



Universal Exhibition Paris 1867 – Chatbot

DH-404 Cultural Data Sculpting - Final Report
10 June 2024

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1 INTRODUCTION

This document outlines the design and development process for an immersive archive experience featuring stereo views from the 1867 Universal Exhibition in Paris. Hosted within the Laboratory for Experimental Museology's Panorama+ visualization framework, the project aims to enable visitors to view historical images in their intended 3D format, all within the public, immersive Panorama+ space. The initiative combines advanced technologies with historical research to create an engaging and informative exploration of the 19th-century World's Fair, allowing visitors to experience a collection of stereo views as they were originally intended to be seen.

The process began with an extensive ideation phase, where the multi-layered characteristics of the dataset were analyzed from theoretical, categorical, and visual perspectives. The ideas evolved into the "Conversational Tour" chatbot concept, leveraging the Virtual Large Language Models (vLLM) to dynamically allow users to interact with the archive.

The dataset, comprising approximately 1,500 stereoscopic pairs, required meticulous restoration using Photoshop, followed by manual and semi-automatic annotation to enhance metadata. Key technologies employed include NL2SQL for translating user queries into database searches and a large language model (LLM) for generating contextual responses.

Design decisions focused on the Panorama+ framework for its immersive, social setting, complemented by an iPad interface for user interaction. The virtual agent, Angelus Novus, guides users through the experience, embodying the project's blend of historical depth and interactive innovation.

The resulting prototype integrates Unity, HTML, CSS, JavaScript, Amazon AWS, and GPT-3 api, offering an interactive visitor experience. This project not only revitalizes historical viewing modalities but also presents a contemporary encounter with the diverse narratives of the 1867 Universal Exhibition.

2 BACKGROUND

2.1 1867 Universal Exhibition in Paris

In 1867, France hosted the Universal Exhibition in Paris, where the event featured a grand elliptical palace on the Champ-de-Mars, surrounded by numerous pavilions across a 68,700 square meter park. The exposition drew 52,000 exhibitors and 11 million visitors from April to November, representing 42 countries, including significant participation from French colonies like Morocco, Tunisia, and Algeria.

To commemorate the 1867 Universal Exhibition, official photographers captured the event extensively, resulting in several thousand photographs, including 2,000 stereoscopic views by Parisian publishers Léon & Levy. The "Stereo Spectacular" project leverages this dataset, consisting of about 1,500 stereoscopic pairs, to blend advanced technology with historical research, creating an immersive experience of the 19th-century World's Fair. While some of these stereoscopic images have been restored, many remain in their original state, awaiting restoration to fully realize their potential in 3D visualization.

2.2 History of Chatbots



Figure 1: Chatbot Illustration

There is a lot of hype around chatbots today. Some researchers assert that nearly 60% of the internet consists of "AI-generated and translated content" (Dupré 2024: para. 1, citing Brian et al. 2024).

The observable increase of LLM-created text online has even given rise to the new 'Dead Internet' conspiracy theory which asserts that most of the Internet is chatbot-made and chatbot-curated in order to control the population.

Some members of this group have never used ChatGPT or any LLM, but we all use online search engines to find information and do research online. Working on this project generated interesting conversations among the group members about chatbots, why we use them, and about the ways we expect to find information.

We have (mostly) grown up with the Internet and Google, and we've normalized the idea of searching for information online. When we think about our younger cousins and the current generation of small children, we believe that they will, in the same manner, normalize the idea of conversational search using Generative AI technologies.

We agree that – for better or for worse – chatbots will be increasingly used in a wide variety of fields, including the cultural heritage sector. In fact, the idea of the 'Conversational Archive' is already posited as an archive content accessibility solution in Gallery, Library, Archive, and Museum (GLAM) circles (Potyagalova 2023).

We feel that forward-thinking interactional design must take the growing use of LLMs and other Generative AI tools into account.

If well-trained on a carefully curated corpus of material, we feel that LLMs and other Generative AI tools can offer interesting solutions for delving into and exploring otherwise inaccessibly massive digital archives.

2.2.1 Thinking Machine



Figure 2: American National Exhibition in Moscow

At the American National Exhibition in Moscow in 1959, IBM's Ramac 305 machine was placed inside a massive dome lined with large screens. The machine was trained on an encyclopedia, and it was able to answer questions. Soviet visitors apparently loved it; they could ask "Who is Pushkin?" and the machine would print out an answer in Cyrillic. A screen displayed a list of questions that the machine was able to answer (Kotsioris 2016).

Our design builds on this tradition of marrying the thinking machine and the immersive space.

2.2.2 Living Space



Figure 3: Pepsi Pavilion, Expo '70, Osaka, Japan

Another early work that relates to our project is the Pepsi Pavilion from the 1970 Expo in Osaka, Japan. Artists and engineers collaborated to create a large spherical mirror dome inside of which visitors were surrounded by their floating reflections. Visitors were provided with wireless handsets which emitted a textured montage of environmental sounds. The soundscape shifted as visitors moved around – as though they were listening to the murmuring of a living space (McCrae 2020; Schumacher 2014).

