INTERACTIVE MULTIMEDIA OBJECTS IN PUBLIC INTERIORS: COMPOSITIONAL LOCATION TECHNIQUES

Irina BONDARENKO [a]*, Natalia BRYZHACHENKO [b], Oksana LAHODA [c], Maryna TOKAR [d]

[a] PhD, Prof.; Department of Environmental Design, Kharkiv State Academy of Design and Arts, 8, Mystetstv st., Kharkiv, 61002, Ukraine
ID ORCID 0000-0002-3471-4162
*E-mail address: *bondirra@gmail.com*

[b] PhD, Associate Prof.; the Department of Fine Arts, Musicology and Cultural Studies. Sumy State Pedagogical University named after A.S. Makarenko. 87, Romenska st., Sumy, 40002, Ukraine
ID ORCID 0000-0001-7322-1291

[c] Doctor of art history, Associate Prof., the Department of Fabric and Clothing Design
Kharkiv State Academy of Design and Arts, 8, Mystetstv st., Kharkiv, 61002, Ukraine
ID ORCID ID: 0000-0003-1808-7119

[d] PhD, Associate Prof.; the Department of Fine Arts, Musicology and Cultural Studies. Sumy State Pedagogical University named after A.S. Makarenko. 87, Romenska st., Sumy, 40002, Ukraine
ID ORCID 0000-0001-7322-1291

Abstract

The popularization of multimedia technologies and their active implementation into the process of the object-spatial environment organization is a pressing issue in scientific researches in the field of interior design. It was defined that the application of multimedia technologies, such as sensory touch objects, are fundamental in the process of the creation of an interactive interior for public use. The paper is devoted to revelation of the compositional location techniques of the interactive sensory objects in the interiors of public buildings. The complex of theoretical methods of scientific research has contributed to the analysis of the design of interactive public interiors through the prism of formal composition. The results of the study revealed the compositional techniques for interactive multimedia objects placed in the interior. We conclude that the location of sensory objects in the interior more often carried out by the use of composite grids: a rectangular mesh scheme and a radial scheme. Interactive multimedia objects add an adaptability and attractiveness to the interior, which is an important factor in the formation of public space.

Keywords: Compositional location techniques; Interactivity; Interior design; Multimedia objects; Object-spatial environment; Public interior.

1. INTRODUCTION

One of the areas in the modern innovation is interactive technologies, which is based on the concept of human-object, human-space interaction.

The introduction of interactive multimedia objects in the design of the object-spatial environment of public interiors began during the postmodern period. This style is characterized by pluralism of currents, a focus on theatricality, spectacle, play with forms, as well as the use of information and communication technologies. The late century developed a trend to provide

attraction to the environment. According to the world design experience, one of the ways to implement it is to use of different types of interactive objects in the interior environment, which can involve the viewer in the process of interaction. Their involvement opens the variability in the solutions of being the visitors in the interior and allows them to actively influence its formation.

The use of a variety of interactive multimedia technologies has become one of the ways to embody the aspect of theatricality that characterizes the design of the postmodern. Thanks to the implementation of interactive multimedia objects, the opportunity to create new design solutions for public interiors has appeared as well as the possibility to implement the boldest creative projects. Analysis of existing theoretical explorations has shown that there are currently no works on the systematization of compositional techniques for the introduction of interactive multimedia objects in the design of public interiors. That is why the problem requires thorough research.

2. LITERATURE REVIEW

2.1. Theoretical basis of the research: interactive art, technology and virtual reality

The theoretical basis for the study of the issue of interactive technologies implementation in the object-spatial environment was the work of the Polish scientist R. Kluszczynski [1], who deals with the problems of network art, cyber culture, multimedia art, issues of modern art theory and its critical analysis. According to R. Kluszczynski's classification, interactive art is based on five types of contemporary artistic creation: kinetic art, art of action, installation art, digital media art and conceptual art. The network of connections between them created the foundation for the development of interactive art, giving it a hybrid, interdisciplinary and transmedia character at the same time. The researcher formulated the reasons for the emergence and development of interactive art, its features, substantiated the strategy of its development. R. Kluszczynski noted that the changes in the aesthetic systems of art in the 20th century were caused by the transformations in art that took place from the mid-1950s to the early 1960s. It was during this period that all types of creativity that are included in interactive art began to develop. The scientist identified the characteristic features of a work of interactive art, which was dematerialized, eroded, destabilized, performatized, deformed and transformed [1].

F. Popper was engaged in theoretical research of multimedia art and virtual space [2]. In his writings, the scientist analyzed the development of interactive art from, its origins to modern trends and features of technical equipment to create the effect of complete immersion in an illusory space. F. Popper, considering digital, multimedia and network art, concludes that they are a continuation of the technological art of the late twentieth century. The author emphasizes that their main distinguishing feature is interactivity, the desire to humanize technologies and the combination of the real and the virtual in a multisensory environment. Studying virtual art and examining examples of works by contemporary media artists, F. Popper defines the aesthetic and technological logic of modern digital art, aimed at artistic expression through the implementation of multimedia technologies [2].

Among the studies of media art and issues of virtual reality, it is necessary to note the works of E. Couchot [3]. He indicates that a distinctive feature of media art is hybridization, which is the intersection of heterogeneous technical aspects, as well as semiotic and aesthetic elements. Scientist compares the indicated trend in media art with the biological process of natural or artificial crossing of two varieties, two breeds within one species, or two different species.

Such a comparison with the natural world in the field of research of virtual reality, multimedia and interactive technologies is not unique. In the study of D.S. Baghdadi, which describes the use of interactive applications in the design of the architectural environment of public spaces, the author points out that interactivity is a native state of nature, when all elements interact and influence each other. Such a system of interconnections and interdependencies in the natural environment is due to the need for the survival of all constituent elements, forms and objects. The designated concept of interactive connections has only recently begun to be considered in scientific discourse in terms of the study of computer systems that create interconnected information models that have been isolated until now [4].

