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Kyiv National University of Technologies and DesignDOI:10.30857/2617-
0272.2021.3.1.**SYMMETRY IN THE VISUAL COMMUNICATION DESIGN:
METHODS OF DYNAMIC IMAGE CONSTRUCTION**

The purpose of the study is to reveal methods of image creation in dynamic visual communications based on symmetry.

Methodology. Research methodology is interdisciplinary. It is based on systems and synergistical approaches. They consider dynamic visual communications as an integral field of interaction between human and environment. We systematized design methods of the image creation of a visual message by using the system and functional, structural and dynamic, composition, artistic and image design-analyses according to the principles of symmetry.

Results. We represent symmetry as a method of dynamic visual communications form and image creation. Symmetrical relations are formed at the object structure level (mirror symmetry and central symmetry), the process level (translational symmetry, multilevel central symmetry and radial symmetry) and environment level (scale invariance and recursion). Integrative basis strengthening allows forming the structure of the image content providing fusion with an environment. Rethinking of the design methods on the based on the principles of symmetry increases the efficiency of perception and visual communications dynamic in the context of changeable external conditions.

Scientific novelty. In the research we rethought the role of symmetry in dynamic visual communications design based on the systems approach for the first time. It is well-proven that the symmetric transformations support increasing of aesthetic, functional and communicative qualities of dynamic visual information.

Practical significance. Research materials can serve as basis for harmonization and optimization of the form and content of different visual communications types. Their image structurization according to the principles of symmetry provides new development strategies of the integrated visual communications. It is important to increase perception efficiency in the conditions of continuously growing information volumes. Researched design methods of visual communications symmetric structures can be used by specialists in order to arrange the modern space. We also use them as the basis for designers' system thinking forming as an educational technology.

Keywords: symmetry; dynamic visual communications; image; symmetrical relations; scale invariance; systems approach.

Introduction. Symmetry (from Greek is proportion, identicalness of parts location) surrounds a person. It provides a balance and acts as a symbol of beauty and order. Symmetry is considered as a general feature, a property of all material objects to self-become on certain grounds after some transformations (turn, translation, etc.) [18]. People have realized its universality since ancient times [18; 21], therefore an aesthetic and communicative role of symmetry is invaluable.

Designers use the possibility of symmetry to put in order variable points and links of modern life and to bring stability and balance in visual communications design. In

spite of visual aesthetics of symmetrical relations, people often associate it with static and immobility that makes the design objects monotonous and boring. Accordingly, there is a necessity to rethink a symmetry role as the means of composition in dynamic visual communications design. Besides the modern state of design theory and practice requires the deep working on concepts and models. We can create the integrated visual communications of different levels using them. It also determines the actuality of the problem.

Today we use symmetry to increase the dynamic of communication and to produce the creative image that is confirmed by

practice. On one hand, formation of the design theoretical basis requires the search of new methods of dynamic visual images construction in order to increase of their perception level and to attract the consumers' attention. On the other hand, research of the dynamic visual systems that are based on principles of symmetry is a difficult process. It is based on the interdisciplinary links and the system approach. It involves the new criteria formation of the integrated objects and accordingly requires the transformation of communicative connections. Thus, there is a necessity of research of design methods of dynamic visual communications with symmetry using. It will allow to harmonize the visual and communicative space saturated with different information and to raise the level of information perception.

Analysis of previous researches. In all times symmetry attracts researchers' attention; therefore there are lots of scientific works that reveal different aspects of this concept. From the design and art standpoint, symmetry is the means of composition and it is used for organization and harmonization of the artistic system [30; 31]. Researchers I. Kuznetsova and M. Yakovliev interpret the geometrical principles of symmetry as universal principles of design objects and artistic works forming [25; 32]. From the point of art history view, O. Bodnar emphasizes the pressing question of dynamic symmetry as the natural patterns formation [19]. He says that the dynamic symmetry is a property of some phyllotaxis forms to change (to increase) the order of the symmetry in the growth process. Transfer of these features into the design practice allows interesting design developments getting.

Researches of symmetry are closely related to the study of mathematical bases of fractals and fractal geometry. It expands understanding of the symmetry principles through their manifestations on the different levels of the material world organization [16; 27]. Interdisciplinary approaches explain the design researchers' interest to the use of

recursion possibilities that is closely related to the fractal geometry concepts [22]. At the same time we observe only the descriptive nature of linear compositions with the symmetry elements creation in advertising communications researches. It already requires the rethinking from the standpoint of constantly changing environment [14; 23; 24].

