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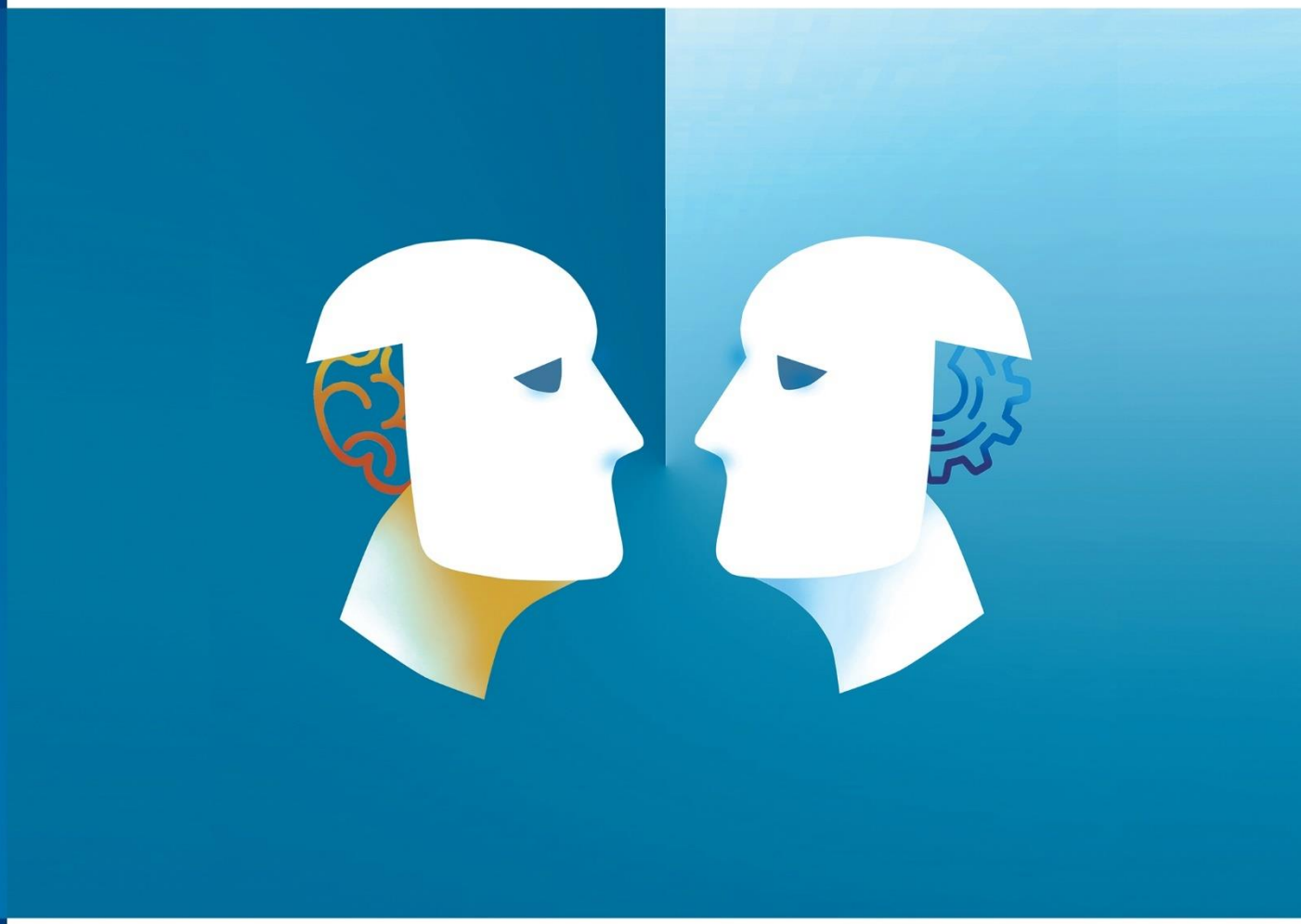

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Содржина

AI AND ITS ROLE IN PRESERVING CULTURAL HERITAGE- TRANSFORMING THE CITY'S URBAN MEMORY

UDC: 004.89:930.85 *Reviews*

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Abstract

The paths of Artificial intelligence and cultural heritage have found shared interest, merging these two disciplines. The advanced development of Artificial intelligence provides opportunities for the production of innovative tools for documenting and managing cultural heritage. The importance of artificial intelligence in preserving our cultural heritage is of great importance.

This paper will discuss different aspects of AI and how it can improve the way cultural assets are managed and presented to the public, mainly through the case of transformation of the city's urban memory. Cities are places where different aspects of past events are projected through personal memories creating urban memory shaped within a particular space. Urban memory is an important aspect of the cultural heritage of a city that with the use of AI can be captured and preserved for future generations.