According to D.S. Baghdadi, in the architectural space the concept of interactivity is implemented as a complex of interconnected systems and applications for the operation of premises, as well as their spatial organization. These systems allow visitors of public buildings to immerse themselves in space management, providing information exchange, controlling its flows in real time. The indicated spatial reconfigura-

tion is a necessity, which is associated with cultural changes, the transformation of people's lifestyles, and an increasing need for a rich information field. There is now a tendency to give the architectural space of public buildings a dialogue structure. D.S. Baghdadi notes that "interactive systems remove the communication barrier between people and the built environment by interpreting and responding to human actions" [4].

D.S. Baghdadi defines the main types of interactive applications used in the architectural space these are: 1) combination of the ideas of video games and video surveillance; 2) context awareness; 3) spatial separation and control; 4) increase in sense of space; 5) allowing the communication and information flow; 6) spatial reconfiguration; 7) optimization of the environment [4].

The use of interactive applications in architectural space is coordinated to create digital visual spaces aimed at creating an immersive effect. A fundamental study of this issue is the work of the famous theoretician O. Grau. Analyzing media art and the evolution of visual spaces, the author points out that at the moment there is a tendency to transform a computer-generated virtual image into a space that creates the illusion of "autonomous change and the formation of a realistic, all-encompassing visual and sensory sphere" [5].

Speaking about the issue of immersion, O. Grau emphasizes that it is the most important element of understanding the media and is a process of transition from one mental state to another. In this context, the author relies on the inextricable connection between immersion and critical distance in the process of perceiving an object, which depend on the location of the observer – a decrease in the critical distance increases emotional involvement in what is happening. The author emphasizes that immersion in virtual reality almost completely isolates a person from external visual impressions [5]. In virtual reality, the main concept is mimesis, which means the desire for visual reproduction of the real world.

R. Bordin and J. Paiva in their paper considered the indicated aspect of the reproduction of the natural environment by computer multimedia systems in its visual sense [6]. The authors analyze the technical support of virtual reality and their capabilities in the process of creating an interactive space.

Modern scientific works have reflected certain issues related to the study of interactive space. In particular, these are scientific publications that reveal the question of philosophical, social, psychological, historical aspects of technology development and their implementation into the human environment [7].

An important factor in conducting this work is taking into account the impact of interior design on the psychological state and human behavior. In a scientific publication of the Egyptian scientist, H. Mahmoud [8] described the factors influencing the formation of a harmonious environment through human interaction with architectural space. The author reveals design techniques to create the most comfortable conditions for human presence in the interior. In this context, it should be noted that the development of innovative technologies raises the question of the rational use of scientific and technical achievements in interior design in order to improve the quality of human life. Interactive space is an environment that responds to interacts with human activity, using visual, tactile, and auditory channels of perception. Certain aspects of the implementation of interactive technologies in the design of public interiors were considered in publications A. Obeidata, H. Al-Nabawi, O. Ashem, H. El Said [9]. The authors studied the impact of interactive technologies on improving the performance of clothing stores. Analysis of the efficiency of stores showed that the nature of the interior and the process of interaction of visitors with goods significantly affect the efficiency of sales.

In their study, the authors made a number of conclusions that reveal the benefits of using interactive technologies in the design of interiors of retail space: 1) interactive objects are bright elements of advertising in the interiors of clothing stores (they catch eyes of visitors, as they interact with buyers during choosing the goods); 2) interactive stands are used as a way of selecting and checking goods without the need of fitting clothes in the locker room; 3) interactive objects facilitate the process of paying for the product without having to stand in line; 4) the use of interactive objects in the interior design of clothing stores intensifies the positive experience of the buyer, creating a convenient space in which the process of finding, fitting and selecting the goods is transformed into a game [9].

2.2. Research in the field of media technology and innovative materials

A comprehensive study of media was reflected in the scientific works of E. Huhtamo [10], who analyzed visual and tactile media, and in collaboration with J. Parrick published a collection of works on media archeology. Focusing on the practical application of

media technologies, the authors consider the technical possibilities of the relationship between the machine and the user through the interface of a multimedia object, as well as the connection of various media carriers with each other [10]. Here the idea of forming an interactive object-spatial environment is traced, where multimedia objects are connected with each other and interact with a person.

Nidal Al Said and Khaleel M. Al-Said considered this issue in the article, where, based on the analysis of the "user-mobile phone system, the advantages and disadvantages of human-computer interaction using a multimedia interface were studied. The authors distinguish three components of the specified system: user, hardware and software [11]. It should be noted that such a system is applicable not only to mobile smartphones, but to all objects equipped with multimedia screens with interactive user interaction capabilities.

In recent years, the development of digital media devices and portable systems has reached a new technological level, new possibilities of touch interaction between the user and the object have appeared, and mobile augmented reality has become one of the new forms of presentation and perception of information. G. Liestøl, A. Doksrød, Š. Ledas, T. Rasmussen, discussed these issues in their article [12], were the authors outlined the practical experience of using mobile media devices during archaeological research in Borrehallen and for virtual modeling of this space with augmented reality. At the end of the article the researchers conclude that the perception of new technologies differs significantly in different generations: while people of the older generation were interested in the research results, meanings and materials that were presented, young people paid more attention to the technical capabilities of these media, systems, virtual reconstruction, visuals and interoperability [12].

The research by G. Liestøl, A. Doksrød, Š. Ledas, T. Rasmussen demonstrates that modern media systems and technologies are perceived by users in different ways and can evoke different emotions.

