



HYBRID MUSEALISATION THROUGH AUDIOVISUAL NARRATIVE AND ARTIFICIAL INTELLIGENCE IN RURAL HERITAGE

La Voz de las Torres (HERIT ADAPT) as a Case Study and Replicable Model

ANA GARCÍA LÓPEZ¹

agarcial@ugr.es

BEATRIZ RODRIGUEZ PÉREZ¹

beatrizrguez83@gmail.com

JOSÉ LUÍS RAMOS MUÑOZ¹

jlramosm@go.ugr.es

¹Universidad de Granada, España

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ABSTRACT

The integration of digital technologies has transformed museums into hybrid and distributed spaces, expanding their communicative, educational and experiential capacities beyond traditional physical boundaries, particularly in rural heritage contexts. This article analyses audiovisual narrative generated through artificial intelligence as a mediating device, based on the case of La Voz de las Torres, developed within the European project HERIT ADAPT, focused on the Nasrid defensive system of Western Granada.

The research adopts a qualitative approach based on a case study and practice-based research. The results show that these narratives enhance accessibility, structure dispersed heritage systems and foster territorial understanding, proposing a replicable model of hybrid musealisation.

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1. Introduction

In recent years, museums have undergone a profound transformation driven by the integration of digital technologies. Augmented Reality, Virtual Reality, Artificial Intelligence and audiovisual narratives have extended museum practices beyond the traditional exhibition space, fostering hybrid experiences that combine physical presence with digital mediation. This shift has redefined the museum as a communicative and educational platform rather than merely a container of objects and has called into question the “white cube” model. According to Pietroni (2025), the traditional museum has evolved from a physical container of objects towards hybrid models driven by digital technologies such as Augmented Reality, Virtual Reality and Artificial Intelligence. These transformations have encouraged the integration of audiovisual narratives and multisensory communication strategies as part of an evolutionary process of extended reality, in which the real and the virtual complement each other to expand accessibility, emotional engagement and audience participation, reinforcing the role of the museum as a dynamic system of cultural mediation.

These transformations are particularly relevant in contexts where heritage cannot be musealised through conventional models. Rural and territorial heritage systems, characterised by their dispersion, difficult accessibility or advanced state of deterioration, present significant limitations for traditional physical musealisation. In such cases, digital communication strategies become key tools for interpretation, heritage education and the activation of cultural interest. Suiçmez et al. (2025) highlight that the use of Virtual Reality and Augmented Reality enables the experience of historical events and cultural assets in a three-dimensional, interactive and multisensory manner. Likewise, AI applications play a significant role in the documentation, preservation and revitalisation of cultural heritage through processes such as digital archiving, automated analysis, the reconstruction of damaged assets and the recreation of lost elements, contributing to the sustainability of heritage in contexts where physical intervention is limited or unfeasible.

This article analyses the potential of audiovisual narrative generated through Artificial Intelligence as a hybrid museum experience, based on the case study of La Voz de las Torres, an audiovisual cultural product developed within the framework of the European project HERIT ADAPT (Interreg Euro-MED) as a strategy to promote sustainable tourism. The project focuses on the Nasrid defensive system of Western Granada, a network of watchtowers, alcazabas (fortified citadels) and fortifications which, despite their historical and territorial significance, remain largely invisible or inaccessible to contemporary audiences.

The aim of this research is to examine how AI-supported audiovisual narratives can function as expanded exhibition spaces, facilitating the interpretation of complex heritage systems and enhancing accessibility, audience engagement and educational outcomes. The research questions are oriented towards understanding the role of audiovisual storytelling as a museum communication strategy and the capacity of hybrid experiences to activate cultural understanding in non-musealised rural contexts.

2. Theoretical framework

2.1 Digital museums and hybrid cultural experiences

The evolution of the museum from a closed physical space towards distributed and expanded models has been widely addressed in the literature on digital museology. In this context, the museum is no longer understood exclusively as a building that houses collections, but rather as a system of cultural communication oriented towards the production of meaning, in which territory, narrative and experience converge. In the field of virtual museums, this transformation entails a reconfiguration of the subject-object relationship, as the encounter between visitor and object is replaced by digital representations mediated through interfaces, data structures and curatorial decisions (Guan et al., 2025).

However, this transformation has not been conceived in a homogeneous way. While some authors emphasise the complete virtualisation of the museum, others advocate hybrid models in which the digital does not replace the physical but extends its interpretative capacity, generating tensions between material presence and technological mediation. In this sense, it is necessary to delimit the concept of the hybrid museum in relation to other similar categories. Whereas the virtual museum is understood as a fully digital environment without a physical space, and the expanded museum extends its reach through

transmedia strategies and distributed narrative devices, the hybrid museum is characterised by the integration of both physical and digital spaces within a single museum experience. This model does not replace the material space, but complements it through technology, enhancing interpretation, accessibility and the continuity of the experience before, during and after the visit. In this way, the hybrid museum is configured as a system of mediation that articulates territory, digital devices and narrative within a unified experiential framework.

