

Joint multimodal search and spatial navigation into the geographic iconographic heritage



What is it? ALEGORIA aims at facilitating the promotion of iconographic institutional collections describing the French territory, from the interwar period up to nowadays. The collections are of variable sizes, between thousands and hundred thousand elements, which are most of the time oblique, vertical aerial or terrestrial photographs. Contrary to the well structured regular surveys in satellite imagery, the promotion of those collections remains confidential and scattered. They are generally spread among various institutions, heterogeneously documented and weakly georeferenced, while they represent a rich heritage, little known by the general public and exploited in a way forced by their main users (researchers, institutions and local authorities), on site at the library or via standard online digital libraries.

Our proposal: 2 web-based platforms dedicated to the promotion of this heritage

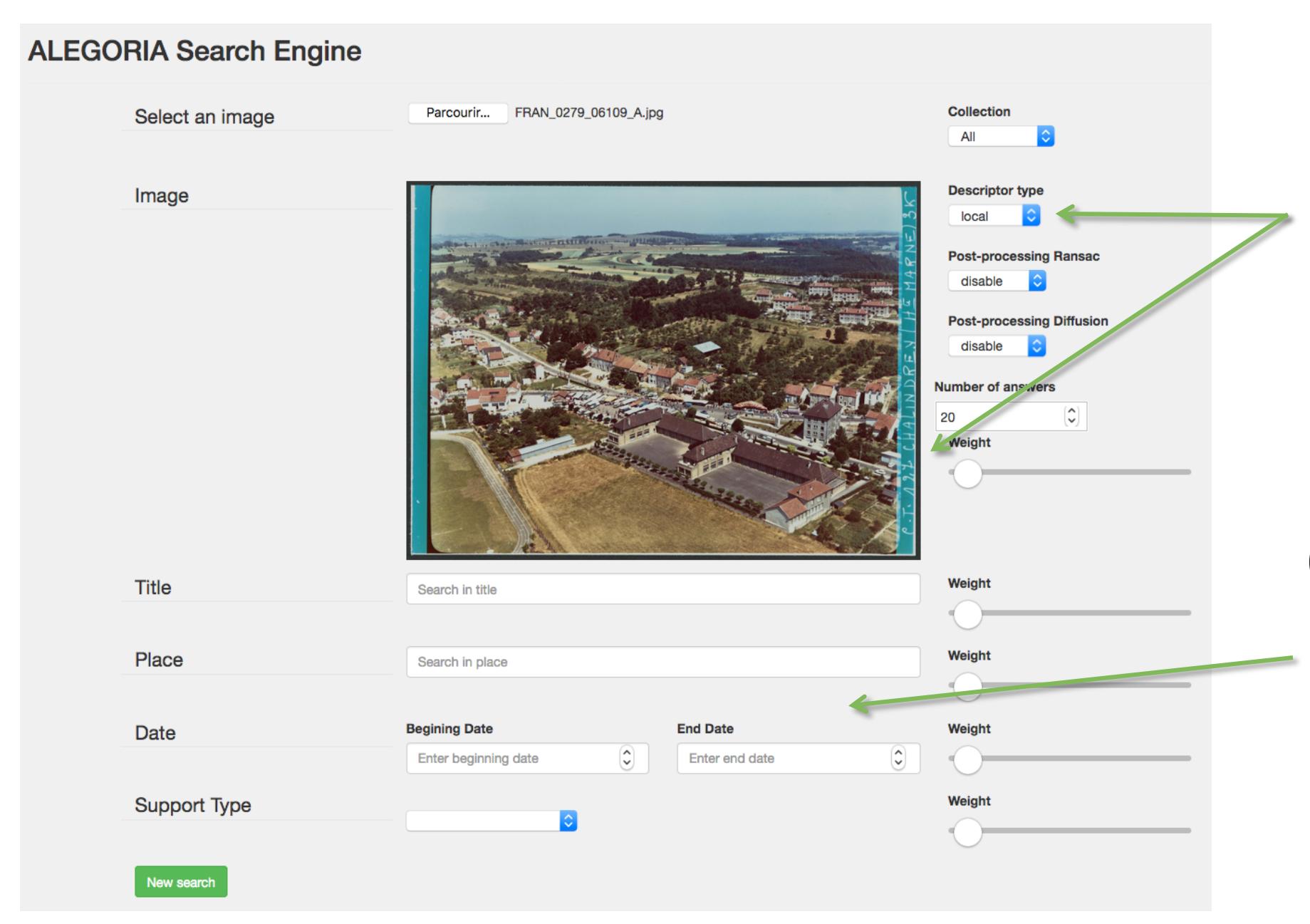
- A multimodal and large-scale search engine, coupling search by content and by metadata within collections
- A visualization engine for the immersive restitution of this heritage in spatial context, allowing spatio-temporal navigation and interaction in the 3D environment