The base of symmetry as design tool is the invariability (invariance) of the object structure relatively to its different transformations. Scientists analyze it from the philosophy view [18; 21; 26; 28]. Universal character of symmetry [26] and wide methodological possibilities [28] are the means of culture synthesis. They are based on the structural objects features. An analysis of the different approaches to the study of symmetry is important. It depends on the idea of symmetry stands together with the conceptual apparatus of synergistic and system approaches through the concept of structure and interaction. It forms wide opportunities for interdisciplinary researches of any difficult objects [20]. However, there is no complex design research of methods of image of dynamic visual communication construction after principles of symmetry today. It proves the relevance of the theme. The necessity of such a theoretical research is determined by its contribution to development of design theory and problems of the integral design dynamic visual communications.

Statement of the problem. The purpose of the work is to reveal and analyze the symmetric relations on the different levels of visual communications organization that lead to increase of their dynamic.

Methodology is based on interdisciplinary researches using and includes synergistical and system approaches. We choose the samples of different visual communications types for the research. They include the visualization of information messages, processes of public life and navigate systems [1–13; 15–17; 29]. The system and functional, structural and dynamic,

composition, artistic and image design-analyses help us to identify the features of creating objects form and image.

Results of the research. We use the motion operations of parts of volumetric spatial composition for symmetrical image creation. These operations provide realization of basic transformations that is reflection; turn (rotation) and parallel transference (translation) [30]. Harmonious dynamic composition of visual information is created by means of symmetric transformations operations.

Typologically the dynamic visual communications system comprises three types of visualization – material information objects, processes of public life and navigation systems. They differ in the form of information visualization and the level of communication organizations that determine their structure. Accordingly, we need to consider the concept of symmetry in the visual communications design through the concept of structure. In this case an image and properties of the design system depend on the properties of the elements and structure of internal and external connections that allows rethinking an idea of symmetry.

Traditionally people got used to perceive visual reports as volumetric spatial objects with printed images. The repetitive object fragments form the patterns that help to reproduce essence and image by the geometrical rules of symmetry. We perceive symmetric patterns as parts of integral form. Therefore, we consider structural symmetric constructions as the external manifestation of symmetry. It is geometrical symmetry that we see directly and can visually assess at the level of design objects structure (e.g. printing bilateral images, inscriptions on mirror surfaces, etc.). Geometrical principles of symmetry apply to transformations of mirror reflections, rotation and parallel transfers in space [21].

A reflection becomes the common method of symmetric image construction. A

reflection is the most widespread type of symmetry in nature. We perceive a mirror as means of visual control. It helps to observe both a process and a result. This statement is popular in urban mirror installations in which many people take part.

The image created by means of mirror symmetry acquires dynamism of visual information. There are two types of reflection – complete and partial. We involve a person as part of volumetric spatial structure to create the construction of a dynamic image by complete reflection (Fig. 1, a–b). Designers use sunbeams so you can read the symmetrical image as well.

Parts of such an image are fully identical and form a universal integral image that visualizes an interconnection between different objects. However, the actual method to increase the system dynamic is partial violation of symmetry (dissymmetry/asymmetry). It means that an object structure dynamically adapts to the environment structure [20]. Dissymmetry is a partial absence of symmetry, disorder of symmetry that is expressed in a presence of some symmetric properties and absence of other ones [26]. It is the principle of symmetry dynamic. It shows a transition moment from the calmness state to motion. Human involvement in communication by such a method gives an opportunity to add a present part of image to the mirror reflection of the viewer (Fig. 1, c). In this case, the method of analogies is based on the principle of symmetry, which means the search of general properties in different objects.

A partial reflection is an effective creation method of the optimized image in which the part of image complements an own reflection (Fig. 1, d). Combination of the image with a mirror surface provides dynamic formation of the integral visual balanced image with identical parts.

The use of central symmetry got distribution in creation of dynamic visual message in printing. Cutting technology with preservation of the cut part appears to create

the image in a social advertisement (Fig. 1, e). The direction of symmetric image creation is clearly formed by involving a person to the design system in an outdoor advertisement. Everyone can complete an image. Every time they restore an image using some set of symmetric transformations (Fig. 1, f).