In the context of rural heritage, this hybridisation acquires a particular dimension, as the landscape itself can be conceived as a museological support. The visitor experience is thus constructed through the relationship between the physical environment, digital narratives and processes of cultural interpretation. In this context, immersion can be defined as the capacity of virtual environments to generate a sense of presence within the represented space, facilitating active exploration, interaction with the environment and contextual perception of place on the part of the visitor. These immersive experiences significantly influence the construction of perceived cultural value and processes of identification with heritage, reinforcing the complementarity between digital mediation and physical experience (Deng et al., 2023).

Digital communication strategies in museums not only expand the reach of cultural content but also enable more inclusive and accessible forms of engagement with heritage. In this sense, territory becomes an expanded museum space, where mediation does not depend exclusively on the physical presence of objects, but on the capacity to construct meaningful narratives. The territorial configuration of *La Voz de las Torres* aligns with approaches that conceptualise the museum as an extended structure not confined to the exhibition space. From this perspective, heritage value does not reside solely in material remains, but in the meanings constructed through their interpretation, transforming the environment into a space of distributed cultural experience (Smith, 2006). In this regard, audiovisual narrative generated with the support of artificial intelligence and cinematic techniques reinforces this contemporary logic of the expanded museum, integrating territory, narrative and digital accessibility.

Multichannel and digital communication has demonstrated how sectors of society historically excluded from cultural participation can access activities and cultural products under equal conditions, promoting immersive and participatory experiences (Espinosa Barahona & Chacón Betancourt, 2025). Furthermore, the need to rethink museum communication during and after the pandemic has led to more interactive models that strengthen the relationship between museum and community beyond traditional physical spaces (Raposo Camacho, 2022). From a design and mediation perspective, the incorporation of digital technologies also functions as a mediator, facilitating universal access to cultural heritage and the construction of meaningful narratives that transcend the physical presence of objects (Capra, 2022; Escadón-Montenegro, 2023).

2.2 Audiovisual Narrative and Artificial Intelligence in Museum Education

Audiovisual narrative has become a fundamental tool for cultural and educational mediation in museums and heritage contexts. The use of images, sound and storytelling enables the articulation of complex discourses in an accessible way, fostering both the transmission of knowledge and the emotional engagement of audiences. Kiourexidou and Stamou (2025) argue that artificial intelligence plays a key role in the transformation of digital museums by promoting more interactive, visitor-centred experiences, and that these audiovisual languages enhance both cognitive understanding and emotional engagement, acting as intermediaries between expert knowledge and the visitor's experience, particularly in digital or hybrid environments. In this context, artificial intelligence has shifted from a primary focus on increasing visitor numbers towards improving the qualitative dimension of the museum experience, becoming integrated into interactive narrative devices such as touchscreens, virtual tours, chatbots and personalised recommendation systems. Examples such as the conversational assistant at the National Museum of Copenhagen, AI-driven digital reconstructions and 3D printing at the Sanxingdui Museum, or immersive AI-based experiences developed in institutions such as the Dalí Museum in Florida or the MoMA, demonstrate how these technologies expand the possibilities for interpretation, personalisation and audience participation. Likewise, cultural platforms and artistic projects based on AI illustrate the potential of these tools to generate new forms of audiovisual mediation, strengthening learning, accessibility and the emotional connection between audiences and cultural heritage (Kiourexidou & Stamou, 2025).

The incorporation of artificial intelligence into the production of cultural content opens up new possibilities for visualisation, personalisation and accessibility. In the museum context, AI can support processes of visual reconstruction, narrative generation and the adaptation of content to different audiences. Moreover, AI not only optimises technological processes but also contributes to transforming the museum into an experiential learning environment, in which visitors actively interact with content and become part of the process of meaning-making (Kiourexidou & Stamou, 2025).

Sánchez, Guillén and Hernández (2025) highlight that AI, combined with immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR), is transforming heritage tourism by enabling educational, inclusive and personalised experiences that do not depend solely on physical visits to cultural sites. These tools facilitate historical reconstruction and cultural storytelling, enhance spatial perception and support the understanding of heritage in context, while real-time data analysis allows content to be adapted and personalised recommendations to be offered, including multilingual accessibility and more inclusive experiences. Furthermore, predictive and recommendation systems contribute to the sustainable management of tourist flows and the protection of heritage resources, while integration with generative models and blockchain technologies ensures authenticity, traceability and the global dissemination of cultural assets (Sánchez-Martín et al., 2025). From an educational perspective, AI should not be understood as a substitute for expert interpretation, but as a supporting tool that expands the narrative and communicative capacities of museum devices, providing broader strategies for cultural and scientific dissemination. In this way, the combination of AI and immersive technologies expands access to heritage, fosters participation, intercultural empathy and the revaluation of local identities (Sánchez-Martín et al., 2025).

