

UNDERSTANDING INTANGIBLE CULTURAL LANDSCAPES

Digital tools as a medium to explore the complexity of the urban space

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Abstract. The cultural heritage landscape (CHL) of the urban space in cities is the result of multiple layers of complexity, encompassing both the tangible built environment and intangible cultural values that together influence the living heritage that forms the spirit of place. This paper explores the gap in the intangible and living heritage documentation of CHLs by using a section of public space in the medieval historic centre of Bologna, Italy. Digital technology is used to propose a new paradigm in the study of the complex link between the tangible, intangible and living cultural heritage, co-existing in public spaces of a city's cultural heritage landscape.

1. Introduction

Heritage, which has traditionally been recognized as the architectural legacy from the past (*tangible*), is also made up of traditions and expressions of living societies that are difficult to measure (Radovich and Boontham, 2015), temporary and unpredictable (*intangible*). The cultural heritage landscape (CHL) formed by the urban space of cities, and their *spirit of place*, is the result of multiple layers of interconnected complexities, encompassing both the tangible built environment and intangible cultural values.

As this paper will further discuss, professionals are currently able to recreate the tangible built environment of a CHL with increasing accuracy by using digital photogrammetry and terrestrial laser scanning (TLS); yet, current processes for documenting the intangible dimension that contributes

to the urban complexity and *spirit of place* of CHLs are often lacking a comprehensive approach. To explore this gap, a section of public space in the medieval historic centre of Bologna, Italy, was chosen as a case study to test and validate an interdisciplinary, collaborative process that the private and public sectors could use to produce innovative outcomes on the understanding of urban spaces and the *spirit of place* in cities; thus, digital technology is used to promote a new paradigm in the study of the complex link between the tangible and intangible cultural heritage.

2. Cultural Heritage Landscapes, Public Space and Intangible Heritage

UNESCO defines a cultural heritage landscape as, “a concrete and characteristic product of the interplay between a given human community embodying certain cultural preferences and potentials, and a particular set of natural circumstances; it is a heritage of many eras of natural evolution and of many generations of human effort” (UNESCO, 2008). In 2005, UNESCO’s World Heritage Convention (WHC) adopted the *Declaration on the Conservation of Historic Urban Landscapes* that identified cities as intricate cultural heritage landscapes that result from multiple layers of complexity, encompassing both *tangible* and *intangible* values (UNESCO, 2005).

The declaration, which was a direct response to the challenges faced by professionals to conserve non-static ‘*urban heritage*’ in living cities, further pushed traditional considerations of heritage from the architectural legacy of the past (*tangible*) to a more holistic understanding, including traditions and expressions of living societies that continuously changed and were linked to the built environment, even if difficult to measure (*intangible*). This was, of course, influenced by UNESCO’s 2003 *Convention on the Safeguarding of Intangible Cultural Heritage* that recognized and defined intangible cultural heritage as, “the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage” (UNESCO, 2003). Public space, which forms part of the complex urban space making up the cultural heritage landscape of a city, encompasses the tangible and intangible values of a community that in effect influence the living heritage of these places (ICOMOS, 2008). The *Charter of Public Space* (Biennial of Public Space, 2013) describes public space as “a key element...of a community’s collective life...and a foundation of their identity...”. The public space of a city becomes the domain where the tangible, intangible and living heritage of the city’s CHL can be found (Goetcheus and Mitchell, 2014). Living heritage, which is formed by both tangible and intangible heritage, is understood as

the actions of doing or practicing intangible cultural heritage (culture) or the process of, “[*transmitting*] *intangible cultural heritage...from generation to generation, [that] is constantly recreated by communities and groups in response to their environment [(tangible)], their interaction with nature [(living)] and their history [(intangible)], and [which] provides them with a sense of identity and continuity...*” (UNESCO, 2003). Living heritage moves away from focusing on the preservation of the past to a focus on how the past is used in a contemporary context, which becomes the essence of the *spirit of place*.