The formation of emotional impact on a person through design was considered in the work of P. Mothersill [13]. The scientist studied the "grammar" of the objects shape and developed an emotionally-semantically driven computer-aided design tool, which was designed to help the designer in their practical activities. P. Mothersill has focused on identifying a set of universal values for how a person perceives the meaning of objects. The author emphasizes that "the semantics of a product are embodied in its color, material and shape, and these are attributes that designers can use to embody meaning in their creations" [13]. In this work, media systems and technical support (2D, 3D programs, virtual reality, etc.) are considered as one of the tools in the process of creating an emotionally expressive design object.

D. Wessel and E. Mayr in their article discussed the possibilities of practical application of media technologies, the variety of their scenario use and the problematic aspects that arise in this regard [14]. The authors investigated the correspondence of the characteristics of mobile media technologies in relation to the specific characteristics of the museum space. D. Wessel and E. Mayr argue that mobile media can optimize museum visits by helping visitors to: 1) focus and guide the exhibition space; 2) satisfaction of situational interest; 3) adaptation of information to a specific visitor; 4) adaptation of the material to a specific location; 5) development of information through knowledge exchange; 6) processing information by supporting external memory; 7) helping the museum in evaluating exhibitions (opinion of visitors) [14].

Investigating this practical issue, D. Wessel and E. Mayr come to the conclusion that the integration of mobile systems and applications into the museum space should be of an auxiliary nature, mobile devices should help visitors in the process of viewing and familiarizing themselves with the exhibited material, and not become the main part of the exhibition [14].

Scientist P. Dourish made the study of the interaction between the user and the media system, as well as the relationship between technical design and public understanding [15]. The author argues that the establishment of the indicated interaction becomes possible only at the fundamental level, through the prism of sociological research [15]. P. Dourish views interactivity as a basic element of modern media systems. Considering interactive media in the aspect of social processes, the researcher identified design principles that must be taken into account when creating media systems. For our study, the most significant are the principles that focus on the fact that users, not designers, create meanings in the media system, and it is users who manage all connections in this digital space.

The possibilities of interactive cooperation between a person and multimedia objects are provided not only by the technical component, but also by the use of a number of new materials. A voluminous study of smart materials and new technologies is the work of D.M. Addington and D. Schodek [16]. In this study authors indicated the main characteristics of new

technologies: 1) efficiency (respond in real time); 2) short duration (react to more than one environmental condition); 3) self-activation (intelligence is internal in relation to the "material", and not external in relation to it); 4) selectivity (the reaction of smart material is discrete and predictable); 5) immediacy (the reaction is local to the "activating" event) [16].

D.M. Addington and D. Schodek distinguish two types of smart materials: 1) a material that changes one of its properties (chemical, mechanical, optical, electrical, magnetic or thermal) in response to changes in external conditions; 2) a material that converts energy from one form to another to achieve the desired end state [16]. Distributing smart materials according to the indicated principle, D.M. Addington and D. Schodek systematize them by changing the color system, increasing / decreasing the luminous flux, changing the stiffness / viscosity, and the degree of deformation.

2.3. Research of characteristics of multimedia interactive objects

Interactive objects become widespread and variable not only as equipment of shopping malls. They are increasingly placed in exposition and exhibition halls, catering establishments, medical institutions, offices, entertainment and educational centers. Their innovative capabilities initiate the designer's interest in the effects of modern multimedia technologies [17]. Design, based on the application of multimedia technologies, forms a new level of synthesis of natural-scientific, technical and intuitive-artistic thinking. The expressiveness of multimedia images is achieved by a wide range of methods of visualization, sensitivity, environment management and virtual space. The interactivity of computer tools allows involving a person in the process of creating visual images on the surface of a multimedia object.

For this study, it was important to note the characteristics of multimedia objects, which explains the popularity of their use in interior design. These include: polysensory; the possibility of interactive interaction between the object and the user; variability of parameters (color, sound, shape); ability to move in cyberspace and time [17].

The analysis of the world design practice of the early XXI century helped to identify technological solutions that take place in the creation of interactive objects. This allowed us to identify the main ways of their integration into the interior in the formation of an interactive multimedia object-spatial environ-

ment. Common multimedia objects in the modern public environment include sensory objects and interactive video projections.

The relevance of the study of interactive sensory objects placed in public interiors is due to both the many variations of their solution and the breadth of application in modern design practice. In the aspect of creating interactive touch objects, the key importance is the kind of the multimedia interface. The issue of creating interactive infographics and presenting information is revealed in the work of Korean scientist J. Won [18]. The main purpose of his research was to confirm the communication effect of infographics and to test the impact of design elements on the perception of information.

Today, the use of interactive objects in the interiors of public buildings takes place according to different scenarios of their location in the interior, due to their interaction with visitors. Integrated implementation of interactive objects in interior design is an integral part of adaptive architecture. The advantages of adaptive space are the ability to respond to human actions and the ability to transform, according to specific user tasks [19]. The main idea of interactive space design is to turn everyday interior elements into adaptive artifacts. A feature of interactive interiors is their ability to adapt to the personal preferences of those who are in them: changes in appearance, color, surface pattern, lighting, etc. This trend can bring new potential benefits when the adaptive space will maintain the psychological and physiological condition of visitors, taking into account their aesthetic preferences. In terms of living environment, the significant benefits of its adaptability are based on the ability to use the personal data of residents, which creates the ability to constantly dynamic support their preferences and improve living space [19].

The presence of extensive design practice of using interactive objects in public interior design and the lack of a developed system of compositional techniques for their integration into interior spaces makes this study relevant.

The purpose of the work is to systematize the compositional techniques of placing interactive multimedia sensory objects in the object-spatial environment of public purpose.