However, the use of AI in museums raises ethical, epistemological and governance challenges that go beyond technical limitations, particularly in relation to historical fidelity, authorship, transparency in mediation processes and curatorial authority. Algorithmic and generative systems may challenge authorship and shift part of the interpretative authority away from curators, creating risks for the coherence of exhibited narratives and public trust. In addition, privacy and surveillance constitute critical issues, as smart museums collect large volumes of personal data to optimise experiences and manage visitor flows, requiring robust frameworks for data protection and informed consent. Intellectual property is also affected, as AI systems trained on protected content generate legal uncertainty regarding the ownership of produced works, especially in collaborative projects. Furthermore, data bias may reproduce cultural inequalities, and technological dependence may exacerbate disparities between institutions with differing resources, at times prioritising spectacle over educational and heritage value. Within this framework, AI should be understood as a tool supporting cultural and educational mediation, expanding the narrative capacities of the museum without compromising academic rigour or heritage responsibility. Its implementation therefore requires ethical frameworks and inclusive governance mechanisms that ensure equity, respect for cultural diversity and alignment with the museum's mission of conservation, education and public engagement (Yu, 2024, 2025).

3. Context of the case study: the Nasrid defensive system of Poniente Granadino REGION

¹The Nasrid-period defensive system in the Poniente Granadino region of the province of Granada (Spain) constitutes a complex territorial network composed of watchtowers, alcazabas, castles and structures for visual control of the territory. This system played a fundamental strategic role during the Nasrid period, articulating a defensive reading of the landscape based on intervisibility and the connectivity between sites, enabling Nasrid rulers to monitor strategic routes and coordinate military actions along a frontier marked by tension with the Christian kingdoms (Mattei, 2013; Trapero Fernández et al., 2024).

At present, many of these heritage elements are in a state of ruin, abandonment or difficult access, which limits their integration into conventional museum or tourism circuits. Territorial fragmentation and the absence of interpretative infrastructure hinder the understanding of the defensive system as a coherent whole.

¹ The Nasrid period in Granada refers to the time when the Nasrid dynasty (or Banū Naṣr), the last Muslim dynasty on the Iberian Peninsula, ruled from its capital in Granada (Spain) between 1232 and 1492.

Figure. 1. Torre de la Gallina (Moclín, Spain)



Retrieved from: <https://castillosnet.org//monumento.php?r=GR-CAS-126&seo=torre-de-la-gallina>, 04/01/2026/

These conditions reveal the limitations of traditional musealisation in addressing extensive and dispersed heritage systems and highlight the need for alternative strategies that enable their interpretation and communication without relying exclusively on physical intervention on the assets. Such factors underscore the importance of approaches such as digital interpretation and the creation of virtual routes, which allow heritage to be communicated and disseminated without direct physical intervention (García-Pulido & Ruiz-Jaramillo, 2018).

Specific case studies conducted by Rafael Pedregosa (2014) provide a detailed analysis of surveillance and territorial control structures in strategic locations such as Montefrío and Moclín, demonstrating how the architecture and spatial arrangement of towers and castles formed a coordinated network that ensured visual coverage and the effective defence of the Poniente Granadino region. This research, combined with broader spatial approaches, enables a deeper understanding of the territorial and strategic logic of the Nasrid kingdom and constitutes a solid foundation for the design of cultural and educational interpretation programmes that integrate dispersed elements into a coherent narrative (Mattei, 2013; Trapero Fernández et al., 2024).

Taken together, the historical, archaeological and spatial analysis demonstrates that the Nasrid defensive system of the Poniente Granadino region cannot be fully appreciated solely through physical visits to individual fortifications. Rather, it requires integrative and mediated strategies that incorporate digital tools, contextualised narratives and interactive routes, enabling the system to be interpreted as a coherent and accessible heritage unit for researchers, students and the general public.

4. Methodology

The research adopts a qualitative approach based on a case study and a practice-based research methodology, in which the audiovisual creation process constitutes both the object of study and the means of knowledge production.

To strengthen the analysis, three analytical categories were established:

- (1) narrative coherence,
- (2) visual continuity in generative environments, and
- (3) capacity for territorial mediation.

These categories enabled the evaluation of the audiovisual device in relation to its interpretative objectives.

The analysis focuses on the design, production and implementation of *La Voz de las Torres* as both a cultural product and a heritage mediation device, drawing on the systematic observation of the creative process. This approach is particularly appropriate in the fields of visual communication and digital museology, where narrative and technological experimentation form part of the research process itself and generate knowledge through decisions related to scripting, design, generation and editing (Candy & Edmonds, 2018; Yin, 2018).

The sources used include historical documentation, specialised bibliography, visual archives and territorial references. Based on these sources, an audiovisual creation process was developed using artificial intelligence tools, enabling the generation of images, narratives and coherent sequences

inspired by historical episodes linked to the heritage of the Poniente Granadino region. These representations do not aim at exact reconstruction, but rather at a narrative and interpretative dissemination grounded in real events.

The workflow integrates criteria of heritage fidelity, communicative clarity, visual coherence and educational potential, and considers both in situ access via mobile devices and remote access through digital platforms.

