HeritageMap for accessibility and inclusivity in cultural heritage. The ‘Open-air Museum of Contemporary Art Works - MAP’ in Faenza

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DAI Il Disegno per l'Accessibilità e l'Inclusione

A CURA DI
Tommaso Empler, Adriana Caldarone, Alexandra Fusinetti

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Il disegno per l'accessibilità e l'inclusione museale

FOCUS 1

Il disegno per l’accessibilità e l’inclusione socio-culturale

HeritageMap for accessibility and inclusivity in cultural heritage. The 'Open-air Museum of Contemporary Art Works - MAP' in Faenza.

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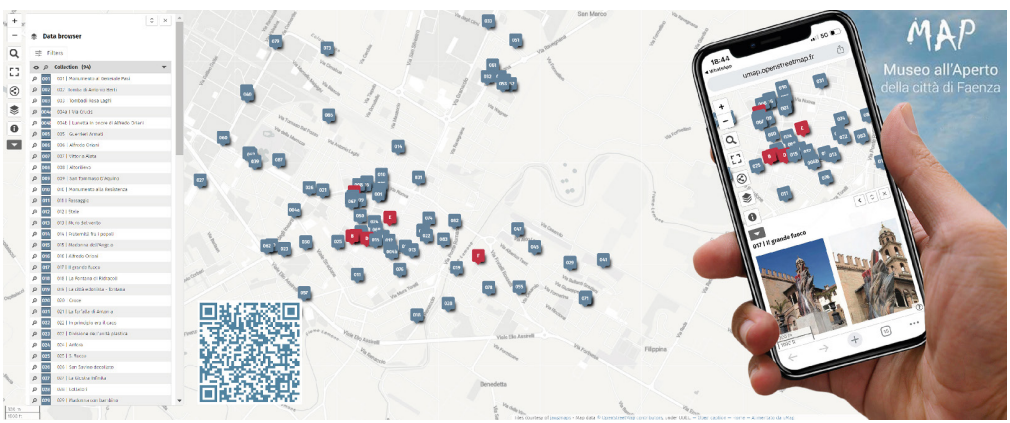


HeritageMap
museo all'aperto
patrimonio digitale
itinerari di visita
collezione d'arte contemporanea

HeritageMap
open-air museum
digital heritage
city tour routes
contemporary art collection

L'articolo illustra un *workflow* metodologico per la realizzazione di una *HeritageMap* dedicata a un museo all'aperto, finalizzata a migliorare l'accessibilità al patrimonio culturale urbano e diffuso da parte dei suoi abitanti. Alla luce dei processi di digitalizzazione e della transizione digitale che hanno coinvolto il settore dei beni culturali nell'era post-pandemica, la *HeritageMap* proposta, basata sul *web*, rappresenta una soluzione innovativa per promuovere l'inclusione socio-culturale, consentendo ai cittadini di riappropriarsi del proprio patrimonio.
A differenza di altre applicazioni come i sistemi informativi geografici storici (HGIS) e le *StoryMap* (un'applicazione di *authoring* ArcGis *web-based*), la *HeritageMap* si distingue per la capacità di combinare dati geospaziali con elementi di *storytelling*. Questa nuova modalità di comunicazione, valorizzazione e preservazione del patrimonio culturale integra narrazioni interattive georeferenziate con le attività di conservazione di oggetti e monumenti che caratterizzano le nostre città e i nostri paesaggi. La *HeritageMap* permette di georeferenziare i contenuti culturali e di renderli accessibili a un vasto pubblico tramite *smartphone* e dispositivi mobili, offrendo la possibilità di fruire delle informazioni in modo indipendente e di esplorare dettagli approfonditi relativi a punti specifici dello spazio.

The paper presents a methodological workflow for developing an open-air museum's HeritageMap to improve the accessibility of urban and diffuse cultural heritage by society. According to the digitisation processes and digital transition of the cultural heritage sector and cultural institutions in the post-pandemic era, the proposed web-based HeritageMap is a possible solution for effective socio-cultural inclusion, allowing citizens to reappropriate their heritage.
The HeritageMap differs from other applications, e.g. historical geographic information system (HGIS) and *StoryMap* (an authoring ArcGis web-based application), to combine geospatial data with storytelling elements. The HeritageMap is a novel way of communicating, valorising, and preserving heritage. It combines the necessity of creating interactive georeferenced storytelling with conservation activities related to objects and monuments that populate our cities and environments. HeritageMap allows cultural content to be georeferenced in space and made accessible to the general public by smartphones and mobile devices. It will enable them to enjoy the content independently and benefit from the in-depth information offered within the descriptive fields linked to a specific point in the space.

