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Tracing and Telling:
Exploring collection holdings through graph-based narratives

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ABSTRACT: Cultural collections have transcended the boundaries of physical showcases and storage cabinets, evolving into intricate digital webs of interconnected data. The research project Restaging Fashion aimed to expand the possibilities for experiencing the linkages in digitized cultural heritage, focusing on the visualization of collection holdings related to the history of garments. Through graph-based narratives, the project investigated the complex interplay between the linear – and at times tentative – art historical discourses and the non-linear explorations of associated cultural heritage data. The resulting visualizations have been designed with the aim to allow for curated and dynamic exploration of the collection along research essays and their interrelated graphs.

1. INTRODUCTION

"Restaging Fashion - Digital contextualization of vestimentary sources" has been a three-year research and digitization project, funded by the Federal Ministry of Education and Research and situated at the Urban Complexity Lab [1] at the University of Applied Sciences Potsdam. Researchers from interface design, information science, and art history collaborated to represent fashion history and its sources from a linked data and information visualization perspective. The methodological approach in dress research of juxtaposing sources is being represented in the digital realm by connecting multimodal fashion sources through semantic relationships within and in between items." (see Fig. 1).

Figure 1: Garments depicted on paintings are semantically tagged and linked

The Berlin based publishing couple Franz and Frieda von Lipperheide gathered a collection of paintings, miniatures, relief sculptures, photographs, prints, drawings, almanacs and costume books as well as secondary literature while traveling in Germany, Austria, Italy and Switzerland in the late 19th century. This collection was and still is among one of the largest collections of sources worldwide with

regard to the history and use of fashion, costume and regional dress.

The donation of this vast collection to the state in 1892 resulted in the emergence of the Lipperheide Costume Library, which opened in 1906 next to the Arts and Crafts Museum in a separate library building. Today the Lipperheidesche Kostümbibliothek - Sammlung Modebild is housed in the Art Library (Berlin State Museums). The separation of Berlin during the aftermath of World War II also caused the splitting of the collection. While the prints and drawings as well as the literature were available for researchers, the collection of over 600 paintings and miniatures has not been displayed up to this day.

The Restaging Fashion project conserved, digitized and cataloged the paintings collection in terms of its clothing-historical content and source value. This was supplemented by 1000 selected prints and drawings from the Lipperheide collection. The selected depictions are perceived as contextualizing as well as complementing pictorial sources, enriching each other. Furthermore, a total of fifteen historical garments from the textile collection of the Germanisches Museum in Nuremberg serve as material evidence. The textile items span from 1600 to 1815 and range from the early modern doublets to a chemise dress from the early 19th century. The data capturing process involved 3D scanning and photogrammetry and they are now viewable and navigable as 3D objects. Archival documents on the history of the painting and miniature collection situate the collection objects in the historical context of the 19th century and document the genesis of the collection, its first presentation, its division after World War II as well as its reunification at the Berlin Kulturforum after the fall of the Berlin Wall. In addition, exemplary historical text sources have been selected for completing the source triad of image-text-dress and exemplifying the methodological approach of the project.

Restaging Fashion draws on visual, documentary, and material evidence, sources that are connected and communicated through the means of information visualization. The proposed visualization hence showcases paintings and miniatures alongside prints and drawings from the same collection, as well as textual and archival sources and material

evidence provided by digital 3D objects of historic garments.

2. MODELING PREVIOUS AND ONGOING RESEARCH DATA

A significant part and core component of Restaging Fashion has been the documentation of the artworks and garments as well as the modeling and maintenance of the created research data, which then forms the basis of the resulting visualizations. The structural data that was generated followed specific modeling principles that enable semantic enrichment. Based on these premises, the Conceptual Reference Model of the International Committee for Documentation (CIDOC CRM) [2] was selected as the core model for the representation of the collection items. CIDOC CRM is being used extensively in the cultural sector, e.g. at the Rijksmuseum Amsterdam, the Germanisches Nationalmuseum Nuremberg, and the British Museum in London, and allows for representing cultural objects, their history, life cycle and relationships, due to its event-driven approach.