In an initial phase, relevant historical events, motifs and situations were identified in order to articulate a narrative pathway capable of representing the defensive system as an interconnected whole. Based on this corpus, a storyline was defined, structured into serial narrative units, allowing for flexible construction during editing. The script incorporates a fictional character situated around 1550, linked to the academic context of Granada, who serves as a narrative thread, facilitating the articulation of spatial and temporal transitions.

In parallel, a visual design phase was developed to ensure aesthetic coherence. Character sheets and environment sheets were produced to stabilise features, clothing, architecture and atmospheres, thereby reducing the variability inherent in generative systems. The generation of still images followed an iterative process of production, selection and refinement.

Audiovisual production was structured through an image-to-video approach, using previously validated frames as the basis for motion generation. This method enabled the maintenance of visual continuity while reducing generative variability. Editing was conceived in a modular way, through micro-sequences that could be reorganised or replaced without compromising overall coherence.

The sound design was organised into four layers: ambience, effects, music and voice. Music was generated using AI tools based on stylistic criteria, while the verbal layer was developed through dialogue writing and voice synthesis differentiated by character, with subsequent adjustment of rhythm, pauses and emphasis during editing.

Historical plausibility was controlled throughout the entire process, considering territorial coherence, materiality and contextual appropriateness. Detected inconsistencies were resolved through the correction or replacement of sequences.

Finally, the result is integrated into a hybrid mediation device designed for digital dissemination and territorial use, with the capacity for progressive expansion.

One limitation of the study is the absence of empirical validation with end users, which opens future lines of research aimed at evaluating reception, educational impact and visitor behaviour.

Figure. 2. “The Voice of the Towers”



José Luis Ramos & NanoBanana Pro (September 2025)

5. La Voz de las Torres as a hybrid museum experience

5.1 Audiovisual narrative as an exhibition device

In the absence of a physical museum infrastructure—or as a means of augmenting existing provision through a hybrid approach—*La Voz de las Torres* positions audiovisual narrative as the primary exhibition device. The project constructs a museum space grounded in storytelling, in which image, sound and voice articulate the interpretation of the Nasrid defensive system. In this way, the audiovisual resource ceases to function merely as a complementary support and instead becomes an autonomous

exhibition language, through which the museum is conceived as a narrative constructed by means of images, sounds and sequential storytelling.

From this perspective, audiovisual media enable the configuration of an expanded exhibition space that integrates and reinterprets inaccessible, fragmented or lost heritage assets, overcoming the constraints imposed by the material object and by the conventional architectural container. In doing so, the focus shifts from material objects to the experience of interpreting and communicating heritage (Kasemsarn & Nickpour, 2025; Marfil Carmona, 2011).

Figure. 3. Torre de la Porqueriza (Moclín, Spain)



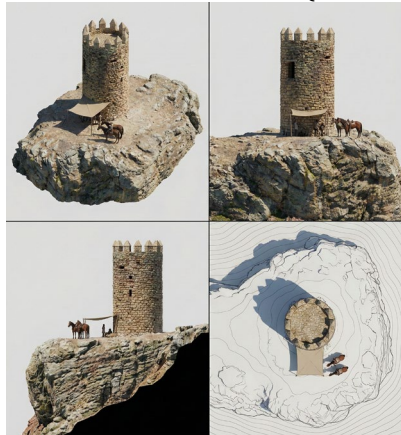
Manuel Argüelles Márquez (1987)

Figure. 4. Torre de la Porqueriza (Moclín, Spain)



Retrieved from <https://consvega.com/torre-de-la-porqueriza/04/01/26>

Figure. 5. Torre de la Porueriza (Moclín, Spain)



José Luis Ramos & Gemini (January 2026)

Landmark projects such as the Imperial War Museum North, which uses audiovisual projections to narrate complex historical contexts, or EUscreen, which digitises and exhibits audiovisual heritage archives, demonstrate how audiovisual media can function as exhibitions in their own right, placing content at the centre and shifting the experience from the container to the narrative (Imperial War Museum North, 2021). Likewise, recent research on archaeological museums and virtual environments

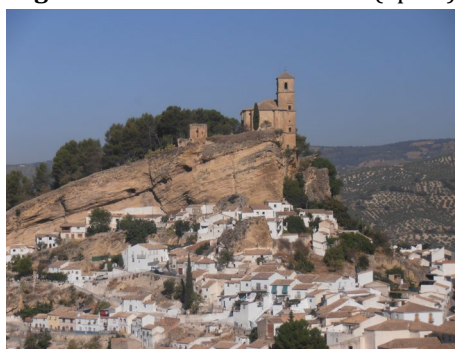
highlights that the combination of image, sound and interactive technologies enables the construction of a coherent and emotionally engaging discourse, capable of cognitively involving visitors and reinforcing heritage memory (Benente, Minucciani & Semeraro, 2024).

Audiovisual media thus operate as an expanded exhibition space capable of integrating inaccessible or lost heritage elements, overcoming the limitations of the physical object and the traditional architectural setting. In this way, the museum experience shifts from the container to the narrative content.

