to express their thoughts. This method over time became symbolic forms and then lines. Therefore, visual literacy turned into written literacy, and written reading is rooted in the visual reading of images. In this type of attitude, reading images is the same as reading text, so the transfer of meanings and conceptual content in images becomes especially important. In this view, the direction and extension of visual reading have been proposed in such an image reading way from left to right and in accordance with reading direction and written language in western societies.

In the neurology field and cognitive sciences, by looking at studies of Fink et al., we can see that visual tendencies and spatial biases are rooted in the activities of different brain regions and layers. His tests on healthy and normal people not only

along the horizontal but also along the vertical and radial (Oblique) has also been done and significant results have been obtained. The basis of studies is the judgment on the midpoint of dividing horizontal, vertical, and oblique lines, and the deviation from the center is interpreted as dependent on the spatial judgment and the dominance of different brain layers. The root of this type of study goes back to the research of William James (Fink, Marshall, Weiss, & Zilles, 2001). Studies show that the mental structure is not completely symmetrical, but on the contrary, a healthy brain naturally has a perceptual asymmetry and a visual bias in a certain direction. A clear example of this scientific truth is stated in the article by Foulsham et al. with the title that people with spatial neglect disorder tend to the middle right in dividing the horizontal line, and healthy people without spatial neglect tend to the middle left (Foulsham, Gray, Nasiopoulos & Kingstone, 2013, 14). Similar the same results, is mentioned more clearly in the studies of Nicholls et al., with the theme that normal people have an attention deviation of upper left area, while people with a spatial neglect lesion in the right hemisphere of attention deviate to the upper right side (Nicholls, Mattingley, Berberovic, Smith & Bradshaw, 2004, 289). Many similar studies in the spatial neglect field can be mentioned, including (Brodie & Pettigrew, 1996), (Fink et al., 2000), (Post, Caufield & Welch, 2001), (Van Vugt, Franssen, Creten & Paquier, 2000) and (Chokron, 2002). which refers to spatial deviation in healthy or injured people or other studies that attribute spatial deviation to right and left reading and written language including (Chokron & Agostini, 1995) which have measured this issue in Latin societies (left writers). This type of bias and attention to the left in healthy people is also called false neglect, which is due to right hemisphere activities. Also, there is a greater tendency to pay attention in the vertical direction. Up increases the activity of the right hemisphere and increases the tendency to the left. While the tendency to the right is more observed in people with brain lesions of the

right hemisphere (Thomas, Castine, Loetscher & Nicholls, 2015, 180). Attention bias to the left is also referred to as false neglect caused by the activity of the right hemisphere cortex in other texts (Loftus & Nicholls, 2012, 2573). According to some studies in left-writing societies, the direction of reading and writing has an effect on aesthetic preferences, while previously this issue was only attributed to the dominance of the cerebral hemisphere (Chokron & Agostini, 2000,47). Some studies consider the hidden layers and lines in the image to guide and eye orientation (Koleini Mamaghani, Seyedarabi & Nasser Al Islami, 2014). Sometimes these spatial biases depend on several independent internal and external factors and can create different biases in different people (Wexler, Mamassian & Schütz, 2022). The issue raised here is that if a powerful stimulus is created on one side of the visual scene, the mind will tend to that side, and in fact, spatial bias can be manipulated based on visual field design. Therefore, spatial bias is a function of the attention center that has been created. The research of Rahnev et al. (2011) concludes that if the attention center is focused on one side, the viewer will still be able to perceive the other side of the scene in a strange way, while the observer has not consciously paid attention to the areas outside the scope (Rahnev et al., 2011) and (Sharifi, 2001). This topic is called "hidden and obvious attention". Evidence shows that brain activity areas in both attention types occur in almost the same area of the brain (Haan, Morgan & Rorden, 2008). When placed finding next to multiple eye saccade movements in one second and the unconscious mind perception, concluded eye movement speed and brain processing in a way that happens outside of our awareness. In addition, spatial bias and natural reading direction should be checked in a homogeneous space without visual gravity to determine the natural direction of the mind without manipulating attention. Experimental clinical studies make more reliable results than personal inferences and guesses. For this reason, this article has been prepared and adjusted based on

this approach and considering its effectiveness in the architecture field. At the same time, this kind of study in the architectural field and accordance with related concepts are very limited.