3. MATERIALS AND RESEARCH METHODS

The material for the study was public interiors that use interactive multimedia objects. The selection of research objects was based on the method of a representative sample. This method made it possible to select in a wide range of examples those that correspond to the necessary characteristics for the analysis. This made it possible to best illustrate theoretical fabrications. The vast majority explores the object-spatial environment of museum-exposure and trade and entertainment centers, which have been developed over the past 15 years – a period when there is an active involvement of technological innovations in environmental design.

The work is based on the use of general theoretical and special methods of scientific research. A set of these methods allowed us to analyze the design of the interactive public environment through the prism of the formal composition.

The following scientific methods are used in the work:

– analysis of literary and graphic materials by the structural-analytical method made it possible to determine the characteristics of the studied interiors;

– the method of morphological and compositional analysis was used to describe the object-spatial solution of interiors;

– the method of comparative analysis and typology was used to compare the characteristics of the interiors and summarize the data obtained;

– graphical-analytical method allowed to visualize schematic images.

4. FINDINGS

The balance of integrity of the object-spatial environment reflects the logic and organic connection of the solution of objects with their technical support. One of the directions of formation of an interactive object-spatial environment is the introduction of multimedia sensory technologies. In the vast majority of design developments regarding the public interior, there is the use of sensory objects and interactive video projections. World design practice shows that the introduction of touch objects, which include thin touch screens and bulk LED blocks, is more common and variable. This is due, to the wide possibilities of their implementation in space, ease of installation,

the ability to combine touch panels with existing stationary equipment, etc. In addition, the level of saturation and clarity of visual effects on the surface of the touch screen is much greater than the brightness of the image created by video projections.

Thus, the application of sensory technologies is the basis for the creation of various interactive objects used in the design of the object-spatial environment of public purpose.

The research of public-purpose interiors, which were formed by the means of sensory technologies, provided an opportunity to identify three main ways to integrate sensory multimedia objects into the structure of the object-spatial environment of public interiors: 1) the compatibility of touch blocks and screens (panels) with fencing surfaces (walls, floor); 2) the integration of touch screens into stationary equipment; 3) the installation of separately located objects equipped with touch screens [20].

Analysis of the design experience of the application of sensory objects, which are compatible with fencing surfaces and become a compositional accent of the object-spatial environment, allowed to establish their varieties and characteristics:

– *touch LED blocks* are mounted in the enclosing surfaces (usually the floor), creating a holistic interactive coating. Touch blocks have a volumetric shape and are modular elements;

– *touch screens (panels)* can occupy both the entire plane of the enclosing surfaces (mostly – walls), and be used as small separate touch screens. The specified objects have a planar shape.

A research of examples of global design practice in the formation of public interiors has revealed that touch LED blocks turn the monotony and expected static of space into a dynamic and bright theatrical environment in which color or pattern changes on the surface of touch blocks occur due to visitor movement. In addition to the function of accentuation on the transit area of the room, integrated touch blocks on an aesthetic level contribute to the formation of a bright artistic image of the object-spatial environment. The great example of the integration of sensory objects into the structure of the object-space environment, where sensory objects become a composite dominant, is the interior of the store "Louis Vuitton" in Hong Kong from the office of architect P. Marino [21]. In the store, an interactive staircase has become a compositional accent, the bright view of which attracts the attention of visitors to the transit zone of the interior. Touch LED blocks have been built into

the construction of the stairs, where the color scheme, light saturation and patterns on their surface change under the influence of visitor movements.

Another interesting solution from P. Marino became a store in Rome for Louis Vuitton [22]. Media LED blocks are built into the design of stairs leading to the second floor. This decision provided an opportunity to present vivid video images that are constantly changing and attracting the attention of visitors to the transit area of the environment. It is important that the color scheme of video images corresponds to the product that is presented in the shopping space. This technique is focused on the formation of a holistic visual perception of the object-spatial environment. In the applied multimedia structure of the stairs, an interactive connection is built between the object and the author, who programs changes in audiovisual information on the surface of the object.

Analysis of numerical examples of compatibility of touch LED blocks with fencing surfaces allowed to state that the identified objects are aimed at forming an attractive object-spatial environment. Main tasks are creation of a unique artistic image of the interior, attract the attention of visitors and identifying the transit area of public space (with the appropriate placement of touch blocks).

Unlike the above LED blocks, touch screens can not only form a bright artistic and figurative solution of space (when totally applied on wall surfaces) and emphasize the attention of visitors in the transit area of the interior, but also play the role of information stands (when integrating small touch screens) in vertical or inclined enclosing interior structures).

Among the interesting examples of combining small touch screens with fencing surfaces, it can be marked the interior of the Aquarium "The Water Planet" from the design bureau "Urban A&O" (San Francisco, USA) [23]. The total area of the exhibition space is 929 m². Touch screens are located at different heights near each segment of the aquarium – they became a multimedia information stands. These screens have a simple rectangular shape and contrast with the general plastic solution of the enclosing surfaces, which are decorated with relief lines and form associations with the underwater world. Due to the fact that the fencing surfaces have a dark blue color, the touch screens become light accents on this background. In the center of the object-spatial environment there are three podiums, the shape of which is subject to the general decision of the interior. The surfaces of these podiums have touch screens and interactive video projections, which makes these ele-

ments the compositional center of the environment.

Another example of the compatibility of sensory objects with fencing surfaces is the interior of the terminal of the airport "LAX Tom Bradley International Terminal" (Los Angeles, USA) [24]. It is one of the largest centers where integrated multimedia interactive systems have been used. Among the interactive objects that saturate the space of the airport, we can distinguish a metric composition from narrow and vertical touch panels, which are installed near the North and South exits from the terminal. These panels (8.5 m high) are planar shapes, the surfaces of which are equipped with liquid crystal interactive monitors, where under the influence of passenger movements there is a change in visual effects on the surfaces of the marked screens. The introduction of interactive multimedia objects joins a person in the visual transformation of the internal space of the airport terminal, which significantly affects the first impression of travelers.