5.2 AI-generated narratives for heritage interpretation

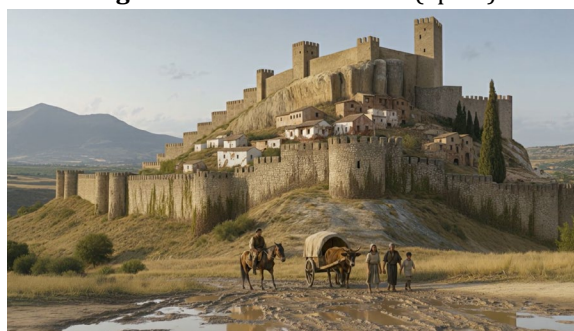
Artificial intelligence plays a central role in the generation of visual and narrative content in *La Voz de las Torres*. AI tools enable the recreation of historical landscapes, the visualisation of vanished structures and the development of audiovisual narratives grounded in documentary sources, facilitating the articulation of an integrated territorial interpretation of the Nasrid defensive system.

Figure. 6. Castillo de Montefrío (Spain)



Retrieved from: <https://www.monumentalnet.org/monumento.php?r=GR-CAS-024&seo=castillo-de-montefrio-montefrio-granada-andalucia/04/01/2026/>

Fig. 7. Castillo de Montefrío (Spain)



José Luis Ramos & NanoBanana (August 2025)

Artificial intelligence is conceived here as a mediating tool that expands the possibilities for the interpretation and visualisation of heritage, without replacing historiographical rigour or expert supervision. In this context, the generated images should not be understood as definitive reconstructions, but rather as visual hypotheses—that is, interpretative representations grounded in available historical knowledge, formal and territorial analogies, and coherent narrative criteria. This approach aligns with the methodological tradition of virtual archaeology developed by Jódar Miñarro (2019), who emphasises that any visualisation of the past constitutes an interpretative exercise and, therefore, must transparently communicate the scope of the interpretation undertaken, acknowledging its necessarily hypothetical and revisable nature, and distinguishing between documented data and reconstructions derived from interpretative reasoning.

This perspective is consistent with the principles established in the London Charter for the Computer-based Visualisation of Cultural Heritage, which advocates interpretative transparency and the explicit distinction between documented evidence, reasoned inference and visual interpretation. Among its key principles is the requirement that digital visualisations should clearly communicate the degree of knowledge they represent, distinguishing between what is supported by documentary and scientific

evidence, what is based on justified reasoning and what constitutes hypothetical visual interpretation. Furthermore, it recommends that all information regarding sources and interpretative processes should be sufficiently documented so that users can understand and evaluate the results of the visualisation in relation to its purpose and context (London Charter, 2009).

These visual hypotheses fulfil a mediating and pedagogical function by enabling audiences to imagine plausible historical scenarios and to understand spatial and functional relationships that are no longer directly visible in the territory. At the same time, the project maintains a critical stance regarding the limits of automation, recognising the need for continuous expert supervision and acknowledging the inherently provisional and open-ended nature of this type of visualisation.

5.3 Hybrid experience: territory, screen and visitor

La Voz de las Torres is conceived as a hybrid museum experience that integrates territory and digital mediation. The audiovisual content can be accessed both *in situ*, during visits to the territory, and remotely via digital platforms, extending the reach of the project beyond its geographical context. As Ross Parry (2010) observes, contemporary museums manage both traditional and digital collections, with new technological media integrated into exhibition spaces, and online visits becoming as significant as physical ones. In this same vein, new technologies enable the museum experience to extend beyond the physical site, evolving into a continuous engagement for the visitor, enriched by technological resources (Tallon & Walker, 2008). This implies a complementary relationship between the physical and the digital within the museum experience.

The audiovisual content of *La Voz de las Torres* can therefore be consumed both *in situ*, during visits to the territory, and remotely through digital platforms. As John H. Falk and Lynn D. Dierking (2013) argue, this dual modality means that the museum experience does not begin when the visitor enters the museum space nor end when the visit concludes but extends over time. The museum visit may function as a starting point or as reinforcement of pre-existing interests. When the experience is meaningful and connects with activities beyond the museum—such as visits to other institutions, reading, audiovisual consumption or play, particularly in family contexts—it can lead to deep learning that develops over weeks, months or even years.

This continuity between physical and digital experience strengthens learning processes and fosters a deeper relationship with heritage. The territory thus becomes a distributed museum, supported by audiovisual narrative and digital accessibility, offering a replicable model for other rural or non-musealised heritage contexts. The territorial configuration of *La Voz de las Torres* aligns with approaches that conceptualise the museum as an extended structure not confined to the exhibition space. From this perspective, the landscape operates as an interpretative medium, transforming the environment into a space of heritage mediation and distributed cultural experience (Mazuecos-Sánchez & García-López, 2014). In this sense, AI-generated audiovisual narrative reinforces this contemporary logic of the expanded museum, integrating territory, narrative and digital accessibility.