## Theoretical Foundations

### • Visual bias

The viewer naturally tends to a certain area vision field. This type of tendency is not the same and certain for all people, but it governs the vision mechanism for most people. The left and right fields of vision are not the same. People who have different preferences in visual direction also differ in attention amount. They pay attention to different directions of images. Some of them pay less attention to the right side and some to the left side of images. This phenomenon is determined by a simple test of visual interaction by dividing horizontal and vertical lines into two equal parts by the audience. The amount of deviation from the middle point shows the degree of inattention to one side of the view field. For example, if the determined middle point is inclined to the right, it is a sign of not paying attention to the left side of the field, this problem makes the viewer perceive the length of the line left as less than the actual amount. Tendency to left or deviation in vertical lines is also caused by the same lack of one-sided attention to the visual field. In more severe cases, not paying attention to one side of the visual field is classified as a mental-visual deficiency, which is not in our opinion. Finally, this issue shows the viewer's desire and tendency to a certain side of the visual field, which is related to a person's cognitive mechanism (Churches, Loetscher, Thomas & Nicholls, 2017). Visual gravity difference, attention, and mental tendency to a certain area of a visual scene can indicate the starting point of image reading. Different gravities in a visual field can create a specific flow direction in the mental and visual reading of an image.

In an article related to the treatment of severe hemispheric neglect, Duecker et al. implicitly mention this issue that there is a mental tendency to

one side of the visual field even in healthy people with a less severe degree. He attributes this issue to the competition of hemispheres (Duecker, Graaf, & Sack, 2014, 17). Visual orientation appears to be related to hemispheric dominance. Vision first pays attention to the direction in which the opposite hemisphere of the brain is dominant, then the attention is directed to the other side, this situation will follow the objective direction and mental navigation. It can be expected that the obvious effects of brain hemispheres dominance in right-handed and left-handed people will be more visible and will be an effective indicator of visual tendencies, which can be the subject of independent research in this field due to its importance and extent.

The reason for spatial bias to left can be due to the responsible of the left hemisphere for identifying objects and the right hemisphere is responsible for determining spatial locations. In the perception of space, the spatial positioning system, the right hemisphere, has the most activity, so the tendency to the left occurs (Crosson, Crucian, & Heilman, 2000). The left-to-right bias of visual perception makes the slanted line drawn from the lower left corner to the upper right corner associated with an upward movement and a good outcome. The reverse of this case is also related to the lines drawn from the upper left corner to the lower right corner, which is reminiscent of a downward movement (Meyer, 2020, 19). When paying attention to space, there are always one-sided tendencies in brain activities, this asymmetry in mental activities will create a non-equivalent space of vision and attention (Arrington, Carr, Mayer & Rao, 2000, 106), (Mao, Zhou, Zhou & Han, 2007) and (Thomas & Elias, 2011). Deviation to the left side from the middle in the eye scan for displays can also be seen, and this spatial and perceptual asymmetry is not considered hemispatial neglect caused by a neural structure defect, but rather a suspicion of natural hemispatial neglect (Dickinson & Intraub, 2009). This issue has been taken into consideration in previous studies such as Heinrich Wölfflin's studies on the way that