Introduction

Geographic information is becoming increasingly important in the cultural sector, especially for visualising and analysing geo-referenced data related to cultural heritage (CH). This is due to new digital tools and technologies that provide ready-to-use opportunities for contextualising and re-contextualising cultural objects and their history [Portalés et al. 2022], also known as object biography [Verdiani & Giovannini 2024].

To date, interactive maps with geo-referenced elements are widely used in Digital Humanities and cultural heritage to increase the information capacity of places and monuments. Together, Map and storytelling [Alexander 2017)] are also defined as geo-storytelling [Bonacini 2022] and offer cartography interfaces and mobile geolocated media [Brouillard et al. 2015].

In the field of historical disciplines, the term Historical Geographic Information System (H-GIS) has been used for several years. H-GIS maps are tailored to incorporate historical data and spatial analysis, allowing scholars to create maps and analyse changes in geographic patterns over time [Vedoà 2024]. It is possible to find H-GIS applications that combine historical maps, census data, and other sources of historical records to reveal past landscapes, demographics, and cultural trends.

Another type of map used to enhance accessibility and inclusivity in cultural heritage sites is *StoryMap* [Caquard 2011]. *StoryMap* uses georeferenced maps, text, and multimedia to present interactive narratives that engage users and provide instantly accessible geographic context to any project. These interactive digital tools in the cultural and digital heritage context allow visitors to navigate and explore cultural heritage sites, providing efficiently, in real-time, location-specific information that is eventually tailored to individual needs and offers alternative tour routes [Caquard & Dimitrovas 2017]. These maps can also provide multilingual support, suitable for diverse audiences and breaking language barriers. By integrating user feedback and continuously updating the maps, cultural heritage sites can create a more inclusive environment, inviting all community members to engage with and appreciate their cultural heritage. *StoryMap*s are generally made by the general public, journalists, and educators as

Cover
The web-based application for a *HeritageMap* for the 'Open-air Museum of Contemporary Art Works' (MAP) in Faenza accessible by QR code.

Fig.01
Comparative analysis of H-GIS, *StoryMap* and *HeritageMap* main uses and features.

	H-GIS	StoryMap	HeritageMap
Focus	Historical data spatial analysis	Storytelling through interactive maps	Cultural heritage, sites and monuments
Primary Use Case	Academic research-driven	storytelling for all users	Heritage documentation, valorisation and conservation
Temporal Data	Strong focus on time-series data	Limited (maps are usually static or interactive)	Can incorporate historical periods for sites
Ease of Use	Requires GIS expertise	User-friendly, no expertise needed	Moderate (depends on the platform used)
Data Types	Historical maps, census, archives	Maps, text, images, multimedia	Heritage site details, geospatial data, inventories and archives
Multimedia Integration	Limited (primarily data-focused)	Extensive (images, video, audio)	Focused on heritage-related content and object biographies (3D, images, video, audio)
Target Audience	Historians, researchers, academics	General public, journalists, educators	heritage professionals, architects, archaeologists, governments
Main Aim	In-depth historical analysis	Telling engaging stories	Documenting and preserving cultural sites

novel ways to create educational solutions and cultural storytelling. *StoryMap* includes features such as audio guides, text-to-speech options, and high-contrast visuals, making the information accessible to people with various disabilities. They can highlight accessible routes, entrances, and facilities, ensuring that all visitors, including those with mobility issues, can plan their visit effectively.

In this paper, we would like to introduce a novel type of Map: the *HeritageMap*.