3. Experimental Methodological Framework

This paper describes the experimental work-in-progress that explores the development of a specific digital framework able to store, visualize and analyze public space in 3D models, inclusive of tangible, intangible and living CHLs as identified by UNESCO. The case study area for this work was selected through investigations on the architectural and urban context and preliminary “*on-site*” visits to the city centre of Bologna. This area, which is made up of two major piazzas and a public street, was used for this experiment to plan a coordinated process on how the documentation of intangible and living cultural heritage could be integrated into a digital tool.

A preliminary investigation into the *state-of-the-art* of CHL representation from a human perspective was completed following a well-consolidated scientific literature review, in order to produce an experimental tool that was able to digitally visualize elements representing the CHL of a place. The workflow began by prearranging a GIS map of the case study area and its surroundings. This first step was determined to be the traditional and primary way to approach and visualize a site in the context of Bologna. This became the basis for embedding additional information into the database. However, two-dimensional cartography was not a sufficient medium for representing the complex dynamics produced in the urban space by multiple people with intersectional identities (i.e. age, gender, sexuality, ethnicity, nationality, etc.). Users could gain knowledge about the shape and morphology of the built environment in a specific time through two-dimensional cartography with hyperlinked geotagged images, panoptic panoramas or video clips, but they still could not fully experience the potentials interactive 3D models could provide for understanding place (Bravo and Garagnani, 2013). C. Baudelaire (1995) describes how people living in the city are just like painters that are freely designing their own lives, continuously sketching on canvas. This artistic perspective illustrates the idea that places are characterized by dynamic flows; intangible and living cultural heritage could be indicators of changes, yet many spatial

representations are needed to understand the relationship between the intangible, living and flows of change. Three-dimensional models were therefore chosen as the graphic media that could be linked to open *WebGIS* maps, in order to let users easily identify places with representations of intangible and living heritage. Three-dimensional models were authored using digital photogrammetry, terrestrial laser scanning techniques (*TLS*), and point cloud *DataViz*, combined to replicate the cultural heritage landscape of the selected case studies in the digital domain. In more general terms, this reproduction was meant to allow the contextualized perception and analysis of specific intangible resources that belonged to the place, but that were not so easily understandable from traditional maps, image databases or site visits (Figure 1).

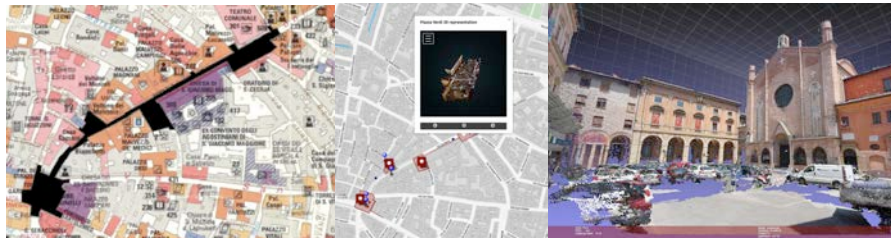


Figure 1. Bologna, Italy case study area, WebGIS interface with classification of hyperlinked intangible elements, and point clouds representing public spaces in Bologna: the ephemeral geometry is a valid metaphor to represent intangible elements (3D digital photo-models by J. Arteaga).

Due to the ephemeral nature of intangible and living elements, 3D models made of *point clouds* (unstructured representations of shapes generated with *TLS* or digital photogrammetry) were considered to be the best compromise in terms of fast production and actual morphology capture. Accuracy of the tools and procedures, even if well qualified by the scientific literature (Singh et al., 2014), was not mandatory at this stage, since simple coloured points were mainly used to represent unmeasurable entities without being precise site surveys. Taking advantage of *Structure from Motion (SfM)* algorithms and terrestrial laser scanning, some streets and squares in Bologna were *photo-modeled* and replicated, outputting point clouds that were connected to a general *WebGIS* map. Well-known existing software applications, such as *Agisoft Photoscan*, *OpenStreetMap*, *Potree*, *Meshlab* and *CloudCompare*, were chosen to perform this workflow's stage. This tool, which is in the developing stage, was primarily made of a *WebGIS* framework (based on *OpenStreetMap*) with vector entities related to WebGL pages (Martinez-Rubi, 2015) that hosted interactive *point clouds* (generated using *Potree* software by Markus Schuetz). Data was layered on the shared map, ordered

in layers based on contents' taxonomy (the building's age, popular legends, people's perceptions, etc.) then linked to point clouds that were produced through the processing of substantial images and movie frames with the *SfM* algorithm.