visual reading is done from left to right. Mercedes Gaffron continues these studies and believes that engravings on Rembrandt's stereotype inverted handprints were the appropriate situation and desired by the artist. This is the reason why popular movie characters are shown on the left side of the screen. Gaffron considers this phenomenon to be the difference between the superiority of the brain hemispheres, as a result of which elements on the right side of the image become clear and prominent and there is more sensitivity than the elements on the left side. The right side has more weight due to its prominence and the left side is attention focus. These two visual perceptions of left and right cause a kind of balance in these two directions. Also, based on Van der Meer's studies, the left-to-right movements of the human head compared to right-to-left with it happens more quickly. He suggests that academic training has influenced these assumptions and attitudes (Arnheim, 1965, 33-34). According to this theory, the reading of images from left to right goes back to the way of writing in Latin, and as a result, the reading of the visual field from left to right has been institutionalized. If this is the case, it is expected that the direction of visual reading in right-writer societies such as Iran must be right to left. In this regard, Rinaldi et al. in the aforementioned article, the effect of language type on the spatial bias to the left or right has been confirmed, at the same time, there is a deviation from the center and a bias in the sense of touch. In addition, in the same article, the asymmetry of the brain hemispheres is also mentioned, which is the root concept. The structural brain is a deviation from the center (Rinaldi, Di Luca, Henik, & Girelli, 2014). On the other hand, some researchers believe that written language instruction has little effect on the visual reading of eyes, although the saccade movements and frequency of eye pauses are different in right-writer and left-writer languages (Liversedge & Findlay, 2000, 11). Of course, it should be kept in mind that reading type in language and writing is fundamentally different from the visual reading of

images. Reading text from the left or right requires forced attention and a guided saccadic path, while in the visual reading of images, attention and saccadic movements and eye pauses take place freely and there is no compulsion in the direction or length of reading.

**• Preference for horizontal and vertical extensions**

Each preferred extension represents a specific type of cognitive mechanism in people’s brains. There is evidence that the choice of horizontal extension shows the mind’s sensitivity to symmetry in the vertical axis, and vice versa, the preference for vertical extension shows the mind’s sensitivity to symmetry in the horizon axis (Churches et al., 2017). In other studies, the topic of preference and perception of vertical and horizontal lines has been attributed to the direction of gravity and the axis of the body, but mental alignment and retina have priority in mental processes compared to gravitational alignment (Lipshits & McIntyre, 1999, 1089). On the other hand, eye saccade movements in scanning images have a systematic order, and in an eye search, the number of horizontal saccades is more than vertical saccades. In a test using three panels from a to c arranged from the most regular to the most irregular, the eye saccades in the horizontal angle are more than vertical movements in all three cases. Although in irregular conditions, the angle of horizontal saccades becomes narrower, it still

follows a dominant and specific mechanism. The results of this test are shown in Fig. 1 (Gilchrist & Harvey, 2006, 711).

According to the theories of Lipshits et al. (1999), the optimal extension based on the retinal level and mental level is a horizontal extension (Lipshits & McIntyre, 1999). Therefore, the eye moves more easily in the horizontal direction and it is easier to understand the lying forms, but it has less innovation. Standing forms are a trend indicator for the viewer (Grutter, 2018, 227). whatever has been discussed so far not only shows the desired extension and direction in visual perception but can also justify the attractiveness of proportions such as the golden ratio. The ratio of the length to the width of the golden ratio (phi number) provides the best dimensions and fit on the surface for the highest speed of eye scanning and brain processing. The minimum time required to scan a rectangle with LxH dimensions is that the ratio of dimensions of two edges is equal to the ratio of eye speed movement in the horizontal to the vertical edge. This ratio is close to the number shown in Fig. 2. The horizontal orientation of the eye axis (not vertical, not oblique) is the easiest mode for the flow of visual information from the horizontal environment to the brain (Bejan, 2009, 97). The golden ratio is compatible with the vision system and its processing speed in both vertical and horizontal directions only if desired visual element spread along the horizon. According

