

Georeferenced digital tools: facilitating Cultural Heritage tourism experiences

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Abstract

This research explores effective ways of representing Cultural Heritage data for tourist users, emphasising the relevance of georeferenced digital tools. It addresses the need for long-term storage and visualisation of 3D models, aligning with UN Agenda 2030's emphasis on digitisation. Leveraging free and open-source technologies, it advocates for methodologies for online data storage and stresses standards like the Semantic Web for interoperability. The study focuses on designing a digital product for tourists, integrating historical research with digital data acquisition – incorporating textual documentation, 3D models, images, videos, and geospatial information, optimised for machine-readability and integration into Linked Open Data networks; plus, Semantic Web technologies enable effective searches also for non-experts. Such products can facilitate autonomous tourism, avoiding mass tourism and potentially promoting positive socio-cultural impacts. They cater to diverse user bases, contributing to tourism identity construction and possibly shaping future academic and tourism industry developments. The examination of the case studies, the Franciscan convents in the Umbrian region, offers interesting points for reflection, especially for the relevance of its adequate safeguard and inclusion in tourist routes.

Keywords

cultural heritage, georeferenced digital tools, tourism, semantic web, data representation.



Graphic elaboration of the author.

Introduction

The research outlined in this contribution aimed to investigate the most appropriate ways of representing the data relating to the Cultural Heritage, in the context of dissemination aimed at a tourist user, considering the relevance that georeferenced digital tools are gaining internationally. This topic has been addressed from various perspectives, both in the practice of conservation and in the theories of heritage protection and enhancement: Web repositories, WebGIS platforms, and cloud-based storage are emerging, for the purposes of long-term storage, visualisation, and analysis of 3D models. The United Nations' Agenda 2030, among its many objectives, aims to “strengthen efforts to protect and safeguard the world’s cultural and natural heritage”, also emphasising digitisation [United Nations UN]. Research in this field aims to define methodologies for the long-term online storage of data related to Cultural Heritage, repeatable and expandable, using free and open-source technologies [Nishanbaev 2020]. Furthermore, over the past two decades, there’s been a notable focus on enhancing the connectivity and compatibility of data online, integrating diverse sources into a unified framework, and standardising resource descriptions. Tim Berners-Lee’s response to the rise of unstructured online information was the Semantic Web project, aiming to establish a standard format for data description, leading to a network of documents readable both mechanically and semantically. This initiative was further advanced by the Linked Data movement, promoting interconnected sets of semantic data. Users, particularly in gathering geographic data, have played a pivotal role. The collaboration between crowdsourcing, Volunteered Geographic Information (VGI), and the Semantic Geospatial Web has spawned notable projects like Wikipedia and OpenStreetMap (OSM), leveraging a wiki-based approach for an open-world map. Various Geo-Knowledge Bases, such as LinkedGeoData, GeoNames, and GeoWordNet, have structured existing data for dissemination on the Semantic Web [Ballatore et al. 2014].

Maps and critical data representation

The use of georeferenced tools in Cultural Heritage requires careful consideration of optimal methods for map representation and related data visualisation, to facilitate user comprehension. Enhancing User Experience (UX) is crucial, as emphasised in Ergonomics literature [Tosi 2018]. Effective visualisation techniques are essential for interpreting data collections, with certain methodologies proving more effective in conveying content [Tomasi 2022]. Adaptation to specific cases is key; for instance, spatial and temporal data analysis can be effectively expressed through maps and timelines, while 3D models aid in understanding architectural spatiality. Maps, like all human artifacts, embody cultural values, interpretations of the world, and encoding conventions [Drucker 2014]. Mapping records experiences, not just elements, initially serving as guides for spatial orientation. The distinction between space and place raises questions about appropriate geographical data



Fig. 1. Left: one of the interactive maps of the *Noisy Cities* project, in which maps and noise pollution data in major cities are correlated; right: example of a thematic map where the maps are overlaid with data from the running monitoring apps (from: BigThink).