Artificial intelligence has the potential to revolutionize the preservation of cultural heritage in multiple ways. AI can serve as a communicator for relevant information on history, culture (in any language) which informs in an interactive way. AI can act as a guardian of culture making access to information easier than an online encyclopedia providing much more vivid cultural experience. Through the use of different applications urban memory can be captured and preserved allowing citizens to interact with urban memory by offering their memories and by viewing others' memories. The direction towards which cultural heritage should aim is transforming cities in a cultural environment where cultural heritage is both preserved and enhanced.

Key words: *urban memory, city, transformation, cultural heritage, artificial intelligence.*

Introduction

Architecture is a considerable part of our cultural heritage, but while other elements of cultural heritage can be protected by placing them in a museum or other type of their presentation, architectural heritage is endangered by the long term influence of the environment. Therefore emerges the need and importance of documentation of its actual state which opens the opportunity to detect damage by using change detection techniques and to restore the monument in case of heavy damage. The new technologies like Geographical

Information System (GIS), Remote Sensing and 3d modeling as part of artificial intelligence are used in the process of documentation and conservation of architectural monuments. Artificial intelligence through these technologies is used for research purposes for cultural heritage sites regarding historical and physical site documentation, analysis, preparation of conservation and management strategies and implementation. In the recent years, the usage of GIS systems has been increasing thus becoming main tool for analyzing spatial data in different fields of activities. The integration of GIS with modeling technologies applied in the field of cultural heritage became an important tool for management and decision making. Combining information in GIS with visualization methods can provide an important contribution in the development of the historic areas and their preservation. The analysis of cultural data is playing a special role in the management of historic sites, including urban historical parts of cities that can be used for future planning. [1]

In all the phases of research and protection of cultural heritage, the contemporary way of research is connected to the models of modern technology, therefore, Artificial intelligence plays an important part of today's preservation.

GIS system as a tool for preserving cultural memory

One way to use artificial intelligence in order to preserve cultural memory for a certain architectural monument is through the use of software like GIS (Geographical Information System) and different add-ins that can deliver the certain content among the population, especially youth. First we are going to give examples of case studies and implemented projects and then compare them to the possibilities that can immerge regarding the same development of projects for the architectural monuments of the city of Skopje-its palaces.

Case study, Hopi Tribe, California, United States of America

Through this case study we want to give an example how one past can be preserved and its memory shared through the use of artificial intelligence. A team of archeologists and GIS programmers at the University of Redlands in California, created an add-in for ArcGIC that delivers archeological content that encourages hands on exploration of the Hopi past.

The history of the Hopi Tribe, stretching back centuries before European contact, has been passed on through oral accounts. But when members of the Hopi Cultural Preservation Office noticed that some Hopi youth were more interested in video games than traditional cultural history, they wondered if they might be able to use digital technology to help communicate Hopi history to the next generation. Building on University of Redlands expertise in GIS and working closely with the Tribe, the team developed the Hopi Landscape Portal, an ArcGIS Explorer tool that allows Hopi High School students and others to explore Hopi history in a virtual 3D environment.[2]

1 G. Droj, online article
2 W. Bernardini, online article

RE-designing access to Cultural Heritage for a wider participation in preservation

In the field of Cultural Heritage, a reality-based survey is a very important instrument of knowledge, documentation, and analysis, preliminary to any work of cataloging, restoration, and conservation. With the integration of different 3D recording techniques and instruments for survey of cultural heritage sites, 3D point clouds and textured models can be obtained of the site and orthoimages for archeological needs, conservation, documentation and graphical representations. In this way we can manage the protection of existing cultural heritage and prevent degradation or its loss which is of vital importance. The continuous expansion and development of Artificial intelligence like new recording and visualization techniques allow us to produce 3D models with high geometric accuracy and realistic appearance.[3] The 3D products can be used for detailed accurate documentation and digital preservation of existing tangible heritages as well as for new archeological or architectural studies and analyses.

The 3D models would be a starting point to create a virtual museum and online cultural platforms, thus promoting and sharing cultural heritage. Utilizing photogrammetric data, a scaled three-dimensional model could be produced by using two-dimensional photographs also referred to as reality capture. The creation and analysis of the models are the initial phases in any architectural historic preservation and/or adaptive reuse projects. With the use of Virtual Reality, Augmented reality and 3d online object viewers the three dimensional information can be shared. This allows for the dissemination of the information, embedded in the model, to be accessed by any interested individuals. These kinds of projects will assist in the future development of architectural photogrammetric applications for the preservation of architectural heritage and share the collection of 3D interactive elements with all that are interested in the art, history, and evolution of cultural monuments. With the use of AI as the drones and other technologies applied to cultural heritage a 3D reconstruction is possible of all the archeological and architectural monuments in order to preserve them and to make them enjoyable for everyone.[4]