In order to choose a platform for cataloging and publishing the collected data and images, aspects and requirements such as open source, documentation and a lively coding community were taken into account. Omeka S [3] provided these requirements and the possibilities to further extend it. Omeka S became the primary platform for artifact documentation and provides an interface for establishing relationships between objects and concepts within the framework of Linked Open Data (LOD). At the same time, it offers the possibility to incorporate additional ontologies that would enrich and precisely describe the primary sources. The first step was then to migrate an already existing research database, which had been developed in a previous project at the Berlin Cluster of Excellence *Image Knowledge Gestaltung*.[4] When starting with the data generation process in Restaging Fashion the framework chosen for the description of the art works proved to be complex, unclear as regards the selection of object entities and properties in a structure that appeared to be nestled and complex. CIDOC CRM's extensive list of concepts made it challenging to distinguish between some of them, whereas at the same time they were not adequate for a more pragmatic approach. The difficulty in adopting its classes in combination with the granular approach that linked data

necessitated made data input cumbersome (an example of the granular approach in linked data representation can be seen in Fig. 2). As a result, some decisions had to be made, which would enable a more user-friendly approach in relation to cataloging and information presentation.
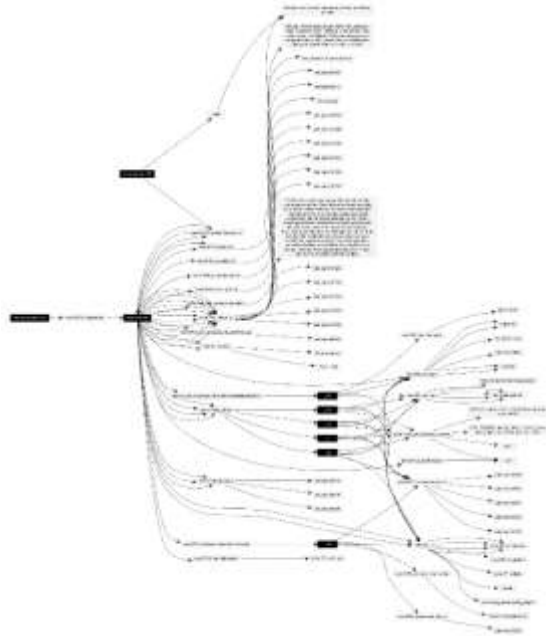
Figure 2: Screenshot ReFa data model, see https://observablehq.com/@sinanatra/cidoc-crm

In this regard, data curation emphasized the need for simplicity while at the same time ensuring precision to sufficiently characterize the collection. Properties that represented relationships too exhaustively were replaced by terms from other ontologies. As a consequence, CIDOC CRM was enriched by the use of other systems, especially Dublin Core [5] and Linked.Art [6]. Moreover, for some relationships local properties were implemented, whereas for the description of concepts the Simple Knowledge Organization System (SKOS) [7] was used. In terms of simplicity, readability, and time management, textual descriptions (with literal values) were preferred, in cases where more granular linking of entities (e.g., inscriptions or dimensions) and their properties would impede data input and visualization.

Furthermore, the data created were to be accessed alongside research essays that described and contextualized the artworks and their relations. Despite the rich semantics and the extensive representational capabilities of linked data, it was important for the project that the structure of the data would be readable by both humans and machines, raising the

awareness that the contemplative and reflective nature of art history discourse, often disseminated in narratives, could not adequately be replaced by an extensive network. In this regard, an effort was made for a detailed representation of cultural data, while at the same time reducing complexity and focusing on the visual representation of the information.

3. DESIGN PROCESS

Data visualization projects are often initiated on the basis of an existing dataset, which may need to be prepared and analyzed before being visualized. In contrast, this research project provided for a parallel and interconnected process of data modeling and creation, closely coupled with the design and prototyping of visualization. Since the beginning of the project, several prototypes and experiments, in the form of Observable Notebooks, have been made, in order to test the appropriate representation of the information.

3.1 PROTOTYPING METHODOLOGY

Initial efforts focused on the correct semantic structure of the data: from processing and visualizing semantic triples, to verifying the correct import of data in Omeka S. Simultaneously, the data modeling and the vocabularies used in the project have been visualized to carry out quantitative analyses. Visually representing vocabulary structures and associated artworks (see Fig. 3), helped in understanding how to enrich the descriptions of items, while visualizing ontologies facilitated a more precise semantic description of artworks.
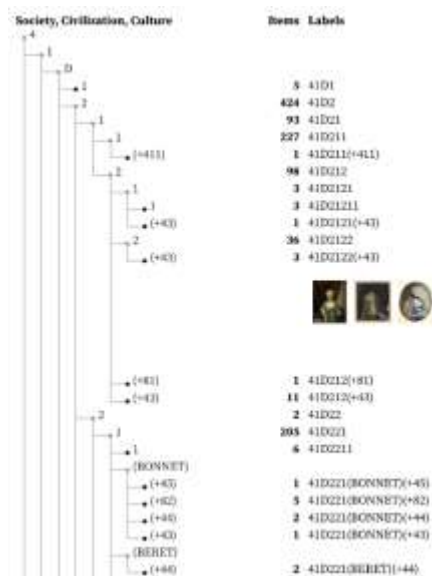
Several different approaches were tested out to display the collection. From showing it in its entirety, based on similarities between paintings (see Fig. 4), to representing it on a temporal scale, to scaling up to a single painting and telling stories based on the connections it draws.