Thus, it can be concluded that the integration of touch blocks and screens into the structural system of fencing surfaces becomes an important factor in the formation of artistic expression of the interior. However, at present this method of application of interactive objects is not quite common, as it requires the preliminary development of a design proposal of a design solution of the object-spatial environment, requires special engineering training and construction of individual engineering systems. That is why the way in which touch screens are integrated into stationary equipment and the installation of separate objects equipped with touch screens became more in demand.

The integrating touch panels into stationary equipment, the latter becomes more functional as its surfaces are converted into interactive multimedia screens.

An example of the formation of an interactive object-spatial environment based on the integration of multimedia touch screens into stationary equipment is the interior of the exhibition center "VW Knowledge Gate Installation and Computer Generated Information Design" (Wolfsburg, Germany) [25]. The main forming element in this environment is a parallelogram, which is traced in the design of internal partitions, tables and stands. The specified stationary furnishing is equipped with integrated touch screens (both on horizontal and vertical planes). Due to this substantive filling, the inner space of the exhibition center is divided into three extension zones, each of which is marked by different techniques of

integration of touch screens. The interior furnishing, equipped with integrated horizontal touch screens, has a multilevel structure and is located in the central longitudinal zone – occupies the central part of the interior. And the equipment with vertical interactive multimedia screens is located in the side past areas. Here the implementation of touch screens is carried out in two ways: 1) integration of touch screens into metric-placed partitions, installed at an angle to the plane of the wall; 2) application of single multimedia touch panels. This example confirms that the integration of such multimedia objects into stationary equipment can be comprehensive and form an interactive interior saturated with technical innovations [20].

Analysis of the world design practice for the formation of an object-spatial environment using touch blocks and screens (panels) allowed establishing that the most numerous are examples of introduction of separately located objects equipped with touch screens. The distribution of this method is based on the fact that these objects are small in size, are convenient in manufacture, transportation and installation. Installation of objects equipped with touch screens does not require global pre-treatment and development of complex engineering solutions. The mobility and ability to create multi-component combinatorial compositions from such individual elements led to the spread of this method.

Example of design solutions with separate objects equipped with touch panels indicate that the latter can create both compositional accents and be subject to a common solution. Creation of compositional accents in the object-spatial environment can be carried out by contrasts of:

− *forms* of objects equipped with touch screens, with a common form-making system of the object-spatial environment;

− *scale* of the specified objects with other equipment in the interior.

The organization of the environment on the contrast of forms is present in the design of the exhibition center "AUTOWERK Portal zur Produktion" from the architectural bureau Jangled Nerves (Wolfsburg, Germany, 2014) [26]. In this space, with a total area of 260 m^2, the main elements are exhibition structures for exhibiting parts of car mechanisms and a multimedia touch information stand. It is solved as a table with an interactive touch surface. The basis of shaping in this room is a rectangle, however, the design of a multimedia interactive table is made on the basis of a circle. Thus, this object, which contrasts with the general object-spatial environment, becomes a compositional accent of the interior.

An interesting example of applying the contrast of scale between objects equipped with touch screens and other equipment is the design of the center-museum for visitors "PARLAMENTARIUM" in the building of the European Parliament in Brussels (architectural company Atelier Bruckner, 2011) [27]. The rooms of this center have created several exhibitions dedicated to the history and prospects of the European Union. The concept of environmental formation was based on the interpretation of the motto "Unity in Diversity". The space of the museum is divided into several zones, each of which reflects different issues of European society. One of the halls has a large parallele pipe with integrated touch screens, which works as an information stand. This design, which occupies the central part of the interior, contrasts in scale with other interior equipment and becomes a composite dominant of space.

Thus, the formation of compositional accents, which is carried out due to the contrast of shapes or scales of objects equipped with touch screens, with a common system of object-spatial environment, allows to focus visitors on certain areas of the interior.

A study of the practice of using separately located objects with touch screens in public interiors shows that the subordination of certain objects to the general artistic decision of the environment is a common reception. Its implementation is due to the design of forms of interactive objects that can act as:

− modular elements that become separate components of public interior formation;

− disparate elements that are harmoniously included in the composition of the object-spatial environment.

Examples of the organization of the environment by applying modular objects equipped with touch screens are the design of the exhibition center "Level Green from J. Mayer H. (Wolfsburg, Germany) [28], "Porsche Museum by Jangled Nerves" (Studgart, Germany) [29], "Jewish Museum and Tolerance Center" (Moscow, Russia) [30], Tallinn Television Tower" (Tallinn, Estonia) [31], Multimedia Museum of the Teutonic Order (Dzialdowo, Poland) [32] etc.

An interesting example of the formation of an interactive environment using modular objects with touch screens is the interior design of the observation deck of the Tallinn Television Tower. This space is organized by using unique modular elements of the fungal shape, which are equipped with touch screens. The

objects are by three grouped and placed in the interior or according to the radial system. These objects, which act on the contrast of forms in relation to the general solution of the interior, perform two functions: 1) creation of modern information stands (each object is a source of information about the city); 2) formation of a futuristic image of the interior environment. Due to their shape and the presence of touch screens, the identified interactive objects acquire the character of a dominant in space design.