From this standpoint, the territory can be understood as an expanded museum, in which physical space functions as one of the central axes of a broader, mediated and digitally augmented museum experience. At the same time, the incorporation of audiovisual narratives enables the transformation of the territory into an active narrative space, where meaning is constructed through the interaction between the physical context and digital content (Pietroni, 2025). This approach is particularly relevant for rural or non-musealised heritage contexts, as it provides a flexible, accessible and replicable strategy without the need for conventional museum infrastructures.

6. Results and analysis

The case study of *La Voz de las Torres* yields significant results both in terms of heritage mediation and in the definition of an audiovisual production method based on artificial intelligence, applicable to rural and territorial heritage contexts. First, the project's serial structure, organised into interconnected narrative units, facilitates a progressive understanding of the Nasrid defensive system, reducing the fragmented perception typically associated with dispersed heritage landscapes. The progression through short segments enables the viewer to establish relationships between places, functions and landscapes throughout the sequence, reinforcing an accumulative reading of the territorial whole. This approach aligns with perspectives that conceive audiovisual media as a narrative device capable of

articulating complex heritage systems through storytelling and interpretative experience, beyond the isolated presentation of individual heritage elements (Marfil Carmona, 2011).

The use of a guiding character situated in the sixteenth century reinforces narrative continuity and facilitates transitions between spaces and temporalities. This device introduces a dramatic thread that organises information, sustains the viewer's attention and improves the readability of the overall narrative when landscapes, historical episodes and varying tonal registers are combined. From a narrative perspective, this strategy contributes to the construction of a coherent and recognisable world, enhancing immersion and supporting the understanding of the defensive system as an interconnected network (Jenkins, 2004; Ryan, 2001).

From a methodological standpoint, the pre-design phase based on character sheets and environment sheets proved to be a key element in ensuring the visual coherence of the project. In generative environments, uncontrolled variations particularly affect facial features, clothing, construction materials and architectural elements. The development of character sheets with multiple views, consistent costumes and recurring attributes enabled the stabilisation of visual identities and reduced unwanted variation across sequences. Complementarily, the systematic design of settings and reconstructions helped maintain continuity in atmospheres, textures and spatial legibility, even when alternating between tools and generative models. This approach reinforces the credibility of the mediation device by positioning generated images as grounded visual hypotheses—explicitly interpretative and subject to revision—in line with the principles of critical heritage visualisation (Jódar Miñarro, 2019; London Charter, 2009).

The image-to-video workflow, based on previously refined master frames, proved effective in maintaining aesthetic continuity and improving the predictability of results. Starting from validated visual bases facilitated the generation of motion without compromising identities or environments, a particularly relevant factor in sequences where the recognition of characters and places is essential for narrative comprehension. The combination of local tools and external platforms—such as Wan Video, Kling and, occasionally, Veo 3—provided flexibility in addressing different types of shots and adjusting motion behaviour and atmosphere according to narrative requirements. Moreover, this approach enabled the regeneration of specific shots without disrupting the overall editing process.

One of the most significant outcomes is observed in the modular editing structure. Working with micro-sequences enabled a dynamic and flexible editing process, capable of incorporating adjustments as the overall composition was evaluated. The possibility of adding short supporting shots, reinforcing transitions or correcting rhythmic imbalances allowed for continuous refinement of the edit, consistent with the incremental improvement logic characteristic of generative production environments. Unlike traditional workflows, the reduced dependence on filming expanded the capacity for intervention during the editing phase, transforming the timeline into the primary space for narrative and formal decision-making (Manovich, 2013, 2020). This model also facilitates future expansion of the device, as it allows for the incorporation of new units without altering the overall architecture, provided that established design and continuity criteria are maintained.

In the sonic dimension, layered integration—comprising ambience, effects, music and voice—enhanced narrative cohesion and viewer immersion. Territorial soundscapes contributed to sustaining a sense of place, while sound effects added narrative texture and supported actions and transitions. Music generated through AI enabled fine-tuning of tone according to each segment, alternating evocative registers associated with the Andalusí context with contemporary epic textures during moments of dramatic progression. In this way, the soundtrack contributed to balancing variety and continuity within a serial structure, maintaining a recognisable sonic identity.

The verbal layer, based on dialogue written in segments and voice synthesis with differentiated identities, reinforced narrative clarity and character recognition. Control over timbre, tone and cadence ensured interpretative continuity throughout the edit and improved integration between voice, image and music. In terms of reception, the voice functioned as a narrative guide in segments with higher informational density, modulating rhythm and enhancing content legibility without overloading the visual layer.

From a museological perspective, the hybrid format extended the continuity of the interpretative experience. The content can be consumed remotely and used to complement the territorial visit, enabling viewers to access interpretative keys in advance, recognise relationships during the visit and retain contextual understanding afterwards. This approach is particularly relevant in rural contexts with

dispersed heritage, where in situ mediation is often limited and comprehension depends on devices capable of connecting spatial points and providing them with integrated meaning (Parry, 2007; Sánchez-Martín et al., 2025).