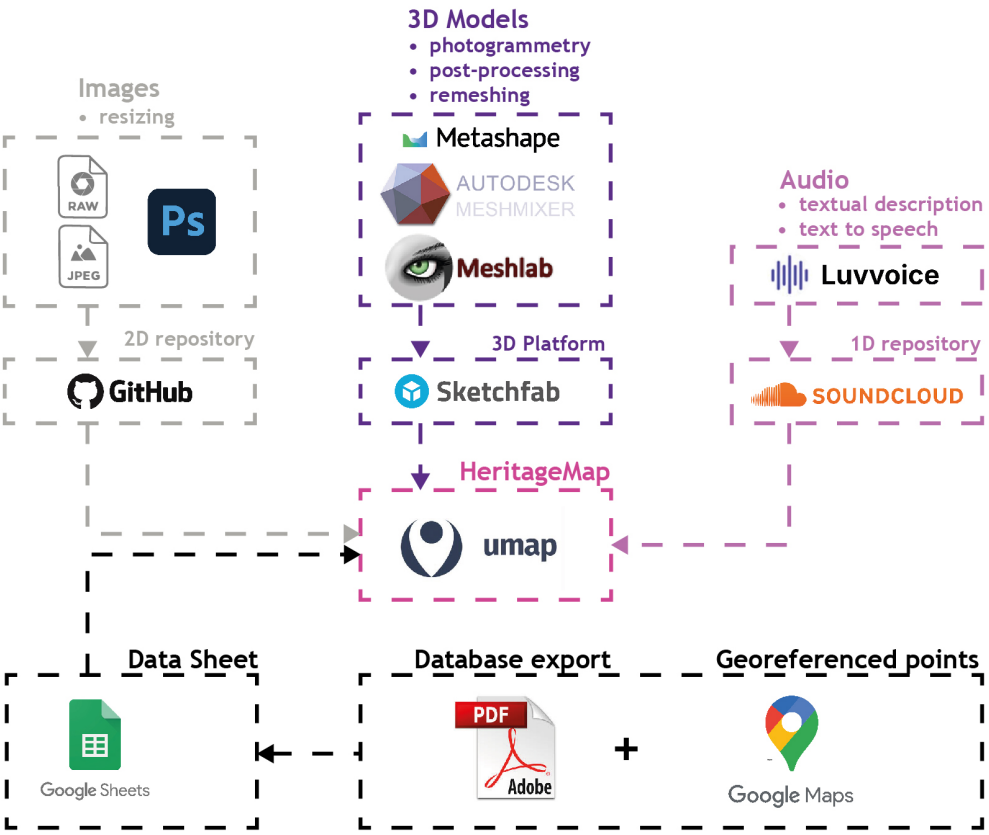
The *HeritageMap* can be considered a way for professionals in the cultural heritage sector and scholars to create storytelling connected with management systems. It differs from the H-GIS maps because it is not necessarily related to historical time or period and differs from *StoryMap* because it uses metadata from institutional inventorying, allowing the possibility to trace the way how an object or monument is narrated to the public and, at the same time, monitoring and planning conservation and restoration plans.

HGIS, *StoryMap*, and *HeritageMap* are all tools designed to combine geospatial data with storytelling elements tailored for diverse target audiences and created by diverse figures, each with a unique focus and application (Fig. 1).

The main popular applications used to create maps are based on Google Maps [1] and OpenStreetMap (OSM) [2] initiatives. Google MyMaps [3] [Martins et al. 2020] and Google Tour Builder [4] [Dixon 2019] are two solutions based on Google Maps, while Umap [5] is based on OSM, a collaborative mapping project that allows users to create and edit maps. Leaflet [6] [Edler & Vetter 2019] and the platform company Mapbox [7] [Rzeszewski 2023] offer similar solutions. The first is an open-source JavaScript library, while Mapbox offers geolocation, route mapping, and data visualisation with a subscription cost. Both solutions require a prior basic knowledge of programming languages. Another technical solution is Q-GIS [8], a desktop application that allows the creation of detailed maps and tours, including markers, lines and shapes, offering the possibility to include 3D models [Colucci et al. 2024].

Besides tools for creating maps and interactive maps, other applications are available to make tours and more devoted to storytelling. We can mention *StoryMap*JS [9], developed by the Knight Lab of Northwestern University [Bartalesi

Fig.02
HeritageMap digital ecosystem and operative workflow.


3D Models
• photogrammetry
• post-processing
• remeshing
Images
• resizing
Audio
• textual description
• text to speech
Metashape
AUTODESK
MESHMIXER
Meshlab
RAW
JPEG
Ps
Luvvoice
2D repository
GitHub
3D Platform
Sketchfab
1D repository
SOUNDCLOUD
HeritageMap
umap
Data Sheet
Database export
Georeferenced points
Google Sheets
PDF
Adobe
Google Maps

et al. 2023], Google Earth Studio [10], which uses web-based 3D animations [Isikdag & Zlatanova 2010], and ArcGIS *StoryMaps* [11] [Bajjali 2023; Howland 2020]. Organisations use ArcGIS *StoryMaps*, integrated into the ArcGIS system, to share their GIS-related stories with their audiences. At the same time, *StoryMaps* [12] offers essential storytelling capabilities for free and advanced and customised storytelling capabilities as a Premium subscription with monthly and annual payment options.