Another method of image creation is the use of translational symmetry (symmetry of transfer). However, we use not only structural object transformations but also analysis of process structure to create it. Symmetrical relations at the level of process structures are related to the physical phenomena and environmental laws. Such an interpretation allows expanding of the symmetry concept to the level of process properties reflection. Translational symmetry arises up when identical elements are repeated through certain intervals and direction of their location coincides. Storyboards are a clear example of such symmetry. Their visual content is formed by location of their parts on separate billboards. Designers set a rhythm and speed of the viewer for effective perception. It makes an image dynamic and allows watching it as the movies (Fig. 2, a). It is necessity to notice that asymmetry of image is one of the manifestations of orderliness of content and form. Such objects are asymmetric according to their geometrical essence but their component parts are symmetric. In spite of different printed images, the structural elements of billboards are symmetric and together they form the long visual image created from parts. Asymmetry appears exactly in an image. It attracts the viewer's attention and forms more difficult relations between the space elements. We have the analogical method of image construction in printing where geometrical symmetry of paper sheet bends makes it possible to imitate a process of objects cutting on equal parts (Fig. 2, b).

Symmetrical relations are always an operation or procedure [18]. Thus properties of symmetry are conditioned by both functional and aesthetic factors. Unity of

symmetry and asymmetry at the process structures level creates an integral visual image that has features of paradox causing a surprise and attracting the viewers' attention. For example, symmetrical connections are the method of semantic and composition organization of dynamic advertisement form on a transport or in elevators (Fig. 2, d). The symmetric constructions of functional elements interact with a symmetric/asymmetric image. They represent opening/closing/rotation processes that create dynamic image of visual communication, which is complex in semantics and form. We can consider such design objects as multilevel symmetries. If we want to create an image as a difficult multilevel symmetric system, we synthesize a few symmetrical subsystems and then unite them into an integral image. First, symmetry is formed at the image structure level. Then process aspect forms integral image (Fig. 2, f). Thus the symmetric image is not the still system but endless process of new form recovery.

Symmetry characterizes correlation of form, process and result in magazine products design. The use of central bilateral symmetry of magazine cover allows forming a dynamic image, in which we can constantly change a person as a participant of the visual message (Fig. 2, e). There is a high complexity of elements correlation but it creates wide opportunities for creativity involving consumers in communication. Series of opening/closing actions represent the image content fixed visually that is cutting in half, removing/adding of parts, doubling, and destruction. The form of object becomes multi-layered. Symmetric structures are spatially and temporally variable because they represent interactions of different levels of symmetry construction in the image. These transformations expand interpretation of symmetry concept in design by using the processes of objects and processes integration.

