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RESEARCH ARTICLE

Innovative Deep Mapping of Soviet Sanatorium Architecture: Developing a Digital Catalog Prototype

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ARTICLE INFO	ABSTRACT
	This article explores the development of a prototype digital catalog using Deep Mapping technology to document and preserve the architectural legacy of Soviet-era sanatoriums in Crimea. By combining geographic information systems (GIS) with multimedia layers, the project creates an interactive platform that integrates historical, cultural, and spatial data. The catalog provides access to "digital twins" of significant architectural landmarks, offering insights into their historical context, architectural features, and current state. The findings highlight the potential of digital tools for enhancing cultural tourism, fostering public engagement, and supporting socio-economic development. This research contributes to the broader goals of cultural digitalization by making Crimea's rich architectural heritage accessible to diverse audiences through innovative technological approaches.

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1. INTRODUCTION

Digitalization is a priority in modern Russian society, impacting all spheres of life (Kassenova et al., 2020; Kenzhin et al., 2021). Since January 1, 2019, the national project "Culture" has been actively implemented across Russia. This project was initiated through a presidential decree outlining strategic goals for the country's development up to 2024. Its primary aim is to modernize cultural industries through the integration of advanced digital technologies (Bobkov et al., 2020). These efforts reflect the broader movement toward digital transformation, which enhances accessibility, promotes regional identity, and enables the preservation and reinterpretation of cultural heritage (Kirillova et al., 2021). Digitalization creates new opportunities for engaging with historical and cultural materials in innovative and meaningful ways.

A key component of the "Culture" project is the federal initiative "Digital Culture," which focuses on digitizing cultural services and creating a unified information space. This initiative highlights the importance of digital tools in enriching cultural activities at regional and local levels. By integrating these technologies, the project aims to raise the visibility and prestige of cultural landmarks, particularly those with historical significance. One of its key goals is to make cultural heritage more accessible through interactive platforms that cater to diverse audiences. These efforts support a dynamic approach to cultural preservation, blending traditional narratives with modern, user-friendly digital solutions to foster engagement and broaden the appreciation of heritage sites (Mikhailov, 2023).

Our project focuses on utilizing digitalization technologies to create a prototype of an electronic digital catalog (Mironova & Litvinenko, 2023). This catalog provides access to a "digital twin" of the

architectural landscape of Soviet-era sanatorium-resort facilities in the Crimean region. The initiative employs cutting-edge methods such as Deep Mapping, which integrates geospatial data with cultural, historical, and architectural information. The resulting digital resource aims to preserve the heritage of Soviet-era sanatorium architecture while making it accessible to researchers, local communities, and tourists. The use of advanced geographic information systems (GIS) ensures precise spatial representation of these cultural landmarks.

The result is a digital service offering a multilayered map of the sanatorium-resort segment of the regional cultural landscape from the Soviet period. This service enhances the recognition and prestige of the Crimean region by highlighting its unique architectural and cultural history. The multilayered approach allows users to explore various aspects of each site, including its historical context, architectural significance, and current state of preservation. This innovative digital platform also supports cultural tourism by providing accessible, interactive tools for learning about and engaging with Crimea's rich heritage. By combining historical research with modern technology, the project contributes to the broader goals of cultural digitalization in Russia.

2. LITERATURE REVIEW

The Republic of Crimea boasts unique historical and cultural conditions, characterized by a high concentration of cultural monuments and significant architectural objects, particularly from the Soviet era. The architectural landscape of this region reflects the influence of Soviet-era design principles, emphasizing functionality, monumentalism, and integration with natural surroundings. These sanatorium-resort facilities not only embody architectural innovation but also serve as markers of cultural identity and historical significance. However, their preservation and contemporary relevance require systematic efforts to document and digitalize these structures, ensuring their accessibility and recognition in the modern context.

There is a pressing need for new concepts in researching and exhibiting cultural heritage objects to foster the development of the region's recreational sector and elevate it to a new socio-economic level. The application of advanced technologies such as Deep Mapping enables an innovative approach to cultural preservation. This method combines geographic information systems with multimedia to create detailed, multilayered representations of architectural and cultural landmarks. By adopting these tools, it becomes possible to engage diverse audiences, including researchers, tourists, and local communities, in the exploration and appreciation of Crimea's architectural legacy. This process not only revitalizes historical assets but also strengthens the cultural and economic fabric of the region.