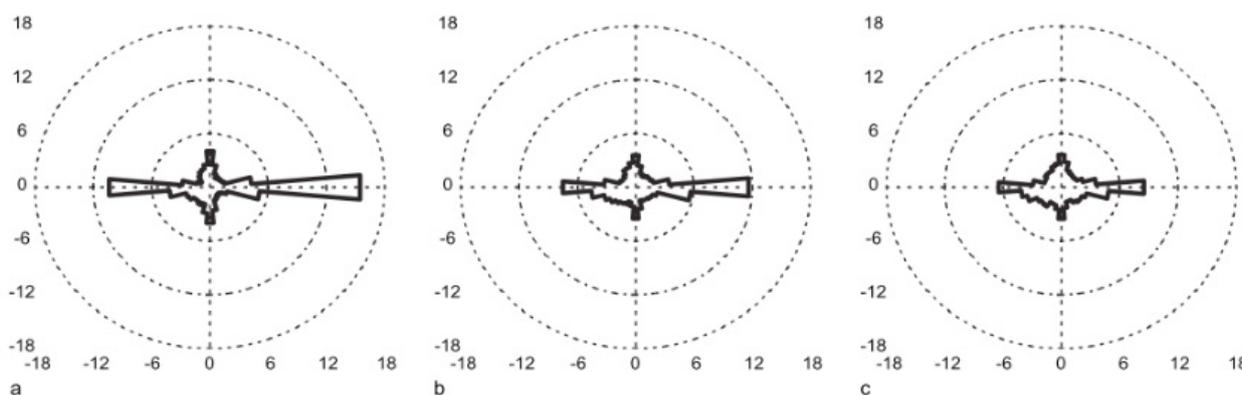


Fig. 1. The graph of the angle frequency of horizontal eye saccades versus vertical saccades in visual test, diagrams c, b, a are arranged from most regular image to most irregular one. Source: Gilchrist & Harvey, 2006, 710.

to this study, if an element with a golden ratio is placed vertically, it will not match the scanning and vision processing mechanism, even though it has the exact golden ratio. In the visual test of this research, which is given in the next sections, the findings are in significant correspondence with this theory.

### Research Methodology

This research has a theoretical part developed based on content analysis of literature research and it is a descriptive-analytical type. In the other part, aligned with the theoretical background, there is an experimental visual test along with the interpretation of statistics and related data. The second part includes experimental research. The experimental part falls in the category of the visual test and has been done with causal-comparative studies. The research is considered to be applied research in terms of classification in goals.

The questionnaire is organized in visual questions form and the visual tendencies of the audience and considered on the judgment test. The visual preferences of participants are measured in the field of extension and desired direction, and the

results were compared and matched with the theories. The data were analyzed using SPSS software and statistical methods. The sample size is equal to 97 participants and it was done randomly with the available sampling method.

### Discussion

This research shows us whether writing direction and reading language affected the way of visual reading or not. At the same time, the dominant extension and direction of visual reading will be implicitly tested. This experience is not an interactive experiment but a judgment test by being considered an observer. If a reading direction is the same in right-writer and left-writer societies, then this is a general issue related to human brain processing structure. This kind of visual test, such as Churches et al. (2017) test, asked the audience to divide a horizontal line in half. If the right hemisphere is dominant, due to bias to left and neglecting the right, the marking location will be inclined to the left and vice versa. This article, among the tests, tried to use tests more related to architecture while analyzing the mental structure. Therefore, a test for optimal