representation: cartographic markup languages offer rational point localisation but may not fully convey spatial meanings, necessitating the use of suitable legends, symbols, and spatial distortions for effective communication [Strange Maps; FlowingData; Casti 1998]. Maps are not just texts but also spaces, extending beyond the margins of paper through intertextual connections with other texts and spaces. This understanding poses methodological challenges, requiring a non-linear approach to trace intertextual connections. Rather than simply providing background context, maps “make present” images, memories, and spaces for interpretation. By exploring the symbols and icons within the map itself and comparing them to other representations, we reveal how map spaces contribute to the reproduction of spaces and identities while also undermining fixed categories [Del Casino et al. 2000]. Territorialisation involves naming and imbuing anthropic characteristics, transforming spaces into experienced places [Casti 1998]. Map functions include practical use for mobility and orientation, metaphorical representation of territories, and mediation between users and territories. In Digital Humanities, a crucial lesson for georeferencing and representing digital data within a holistic approach is contextualising material artifacts within their specific production circumstances. While artifact properties are evident, their meanings require critical analysis. Analysing digital artifacts reveals insights into their production modes, focusing on media that shape meaning rather than just serving as tools. Quoting Drucker [2013], rep-



Fig. 2. Aerial photos of the conventual complexes of the Romita di Cesi (TR), the Speco di Narni (TR) and the Eremo delle Carceri (PG). Pictures by P. Becherini, A. Lumini, M. Medici.

representations are not merely presentations, but specific theoretical abstractions expressed in various forms, becoming transactional objects of meaning production within material forms. Emphasis is thus placed on understanding artifacts as constitutive rather than representative [Drucker 2013].

In this context, the georeferenced tools currently available for the digitisation of Cultural Heritage also prove to be effective for the representation of heritage for communication purposes aimed at a tourist audience.

The case studies: Franciscan Observance settlements in Umbria

The examination of case studies, namely the Franciscan convents in the Umbrian region, offer interesting points for reflection. They are part of a broader territorial management system rooted in the origins of Franciscanism but presents distinct peculiarities due to individual evolution. Many of them represent important landmarks at the regional level – but they are also places of worship; others have been repurposed into lodging facilities or lay in disrepair or inaccessible due to seismic activity. This heritage, dispersed across the regional landscape, intricately intertwines with local and national histories and cultures. Its tangible and intangible worth, encompassing architectural, artistic, and historical dimensions, not only resonates within its context but also offers fertile ground for thematic knowledge network development and correlation with other religious and cultural sites. Aligning with Umbria Region's tourism promotion strategies, which emphasise religious, cultural, and UNESCO heritage sites, effectively disseminating and safeguarding this heritage for non-academic audiences is paramount [UmbriaTourism].

Since the specific objective of the research was linked to disseminating this Heritage to make it known to the non-academic public, its adequate safeguard and inclusion in tourist routes were crucial. The holistic structuring of projects aimed at representing this Heritage requires meticulous attention from initial data acquisition and selection to end-user presentation. This entails various stages, including project analysis, objective definition, analogous project evaluation, data collection construction, structuring and modeling, conceptual mapping, User Interface definition, and explicitation of data sources [Tomasi 2022].

Target users

When defining the destination users, it is essential to understand which types of tourists the final product should target. Umbria, situated in central Italy, is characterised by hilly terrain, mountain ranges, plains, and river valleys. It hosts six regional parks and numerous medieval villages, promoting activities such as cycling, hiking, and cultural events [Jace 2022]. The types of tourism promoted include religious, cultural, and culinary experiences, while regional legislation recognises tourism as vital for economic, social, and cultural growth and emphasises sustainability. Slow tourism, focusing on preserving local identity and sustainability, is advocated post-Covid. Investments in smart mobility and sustainable tourism are part of the regional recovery plan [UmbriaTourism; Regione Umbria 2017]. The target tourist audience is heterogeneous, and encompasses cultural, religious, culinary, and itinerant holiday interests. The definitions provided by the United Nations World Tourism Organization (UNWTO) highlight how slow tourism activities are designed to remain vital indefinitely, without altering the environment or hindering the development of other social and economic activities, considering the economic, social, and environmental impacts and responding to the needs of visitors and host communities [UNEP, UNWTO 2005]. In 2017, the European Council reiterated the importance of Cultural Routes for tourism development and focused on the economic and social development opportunities that can arise even in lesser-known destinations characterised by significant cultural, natural, and historical elements. Identified priorities are enhancing local identities, memory, and history, especially in rural and peripheral areas; supporting activities and artistic projects exploring the connections between heritage and contemporary culture [European Institute of Cultural Routes 2017; Grossi et al. 2020].