Methodological Approach for HeritageMap and web-based digital ecosystem

The theme of *HeritageMap* comprises the development of digital assets created to be retrieved by the geo-referenced points in a Map. *HeritageMap* is a digital ecosystem where diverse media coexist to develop storytelling and interactively describe collections (Fig.2). Images, video, textual descriptions, and 3D models can help comprehend objects and artworks by making them accessible.

According to the main aim of the *HeritageMap* for museum collections, considering the most commonly used media, the methodology can be summarised into five phases, described as follows:

1. Data Collection: Data available about the collection are identified and downloaded. It is also possible to retrieve data using APIs. These data are then cleaned and normalised for reuse within *HeritageMaps*. Depending on the chosen repository, this step may also include mapping the data to recognised standards according to the reference domain (e.g., ICCD or CIDOC-CRM). This allows data reuse in line with the FAIR principles of data, making them findable, accessible, interoperable, and reusable [Bertocci et al. 2023].
2. Data Acquisition: The role of storytelling consists of developing narratives about primary data and metadata (data about data). This means creating novel digital assets to create comprehensive knowledge to tell stories. Diverse types of media can be gathered and digitally acquired. Digital cameras can digitalise images and texts. Artworks can

Fig. 03
Map of the 'Open-air Museum of Contemporary Art Works' (MAP) downloadable from the Municipality of Faenza Website [13].


Bologna
Ravenna
Forlì
Rimini
FAENZA

be acquired by photogrammetric technologies, creating 3D digital replicas. Textual descriptions can be digitalised using 'text to speech' AI-driven technologies.

3. Data Post-processing: All digitalised content is usually acquired with the highest definition for research purposes. Retrieving data that is available and accessible online requires the post-processing of most data, especially images and 3D models, according to the requirements of chosen data storage repositories and platforms.
4. Data Storage: Diverse data storage solutions can be chosen depending on the data type. Generally, Map editors allow data storage (e.g., QGIS and ArcGIS *StoryMap*s), but web-based solutions (e.g., Google MyMaps and UMAP) are configured to retrieve data from the web. Then, storing data on platforms and repositories specialised in diverse media content is possible. Most of these platforms (e.g. Sketchafb, YouTube and SoundCloud) also provide URLs to directly embed both media and player, allowing to simplify data fruition and visualisation. Finally, images can be retrieved from cloud services or online hosting solutions (e.g. GoogleDrive and GitHub).
5. Data Visualization: The tool chosen to develop the *HeritageMap* defines the final user interface. The map editor can retrieve previously organised and stored heterogeneous data using URLs or compiling online fields.

A public and urban dimension of Art in Faenza

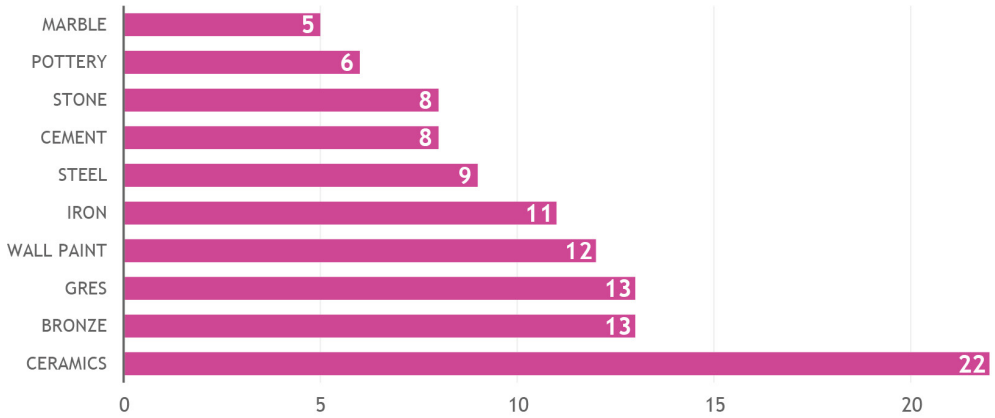
The city of Faenza, internationally known as the city of ceramics, is 50 kilometres (31 miles) southeast of Bologna, in the province of Ravenna, Emilia-Romagna. The town gave its name to the type of pottery known as faience, and it has several museums, including the International Museum of Ceramics (MIC).

The city is active in the cultural and tourist sector, and the Territorial Department of the Municipality of Faenza also manages and curates two museums related to contemporary art: MAP [13] and MUS.T [14].