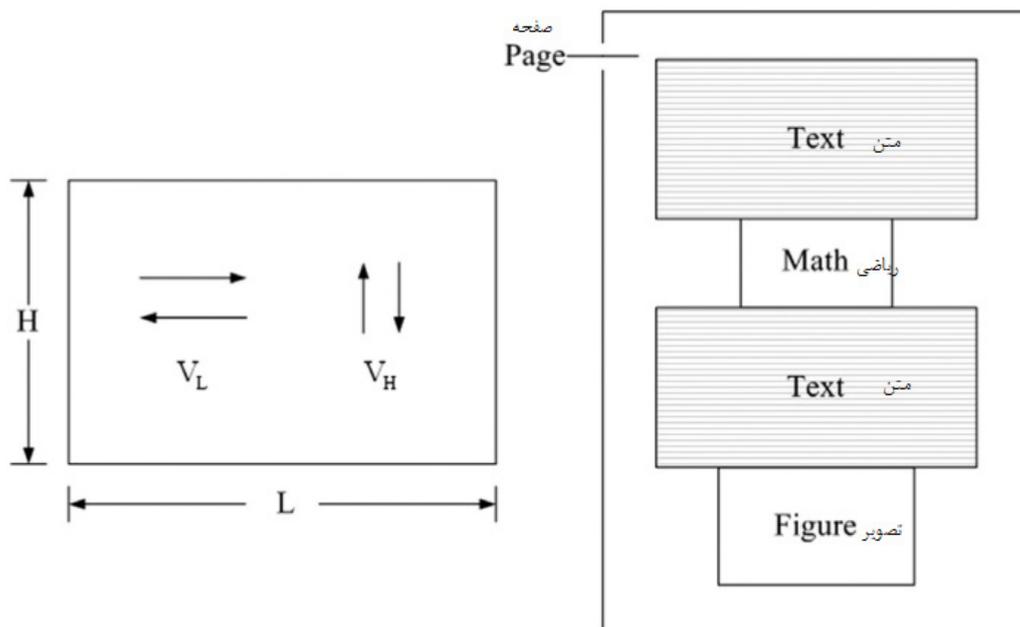


Fig. 2. Proportion of rectangle dimensions in accordance with the horizontal to vertical scanning speed of the source's eye. Source: Bejan, 2009, 98.

extension and detecting dominant direction have been considered. As mentioned, the nature of these tests such more compatible interest in architectural topics, such as inclined surfaces and the golden ratio. The first test asked the audience about the optimal position of two golden rectangles of the same size. One of these rectangles is spread along the horizon and the other is spread vertically. The second question is about inducing a sense of uphill in two inclined surfaces of the same size. The placement of the golden rectangle shows the desired length and inclined surfaces indicate the visual reading direction along the dominant length.

In the first test, two rectangles of the same size in accordance with the golden ratio were presented to the audience in both horizontal and vertical positions and they were asked to choose a rectangle that according to them has better dimensional proportions. While the two rectangles did not have any difference in terms of size and proportion, the horizontal rectangle was chosen as a more appropriate rectangle. About 83.5% of the participants preferred the horizontal extension and 16.5% preferred the vertical extension. The results are shown in [Table 1](#).

Processing the horizontal extension is easier and more favorable for the visual device than vertical alignment. The point is both rectangles are the same size and the golden ratio is used in both, but the only difference is the extension of these rectangles, there is a 67% difference between the audience’s visual preferences. This significant aesthetic difference occurs between two forms that are the same size. This issue alone shows the sensitivity of the vision system and mental

processing of humans to the extension of volume placement and forms. The golden ratio is obtained from the horizontal length to vertical length ratio, only if it matches the mental and visual system, while if the same form is placed vertically, by dividing the horizontal length (shorter dimension) by the vertical side, the golden ratio will be obtained 0.618, which is not proportional to the visual processing structure. The two mentioned rectangles are shown with the preferred percentage in [Fig. 3](#), so the length of being placed in a golden ratio is important and just having a proportion is not enough. In this test, just desired extension between the vertical and horizontal lines has been measured, and the reading direction is not determined, but the desired and dominant direction in the vision system, which is spread along the horizon, is determined with a significant percentage.

To determine the reading direction along the horizontal, two cross-sections of a hypothetical path in two relative directions have been used, as shown in [Fig. 4](#). The sense of uphill or downhill in these two sections will indicate the direction of the viewer’s mental image reading. While both of these cross-sections’ hypothetical routes can be considered both uphill and downhill, one of these profiles induces a more uphill feeling. The reason is as mentioned in background studies. The direction of visual reading is in the viewer’s mind. Image processing from left to right causes the movement of the visual system to extend from the lower left point to the upper right point.