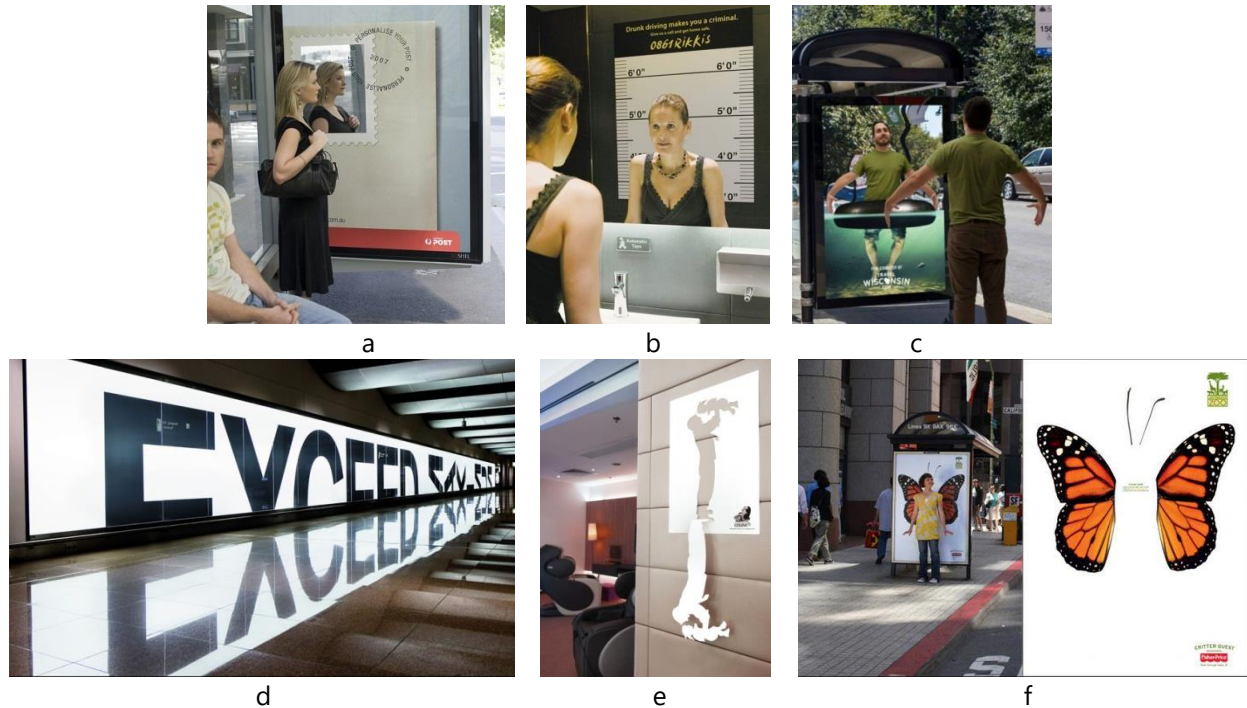


Fig. 1. Geometric principles of symmetry in the dynamic visual communications design:
 a – Australia Post: Personalize Your Post, Melbourne, Australia, 2007 [4];
 b – Drunk driving makes you a criminal, Cape Town, South Africa, 2016 [12];
 c – Sticker with tourism touch, Wisconsin, USA, 2016 [5];
 d – The BMW Light Wall Hamburg, Germany, 2011 [11];
 e – Brings Your Strength Back, Hong Kong, 2012 [10];
 f – San Francisco Zoo, USA, 2008 [13]