The subordination of modular objects equipped with touch screens, the general solution of interior design is available in the organization of the object-spatial environment of the exhibition center "Porsche Museum" [29]. Architect and author of the project M. Delugan noted that the main concept of the project was a combination of traditions, innovations and passion - the main defining features of the brand. If traditions are presented in the form of famous classic models of the mentioned car brand, passion is expressed in the dynamic nature of forms of architectural elements and partitions, then innovations are presented not only in the design of new car models, but also in the inclusion of interactive objects in the overall environment. Modular stands equipped with touch screens in the interior of the exhibition center

"Porsche Museum" are presented in several variations: 1) bulky boxes with touch screens of small size, which are suspended near the exhibits or are in a horizontal position in the windows; 2) separately located columns with built-in touch screens that replace the nature of the information stand. These columns are in a space adjacent to the main exhibition hall. They are solved as a group of modular forms, which defines the center of the compositional structure of the interior and is in rhythmic combination with the traditional equipment of the showcases.

In this example, interactive elements have a purely functional purpose – to present the necessary information.

Analysis of design practice shows that the use of objects of disparate forms, equipped with touch screens, is not so common than the use of modular forms. This is due to the time-consuming production of objects of complex geometric shape (compared to rectangular) and their single exclusive character.

A great example of the use of objects of heterogeneous shapes, equipped with touch screens, is the interior of the Museum of Science in London. The space of this museum is formed by a combination of objects with different molding bases, colors and sizes.
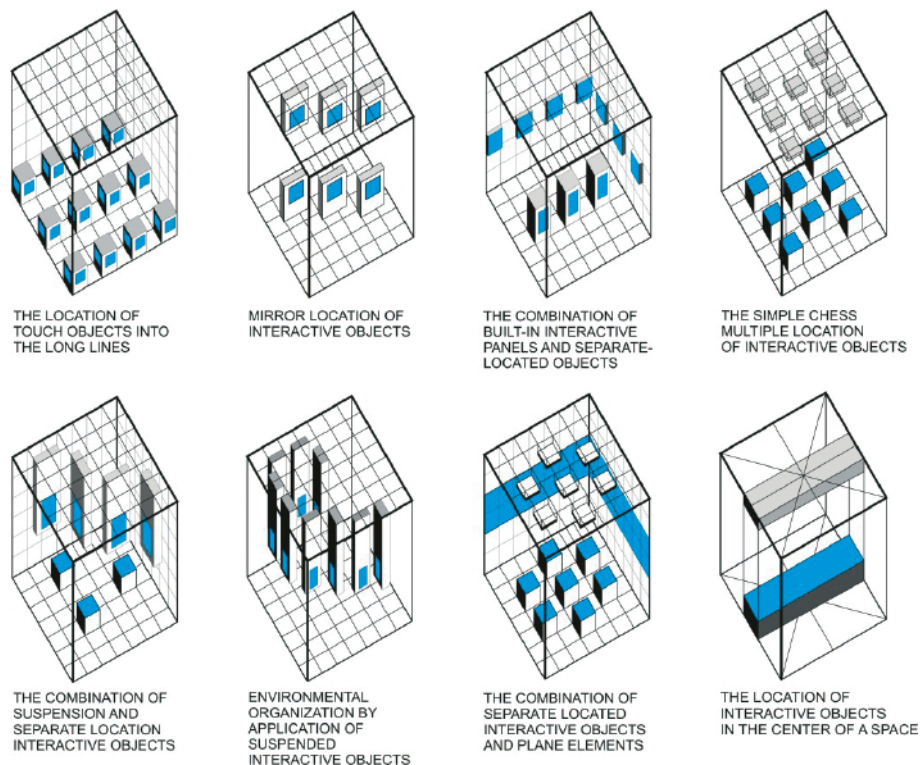

Figure 1.
The creation of composition with metric or rhythmic arrangement of elements in the central part of space
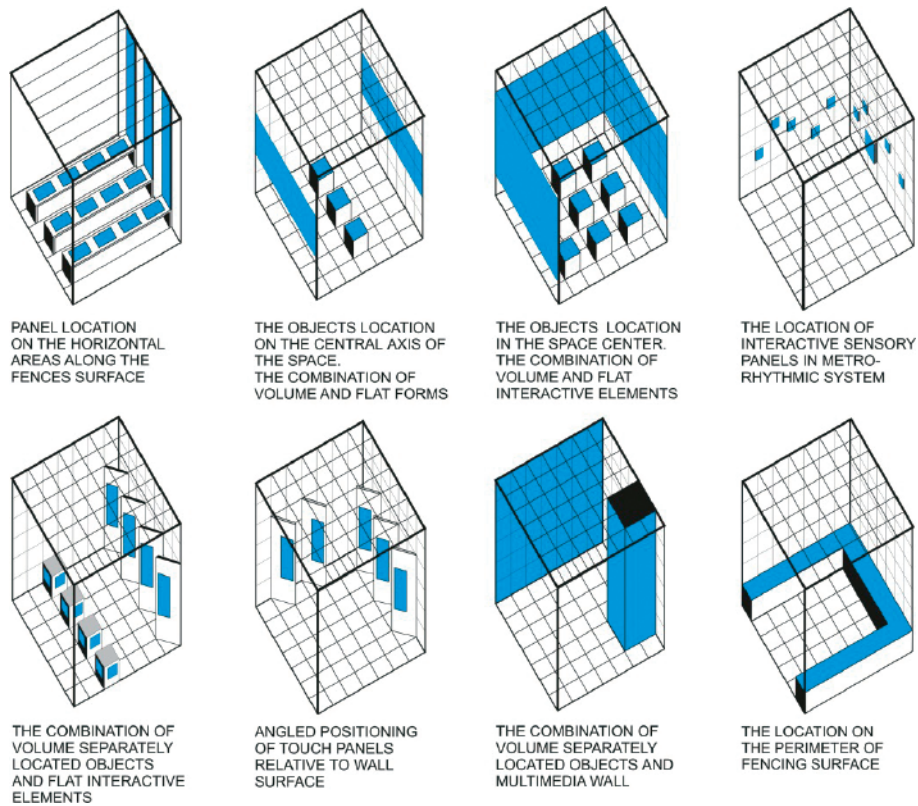
Figure 2.
The location of touch interactive objects along the perimeter of the enclosing surfaces

The holistic coloring solution of the fencing surfaces, which have a dark blue color, creates a harmonious background for the exhibits of the museum. A feature of the design solution is the curvilinear plastic of objects with touch screens, which in contrast is perceived in relation to the whole interior, built on the basis of straight-line forms. The lack of natural light sources and the specified compositional reception allows you to brightly present sensory objects.