Guided by geolocation, these platforms can be used jointly: they bring structure and knowledge to the manipulated collections, with the aim of serving several use cases in SSH

Collections. 90,000 iconographic contents, coming from several French institutions: French national archives, French mapping agency (IGN) and Nicéphore Niépce Museum

- A bird's eye view of the French territory from the 20's to the 70's (mainly oblique, some vertical or terrestrial)
- 70,000 views described with harmonized metadata (RDF, ICA/RiC-O)
- Various levels of geolocation: no information, toponym, 2D location up to a 6-DoF pose [1]

ALEGORIA multimodal search engine



(1a) Query by content of the collections

The image loaded as query by content, in this example by selecting local image descriptors [5] to search photographs of the same scene (Chalindrey town)

(1b) Multimodal query

It is also possible to retrieve images from harmonized metadata, and by the joint use of metadata and content description

(2) Retrieval

Retrieval is performed in one or several collections. The k first results are presented with main metadata, in this example by decreasing order of visual similarity of the query by content: they exhibit the same area (column "Location")

(3) Go to spatial navigation

It is then possible to select one image in order to see it in its 3D environment (button "show"), either by selecting its location when available, or the one of a similar retrieved image (button "Select this location").

"show" button colors:

- Green: 6-DoF location available
- Yellow: toponym available
- Gray: no location available

Main publications

- [1] E. Bletry, N. Fernandes and V. Gouet-Brunet, How to Spatialize Geographical Iconographic Heritage, In Proceedings of the 3rd Workshop on Structuring and Understanding of Multimedia heritAge Contents (SUMAC 2021 @ACM Multimedia 2021), p. 31–40, Chengdu, China, 2021.
- [2] E. Bletry, P. Lecat, A. Devaux, V. Gouet-Brunet, F. Saly-Giocanti, M. Brédif, L. Delavoiplière, S. Conord and F. Moret, A Spatio-temporal Web-application for the Understanding of the Formation of the Parisian Metropolis, In 3D GeoInfo 2020 conference, ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences, VI-4/W1-2020, London, UK, p. 45–52, 2020.
- [3] B. Bucher, C. Hein, D. Raines and V. Gouet-Brunet, Towards Culture-Aware Smart and Sustainable Cities: Integrating Historical Sources in Spatial Information Infrastructures, ISPRS International Journal of Geo-Information 10, 9, p. 1–24, 2021.
- [4] A. Devaux, M. Brédif and N. Paparoditis, A web-based 3D mapping application using WebGL allowing interaction with images, point clouds and models, In 20th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems. ACM-GIS'12, ACM Press, p. 586–588, 2012.
- [5] D. Gominski, V. Gouet-Brunet and L. Chen, Connecting Images through Sources: Exploring Low-Data, Heterogeneous Instance Retrieval, Remote Sensing 13, 16, 3080, 2021.
- [6] M. Harrach, A. Devaux and M. Brédif, Interactive image geolocalization in an immersive web application, ISPRS International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences XLII-2/W9, p. 377–380, 2019.
- [7] E. Paiz-Reyes, M. Brédif and S. Christophe, Geometric distortion of historical images for 3D visualization. ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences, p. 649–655, 2020.

Vizualisation in spatial context



iTowns, an open source web-based library (WebGL and OGC) for accessing and visualizing 3D [4]

- Rendering of heterogeneous geospatial data (aerial, terrestrial 2D/3D imagery, vector or statistical data, etc.) into a common 3D reference model [7]
- ALEGORIA tools: navigation through time, free viewpoint navigation and management of massive data [2]
- Semi-automatic 6-DoF geolocalization tool, from 2D-3D registration of user clicks [1, 6]



This view, associated with toponym "Chalindrey" (from another view) converted in 2D geolocation, is displayed in the 3D scene by simple overlay, before a semi-automatic 6-DoF geolocalization step



This view (Chalindrey town) is 6-DoF localized and displayed with the camera pyramid model in the 3D scene, around which the user can turn freely

Credits: Nicéphore Niépce Museum and IGN photothèque

Use cases and applications

ALEGORIA gathers historians, sociologists, archivists and museum curators, who evaluated the proposed functionalities for several use cases:

- Link by content similar images according to a given criterion, in order to improve metadata, or to share multisource documentary information
- Help in structuring a collection, for instance by retrieving duplicate or derived visual contents
- Link similar images of the same location, across collections and times; similarly, show an old photograph in its present-day 3D spatial context
- Navigate into the 3D environment and juxtapose other contents (photographs, 3D models, statistics, etc.)

Several applications were considered: study of the territory evolution [2], visual sociology, virtual and sustainable tourism [3], education, etc.