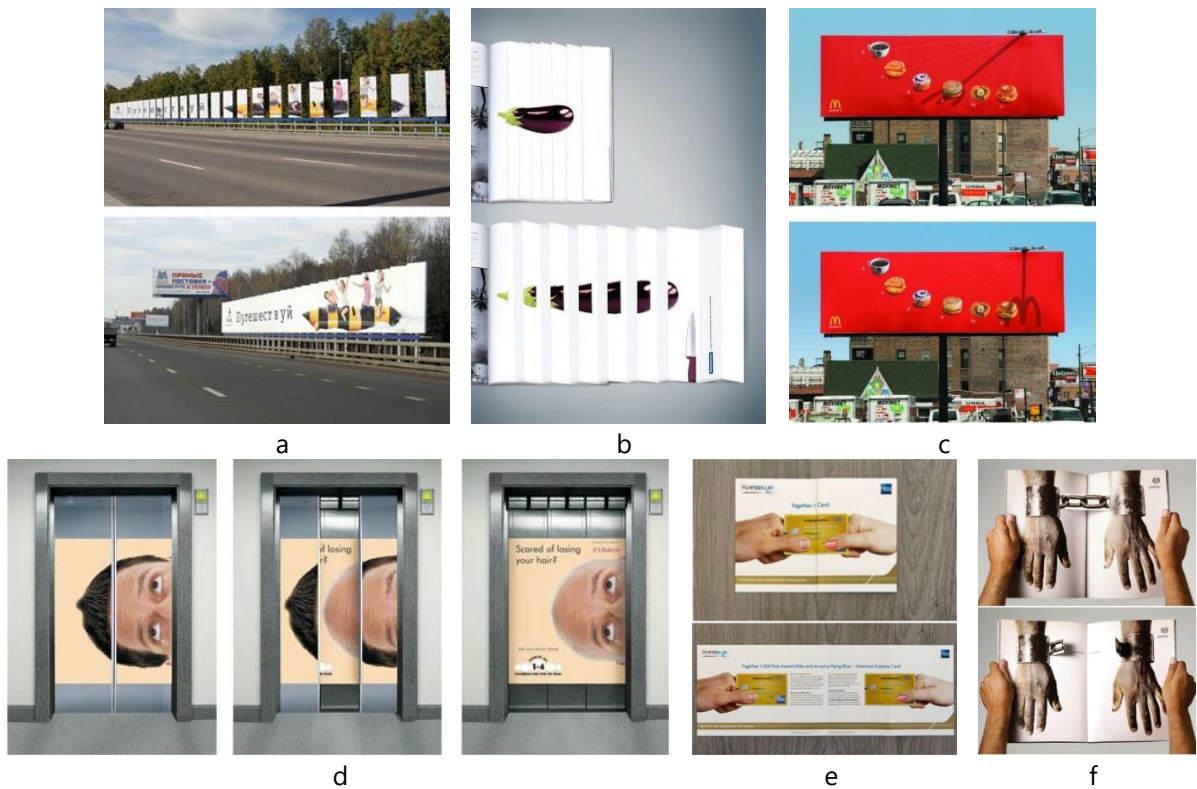


Fig. 2. Symmetry as representation of processes structures in the dynamic visual communications design:
 a – a multicomponent Beeline, Russia, 2021 [29];
 b – Cutting edge – Eggplant, Riyadh, Saudi Arabia, 2015 [8];
 c – Mcdonald’s Sun Clock, 2010 [17];
 d – Folliderm Hair Loss Remedy: Bald Man, 2009 [1];
 e – Doubles Up After You Tug on the Pages, Netherlands, 2013 [6];
 f – This is not easy, 2019 [2]

Radial symmetry is the method of symmetric composition creation that is based on the constant updating of image content. It appears when objects are situated round a general center. In this case, objects and environment phenomena, including sunbeams, become the parts of design image. Moreover, the elements located round a center can be different (Fig. 2, c). Symmetry reveals the image content through dynamics that provides visual communication with a consumer. We use an integrative property of symmetry forms as structuring basis in dynamic visual communications design.

Design objects perception as component parts of environment allows combining the environment state with the existence processes of material form. Combination as a method of image creation is the basis for passing to the new system level of world development by means of symmetry. However, the concept of symmetry closely combines with the concept of natural patterns. It

characterizes preservation and constancy of natural properties in a material object.

Symmetric relations at the environment level we can describe as scale invariance (symmetry). It is symmetry between the physical objects structures but not between their geometrical sizes. Scale similarity appears as fractal symmetry and symmetry of similarity [27]. We observe this symmetry between the system and its element, self-repetition at another scale level in the design of visual messages that becomes integral part of environment (a transport advertisement, billboards as environment part (Fig. 3, a-c)). The method of such images construction is cropping. The fragment of natural environment global structure gets in a frame. A designer focuses on part that is fractally symmetric in relation to the whole. In this case, we talk about the recursive system [22]. Fractal design acts as a method of such system visualizations.