The Museum of Territorial Department for Contemporary Art (MUS.T), founded in 1997, consists of a permanent installation of contemporary artworks that gradually and spontaneously

Fig. 04
Materials of the MAP artworks.

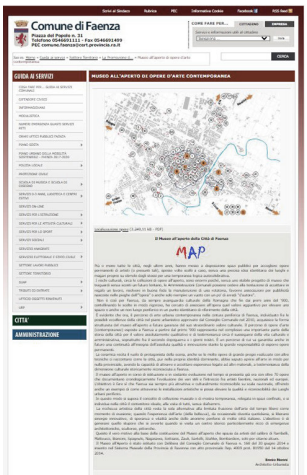
Fig. 05
Digitalisation process for developing the *HeritageMap* using previous DB data and images.

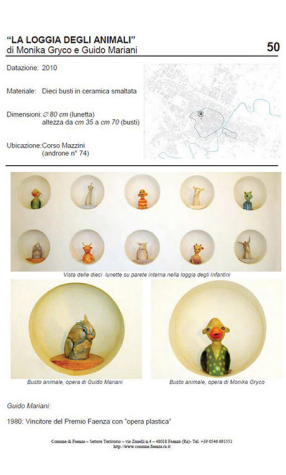


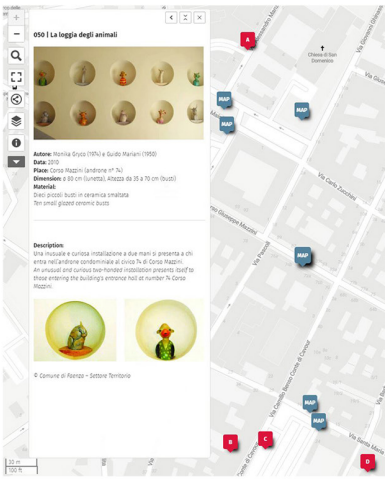
accessible website with DATA BASE and 2D MAP

single inventory tabs with METADATA and IMAGES

web-based application with interactive map for the MAP collection







give the spaces a natural artistic and innovative feel for the Territorial Department's offices [Nonni 2022].

The 'Open-air Museum of Contemporary Art Works' (MAP) is an itinerary (Fig. 3) of modern and contemporary urban art stretching from the historic centre to the city's outskirts [Nonni 2020]. The museum thus aims to go beyond the concepts of temporary exhibition and museum collection, which are too often relegated to closed spaces. The city of Faenza, from the extreme outskirts to the historic centre, is transformed into an open-air museum usable and visible to all: walls, roundabouts, squares, fountains, and parks become places to host the work of many artists from Faenza and beyond.

The MAP was founded in October 2004 and now consists of a collection of 87 works that, taken individually, are art masterpieces documenting the history of the city and the evolution of artistic styles since the beginning of the 20th century. This initiative's peculiarity is that art takes on a public dimension, offering an alternative enjoyment of art in free time and transforming it from an occasional to a daily experience.

Masterpieces part of the collections have diverse dimensions and different materials with prevalence of ceramics and pottery but that also includes monuments and statues made of iron or metal materials eventually combined. The latest acquisitions in the collection also include street art and murals (Fig. 4).

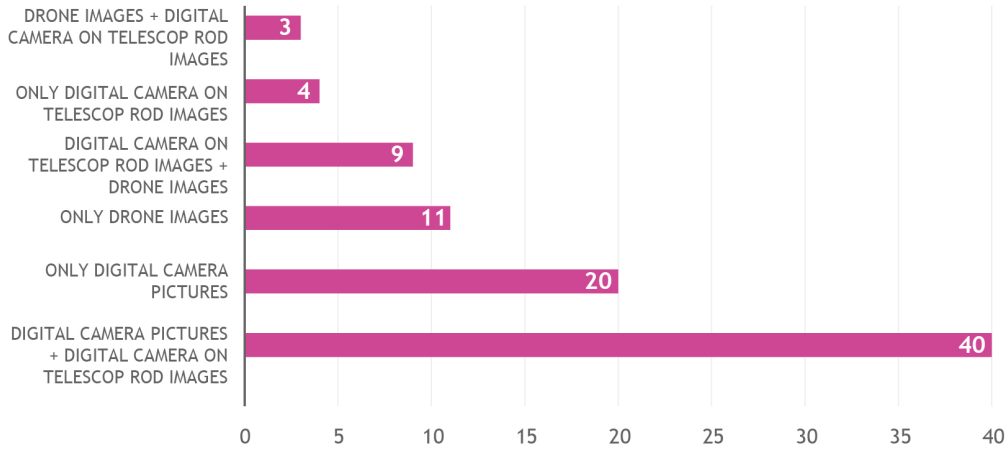
Towards a HeritageMap for 'MAP'