Figure 4: Painting and miniatures sorted by visual similarity

Finally, the focus centered on the visual juxtaposition of essays and graph visualizations for better representing the art historical discourse and giving access points to navigating the collection (see Fig. 5). Further prototypes were created to test how to combine essays and graphs. Both from a technical point of view: how to simultaneously write an essay by creating connections with the elements of a database, and from a visual point of view: at what level of granularity to represent a network that potentially allows thousands of connections?

Figure 5: An early prototype of the ReFa Reader

Early versions combined textual elements and graph representations, allowing the multiple connections between objects to be visualized. The network showed an overview of the material but did not allow further exploration of the collection. The curation of space is limited because the algorithms used to design the networks push and pull objects based on the strength of their relationships. Objects with more relationships would be central, while those with fewer relationships would be pushed away. This would produce a visual clutter,

where the understanding of overall structural relationships would become very difficult [8]. Instead, by following the footsteps of the information flaneur [9] and perceiving the network from a local perspective, further prototypes were created. Starting from a term or phrase mentioned in a text and opening up a graph of relations from it allows for more editorial possibilities both in terms of essay writing and in terms of the resulting graph of connections.

3.2 TRACING & TELLING

Based on structured and semantically enriched data, the visualization exposes the data relationships in a graph-based setting in direct connection with introductory essays, giving the viewer the possibility to learn about art and fashion history as well as discover contextualized vestimentary sources. The iterative and collaborative design process, conducted through a series of co-design workshops with participants' backgrounds ranging from the digital humanities to interface design, has been centered around the question of how to convey the artworks, their rich interrelations, and relevant research. Despite an intricate modeling structure, it seems that some discourses remain "unrepresentable" [10]. The chosen reference model allows a detailed description of objects. However, regarding the representation of the ongoing research process, it is not always necessary (or feasible) to make all observations machine-readable. Instead, the priority is to present information in a way that is accessible to other researchers, avoiding the need for extensive formalization [11]. Mapping the results of art historical research into a data model based on a sequence of facts or on circumstantial evidence can quickly lead to a densely interwoven system that is neither satisfactory nor readable. To represent tentative observations or art historical argumentation threads, it was opted to design a prototype that provides access to the collection holdings via curated entry stories. Through such stories one can grasp the meaning of the artworks by following the art historical account, while at the same time relationships between artworks are shown in a graph-based environment.

Deviating from the common "Overview first" approach [12], it is possible to follow the narratives and iteratively build an understanding of the collection or dive deeper

into the collection by navigating the adjacent graph. Moreover, based on the idea that a collection should not only be accessible and navigable via different modes of granularity [13] but should also provide an introduction to the genesis of the collection and its artworks, a curatorial selection of essays, which address specific artworks, themes, and connections from the collection, is also showcased.

Following the notion that networks are also maps that act as instruments for navigation and representation [14], a curated approach to the design of the graph has been employed. The positioning of nodes suggests possible directions to explore the collection, interlacing texts with further information [15]. The viewer can delve into specific entities by clicking on them and thus opening up a new graph of relations to other entities. The generated graph comprises the core component of the interface and enables open-ended exploration. At the same time, artworks mentioned in the essay are highlighted, providing their visual representation in high resolution along with their related metadata.

Figure 6: Screenshot of an essay in the ReFa Reader

The proposed visualization concept, namely the *ReFa Reader* (see Fig. 6) [16], serves not just as a hybrid medium for the communication and exploration of fashion histories, but can be arguably used to experience digitized cultural collections in other domains, too. By combining the linearity of the narrative form with the topology of graphical nodes and edges, the prototype demonstrates the viability of the visualization concept that can be adapted to other data sources beyond the scope of fashion history. Potentially, formulating stories within collection visualizations allows for a more contextualized approach. Handing this tool to researchers from different disciplines and backgrounds could lead the way to more pluralistic readings of cultural collections in general.

4. CONCLUSION

One central premise of this research was that "[t]he use of computer supported, interactive, visual representation of data [can] amplify cognition" [17], which underlines the epistemic function of information visualization. However, linked open data is often hidden in collection interfaces. The semantic interconnectedness within a cultural collection is rarely used to stage narratives and pursue open-ended exploration. Even rarer is the integration of storytelling into exploratory collection visualizations. This research investigated the potential of interweaving linear description of art and fashion history with the non-linear exploration of the respective cultural heritage data.

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