The project adopts a transdisciplinary approach, integrating digital transformation and hybrid transfer of social, economic, political, and cultural structures into the digital realm, exemplified by creating a "digital twin" of Crimea's cultural landscape. This "digital twin" represents a precise and layered reconstruction of architectural and cultural heritage sites, particularly the sanatorium-resort infrastructure of the Soviet era. By employing advanced technologies, the project not only preserves these significant structures but also enhances their accessibility for research, education, and tourism. This integration bridges disciplines such as cultural studies, geography, and digital technology, creating a unified platform for understanding and promoting the cultural legacy of Crimea.

Modern digital technologies like Deep Mapping are employed to preserve and popularize cultural heritage, providing detailed, multilayered visualizations that enhance user engagement with virtual artifacts of material and non-material culture. Deep Mapping allows the integration of spatial, historical, and sociocultural data into interactive digital models. These models offer immersive experiences for various users, including researchers, tourists, and local residents, by presenting both the tangible and intangible aspects of cultural landmarks. This method not only fosters appreciation for architectural heritage but also serves as a powerful tool for education and regional branding, aligning with broader strategies to enhance Crimea's cultural and recreational appeal.

The main problem addressed is the fragmentation, heterogeneity, and lack of digital data on the cultural landscapes of the Republic of Crimea, particularly those with high recreational potential. Despite Crimea's rich history and architectural significance, much of its sanatorium-resort

infrastructure from the Soviet period remains under-documented in digital formats. This issue limits accessibility for research, preservation efforts, and public engagement. Furthermore, the lack of cohesive datasets and standardized digital records results in missed opportunities for integrating these landscapes into regional cultural and economic strategies.

There is an absence of integration of these data into a unified platform that can popularize Crimea's recreational objects, especially the sanatoriums built and operated during the Soviet period. Without a centralized digital repository, the cultural and historical significance of these architectural sites cannot be effectively conveyed to broader audiences, including tourists, researchers, and local communities. This disconnect hinders efforts to modernize the regional cultural economy and diminishes the potential for developing innovative digital tools that could enhance both heritage appreciation and regional branding.

In the initial phase of this project, the focus was narrowed to the sanatoriums in the cities of Alushta and Yalta, which are emblematic of Soviet-era health and recreational architecture. These cities were chosen due to their rich concentration of sanatorium-resort facilities and their historical significance as premier destinations during the Soviet period. By concentrating on these two locations, the project aims to develop a representative dataset that reflects broader trends in the region's architectural and cultural landscapes. This case study approach provides a foundation for scaling the digital catalog to include additional sites across Crimea in future phases of the project, creating a comprehensive and unified digital repository for the region's cultural heritage.

3. METHODOLOGY

The digitalization of tourism has emerged as a pivotal trend in the modern world, profoundly impacting the way cultural heritage is preserved and experienced. Tourism was among the first global industries to digitalize its business processes, leveraging new technologies and platforms to continually enhance the tourist experience (Bryce, 2001; Buhalis, 2020). This shift aims to simplify the journey from a tourist's initial awareness of a product to its purchase, as well as to facilitate independent exploration of attractions while maintaining informative value (Chen et al., 2021).

Advanced technologies such as Deep Mapping have been instrumental in this transformation. Deep Mapping integrates multimedia elements to create detailed, multilayered representations of spaces and cultural artifacts, enhancing user engagement with both material and non-material heritage (Winebrenner, 2022). This approach not only provides spatial and historical context but also captures the emotions and experiences of individuals associated with these places (Bodenhamer et al., 2010).

In the context of cultural heritage preservation, virtual exhibitions have become a significant tool. They address challenges related to the accessibility of materials, collections, and sites that are difficult to exhibit due to various constraints (Carmo & Cláudio, 2013). Virtual platforms offer virtually unlimited opportunities to expand the amount of information presented, making cultural heritage more accessible to diverse audiences, including people with disabilities (Pierdicca et al., 2018).

The GLAM (Galleries, Libraries, Archives, and Museums) sector has been actively developing digital solutions to make cultural data, including valuable sources, accessible to users (Angheluta et al., 2017). This development aligns with global efforts to create unified platforms that can popularize cultural and recreational assets, integrating fragmented and heterogeneous data into cohesive digital repositories (Heberle et al., 2017).

