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The Role Of Modern Innovations In The Repair And Preservation Of Architectural Monuments

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Abstract: The article highlights the fact that the preservation of architectural monuments and the use of modern innovations in their repair are more effective. The use of digital technologies in the repair process and the creation of three-dimensional models, laser devices and 3d printing technologies necessary for architectural monuments are described.

Keywords: Three-dimensional modeling, IT technology, architectural, repair, laser device, 3d printing.

Introduction. Preserved architectural monuments or the ruins of ancient cities, castles or temples mean a look into the material past. Historical sites anywhere in the world allow you to look into the distant past, even help you understand the secrets of the past and encourage you to care and learn about their safety. It is worth noting that the integration of modern innovations and high technologies in the process of repair and preservation of architectural monuments provides an integral connection between history, contributes to their preservation, and significantly improves the quality of service to visitors.

The purpose of writing the article. Every generation should try to preserve the architectural monuments in any way. The preserved wealth may be tangible or intangible, but all of them are a part of human civilization and a priceless heritage of every country, which should be preserved to pass on to all generations. In addition, it is a strong economic growth in terms of the development of the tourism sector, which also brings a lot of income to the state treasury.

The main part. Modern innovations make the best contribution to the restoration and preservation of architectural monuments of mankind. Restoration works are difficult and laborious, they require a lot of money, time and effort.

Reconstruction of ruined historical and architectural monuments is a very laborious and expensive task, and these costs are not only represented by funds, but also by thousands of restorers who spend a lot of time and effort to preserve and restore ancient elements, from the exterior structure and styles to the restoration of the interiors. . All this requires a deep study of ancient technologies, architectural trends, working in archives, searching for historical documents, projects, plans or pictures, etc. Serious preparatory work sometimes requires specialists for several years, which delays the restoration process and therefore can lead to even greater destruction.

Active use of modern technologies for preservation of architectural monuments. The issue of adapting the historical building to use is one of the most sensitive issues for the discussions in the world community and for the monuments themselves. Dutch architect - Ewart Verhagen, high-class architect-renovator - Sergey Kulikov, architectural historian - Marina Khrustaleva believe that it is possible to extend the life of the monument by making additional changes in the style of new modern deconstructivism in order to preserve the architectural monuments.[2]

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"Dancing House" in Prague, Czech Republic, Royal Ontario Museum, Toronto. gallery (architect D. Libeskind). (architect Frank Gehry)

Parametric design and modeling are very necessary to apply a modern look to historical architectural monuments. The development of modern technologies is a powerful tool in the fight against the disappearance of the architectural monument. In order to prevent the destruction of architectural monuments, initiative in this field is required. Innovations can stop the destruction of historical places, rebuild them and perhaps t is the key to complete recovery[1].

Virtual reality technology with many applications helps to travel anywhere and feel yourself among the ruins of any archaeological sites.

Virtual Reality (VR). One of the most popular technologies is virtual reality (VR), which allows the creation of interactive digital models of buildings, monuments and other heritage objects. With the help of VR devices, you can explore these models and even immerse yourself in the historical environment in a very realistic way, and you can be tens of thousands of kilometers away from their famous and not so historical places without leaving your home. This technology is now very well received, especially in the field of education or thematic events. It is worth noting that laser scanners are often used to create certain virtual models, which help to create high-resolution three-dimensional digital models of buildings, monuments, statues, various objects of special cultural importance and requiring preservation. These models are used to document the current state of objects, as well as to plan restoration or conservation work. [3]

Recently, in addition to virtual reality, digital reconstruction and augmented reality (AR) have been used. If before, special knowledge, understanding of the values and trends in the art of a certain period, as well as a well-developed imagination were needed to understand the ruins, today, with the help of augmented virtual reality, visitors can use "smart glasses". Digital reconstruction of ancient objects in real time for viewing on smartphones and tablets with their built-in applications can be imagined as if seeing the ruins in real life. It is a very impressive sight, allowing you to stand surrounded by the beauty and ruins of the historic environment and watch the buildings and other objects take their former forms and the streets come alive.