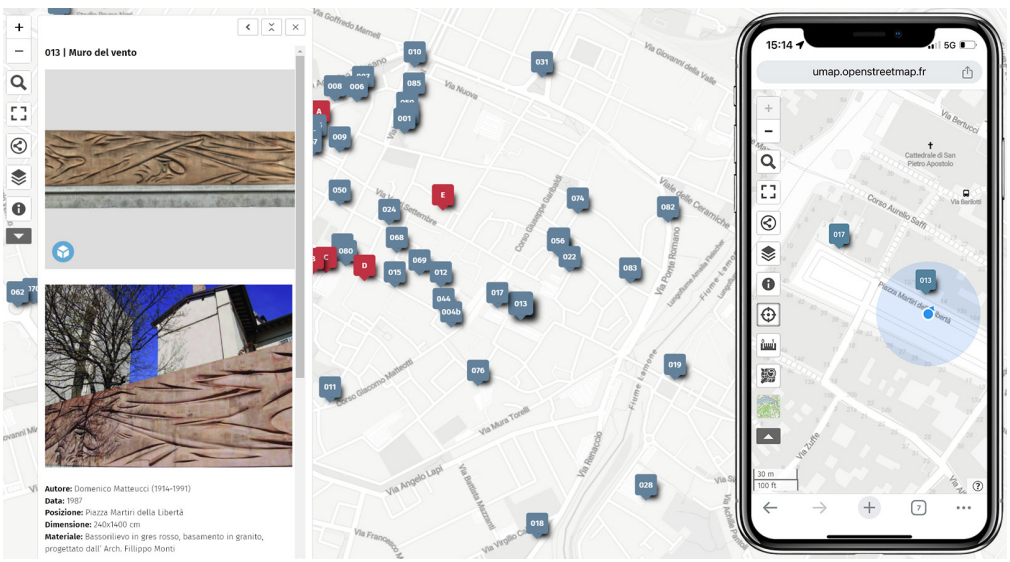
The activity planned for developing a prototype for the 'MAP' *HeritageMap* started with the digitisation phase of the records in the central DB of the Municipality of Faenza territory department. The 87 works, which continue to grow over the years, consist of a card with descriptive metadata: title of the masterpiece, author, year of execution, material and dimensions. Only few artworks have a descriptive field explaining their main characteristics. This field has been included in the most recent works since 2000 and are not available for dated objects. The DB also comprises at least one image with a caption for all inventory tabs.

The DB export from the Municipality of Faenza (.pdf file) already contained all preliminary data. That material was then

Fig. 06
3D Digitization plan according to diverse artworks.

Fig. 07
Artwork description example with integration of 3D model


DRONE IMAGES + DIGITAL CAMERA ON TELESCOP ROD IMAGES
3
ONLY DIGITAL CAMERA ON TELESCOP ROD IMAGES
4
DIGITAL CAMERA ON TELESCOP ROD IMAGES + DRONE IMAGES
9
ONLY DRONE IMAGES
11
ONLY DIGITAL CAMERA PICTURES
20
DIGITAL CAMERA PICTURES + DIGITAL CAMERA ON TELESCOP ROD IMAGES
40
0
5
10
15
20
25
30
35
40


013 | Muro del vento
Autore: Domenico Matteucci (1914-1991)
Data: 1987
Posizione: Piazza Martiri della Libertà
Dimensione: 240x1400 cm
Materiale: Bassorilievo in gres rosso, basamento in granito, progettato dall' Arch. Filippo Monti
15:14
5G
umap.openstreetmap.fr

converted and stored in a GoogleSheet to be implemented online using the UMAP tool. Images previously gathered were collected online in a GitHub repository [15] to be retrievable by the descriptive metadata fields. The DB data were georeferenced using Google Maps to obtain the correct position of each artwork in the city. This digitalisation phase allowed the development of an accessible online database linked to a web-based open GIS application [Shahamati et al. 2022] that could retrieve online DB data and information (Fig. 5).

