



ON-STAGE 3D: Link-based Investigation into Spatial Iconographic Heritage

Emile Blettery, Valérie Gouet-Brunet, Livio De Luca

► To cite this version:

Emile Blettery, Valérie Gouet-Brunet, Livio De Luca. ON-STAGE 3D: Link-based Investigation into Spatial Iconographic Heritage. 18th European Conference on Computer Vision, Sep 2024, Milan, Italy. hal-04797430

HAL Id: hal-04797430

<https://hal.science/hal-04797430v1>

Submitted on 22 Nov 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

ON-STAGE 3D: Link-based Investigation into Spatial Iconographic Heritage

Emile Blettery^{1,2,3}, Valérie Gouet-Brunet¹, Livio de Luca³
emile.blettery@ign.fr, valerie.gouet@ign.fr, livio.deluca@map.cnrs.fr

¹LASTIG, Univ. Gustave Eiffel, IGN-ENSG, 94160 Saint-Mande, France

²Ville de Paris, Direction des Affaires Culturelles, DHAAP, France

³MAP - UPR CNRS 2002, Marseille, France

ABSTRACT

This demo is the front-end part of a global semi-automatic pipeline dedicated to the structuring and valorization of spatial iconographic heritage collections through their multimodal linking up to their visualization at large scale, recently published in [1]. Here, the demo will focus on the visualization and interaction part through the web 3D platform ON-STAGE 3D, which integrates together collections of images in the same 3D space, organized as graphs of links and potentially spatialized, as illustrated in Figure 1. To engage the user, we will target two richly documented sites at several scales of analysis through time: the city (Paris), a monument (Notre-Dame de Paris) with a zoom on its chapels. The experience will consist in diving into this rich heritage by browsing the collections from link to link, discovering areas, details or patterns and evolutions through time as well as investigating like historians or heritage architects in the spatial sites thus documented.

KEYWORDS

Multimodal Data Linking, Graph Visualization, Iconographic Heritage, Structuring, Discoverability, Investigation

1 SEMI-AUTOMATIC STRUCTURING

Adding structure to iconographic collections is key for many applications requiring their management at large scale. In [1], we have developed a full pipeline that aggregates all the advantages of automatic linking coupled with visualization of visual contents. The demo will focus on the front-end part and on two types of links: **visual similarity links**, based on optimal deep image descriptors and re-ranking with diffusion strategies; and **spatial similarity links**, which connect two images according to their spatial proximity in the environment, if available.

To check the relevance of such links and improve the understanding of the contents, we have proposed the 3D immersive web platform ON-STAGE 3D, relying on GraphXR¹ and Neo4j graph databases, which allows to browse the collection in a spatialized 3D environment and intervene on the built links. By exploiting both automatic linking and manual interventions in the platform, an iterative, semi-automatic structuring pipeline was proposed to solve difficult cases missed by automatic structuring, and then improve structuring optimally.

Team. The proposed global framework, up to its application in digital humanities on spatial iconographic heritage, gathers French research collaborations, between a Lab in AI applied to geographical information (LASTIG), a Lab specialized in models for architecture (MAP), the City of Paris and the "Digital data" group of the Notre-Dame scientific restoration program.

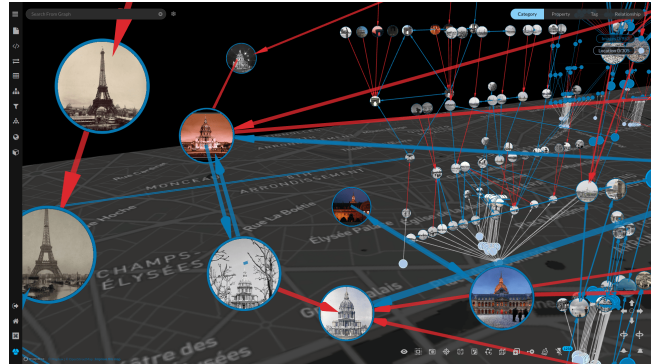


Figure 1: Overview of ON-STAGE 3D at city scale.

2 USER EXPERIENCE AND INTERACTIONS

Data. Photographs are gathered from 9 providers, that is institutions, museums and archives. They represent Paris city at different time periods. One collection consists specifically of images acquired alongside the restoration of the Notre-Dame cathedral. In total, more than 20,000 images are available for consultation.

The demo will allow the users to visualize this rich multi-source visual heritage at large scale in a common spatialized and structured 3D environment. Quizzes on the places visited and images seen will spice up the navigation. They will also have the opportunity to assess the impact of the links built in the organization of the contents and test their capability to investigate the data across different dimensions such as temporal evolution or architectural patterns. In addition, ON-STAGE 3D will provide several interactions:

- control the visualization: focus on a particular spatial neighborhood, on a level or type of similarity, on some metadata, etc.
- update, remove or add data manually in nodes and edges of the graphs, according to the user's knowledge. Visual clues are made available automatically in order to help them focus on more unusual or impacting areas;
- then launch the update of the whole graph-based representation via automatic efficient retrieval and observe the impact on visualization.

More explanations, screenshots and videos are available for the reviewers at these links:

- [Overview of ON-STAGE 3D and of the demo datasets](#)
- [Overview of interactions within the data and links](#)

REFERENCES

- [1] Emile Blettery and Valérie Gouet-Brunet. 2024. Heritage Iconographic Content Structuring: from Automatic Linking to Visual Validation. *Journal on Computing and Cultural Heritage* (May 2024), 1–40. <https://doi.org/10.1145/3666007>

¹<https://www.kineviz.com/graphxr>