As shown in [Fig. 5](#), in the left-to-right scan, point number one is identified as the first and lowest point, in the continuation of the left-to-right flow,

Table 1. Visual preference between vertical and horizontal extension Source: Authors.

	Counting	Percentage
Horizontal axis	81	83.5%
Vertical axis	16	16.5%
Total	97	100%

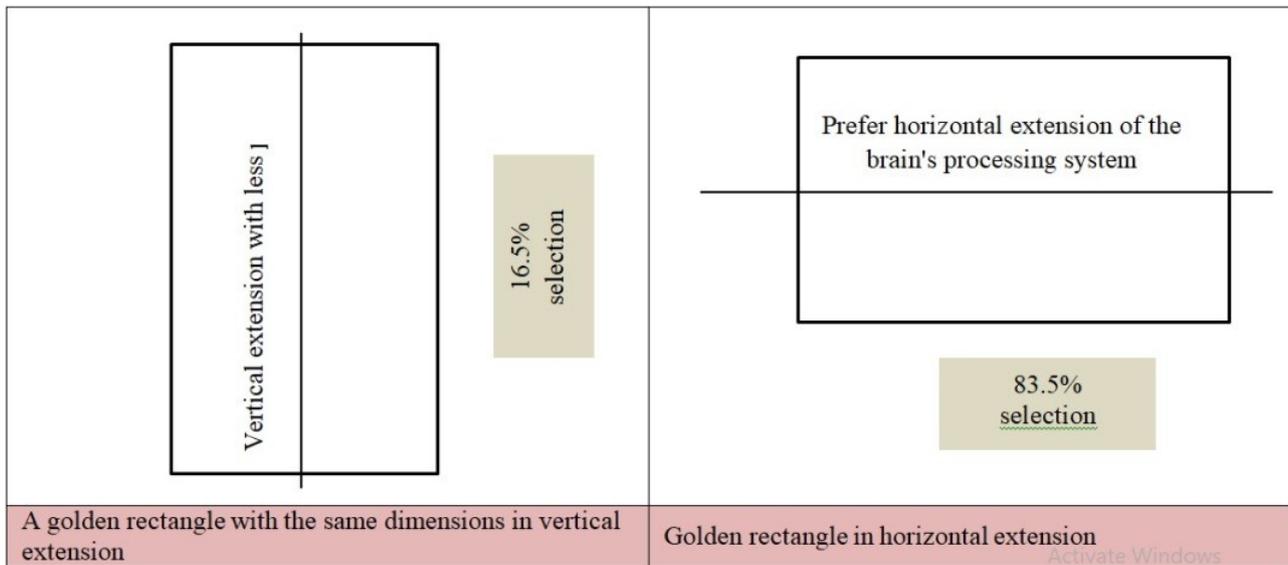


Fig. 3. Desirable and dominant visual extension in mental-visual system processing. Source: Authors.