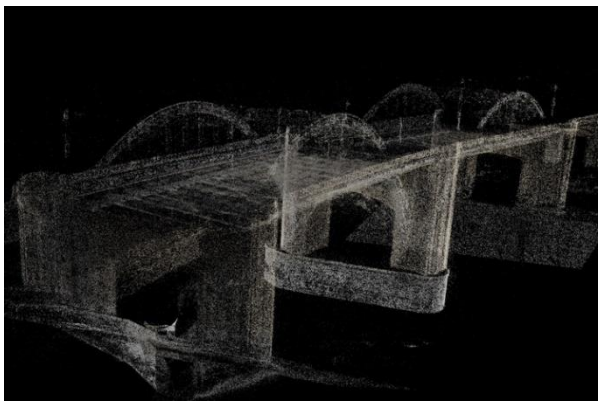
Recently, new online platforms are being created in order to preserve and share the past in different ways. One interesting case study of digital preservation is done by Arc/k Project organization, a new nonprofit focused on digital preservation, plans to create 3-dimensional records of the world's most endangered cultural assets while providing Hollywood filmmakers with a new and better way to incorporate exotic locations and artifacts into their productions. The 3D model of the 6th Street Bridge is just one example that Arc/k Project already have a sparse cloud of the famous section of the bridge crossing over the LA River. The organization hopes "to have a more realized model once we fill in some of the birds-eye with more high quality shots from overhead" and asks people who may have any top down photos or video of the 6th Street bridge that are higher than 1920×1080 in resolution, to donate them.[5]

As in the case of Arc/k Project team by gathering crowdsourced photographs and photogrammetry, endangered cultural heritage sites can be digitally rebuilt and shared with professionals and the community. By creating online

3 J.Kohn, online article
4 J.Kohn, online article
5 J.Antunes, online article

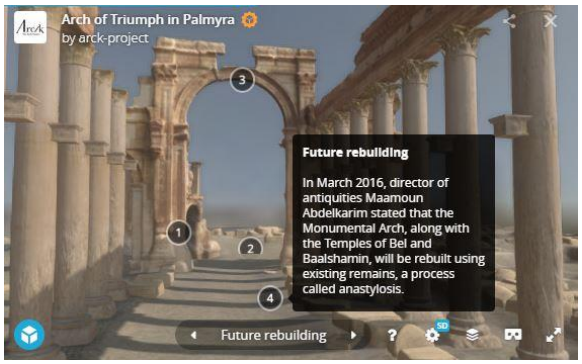
sites and platforms the endangered memory of our architectural heritage in the city of Skopje can be digitally rebuilt and shared. The process of accurately rebuilding cultural heritage sites which have been completely decimated is now a reality because of current technology, image sharing, and the vision and desire to do so. The Arc/k Project was founded for the very reason that cultural sites and antiquities are being destroyed around the world, lost to humanity and all future generations. The team knew that these endangered sites and cultural objects must be captured digitally to preserve them for the present and future generations to learn from and admire.

Figure 1 Sparse point cloud of the famous section of the 6th Street Bridge crossing over the LA River.



Through the process of collecting crowdsourced images online and images directly donated to The Arc/k Project by scholars from their existing historical archives, and by individual photographers, a team of photogrammetry specialists and artists have been able to restore, through photogrammetry, The Arch of Triumph, The Temple of Bel, and the interior of the Roman Theater at Palmyra in Syria.[6] The Syrian city of Palmyra stood for decades as a shining example of ancient civilization, now the city has been ravaged by ISIS, the terror group that has defiantly destroyed the cultural heritage of the lands they occupy.

Figure 2. 3D video of Arch of Triumph in Palmira by archk-project. The video can be experienced in VR as well.



What teams like the Arc/k Project are trying to do is generating the materials in order to be experienced in VR as well. In this case the viewer can get a real sense of what it was like to really be on the site. By making interactive

6 R. Marchou (2016)

online video of Arch of Triumph in Palmyra with information windows for certain elements of the site, everyone can have access to it and get information about the lost site.