The National Recovery and Resilience Plan (PNRR) Umbria 2021–2026 also includes investments in Smart Mobility, 3D digital mapping of the territory, and sustainable tourism among its various intervention lines [Regione Umbria 2021]. Therefore, developing tourist routes around Umbrian convents aligns with these trends, highlighting their significance in regional history and culture, balancing the needs of tourists and residents.

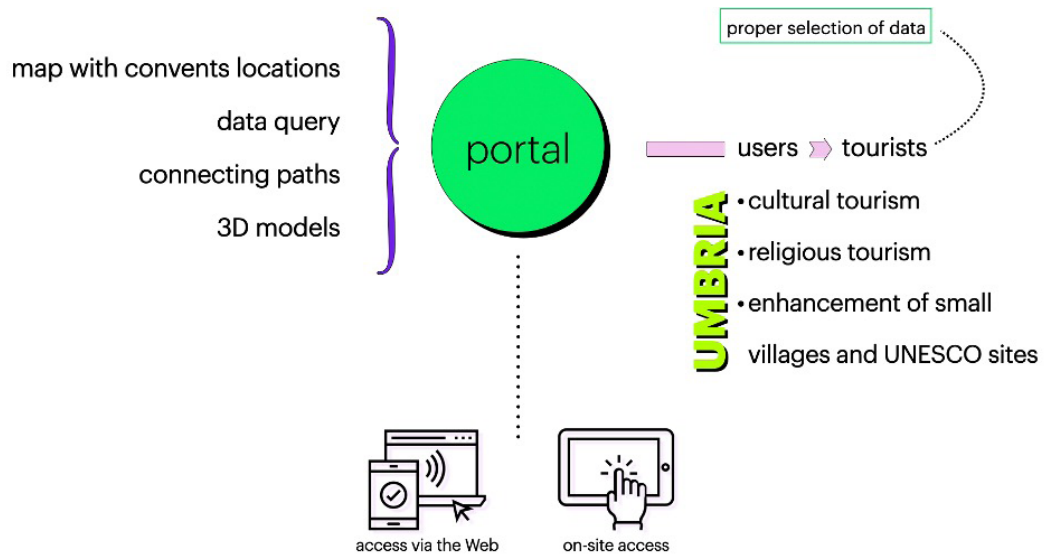


Fig. 3. Project outline for the digital product. Elaboration by A. Cottini.

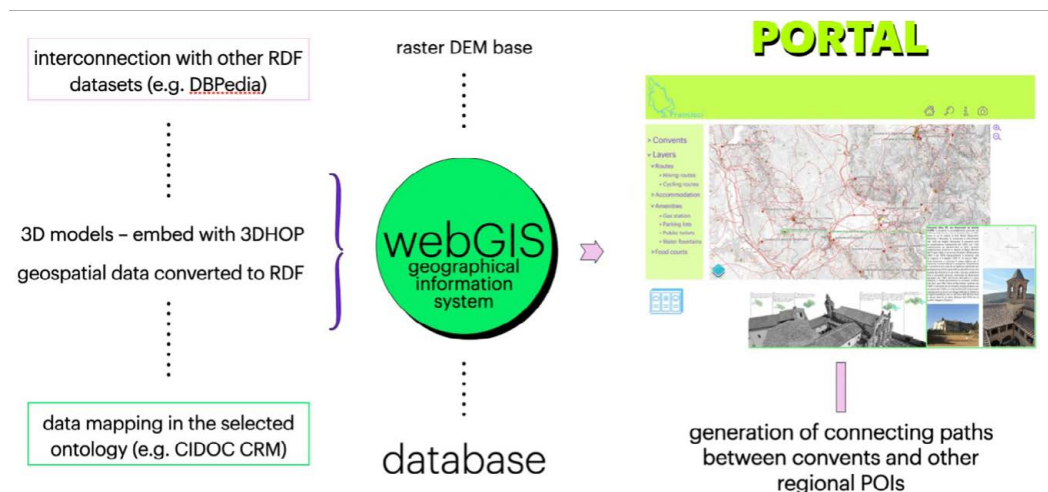


Fig. 4. Project diagram for the portal. Elaboration by A. Cottini.