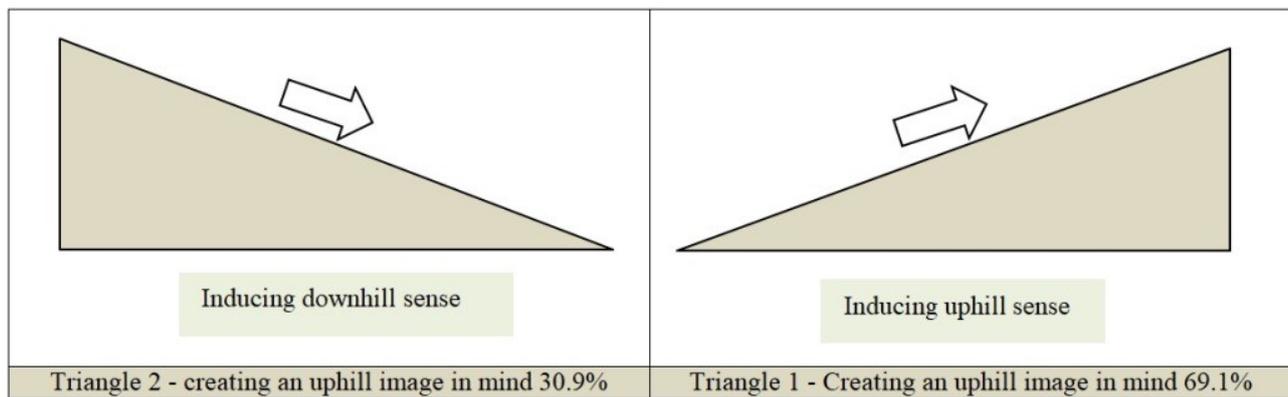


Fig. 4. For visual reading in cross-sections. Source: Authors.

Table 2. Uphill induction rate in two triangular profiles. Source: Authors.

	Counting	Percentage
Uphill induction Triangle 1	67	69.1%
Uphill induction Triangle 2	30	30.9%
Total	97	100%

other slope points are processed and analyzed, and point number two is the last point at the peak of perception. The set of this type of vision mechanism, which has a dominant direction in processing, creates the feeling of uphill in this particular image. This direction of movement identifies one of the triangular sections as an uphill path and the other as a downhill path. The

difference between uphill perception is 69.1% versus 30.9%, which is shown in Table 2. This issue shows that majority of the audience has a left-to-right processing direction, at the same time, a minority of nearly 31% have chosen the second triangle as a section of an uphill path. Therefore, left-to-right reading is not considered a definitive and comprehensive principle, but left-

to-right reading is a dominant fact that exists in mental structure processing. On the other hand, this test was conducted in a society where all candidates are right-writers, they write and read from right to left. This theory proposed in western and left-writer societies is also true in a right-writer society and the different writing education of societies is not considered a determining factor, so this issue is rooted in the general structure of the human brain. Right-writers and left-writers can be different and influenced by the direction of writing, but eventually, the reading direction from left to right will be the dominant side in visual reading.

These findings can have many applications in architectural design, for example, we now know that the golden ratio alone is not enough, but a placed way of that is also very important, because based on studies of the eye and brain scanning speed in both vertical and horizontal directions. It is not the same, and this ratio in both horizontal and vertical directions is about 3 to 2, which is a figure almost close to the golden number (1.618). Therefore, matching this ratio of processing speed in both vertical and horizontal directions with a form in golden ratio requires that the form in horizontal extension should be

expanded. Therefore, if the golden ratio is used in architectural design, the elements should lie on the length with the golden ratio, or the general expansion of design should be done along the horizon.

This fact can be used along windows to frame the visible view of residents. An inside-out landscape viewer wants the horizontal angle of the viewed landscape to be as open and unobstructed along the horizon as possible. This means horizontal windows with a maximum viewing angle, the most ideal of which is a panoramic view. On the other hand, it can be assumed that windows with small widths and high heights will not be desirable for the viewer due to limiting the view in the horizontal range.

On the other hand, reading from left to right showed that the value of the left and right parts in a visual field is not the same, maybe the elements that are placed in a certain part of the image are more important. In designing a ramp to a specific building or point, it is better to have a starting point on the right side and a final peak point on the left side. This direction for the ramp induces a sense of downhill and ease of movement in many audiences, although, in reality, they have to go uphill.