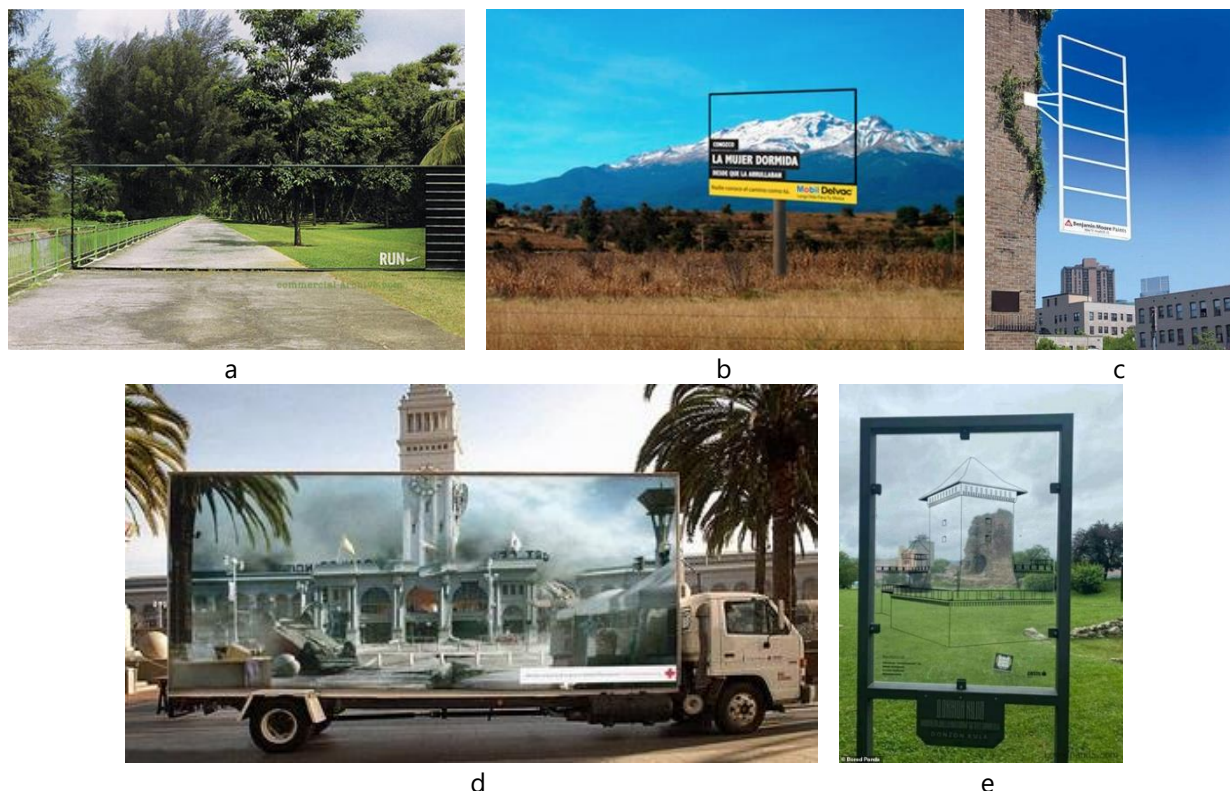


Fig. 3. Scale symmetry in the dynamic visual communications design: a – Nike-Run, 2010 [17]; b – Mobil, 2015 [7]; c – Benjamin Moore’s Color Picker, 2020 [9]; d – Red Cross, 2016 [3]; e – Krushevats’s Castle, Serbia, 2021 [15]

The construction of transport symmetric recursive images has another look. We can fix the certain state of environment as if a frozen fragment of reality and finish image creation on the new stage of environment development (Fig. 3, d). A recursive image is the starting point for a new cycle of fractal structure self-reproduction. Therefore, scale symmetry helps to visualize a recursive procedure of dynamic visual communication formation. The cropping method acquires a scientific and practical direction in the creation of process of architectonically-landscape objects graphic visual reconstruction (Fig. 3, e).

The material objects, based on the scale symmetry, copy the natural patterns structure. The cropping method becomes a transition to the higher level of integration and differentiation simultaneously. Differentiation is outlined by the selection of new structure in environmental composition. This environment is the dynamic description of any process. It provides the design of image, change of properties and functions. Integration appears when we involve the design system as material object in the processes of Universe development. It composes integrity and merging with a natural environment and human.

Conclusions. Symmetry as creation method of form and image becomes widespread in the dynamic visual communications design. It is well-proven that we can create the harmonious image in the dynamic visual communications design by means of symmetric transformations. Symmetrical relations expand the image

content. It confirms the necessity and importance for design categories of symmetry/asymmetry. We comprehend the symmetry concept through the analysis of structure concept. There are three types of symmetrical relations in the visual communications design that actualize at the level of objects structure, processes and environment. Essence and image of design dynamic objects are formed on the basis of geometrical symmetry. Complete and partial reflection and central symmetry methods are their construction methods that involve other objects and people to communication.

Symmetrical relations at the level of structures and processes properties emphasize on the functional side of the design systems. Image visualization takes place on the basis of translational symmetry, multilevel central and radial symmetry. Each level of symmetrical relations forms a structure of the previous one due to the accumulation of the most appropriate properties for the organization of forms and content of processes and constructions logic. Symmetrical relations at the environment level are formed on the basis of scale invariance and recursion in the dynamic visual communications design. Combination and cropping become the methods of image creation. They copy the structure of natural patterns and provide merger with an environment. Thus, image structuring provides forming of new strategies of the integrated visual communications development according to the principles of symmetry. It will increase of perception efficiency.

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СИМЕТРИЯ В ДИЗАЙНІ ВІЗУАЛЬНИХ КОМУНІКАЦІЙ: СПОСОБИ ПОБУДОВИ ДИНАМІЧНОГО ХУДОЖНЬОГО ОБРАЗУ

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Метою дослідження є виявлення способів побудови художнього образу у дизайні динамічних візуальних комунікацій на основі використання симетрії.