The analysis also highlights the importance of continuous review in maintaining contextual plausibility. The evocative power of AI-generated images, music and voice require critical selection, as well as the correction or replacement of elements when inconsistencies of period, stylistic discontinuities or narrative mismatches arise. The method is therefore structured as an iterative process of generation, evaluation, correction and integration into the final edit. Overall, the study outlines an audiovisual production model based on design libraries, controlled motion generation, modular editing and an integrated sound system, particularly suited to heritage mediation in rural and territorial contexts requiring flexible and scalable communication strategies.

7. Discussion

The results of the study enable reflection on the role of artificial intelligence as a cultural mediator in museum and heritage contexts. In the case of *La Voz de las Torres*, AI is not employed as an end in itself nor as a purely technological resource, but as a tool that expands the project's narrative and communicative capacities. This approach positions AI in the service of heritage interpretation and educational objectives, reinforcing its function as a mediating support rather than as an autonomous generator of meaning.

The use of audiovisual narratives generated with AI support offers significant opportunities for rural heritage, particularly in cases where physical musealisation is unfeasible. Among these opportunities are the potential to make overlooked heritage elements visible, to reconstruct historical contexts in an accessible manner, and to provide experiences for diverse audiences. Furthermore, this model contributes to the democratisation of access to heritage by reducing the geographical and material barriers associated with physical visits.

However, the analysis also highlights several limitations and challenges. These include the risks of narrative simplification, technological dependence, and ethical issues related to historical fidelity and transparency in the use of AI-generated content. These aspects underline the importance of maintaining continuous expert supervision and of clearly communicating the mediation processes involved.

From a museological perspective, the case study raises relevant implications for museum communication and heritage education. The integration of hybrid experiences and AI-based audiovisual narratives suggests new models of distributed and “museum without walls” approaches, particularly suited to territorial heritage systems. These models expand the scope of the museum as a cultural institution and reinforce its educational function in non-conventional contexts.

8. Conclusions

The study of *La Voz de las Torres* highlights the potential of AI-generated audiovisual narrative as an innovative strategy for hybrid musealisation and heritage communication. The research demonstrates that this approach enables the interpretation of complex and dispersed heritage systems, overcoming the limitations of traditional musealisation and offering accessible and meaningful cultural experiences.

Among the main contributions of the study is the proposal of a mediation model based on audiovisual storytelling as an expanded exhibition space, capable of integrating territory, history and technology. This model contributes to current debates in digital museology and hybrid museums, providing an applied perspective focused on rural and non-musealised heritage.

Moreover, the replicable and transferable nature of the proposal constitutes one of its key strengths. The methodology and strategies developed in *La Voz de las Torres* can be adapted to other heritage contexts with similar characteristics, both territorially and thematically, fostering innovation in cultural communication and heritage education.

Finally, the article opens future lines of research aimed at further exploring the educational impact of AI-generated audiovisual narratives, as well as the development of ethical and sustainable models for their integration into museum practices. In this sense, artificial intelligence is conceived not as a universal solution, but as a strategic ally in the construction of hybrid, inclusive and knowledge-oriented museum experiences.