As part of the *HeritageMap* of 'MAP' work in progress, a digitisation plan and photogrammetric activities were planned to create a comprehensive digital asset with 3D models. The use of 3D models allows users to interact with artworks and allows Municipality professionals to see and update the state of conservation of each object. The 3D digitisation activity that has just started comprises photogrammetric acquisition using low-cost cameras but an integrated approach will be used according to the type of artwork, its dimensions, and its position. The 3D acquisition is useful also for accessibility purposes when artworks have dimensions or positions far from the sight of visitors (e.g. murals or elements in church façades).

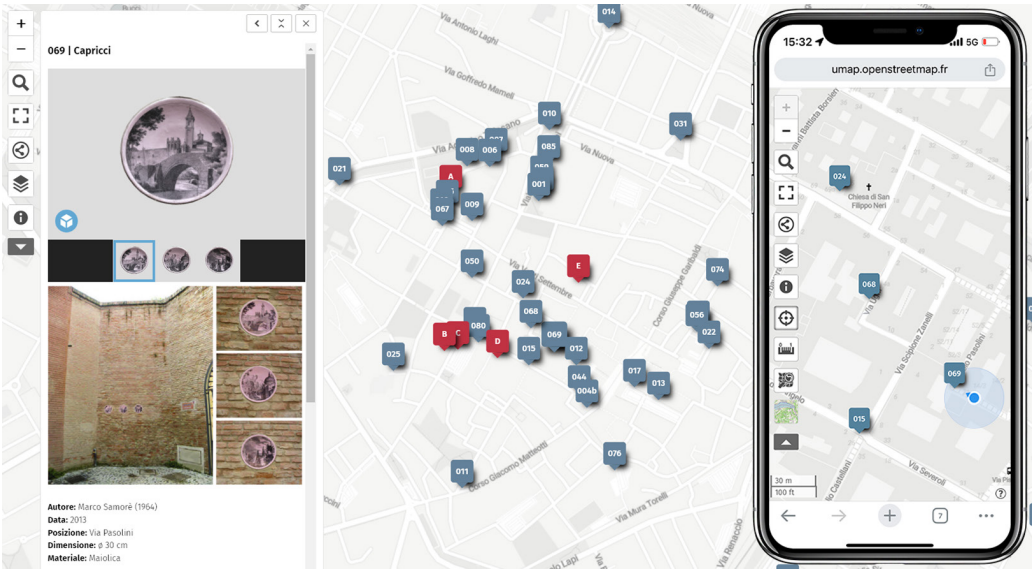
In the preliminary phase we used digital cameras to acquire artworks but we are also planning to use integrated systems that combines UAVs acquisition and digital camera on telescop rod for those masterpieces characterized by big dimensions or placed in sites with difficult accessibility (e.g. artworks in the in traffic roundabouts) (Fig. 6).

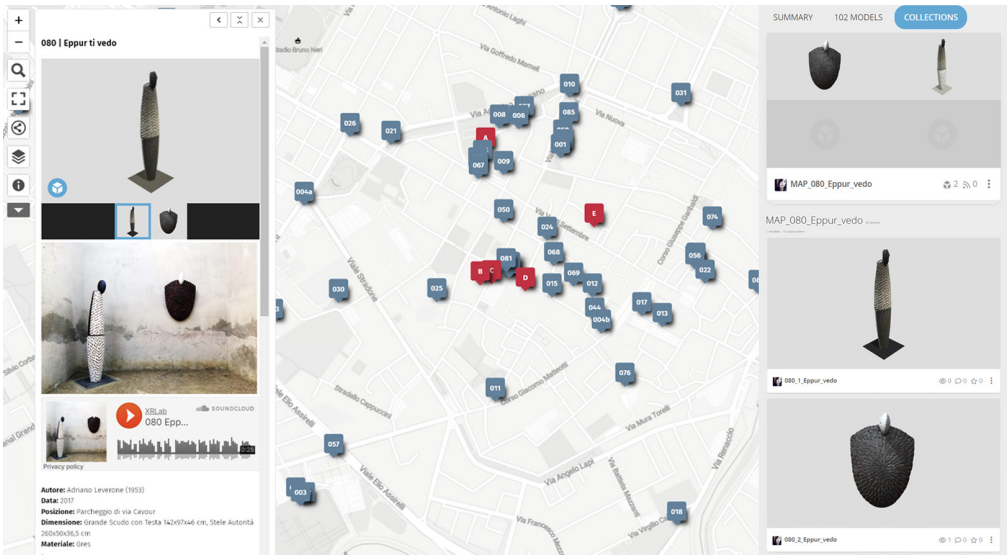
Preliminary results gave the possibility to test embedded solutions offered by SketchFab [16], the 3D platform chosen to host 3D models of the project. Single model 3D view is the most commonly used feature to embed 3D content online (Fig. 7). Other available options include the display of 3D galleries that are created from previously created 'collections' within a sketchfab account (Fig. 8).