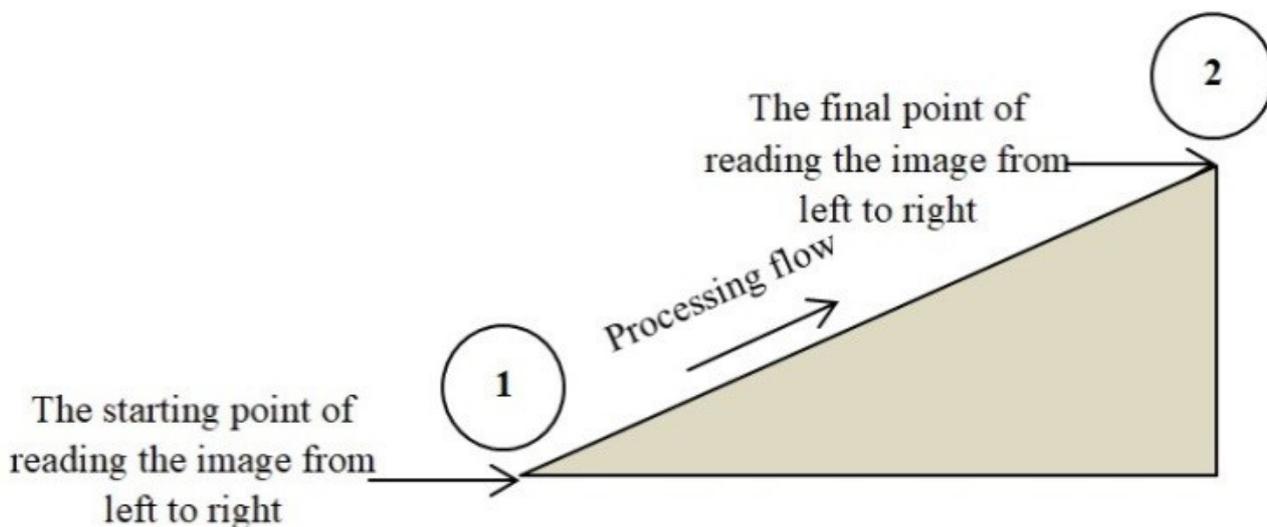


Fig. 5. Inducing a sense of uphill reading from left to right. Source: Authors.

## Conclusion

Based on the results, it seems that in Iranian society, where all are right-writers, the visual reading of images from left to right has a significant majority. Although there is a possibility that the right-writer or left-writer in different cultures has influenced the visual reading of images, in any case, the main and dominant visual reading is from left to right. The degree of difference in the type of reading in right-writers and left-writers or top-to-bottom dictionaries can be obtained by studying and comparing their visual reading methods. This comparison can show the impact of writing direction in Latin and non-Latin languages in visual reading.

Visual perception is not the same in different visual field areas. The valuation of different areas such as top and bottom or left and right depends on the vision system mechanism and mental processing. Therefore, different areas in architectural space do not have the same visual density. Therefore, the valuations of each side are different from the other. This issue also applies to horizontal and vertical extensions. The horizontal extension is more favorable than the vertical extension for processing in the mind, just as nature and the world around us are also extended on the ground along the horizon. In addition to the extension, direction dominant flow of vision is also important. The dominant direction in scanning a visual scene is from left to right. This processing is done at such a speed that the viewer is unable to recognize it and can only be evaluated and proven through visual tests.

On the other hand, some western theorists believe that the writing and reading way in the Latin language has caused this kind of reading from left to right. According to this theory, right-to-left writing societies should have right-to-left visual reading. While, according to the visual tests in the present research, it can be said that image visual reading in a right-writer society mainly takes place from left to right, although in the written

language they write and read from right to left. This issue shows that the extension and dominant visual direction is not an educational phenomenon, but a mental phenomenon and is dependent on the structure of the brain, which operates independently of cultures and language teachings. It is possible that the dominant direction amount of reading images is different in right-writer and left-writer communities. Long-term training in right-to-left or left-to-right reading and writing probably produces little effect on the frequencies of the dominant direction. But what seems to be the predominance of reading images from left to right along the horizon in the visual and mental processing system in both societies.

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