All these developments are not only aimed at creating impressive models, but they are also used to create digital copies that are stored in a special archive. Digital archiving allows us to preserve the most valuable manuscripts and other information that has come down to us. Archiving ensures that even if the original is lost in time, the digital record remains for future generations. At the same time, such storage makes research more convenient for scientists around the world, because you can send an electronic document anywhere in the world and to several dozen people at the same time.

IT technology. Specialists in the field of architecture and IT technologies help to restore ancient objects based on available information. Interactive information panels and holograms expand the possibilities of museum exhibitions, making learning more interesting and meaningful. In addition to individual gadgets that allow you to immerse yourself in the past, a wide range of tools have been developed, such as interactive information panels that have replaced static information boards. Modern panels, which are often sensitive, offer multilingual explanations, detailed descriptions of various objects, processes, provide video comments and even holographic images, thereby enriching learning, making the educational process more diverse and memorable. [4]

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Drones. Drones provide invaluable assistance in the study of vast areas, archeological excavations and preservation of objects, timely notification of danger.

World famous buildings 'restored' using drones

All the above technologies are based not only on existing documentary sources, photographs or confirmed assumptions and hypotheses. In recent years, unmanned aerial vehicles (UAVs), drones used to monitor huge historical sites, have been actively used. They actively assist in mapping and documentation, alerting conservationists and national heritage to structural problems or unauthorized activities that could cause irreparable damage to the site under study. [5]

Various sensors provide round-the-clock monitoring of the environment, which is essential for the preservation of ancient archaeological sites and monuments located in the open air.

From drones launched at a certain frequency, sensors installed in cultural and historical places collect and provide data to research centers around the clock (in real time). As a rule, they provide information about humidity, temperature, wind strength and other environmental factors. This information is very important for objects that require certain conditions to prevent further degradation.

Laser devices. In addition to the research and digitization of architectural monuments, they are spending a lot of effort on their reconstruction and repair. While the process of searching for information to help visualize what the object will look like and obtain the necessary calculations is a challenge for restorers and other professionals involved in the renovation process, cleaning a historic object without damaging it, must judging, building is a very difficult task. But here too, high technologies and innovative developments come to the rescue.

Laser cleaning of carved elements in all types of stones is the most effective way to restore its former beauty.

For example, some parts of the complex patterns of ancient monuments may be damaged. In this case, Laser cleaning comes to the rescue, which helps to remove centuries-old dust, external influences and even overgrown plants without damaging the object. This technology is actively used to clean marble columns and other elements during the restoration of historical temples in India, where many objects of great beauty filled with carvings and delicate decor have been preserved. [6]

Biotechnological approach. There is also a completely unique method of cleaning ancient monuments that uses biological innovations. In recent years, bacteria and microorganisms that masterfully clean the surfaces of ancient architectural monuments or statues have been actively involved, which makes it possible to abandon the use of harmful chemicals. The biotechnological approach ensures the durability of the structures while maintaining their complete authenticity[1].

Afrosiyab wall painting VI-VII century. Biological innovations are actively used both in archeology and in restoration work.

3D printing. After the cleaning of old structures and objects, it is time to restore. Among them, the main obstacle is the restoration of historicity, even if the use of modern materials is allowed. In such cases, the innovative 3D printing method, which is very actively used in modern construction, comes to the rescue. 3D printing, used to recreate damaged artifacts or parts of structures, is also becoming

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a new trend in restoration. It is almost impossible to distinguish these printed products from the original, especially for the production of some architectural details, for example, you can easily use the same material (clay or materials that can be recycled and reused) [7].from palmyra using 3d printing technologies used in the restoration of busts

Specialists are increasingly using 3D printing technology to restore lost and particularly complex elements of ancient decor, building structures, murals, etc. [8].

Summary. Based on these results, the following conclusions can be drawn. Modern innovative technologies allow preserving architectural monuments and at the same time restoring monuments that are on the verge of disappearing. The obtained results confirm the benefits and undoubted prospects of using computer technologies in repair activities. Virtual (VR) restoration and reconstruction can be successfully implemented with a judicious combination of intuitive artistic thinking and scientific technology. Conditionally, the above-mentioned innovative technologies are also the demand of today.

Preservation of priceless architectural monuments with a rich history for future generations can be achieved only through modern innovative developments, special computer programs, 3D scanning, use of artificial intelligence, and the use of innovative technologies and materials in the repair process.

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