The research of the world project experience in the aspect of the formation of an interactive object-spatial environment of public purpose allowed to systematize the compositional techniques of the location of interactive multimedia sensory objects. It was found that the placement of sensory objects in the object-spatial environment can be carried out both in radial and rectangular mesh schemes.

Composite techniques for placing interactive sensory objects in a rectangular mesh scheme provide:

−location in the chess order of bulk forms (establishment of separately located objects or combination of separately located objects with such that are integrated);
−placement along the composite axes of space;

−creation of a composition with metric or rhythmic arrangement of elements in the central part;
−placement of sensory objects on a perimeter principle (Fig. 1, Fig. 2).

Analysis of design practice shows that the trend of combined location of objects equipped with touch screens is becoming increasingly popular in the organization of exhibition centers and museums. These can be suspended structures with integrated touch screens, separately located interactive objects or a combination of separately located touch objects and panels.

The research is showed that the compositional techniques for placing interactive sensory elements according to the radial scheme can be developed as follows:

−revealing of the central interior area. It can be done by placing secondary objects around the perimeter of the environment with the installation of the main interactive object in the center of space;
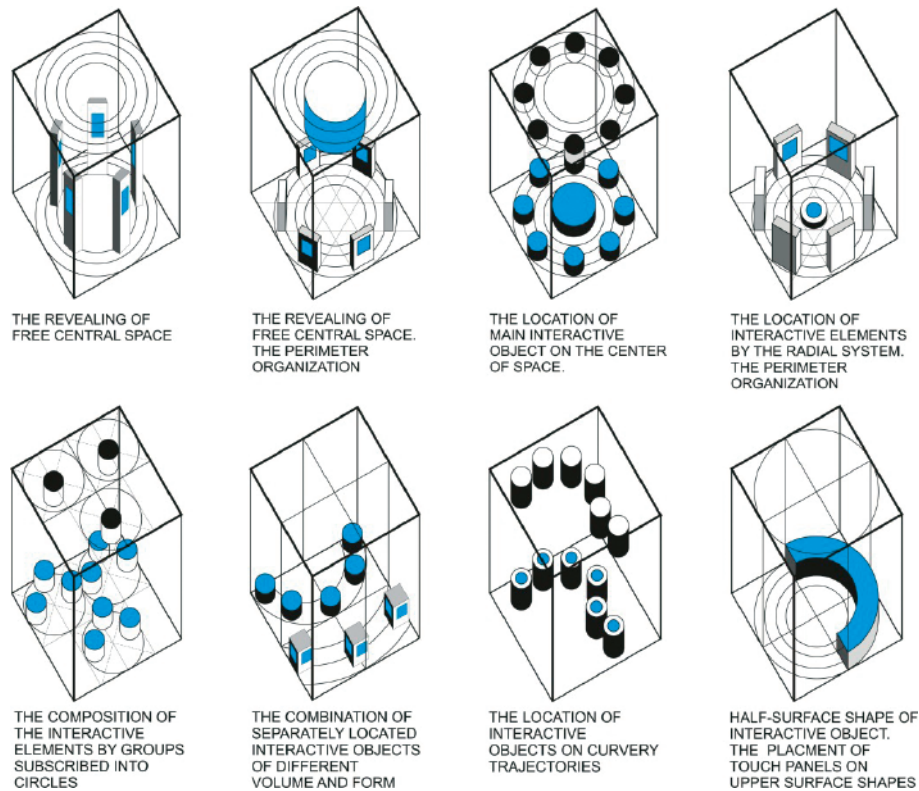−emphasis on the perimeter organization, embodied by the location of elements in a circle with free central space;

THE REVEALING OF
FREE CENTRAL SPACE

THE REVEALING OF
FREE CENTRAL SPACE.
THE PERIMETER
ORGANIZATION

THE LOCATION OF
MAIN INTERACTIVE
OBJECT ON THE CENTER
OF SPACE.

THE LOCATION OF
INTERACTIVE ELEMENTS
BY THE RADIAL SYSTEM.
THE PERIMETER
ORGANIZATION

THE COMPOSITION OF
THE INTERACTIVE
ELEMENTS BY GROUPS
SUBSCRIBED INTO
CIRCLES

THE COMBINATION OF
SEPARATELY LOCATED
INTERACTIVE OBJECTS
OF DIFFERENT
VOLUME AND FORM

THE LOCATION OF
INTERACTIVE
OBJECTS ON CURVERY
TRAJECTORIES

HALF-SURFACE SHAPE OF
INTERACTIVE OBJECT.
THE PLACMENT OF
TOUCH PANELS ON
UPPER SURFACE SHAPES

Figure 3.
The location of touch interactive objects according to the radial scheme

– combining elements in groups and their location at an equal distance from the geometric center of the interior (Fig. 3).

The placement of multimedia touch panels is due to the ergonomic indicator of the required height for the location of screens serving as information stands. Due to the fact that visitors to public buildings have different heights, accordingly, for the convenience of perceiving information, they need different heights of the location of multimedia screens. To solve this problem, designers combine panels of different sizes, install them at different heights, or use transforming systems as a basis for attaching multimedia screens.