These 3D models can be edited (with colors, hyperlinks, etc...) in order to visually represent intangible perceptions in their context. Some analysis could be performed on maps, while several users can dynamically integrate contents. The digital map, augmented by 3D models, can be explored using mobile devices, with specific links leading to stereoscopic representations that can easily be implemented in cheap 3D viewers, such as *Google Cardboard* for smartphones (Figure 2).



Figure 2. The 3D point cloud, visualized into a cheap, immersive environment using a simple smartphone.

4. Conclusion

The developments that are likely to come from the proposed framework can be refined with the application of interoperable contents: data can be exported to more complex GIS systems or 3D viewers, while intangible elements, of the public space studied, can be understood or represented with an improved working pipeline aimed at their identification and choice. This kind of framework has significant potential in the fields of architecture, urban planning, and design. Based on an innovative approach, it can facilitate the planning and design process in both the public and private sectors by providing a way of not only understanding the significance and value of public spaces and CHLs, but also providing a way to better understand, at the human scale, spaces and landscapes as reproduced in a virtual environment. Also, this framework is able to foresee and better understand the effects of potential designs in the cultural landscape of the city. Yet, this work is still under development and a systematic analysis on the advantages and disadvantages of the applied technology is still being investigated, even if the potentials are very promising.

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References

- BAUDELAIRE, C., 1995. *The Painter of Modern Life and Other Essays*. Phaidon Press Ltd. London.
- BIENNIAL OF PUBLIC SPACE 2013. *The Charter of Public Space* available at <http://www.biennalespaziopubblico.it/international/outputs/the-charter-of-public-space/>
- BRAVO, L., GARAGNANI, S., 2013. The city as an extended network of public spaces: reconnecting the spirit of place and time through modeling of old realities and new virtualities. In: *IFoU International Conference, Creative Renaissance*, Cheng Kung University (NCKU), College of Planning and Design, Tainan (Taiwan).
- GOETCHEUS, C., MITCHELL, N., 2014. The Venice Charter and Cultural Landscapes: Evolution of Heritage Concepts and Conservation Over Time. In: *Change Over Time*, University of Pennsylvania Press, 338-357.
- ICOMOS, 2008. *Quebec Declaration on the Preservation of the Spirit of Place* - 16th General Assembly of ICOMOS, Quebec, Canada.
- RADOVICH, D. AND BOONTHAM, D., 2015. *Measuring the Non-Measurable 01: Small Tokyo*. Flick Studio, Tokyo.
- JOKAR ARSANJANI, J., MOONEY, P., ZIPF, A. AND SCHAUSS, A., 2015. Quality Assessment of the Contributed Land Use Information from OpenStreetMap Versus Authoritative Datasets. In: *OpenStreetMap in GIScience: Experiences, Research, and Applications*, Springer International Publishing, 37-58.
- MARTINEZ-RUBI, O., VERHOEVEN, S., VAN MEERSBERGEN, M., SCHÛTZ, M., VAN OOSTEROM, P., GONÇALVES, R., TIJSSSEN, T., 2015. Taming the beast: Free and open-source massive point cloud web visualization. The Survey Association, Delft. <http://resolver.tudelft.nl/uuid:0472e0d1-ec75-465a-840e-fd53d427c177>
- SINGH, S.P., JAIN, K. AND MANDLA, V.R., 2014. Image based 3D city modeling: Comparative study. In: *ISPRS - International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, June 2014, 537-546.
- UNESCO, 2003. *32nd Convention on the Safeguarding of Intangible Cultural Heritage*, Paris.
- UNESCO, 2005. Declaration on the Conservation of Historic Urban Landscapes. In: *15th general assembly of states parties to the convention concerning the protection of the world cultural and natural heritage, Paris*.
- UNESCO World Heritage Centre, 2008. *Operational Guidelines for the Implementation of the World Heritage Convention*, Paris.