Finally to increase the inclusivity of the *HeritageMap* we also include audiotracks. The audio was developed starting from textual description available in the DB of the MAP stored in the Municipality of Faenza website. We used a free online AI-driven solution that turns text into natural-sounding speech, Luvvoice [17]. The obtained audio with .mp3 file

Fig. 08
Artwork description example with integration of 3D gallery.

Fig. 09
Artwork description example with integration of 3D gallery and audio track.


069 | Capricci
Autore: Marco Samorè (1964)
Data: 2013
Posizione: Via Pasolini
Dimensione: ø 30 cm
Materiale: Maiolica
15:32
umap.openstreetmap.fr


080 | Eppur ti vedo
Autore: Adriano Leverone (1953)
Data: 2017
Posizione: Parcheggio di via Cavour
Dimensione: Grande Scudo con Testa 142x97x46 cm, Stele Autonità 260x50x36,5 cm
Materiale: Gres
SUMMARY
102 MODELS
COLLECTIONS
MAP_080_Eppur_vedo

format was then stored in the SoundCloud repository [18] that allows to embed audioplayer within the map (Fig. 9).

Conclusions

Ten years after its foundation, the 'MAP' is today hardly accessible. All the works around the city are often not recognised or perceived as part of a whole or even a Museum. Their presence could be more precise adding specific artwork signage and frequently needs references that capture visitors' curiosity. Finally, most artworks are outdoors and need periodic monitoring and restoration activities.

The developed geo-referenced *HeritageMap* allows to identify the proximity of artworks and planning thematic tours over the city. The possibility to store the data in a DB online allow the possibility to implement and manage over time the information about artwork and also planning restoration and conservation activities.

Future developments include adding 3D models, using integrated photogrammetric acquisitions.

The *HeritageMap* stands as an example of heritage utilisation of the city's accessible heritage, which is inaccessible due to poor communication and inclusiveness campaigns. The aim is to make the existing heritage accessible and understandable to a broader public. Including different types of content, audio and video, offers the possibility of integrating solutions for various audiences and routes that can eliminate architectural barriers for all.

Acknowledgements

We would like to thank Arch Lucio Angelini, head of the 'Land and Environment Department' of the municipality of Faenza for his fundamental and useful contribution in defining the primary requirements for the *HeritageMap* and for his valuable contribution in understanding the development of the MAP collection over the years.

Credits

The research was carried out as part of the collaboration between the Department of Architecture and Design of Politecnico di Torino and the Municipality of Faenza for the creation of an *HeritageMap* for the 'Open-air Museum of Contemporary Art Works - MAP' in Faenza. Elisabetta C. Giovannini is the scientific advisor of the project.

Although the contribution was conceived jointly, Elisabetta C. Giovannini wrote the 'Introduction' and 'Methodological Approach for *HeritageMap* and web-based digital ecosystem'. Jacopo Bono wrote 'A public and urban dimension of Art in Faenza' and 'Towards a *HeritageMap* for MAP'. Both authors wrote the 'Conclusions'.

Note

[1] https://www.google.it/maps/
[2] https://www.openstreetmap.org/
[3] https://mymaps.google.com/
[4] Google Tour Builder was a tech tool that allowed users to create a narrative using Google Earth features and add images, text, and videos. The platform was shut down in July 2021.
[5] https://umap.openstreetmap.fr/it/
[6] https://leafletjs.com/
[7] http://mapbox.com/
[8] https://www.qgis.org/
[9] https://*storymap*.knightlab.com/
[10] https://www.google.com/earth/studio/
[11] https://*storymap*s.arcgis.com/
[12] https://*storymap*s.com/
[13] https://www.comune.faenza.ra.it/Guida-ai-servizi/Settore-Territorio/La-Promozione-dell-Arte-Contemporanea/Museo-all-aperto-di-opere-d-arte-contemporanea
[14] https://www.comune.faenza.ra.it/Guida-ai-servizi/Settore-Territorio/La-Promozione-dell-Arte-Contemporanea/Museo-Settore-Territorio-Arte-contemporanea
[15] https://github.com/
[16] https://sketchfab.com/
[17] https://luvvoice.com/
[18] https://soundcloud.com/

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