VIRTUAL REALITY AS THE TOOL OF INTERACTIVE ARCHITECTURE
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Abstract: *article explains the phenomenon of virtual reality, as a tool of achieving interactive behavior in architecture and built environmental. As a new technological advance, virtual reality provides various possibilities for improving the quality of environment and space, both real and existing only within alternative perception. The article describes existing examples and projects that use virtual reality to create a new kind of space that is able to change in real time and meet emerging needs of users.*
Keywords: *virtual reality, interactive architecture, adaptability, design, environment.*

ВИРТУАЛЬНАЯ РЕАЛЬНОСТЬ КАК ИНСТРУМЕНТ ИНТЕРАКТИВНОЙ АРХИТЕКТУРЫ
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Аннотация: *статья посвящена виртуальной реальности как средству достижения интерактивности в архитектуре и дизайне среды. Являясь новым технологическим достижением, виртуальная реальность открывает множество возможностей для улучшения качества среды и окружающего пространства, как реального, так и существующего только в пределах альтернативного восприятия. В статье приводятся существующие примеры и проекты использования средств виртуальной реальности для создания нового вида пространства, которое способно изменяться в режиме реального времени и соответствовать потребностям потребителей.*
Ключевые слова: *виртуальная реальность, интерактивная архитектура, адаптивность, дизайн, среда.*

Traditional architecture cannot meet the needs of a dynamically evolving humanity, "armed" with the latest technical developments. Architecture should be interactive, responsive to the interaction, conforming to the wishes and the characteristics of each "neo-man." Interactivity, in itself, a concept which reveals the nature and extent of interaction between objects that can arise in a variety of areas: the theory of computer science, programming, telecommunications, sociology, industrial design, and many others. Generally, it can be defined as follows: interactivity is the organizing principle of the system, in which the goal is achieved by information sharing elements of the system [1].

Thus, interactive architecture is a field of architecture, in which objects interact with each other, with space and (or) a person and can change according to the changing needs or the influence of external factors. And change can be both physical and virtual.

The dissolution of borders between silent and responsive, static and dynamic, emerges in society. For instance, frontiers between body and machine, interior and exterior, virtual and real tend to diminish thanks to innovation and technological progress. Nowadays, we can live at the same time in both real and virtual space. Even the cities are organized according to both physical and virtual activities. Therefore, one can wonder how to join these two extremes? How to keep the identity of place and body in such a fluctuating world? How can architectural objects keep their identity and, at the same time, be connected to the world, be everywhere? Stable identities as well as fixed space are no longer possible, because they do not correspond to the reality of today's world. This introduces a transformation of the real and mental space. Such a conversion asks for the invention of the new words and the new spaces, using new already invented techniques [2].

It is therefore to be considered interactive techniques in inseparable communication with each other and with their environment, and in combination with the basic principles of progressive trends, such as eco - architecture as well [3].

An integrated approach is particularly justified in the design of multi-functional structures, such as university research centers. A complex system of volumes, a large number of students and teachers, the management flows of people, organizations need a productive learning systems, energy conservation, and much more requires "intervention" of innovation. The premises must be multifunctional and easily transformable. With interactive architecture a lot of problems can be solved much more "elegant" than before [4].

In the vast reservoir interactive environment can be divided into two main branches: the virtual and the kinetic architecture.

Virtuality (from the English. Virtual reality) from the English. virtual - the actual, from the Latin. virtus-potential, imaginary, Lat. realis - real, valid. Thus, the definition of medieval logic of Duns Scotus is closest to the modern concept of virtuality: the opposite of the natural physical space - the unreality containing information equivalent things. Virtual architecture manifests itself in three ways: parametric design, algorithmic construction of forms and the use of computer programs in the operation of buildings [4].

Museums are great places for learning. In a museum children and adults alike can immerse themselves in distant places or learn how scientific discoveries are made. Museums can also reveal a cultural past, present or future. All in all, museums are great places to learn – especially as new technology helps designers to improve museum exhibit design. Museum exhibits are getting evermore technologically advanced and virtual reality is one of the latest trends. Of course, virtual reality can be immersive, interactive or both. In the paper Immersive Interactive Virtual Reality in the Museum by Maria Roussou, "computer generated interactive experiences" are said to be able to "transcend physical locations". Museum visitors are able to make choices during their virtual travel enabling them to feel a sense of exploration – triggering curiosity and the desire to learn.