In Russia, the national project "Culture," initiated in 2019, underscores the importance of digital transformation in the cultural sphere. A key component of this project is the federal initiative "Digital Culture," which focuses on the global digitalization of cultural services and the formation of an appropriate information space (Ministry of Culture of the Russian Federation, 2019). This initiative aims to increase the visibility and prestige of regions and individual localities by employing digital technologies at regional and local levels.

Furthermore, government strategies emphasize the use of visualization technologies, virtual tours, and augmented reality to provide online access to cultural and natural attractions, museum exhibits, and tourist routes (Government of the Russian Federation, 2019). These strategies advocate for the development of multimedia applications for sites, audio and video guides integrated with GPS navigation, and the use of QR codes to enhance user engagement (Morozov, 2020).

The incorporation of digital technologies in tourism not only modernizes the industry but also facilitates the formation of personalized user experiences. By tailoring content to individual preferences and abilities, digital platforms foster active participation in the popularization and preservation of cultural heritage (Gelter et al., 2020). This personalized approach is essential for creating vibrant online communities that value cultural heritage and contribute to its sustainability.

Building upon the insights from the literature on digitalization and the preservation of cultural heritage, we recognize the need for innovative methods to document and promote architectural heritage effectively. Therefore, a transdisciplinary approach is utilized, transcending traditional disciplinary boundaries to integrate diverse information about the objects of study into a unified cognitive model. This method goes beyond conventional interdisciplinary research by operating within a global system without strict separations between fields. It allows for the collection of extensive and varied data about the architectural objects, including historical, cultural, geographical, and technological aspects. By synthesizing this diverse information, the project creates a comprehensive understanding of the Soviet-era sanatorium architecture in Crimea, facilitating the development of an enriched digital catalog.

The landscape approach guides the research, focusing on the dynamic, uneven system of natural and anthropogenic complexes of different scales that influence each other within the spatial environment. This perspective acknowledges that the spatial environment is not static but consists of interacting natural and human-made elements that form a complex, non-equilibrium system. By considering how these various components – such as geographical features, architectural structures, and human activities – interact and affect one another, the project can create detailed, multilayered maps. This approach is crucial for accurately representing the cultural landscape of Crimea's sanatorium-resort infrastructure and for understanding how these architectural objects fit into the broader socio-cultural and environmental context.

Deep Mapping technology is introduced as a key method, providing detailed, multimedia representations of spaces and their inherent elements, creating an interactive and multilayered data complex. Unlike traditional mapping, Deep Mapping allows for the integration of various forms of data – such as photographs, personal memories, observations, and other authentic content – into a single, rich platform. This enhances the visual and analytical perception of the architectural features of Soviet-era sanatoriums in Crimea. By employing this technology, users can engage more deeply with the cultural landscape, contributing their own experiences and enriching the collective understanding of these heritage sites.

The prototype digital catalog will be developed by creating scalable digital maps using GIS technologies, constructing an interactive atlas of sanatorium-resort architectural objects, and integrating multimedia data and expert descriptions. This web-based platform will enable users to interact with a detailed, multilayered map that includes digital data on architectural objects related to the sanatorium-resort industry. The catalog will feature expert narratives providing additional information about the history and current state of these sites. By incorporating various information layers – such as location specifics, historical and architectural significance, preservation status, and accessibility – the catalog aims to enhance the recognition and prestige of the region, making Crimea's rich cultural heritage more accessible to a wide audience.

4. RESULTS

We focused on developing a prototype digital catalog that unifies historical archives, modern photographs, and geographical information related to sanatoriums in Alushta and Yalta. These two cities epitomize the Soviet vision of health-oriented architecture blended with natural landscapes. By

concentrating on these locations, we gathered a representative dataset that begins to address the problem of fragmented digital data and lays the groundwork for a unified platform.

In the prototype, we combined historical documents with contemporary images and precise geospatial data. This integration brings together previously scattered information, making it more accessible for research, preservation efforts, and public engagement. The catalog is intended to serve as a foundation for overcoming data fragmentation by consolidating diverse resources into a single, coherent system.