Re-designing access to the urban memory of Skopje

Identity assists people in their identification, and in understanding how other people define them. Identity is built through a process of socialization. The society can be perceived as a collection of individuals that are interconnected with common rules and goals.[7]

The image of collective memory focuses on certain people, events and their spatial references - "places of memory". These places have been strengthened in our collective memory by an act of commemoration as invented structuring of time and space. All of this consists of commemorative landscapes composed of landmarks that provide spatial coordinates for remembering.[8] People are identified according to the built environment. Buildings are part of one unity creating an urban context that helps people to know who they are and where they belong. Through the built environment, individuals try to create a specific identity and memory. The identity and memory of architectural groups are rarely static and change when the shaped forms are lost by their destruction.[9] Replacement or reconstruction of buildings can lead to the resumption of memory and identity or their loss. Both the replacement and reconstruction processes are important in the cycle. The built objects play an important role in creating the identity and memory of people. We can say that the very existence and construction of the buildings do not create identity; destruction and disappearance of the buildings and the reconstruction of the lost ones are those that shape the identity of the people.[10]

“The ability of remembering is not specified only for visible buildings,
but also can come from absent ones.”[11]
Mark Krinson

In the urban core of the city of Skopje, the “places of memory” represent the few palaces left on the main

7 N. Houshangi (2013)
8 Coser L. (1992)
9 N. Houshangi (2013)
10 Dowell (2008)
11 Crinson (2005)

Figure 3 *3D reconstruction of a palace in the old urban tissue of Skopje by arch. Ivan Artemushkin. Owner of the palace: Velkovikj Panche, 1926. Reconstruction by Ekaterina Namicheva.*

city square along the river Vardar. These buildings in the urban core of the city are reminder of the past that contains the memory for the urban policies from the beginning of the 20th century. Renewing of the memory for the palaces, dating from the beginning of the 20th century, is one way to connect to Western Europe and one possibility through architecture to express our identity. One way in which we can rebuild memory is by making extended research and popularization of the style that prevails in the existing urban blocks that contain palaces (the urban core on the city square with the Ristic Palace from 1929, the house of Ikonomovi, 1922, and the house of Todorovi 1927). The popularization and education for the architectural heritage in Skopje dating from the beginning of the 20th century can be achieved through 3D models virtual reconstructions, both of the existing palaces and the demolished ones and by doing scientific research and online platforms.

The visual image of each individual for his identification with the place of his residence constitutes the historic part of the surrounding. Besides the rich fund of diversity of cultural heritage, architectural heritage creates a three-dimensional visual image. Certain monuments in one historical period become a trademark of identification of a particular urban settlement, i.e. become a state symbol for recognition (Paris, New York, Berlin, etc.). In Macedonia there is a chronology of the symbolic recognizability of an object in an urban settlement, such as the Stone Bridge for Skopje or the Samuil Fortress for Ohrid, the Clock Tower in Veles, etc. [12]

The memory of the palaces "trapped" in the archives, in archival documents and photographs, among which the most important is the technical documentation that testifies to their existence and planning. The reconstruction of Figure 3 is the work of the architect Ivan Artemushkin; one of the most important Russian architects that designed in Skopje from the beginning of the 20th century. Through virtual reconstructions and research, the central urban core of Skopje can be reconstructed with a large part of the residential buildings as well as the public that made up to the earthquake in 1963, the year when the city's image changes and the memory of the palaces starts to fade. The city of Skopje needs online platforms to which researchers, professionals and citizens can contribute, share stories, experiences, photographs, archival material, so the memory of the lost palaces can be restored for future generations.

12 P.Namichev (2016)

Discussion and findings

According to past experiences and observations during our research, we find significant influence of AI in different architectural domains and aspects of cultural heritage protection. We will emphasize several levels on which the use of AI is directly reflected cultural heritage:

-In the domain of technical documentation for research purposes and implementation of cultural heritage projects.

-In the application of new visual methods and systems for preserving the vital characteristics of cultural heritage.

-In the domain of documentation forms like archival documents as part of cultural heritage protection, where in a direct way contributes towards preservation of the real image of the value of cultural heritage.

-In development of interdisciplinary aspects of approach to cultural heritage conservation, creating a contemporary image of its implementation in the modern society.

Conclusion

The new techniques that are part of artificial intelligence are used in the process of documentation and conservation of architectural monuments and play an important role in preserving our cultural heritage. This paper shows how the use of AI compatible for documentation and conservation of architectural monuments, like 3D models and virtual reality shared at online platforms, can help to share the memory of cultural heritage.

Designing online platforms for heritage documentation can increase the public awareness of the values of cultural heritage. The city of Skopje and its architectural heritage is in need of public platforms and software like GIS (Geographical Information System) and different add-ins that can deliver the certain content among the population, especially youth, in order to preserve cultural memory. The advances in technology are allowing us to conserve, monitor and care for the historical sites and buildings with a lot of effectiveness making our heritage more accessible than ever. New online platforms and developments in digital technologies would enable people to inspect historic sites and artefacts from anywhere in the world, while a combination of digital documentation and animation would allow for accurate recreation of historic environments which can be explored even through gaming, making it more attractive to the young audience. With the help of AI as virtual reality can bring such environments to life, like the lost palaces of Skopje, creating illuminating experiences that transport the user into the past. By launching new technological experiences, people would be encouraged to explore the historic environment in new and innovative ways, contribute to sharing the memory and transforming the city with their knowledge.

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