Методологія дослідження носить міждисциплінарний характер. Вона базується на використанні системного та синергетичного підходів, які дозволяють розглянути динамічні візуальні комунікації як цілісне поле взаємодії людини та середовища. На основі системно-функціонального, структурно-динамічного, композиційного та художньо-образного дизайн-аналізів систематизовано способи проектування художнього образу візуальних повідомлень за принципом симетрії.

Результати. У роботі представлено симетрію як спосіб формотворення та образотворення динамічних візуальних комунікацій. Доведено, що симетрійні зв'язки реалізуються на рівні структури об'єктів (дзеркальна та центральна симетрія), процесів (трансляційна, багаторівнева центральна та радіальна симетрія) та середовища (масштабна інваріантність та рекурсія). Посилення інтегративної основи дозволяє формувати структуру образу, забезпечуючи злиття з середовищем. Переосмислення способів проектування на основі принципів симетрії підвищують ефективність сприйняття та динамічності візуальних комунікацій у контексті мінливих зовнішніх умов.

Наукова новизна. У дослідженні вперше переосмислено роль симетрії у проектуванні динамічних візуальних

СИММЕТРИЯ В ДИЗАЙНЕ ВИЗУАЛЬНЫХ КОММУНИКАЦИЙ: СПОСОБЫ ПОСТРОЕНИЯ ДИНАМИЧЕСКОГО ХУДОЖЕСТВЕННОГО ОБРАЗА

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Целью исследования является определение способов построения художественного образа в дизайне динамических визуальных коммуникаций на основе использования симметрии.

Методология исследования носит междисциплинарный характер. Она базируется на использовании системного и синергического подходов, которые позволяют рассмотреть динамические визуальные коммуникации как целостное поле взаимодействия человека и среды. На основе системно-функционального, структурно-динамического, композиционного и художественно-образного анализов дизайна систематизированы способы проектирования художественного образа визуальных сообщений по принципу симметрии.

Результаты. В работе представлена симметрия как способ формообразования и создания образа динамических визуальных коммуникаций. Доказано, что симметричные связи реализуются на уровне структуры объектов (зеркальная и центральная симметрия), процессов (трансляционная, многоуровневая центральная и радиальная симметрия) и среды (масштабная инвариантность и рекурсия). Усиление интегративной основы позволяет сформировать структуру образа, обеспечивая слияние со средой. Переосмысление способов проектирования на основе принципов симметрии повышает эффективность восприятия и динамики визуальных коммуникаций в контексте изменчивых внешних условий.

Научная новизна. В исследовании впервые переосмыслена роль симметрии в проектировании динамических визуальных

комунікацій в контексті системного підходу. Доведено, що операції симетричних перетворень сприяють підвищенню естетичних, функціональних та комунікативних якостей динамічної візуальної інформації.

Практична значущість. Матеріали дослідження можуть служити основою для гармонізації та оптимізації форми та змісту різних видів візуальних комунікацій. Структуризація їх художнього образу за принципами симетрії забезпечує формування нових стратегій розвитку інтегрованих візуальних комунікацій, спрямованих на підвищення ефективності сприйняття в умовах безперервно зростаючих обсягів інформації. Виявлені способи проектування симетричних структур візуальних комунікацій можуть бути використані фахівцями з метою облаштування сучасного простору, а також як основа для формування системного мислення дизайнерів в якості освітньої технології.

Ключові слова: симетрія; динамічні візуальні комунікації; художній образ; симетричні відношення; масштабна інваріантність; системний підхід.

комунікацій в контексте системного підходу. Доказано, что операции симметричных превращений способствуют повышению эстетических, функциональных и коммуникативных качеств динамической визуальной информации.

Практическая значимость. Материалы исследования могут служить основой для гармонизации и оптимизации формы и содержания разных видов визуальных коммуникаций. Структуризация художественного образа за принципами симметрии обеспечивает формирование новых стратегий развития интегрированных визуальных коммуникаций, направленных на повышение эффективности восприятия в условиях непрерывно растущих объемов информации. Обнаруженные способы проектирования симметричных структур визуальных коммуникаций могут быть использованы специалистами с целью обустройства современного пространства, а также как основа для формирования системного мышления дизайнеров в качестве образовательной технологии.

Ключевые слова: симметрия; динамические визуальные коммуникации; художественный образ; симметричные отношения; масштабная инвариантность; системный подход.

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