Most virtual reality exhibits cater to both the visual and aural senses. Such exhibits can be quite awe inspiring as visualizations are getting increasingly detailed. By using both head-worn and hand-held devices, visitors are able to interact with the simulation in a variety of new ways. However, the problem arises when designers try to meet the varied needs of a multitude of visitors.

Unfortunately, because museums attract a large number of diverse visitors, the technological components are not "one-size-fits-all". Thus, stereoglasses are often clunky – especially for children to use. Another common issue with virtual reality exhibits is that many visitors tend to develop motion sickness. To prevent this, "good sight lines, ample seating, comfortable viewing for extended periods, good field of view and ergonomics" all contribute to positive immersive learning experiences.

Museum exhibits that incorporate virtual reality really can better a visitor's experience. The ability to simulate experiences opens exhibit design up to so many creative solutions – it remains up to designers to comfortably and innovatively apply virtual reality.

Tower, a landmark «Living web» in China (2009) uses an algorithm to build the form. This approach allows us to create an unusual constructive solutions, as well as, at the design stage, creating a compositional variability.

Kinetic architecture is defined as transforming any object that is dynamically predefined physical place, or affects the physical objects that can be shared public space, creating an adaptive spatial volumes [5].

The most prominent project in this area are the rotating building in Dubai, by the architect David Fisher, skyscraper involves the placement of wind turbines being located between the floors that will allow them to move freely with the wind to generate energy.

Transforming Pavilion Prada (Prada) Rem Koolhaas, a good example of adaptive space. Multifaceted building turns swapping the floor, walls and ceiling, depending on exposure [6].

Summarizing international experience, inspiring the creation of new concepts can imagine how the principles can be applied to interactive architecture that solve many problems of the organization of the modern scientific center of the university.

The modern university is the international structure. To facilitate communication between the students there should be interactive objects, allowing to communicate not only verbally. This game style of communication will develop social relationships among students. Examples of objects of this type can be called D-Tower, media facade Electroland LLC, Cameron Mack Nell and Damon CEELI (Cameron Mc Nall and Damon Seely), Project Touch, representing a luminous facade, patterns which may define a passer-by, and many more [7].

Creating a virtual university will facilitate international cooperation between institutions. For example of the new Guggenheim Museum project discussed earlier in this paper, for which Hani Rashid (Asymptote) presented a three-dimensional space, accessible through the network on which visitors can move in these spaces and observe located online art works. Virtual World Research Centre may contain electronic library catalogs, useful information for students and teachers, they will be able to receive real-time. This space will not only facilitate the navigation of the complex will be a key factor in the development of academic mobility, but also act as an interface between all institutions of higher education.

Multi-functional space can be solved by means of adaptability. The modular structure of the dynamic space, mobile partitions, ultra-modern equipment of classrooms and laboratories, such as Pictionaire - place the joint work of several people who help high technology.

Algorithmic building forms can experiment endlessly with the plastic, creating the latest architectural space. Innovative research center implies a just and innovative composite and façade solutions. The aesthetic value of the architecture is currently underestimated. The functional aspect is more important than visual. Online university must break this and many other stereotypes [1].

On the edge of interactivity and dynamism there emerged an idea of slow-acting space, first designed by Michael Bell. It can be described as non-stop, slow and anti-static space. The purpose of this space is to slow

down the perception of surrounding space enough to give an opportunity to understand where you are. The effects used to achieve this perception are not necessarily functional, but they affect the functionality. They may not have come from the place' specific features, but they describe the place. They are not constructive, but they are related to the structure [8].

An analysis of global trends shows that the modern university is not only a place for the transfer of knowledge from teacher to student. The university is a place of formation of intellectual capital in all its forms - knowledge, innovation, competence.

Summarizing the international experience in the design of research centers can be said that the promotion will happen when the online system will be part of a progressive vision, which will facilitate the integration and development of advanced technologies. Therefore, an important condition for the creation of the modern university is a fresh perception and openness to new trends and innovations, integrated vision and avoiding stereotypes.

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