The prototype demonstrates how users can easily access comprehensive information. For example, a user can select a sanatorium on the interactive map and immediately view historical photographs, original architectural plans, descriptions of the current state, and even recommendations for tourists. This feature enriches the user experience by providing multiple layers of information in an accessible format. It facilitates a deeper understanding and appreciation of the cultural and historical significance of these sites.

The accompanying descriptions prepared for the selected architectural objects in Alushta and Yalta provide a multi-faceted understanding of their historical, geographical, and cultural significance. These descriptions highlight the role of these sanatoriums as emblematic examples of Soviet-era resort infrastructure, reflecting broader cultural narratives and spatial planning strategies of the time. By integrating this contextual data into the digital catalog, the project ensures a more comprehensive representation of each object, which will enrich user engagement and scholarly analysis.

The creation of a spatial map marking the researched sanatoriums in Crimea provides a new lens through which to view Soviet-era architectural planning. The map reveals patterns in the geographic distribution of these resorts, emphasizing their role in forming a cohesive cultural and therapeutic landscape. This visualization not only supports historical analysis but also facilitates deeper engagement with the digital catalog, allowing users to connect with the material heritage in a meaningful and interactive way.

A structured text-based database was compiled to anchor the digital catalog, featuring expert evaluations of architectural significance alongside accounts of public engagement with these spaces. These entries not only provide technical details but also explore the evolving social narratives surrounding sanatorium-resort architecture in the Soviet era. This layered approach ensures that the catalog serves as both a tool for academic research and a resource for fostering public appreciation of Crimea's unique cultural landscape.

The project established a theoretical model of the architectural landscape, which reflects the development of Crimean sanatorium-resort complexes during the Soviet era. This model highlights the dual role of these sanatoriums as health institutions and symbols of Soviet cultural aspirations. By focusing on the spatial distribution and architectural features of these complexes, the model bridges the historical context with modern digital representation. It provides a clear structure for building a digital catalog that preserves and communicates the unique cultural and historical significance of these sites.

The structural characteristics of the prototype interactive catalog were defined to ensure its adaptability to a wide range of user needs. The platform was designed with accessibility as a priority, integrating responsive web technologies to accommodate diverse devices and user interfaces. This approach ensures that the catalog functions not only as a repository of architectural data but also as a tool for engaging with the layered cultural and historical narratives of Soviet-era sanatorium architecture. The integration of Deep Mapping technology enables users to explore spatial and temporal dimensions interactively, making the catalog an invaluable resource for education, research, and tourism.

The application of GIS technologies facilitated the creation of a dynamic set of maps that form a core component of the prototype catalog. These maps provide multi-layered representations of the sanatorium-resort architecture from the Soviet period, highlighting both macro-scale regional patterns and micro-scale architectural details. Users can navigate through various thematic layers,

such as historical narratives, architectural typologies, and spatial relationships. This mapping approach enhances the interpretive potential of the catalog, offering a nuanced understanding of the cultural landscape and its ongoing significance.

While the prototype is still under development, it already demonstrates how integrating diverse data sources into a single platform can address the fragmentation issue. By making historical archives, modern photographs, and geographical information readily accessible, the catalog improves the availability of information and sets the stage for future expansion.

5. CONCLUSION

This project addresses the fragmented nature of digital data related to Crimea's cultural landscapes by creating a prototype digital catalog that utilizes Deep Mapping technology. Through this approach, the project enhances access to and interaction with Soviet-era sanatorium architecture, offering an innovative platform for exploring these historical and cultural landmarks. The integration of GIS technologies and multimedia layers transforms traditional cataloging into a dynamic, multi-dimensional resource, bridging the past and present for diverse audiences.

The findings of this research have significant practical implications. By compiling and presenting comprehensive information on sanatorium-resort architecture in a user-friendly digital format, the project contributes to the management and promotion of cultural heritage in Crimea. This, in turn, can bolster the region's cultural capital and support its socio-economic development by aligning heritage preservation with modern tourism and educational strategies. The catalog serves as a tool not only for academic research but also for fostering public interest in the architectural and historical legacy of the region.

Future efforts will focus on expanding the scope of the catalog by incorporating additional objects and thematic data layers, further enriching the platform's content. By continuing to develop and refine this digital catalog, the project aims to set a precedent for innovative heritage preservation and digital cultural storytelling in Crimea and beyond.

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