5. DISCUSSION

The definition of compositional methods for multimedia objects placing was based on the application of a number of theoretical methods of scientific research: 1) gather and analysis of photo and video materials (public interiors where interactive multimedia objects were used); 2) classification of the collected material into groups according to the principle of identity of the used multimedia objects; 3) system-

atization of the material by identifying similar techniques for the spatial placement of multimedia objects in public interiors; 4) generalization of systematized information by creating simplified graphic-analytical schemes for the compositional placement of multimedia objects in a speculative space.

The study showed that the use of multimedia objects in interiors with different parameters has its own patterns. In spaces with a small area, designers and architects most often use multimedia touch screens, installing them around the perimeter of the room. With a larger area and significant ceiling height, it becomes possible to use suspended, inclined or transforming structures with built-in touch panels. Thus, it is possible to deduce the first pattern – the variability of the forms and the scale of interactive multimedia objects depend on the physical parameters of the room – the larger the space, the more diverse the interactive multimedia object can be used in it. In addition, the presence / absence of light sources (natural and artificial) plays a significant role in the process of perceiving transmitted information on the surface of a multimedia object. Here we can see the second pattern – the darker the room, the richer the

images on the surface of the multimedia object look. In addition to the shape, location and brightness of the image on the surface of a multimedia screen, the size of the object is of great importance. The third pattern is - the smaller the screen is in size, the sooner it is used as an auxiliary element, the larger the multimedia object, the more often it becomes an independent element of space.

Practice shows that the use of multimedia interactive objects has a number of advantages over stationary information stands. The use of multimedia touch screens allows to optimize the process of presenting information does not require a constant change of exposition texts (in museums and exhibition centers). Thanks to the brightness of its screen and its interactive capabilities, multimedia objects attract the attention of public visitors. This allows architects and designers to place certain "semantic accents" in the space, where it is necessary to hold the attention of visitors, to involve them in the interaction process. Their placement in the object-spatial environment of a public building allows designers to embody the conceived scenario of the movement of visitors in space, creating a logical system for the presentation of visual and auditory material.

In the process of studying the features of the use of multimedia interactive objects in the design of public interiors, there were some limitations and difficulties associated with the impossibility of practical access to many spaces known to us, where interesting interactive multimedia objects were used. On the territory of Ukraine, the use of these objects is widespread only in the aspect of ATMs, which is not the object of our scientific research. Moreover, the use of multimedia objects as compositional accents in space and interactive information stands in public buildings in Ukraine is not as widespread as in Western Europe, the USA, Japan, China and Singapore. Such remoteness from the objects of study slows down the process of theoretical comprehension of the existing practical experience in the field of modern interior design.

6. CONCLUSION

Modern innovative technical achievements have influenced the formation of public interior design. This process can be traced in the use of interactive objects, in particular such as LED touch blocks and multimedia touch screens. The variety of ways to integrate sensory objects into the structure of the object-spatial environment and a wide range of compositional techniques have led to an increase in the popularity of including interactive objects in various public spaces (office institutions and shopping and entertainment centers, exhibition and exhibition halls, catering establishments, educational and research institutions).

An analysis of the global project experience in the formation of public interiors shows that multimedia sensory interactive objects are becoming important tools in building an artistically expressive and functionally filled object-spatial environment. It is established that the interactive object-spatial environment can be implemented on the basis of two design approaches. The first is based on the emphasis on the artistic expression of space; the second is characterized by the dominance of the functional component possessed by interactive objects. The very application of multimedia technologies provides an opportunity to put the identified project approaches into practice.

Examined design solutions show that between multimedia touch objects in public interior design, the most common were separately located touch stands (implemented by the inclusion of various touch screens in the stationary design). The marked multimedia objects are artistically expressive. They create compositional accents in the environment, become indispensable functional objects in the interiors of museum-exposure and shopping and entertainment centers, as they provide easy access to the necessary information. It is established that the least common among multimedia sensory objects is an interactive floor, which is involved to form a bright artistic image of the interior and highlight a separate area of space.

The result of the study was the systematization of compositional techniques of the location of interactive multimedia sensory objects in the interior, which is realized with the help of:

– *rectangular mesh scheme* (location in the chess order of bulk forms, equipped with touch screens; their placement along the axes of space; creation of a composition with metric or rhythmic arrangement of elements in the central part of space; placement of interactive sensory objects on the perimeter of the interior);

– *radial scheme* (the main interactive object in the center of space, and secondary – around the perimeter; location of interactive elements around the perimeter of the environment with free central space; combining interactive objects into groups and their location at an equal distance from the geometric center of the interior).

A comprehensive of the actual material of the

research led to the conclusion that there is currently a growing trend towards the implementation of interactive multimedia technologies in public interior design. Expression and bright multimedia sensory objects attract the attention of visitors to museum-exposition and shopping and entertainment centers. And the ability to conveniently search for the necessary information (text or audiovisual) on the display of touch screens forms the advantages of interactive multimedia objects over traditional stationary equipment.

The results of this work can become the basis for research aimed at studying design solutions for residential interiors using interactive technologies or a deeper analysis of certain types of public interiors, in particular museums, where these technologies are widely used. The conclusions of the scientific work can become the basis for research in the field of introducing certain types of technical means of forming an interactive interior.

This scientific article can become the basis for research devoted to the consideration of the issue of the dynamic process of disclosure and development of an interactive scenario for filling the object-spatial environment, analysis of the formation of an alternative reality and cyber space in a public interior.

Within the framework of interdisciplinary research, the results of the work can become the basis: in psychology – to analyze the influence of interactive objects on the emotional state of a person, the perception by viewers (visitors, consumers) of dynamic images and forms that are transformed in space and time; in pedagogy – in the study of the properties of interactive objects as factors in the formation of a developing space in educational institutions; in the field of marketing research – when analyzing the economic feasibility and prospects of introducing interactive objects into the design space of the environment of the shopping and retail and entertainment areas.

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