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Referencias

- eeton, S. (2016). *Film-induced tourism* (2nd ed.). Channel View Publications.
- Benente, M., Minucciani, V., & Semeraro, M. (2024). Narrative apparatus in archaeological museums and communication for all. En *Design for inclusion* (pp. 1–11). CMS Conferences.
- Candy, L., & Edmonds, E. (2018). Practice-based research in the creative arts: Foundations and futures. *Leonardo*, 51(1), 63–69. https://doi.org/10.1162/LEON_a_01471
- Capra, M. (2022). El diseño como hipermediador entre las personas y el acceso al arte y la cultura: Experiencias inclusivas y nuevas tecnologías. *Cuadernos del Centro de Estudios de Diseño y Comunicación*, (166). <https://doi.org/10.18682/cdc.vi166.7054>
- Connell, J. (2012). Film tourism—Evolution, progress and prospects. *Tourism Management*, 33(5), 1007–1029. <https://doi.org/10.1016/j.tourman.2012.02.008>
- Deng, Y., Zhang, X., Zhang, B., & Qin, J. (2023). From digital museums to on-site visits: The mediation of cultural identity and perceived value. *Frontiers in Psychology*, 14, 1181954. <https://doi.org/10.3389/fpsyg.2023.1181954>
- Escandón-Montenegro, P. (2022). Comunicación digital para la construcción del patrimonio cultural y cognoscitivo. *Tecnogobierno. Editorial UNRN*. <https://doi.org/10.4000/books.eunrn.6332>
- Espinosa Barahona, J., & Chacón Betancourt, L. (2025). Educación y accesibilidad en museos: Explorando el potencial de la comunicación transmedia. *Uru: Revista de Comunicación y Cultura*. <https://doi.org/10.32719/26312514.2025.11.11>
- Falk, J. H., & Dierking, L. D. (2013). *The museum experience revisited*. Routledge.
- Mazuecos-Sanchez, A.B., & García-López, A. (2014). The Extendable Museum. Art Prosthetics Overlaid on the Natural and Urban Environments in the 1st Granada Millennium Biennale Event. *The International Journal of Social, Political and community agendas in the Arts. Vol. VIII*, Issue 2: 26–38. Common Ground Publishing LLC. ISSN 2326-9960 DOI: 10.18848/2326-9960/CGP/v08i02/27-37. Champaign, Illinois, USA
- García-Pulido, L. J., & Ruiz-Jaramillo, J. (2018). *Muslim heritage and environment: The case of the watchtowers of the Nasrid Kingdom of Granada (thirteenth to fifteenth century)*.
- Guan, H., Chen, P., & Kwon, C. L. (2025). Virtual museums as meaning modeling systems in digital heritage. *Heritage*. Advance online publication.
- ICOMOS. (2008). *The ICOMOS charter for the interpretation and presentation of cultural heritage sites (The Ename Charter)*. https://www.icomos.org/charters/interpretation_e.pdf
- Imperial War Museums. (2021). *Digital immersive exhibitions and audiovisual interpretation at Imperial War Museum North*. <https://www.iwm.org.uk>
- Jódar Miñarro, A. (2019). *Arqueología virtual y visualización del pasado: Metodología y criterios científicos*. Universidad de Granada.
- Kasemsarn, K., & Nickpour, F. (2025). Digital storytelling in cultural and heritage tourism: A review of social media integration and youth engagement frameworks. *Heritage*, 8(6), Article 200. <https://doi.org/10.3390/heritage8060200>
- Kiourexidou, M., & Stamou, S. (2025). Interactive heritage: The role of artificial intelligence in digital museums. *Heritage*, 8(1), 142. <https://doi.org/10.3390/heritage8010142>
- London Charter. (2009). *The London Charter for the computer-based visualisation of cultural heritage*. <https://www.londoncharter.org>
- Manovich, L. (2013). *Software takes command*. Bloomsbury Academic.
- Manovich, L. (2020). *Cultural analytics*. MIT Press.
- Marfil Carmona, J. (2011). Análisis del museo como narración audiovisual. *Comunicar*, 19(37), 151–158. <https://www.redalyc.org>
- Mattei, L. (2014). *Los castillos de frontera nazaríes y sus precedentes en los montes occidentales de Granada: Un análisis espacial y del territorio* (Tesis doctoral). Universidad de Granada. <http://hdl.handle.net/10481/31200>
- Parry, R. (2010). *Museums in a digital age*. Routledge.
- Pedregosa Megías, R. J. (2014). Técnicas constructivas en las torres-atlayas de Montefrío (Granada): La Torre de las Cabrerizas. *Arqueología y Territorio Medieval*, 21, 195–214.
- Pietroni, E. (2019). Digital storytelling and cultural heritage interpretation. *Journal on Computing and Cultural Heritage*, 12(2), 1–15. <https://doi.org/10.1145/3297710>

- Pietroni, E. (2025). Multisensory museums, hybrid realities, narration, and technological innovation: A discussion around new perspectives in experience design and sense of authenticity. *Heritage*. Advance online publication.
- Project EUscreen. (s. f.). *EUscreen: Audiovisual heritage for Europe*. <https://euscreen.eu>
- Raposo Camacho, R. (2022). Reseña de Investigación y buenas prácticas en educación patrimonial entre la escuela y el museo. *MIDAS*, 14. <https://doi.org/10.4000/midas.3073>
- Ryan, M.-L. (2001). *Narrative as virtual reality: Immersion and interactivity in literature and electronic media*. Johns Hopkins University Press.
- Sánchez-Martín, J. M., Guillén-Peñafiel, R., & Hernández Carretero, A. M. (2025). Inteligencia artificial en el turismo patrimonial: Innovación, accesibilidad y sostenibilidad en la era digital. *Entornos de Aprendizaje Inteligentes*, 12, Artículo 45.
- Smith, L. (2006). *Uses of heritage*. Routledge.
- Suiçmez, H., Altınay, Z., Dağlı, G., Zeng, Y., Shadiev, R., İşlek, D., Danju, I., & Altınay, F. (2025). Artificial intelligence applications in museums: Enhancing visitor experience and learning. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-024-12465-7>
- Tallon, L., & Walker, K. (Eds.). (2008). *Digital technologies and the museum experience*. AltaMira Press.
- Trapero Fernández, P., Fernández Lozano, P. J., Iglesias García, L., & Ruiz Pilares, E. J. (2024). La defensa de la frontera del reino nazarí de Granada en el alto Guadalete: Movilidad y control visual. *Gladius*, 44, 386–410. <https://doi.org/10.3989/gladius.2024.386>
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.
- Yu, Z. (2025). Beyond the algorithm: How AI is reshaping museums—Education, narrative and visitor experience. Artículo de revisión sistemática en repositorio institucional (Open Access).