Methodology

In the specific case of designing a mock-up of a digital product for a tourist end-user, the role of digital documentation was of paramount importance in the phases of data acquisition and processing.

The main requirements of the digital product were to allow the display of a map with the location of the convents of the Franciscan Observance in Umbria, the interrogation of data relating to individual convents and the paths of connection between religious complexes and other points of interest of the territory, the display of three-dimensional models.

Given these considerations, a meticulous planning of data collection campaigns related to case studies, conducted in parallel with historical research and archival operations, allowed obtaining the digital elaborations composing the database. These products were heterogeneous in nature and included textual documentation, three-dimensional models, images, and videos, as well as geospatial information. With the perspective of uploading this data onto the Web, they needed to be adequately processed to be machine-readable and integrable into existing Linked Open Data networks – the use of standards related to Spatial Semantic Web is strongly recommended, as it will enable the creation of more accessible, interoperable, and reusable Cultural Heritage data. Lastly, it was important to select the most appropriate mode of visualisation and data utilisation for the end-users. In this specific case, digital and interactive cartographic support proved effective in representing the location of convents within the Umbrian territory, conveying a universally valid message and allowing end-users to easily interpret and interact with the data. Particularly for a tourist, belonging to a generic user base not specialised in any particular field, territorial-scale representation is functional as it allows framing the region in its entirety, moving within it, and simultaneously visualising all the points of interest present, thus considering the convent complexes as part of a network rather than as standalone entities. Equally useful are 3D models and remotely navigable Virtual Tours, as they allow users to visualise the entire convent complex or parts of it, without constraints or following a guided path. They can also be made available within the reference architecture, allowing visitors with mobility difficulties to access certain areas of the convent otherwise inaccessible. The experimentation proved effective in creating a mock-up of the digital product described above.

Conclusions

The opportunities offered by Semantic Web-related technologies also allow non-expert users to conduct effective searches using generic concepts and synonyms of technical terms as search keys. To this end, the importance of adequate data and ontology selection for their definition is reiterated. Undoubtedly, particular attention must be paid to the extreme simplification of the product's front-end, to encourage its usability, while maintaining a certain degree of complexity and articulation of the data composing the back-end.

In conclusion, this type of digital product can also be advantageous in facilitating tourists' movements within the selected territory, encouraging autonomy and freedom of movement, and effectively promoting practices of distributed tourism, avoiding pre-set and obligatory routes, thus discouraging mass tourism. Reading scientific-academic data in the context of tourism industry development, as addressed in this research, can potentially have a significant socio-cultural impact. For example, monitoring tourists' movement patterns can help strategising the management of tourist traffic to prevent congestion, mitigate negative effects on delicate destinations, pinpoint areas suitable for recreational pursuits, and recommend transportation policies [Zhan et al. 2023].

This line of research paves the way for tourism projects where information is not simplified, but rather the method of communication is. This allows serving a broad and diversified user base in terms of nationality, language, ethnicity, gender, and age – also considering that tourism maps not only serve to understand tourism spaces but also contribute to the construction and reproduction of tourism identities [Del Casino & Hanna, 2000]. In the perspective of future development and possible social and cultural impacts, the sector of georeferenced digital tools for Cultural Heritage presents potentialities both in the academic field, for the definition of new scientific-disciplinary sectors, and in the tourism industry, to conceive and enhance enterprises at the intersection between the results of academic research and the demand for validated knowledge that the average tourist requires.

Credits

Case studies data have been collected during the three-year (2020-2023) European project F-ATLAS Franciscan Landscapes (<https://www.f-atlas.eu>), a collaboration between the University of Florence, Instituto Universitário de Lisboa, Universitat de Barcelona, and Universidade Católica Portuguesa. The project aimed at investigating the Cultural Heritage legacy of the Franciscan Observance across Italy, Portugal, and Spain.

Methodologies related to the use of data have been tested in the doctoral thesis of A. Cottini (*Methodologies for the management of georeferenced digital tools for Cultural Heritage. The case study of the convents of the Franciscan Observance in Umbria*, defended on the 6th of June 2023, tutor S. Bertocci, co-tutor M. Soler Sala, University of Florence - Department of Architecture), focusing on the case studies on the territory of the *Provincia S. Francisci* (current Umbria region and small portions of Tuscany, Marche and Lazio).

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