Our design also builds on this early experience of being able to interact with an englobing, 'living' or emotive structure.

2.2.3 Ambient Interactional Design

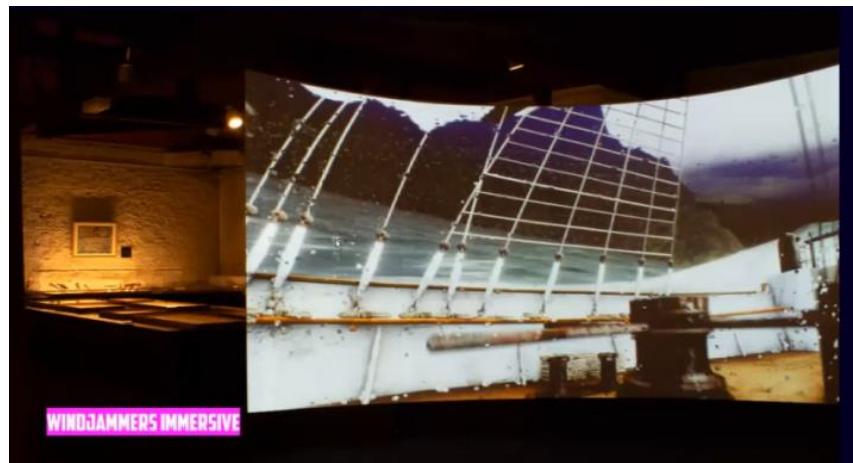


Figure 4: Windjammers Immersive

Jumping into the future – and building on the idea of a ‘living space’ – we take inspiration from Andrew Yip’s *Windjammers Immersive* project which illustrates the principle of ambient interactional design (Yip).

We like how Yip’s narrative screen responds to viewers’ motions and how source material like diary writing is integrated into these motion-based interactions.

Here, the curved screen is not just visually and sonically emotive; it is also responsive. Its responsiveness adds to its ‘liveliness’ and thus, we imagine, to the visitor’s sense of presence as they give shape to the narrative displayed.

2.2.4 Other Sources of Inspiration



Figure 5: ECLOUD WWI



Figure 6: ECLOUDWWI: Multimodal Display Including Objects and Text.

We like the way *ECLOUDWWI* uses a slightly curved screen and a data cloud-esque framework to cylindrically display source documents, as seen in Figure 5.

Furthermore, we like how items are categorized according to themes such as 'Medical' and 'Prisoners of War,' also seen in Figure 5.

What is more, we like the way heterogeneous elements – e.g., images of physical objects and textual information – are integrated into a cohesive view, as seen in Figure 6. This configuration informed our idea for 'Layered Images' (c.f., 'Initial Idea 2' below).



Figure 7: mArchive

We also drew inspiration from the *mArchive* experience (Figure 7), particularly its innovative use of a Datasphere cloud to visualize data. The concept of 'ribbons' of cluster keys, which allows users to explore various categories, informed our approach to organizing and navigating the dataset. Additionally, the ability to zoom in on specific categories and selected images provided a model for creating detailed, focused views within our project. We also appreciated the use of Wordle-style keyword visualizations to complement historical images, enhancing the thematic and contextual understanding for users.

3 CONCEPT

3.1 Ideation Process

At the onset of our project, we engaged deeply with the multi-layered characteristics of the images in our dataset, examining them from theoretical, categorical, and visual perspectives.

Our objective was to enable these images to tell new stories, adding complexity and deconstructing the narratives originally intended by their creators, tailored to the interests of our users.

This approach to experiencing the dataset significantly influenced our ideation process, shaping our considerations and final outcomes.

3.2 Idea I – Discovery Search: Datasphere & Initial Pathways

Our first concept, titled "Discovery Search: Datasphere & Initial Pathways," was visualized in the following steps, which are also illustrated in the initial sketches referenced as Figure 8:

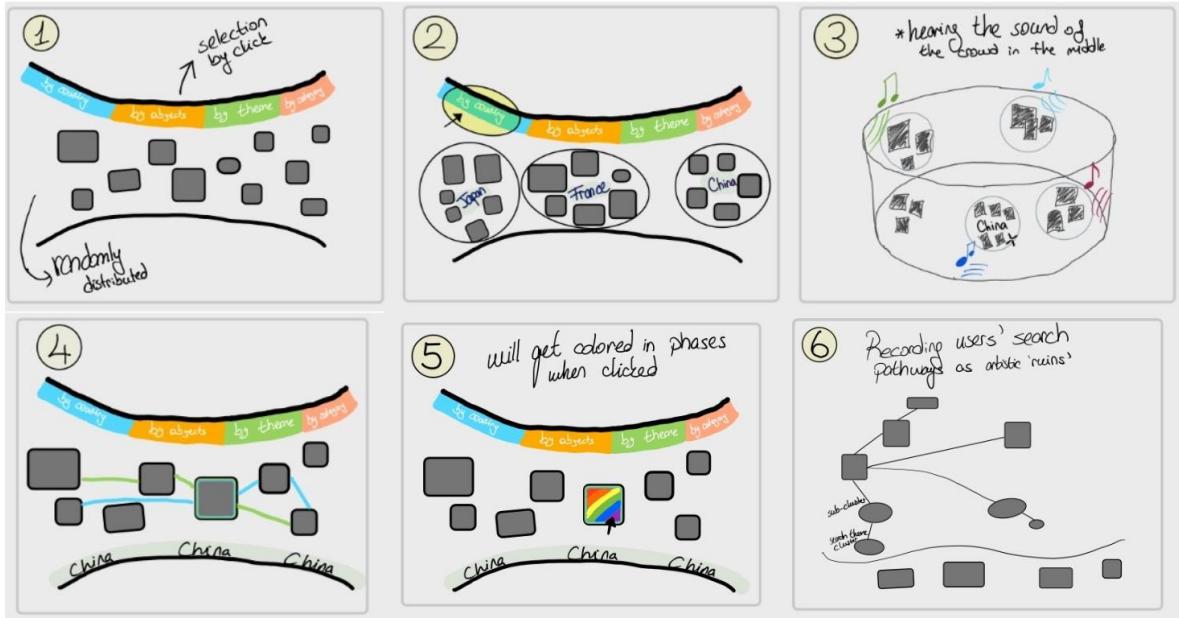


Figure 8: Sketches for Concept Idea I

1. **Initial Appearance:** The experience begins with a 'datasphere cloud' reminiscent of *mARchive*, alongside a ribbon displaying search themes (Kenderdine, "*mARchive*")
2. **Clustering by Theme:** Images are organized into clusters based on various criteria such as official catalogue classifications, countries, and subjects like animals.
3. **Sonification Based on Clusters:** This feature involves sonification of the images where, for example, nationality-related images might be accompanied by national or folk music.
4. **Visualization of Critical, Thematic Links:** Critical themes such as coloniality, extractivism, and gender are visually linked to relevant images.
5. **Interactive Engagement:** Images become highlighted or colored when clicked, enhancing user interaction.
6. **Sharing Users' Path History:** The system preserves the user's navigational path through the dataset. Users can 'extract' and share views of their pathways or specific subsets of images, as inspired by Schneiderman (1996), cited in Whitelaw (2015).

This approach not only enriches the user experience by providing a multi-sensory exploration of the dataset but also enables personal and shared journeys through historical and thematic narratives.

3.3 Idea II – Layered Images: The Image & Its Echoes

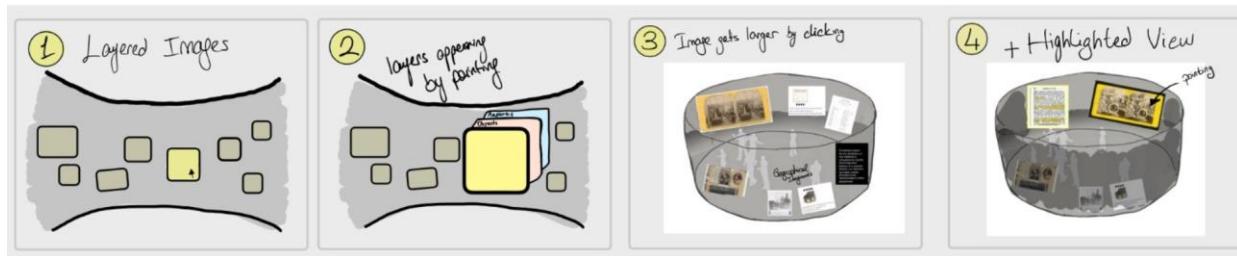


Figure 9: Sketches for Concept Idea II

1. **Integration of Rich Content:** Each image is enhanced with "rich primary content" that connects to the themes introduced in Part 1 (referenced from Whitelaw 2015), integrating multimodal content into the stereo viewing system for a richer informational experience.
2. **Details-on-Demand:** By hovering over an image for approximately 1-2 seconds, users activate layers that reveal additional information about the image, implementing the concept of details-on-demand as discussed by Shneiderman in 1996.
3. **Expansion of Information:** Upon clicking an image, the layered components within it expand to fully occupy the display area, creating a comprehensive visual representation of the accumulated information related to the image.
4. **Interactive Exploration:** When users hover over any part of the expanded image components, this action highlights related fragments within the image or the text, enhancing the connectivity and interaction between different pieces of content.

These steps (Figure 9) were designed to provide an engaging, in-depth exploration of images, though the project direction ultimately shifted towards focusing on the "Conversational Tour" chatbot concept. However, the considerations of layered structures and data connections were retained in the development process.

3.4 Idea III - Conversational Tour: Initial Chatbot Ideas

In the early stages of developing our interactive experience, we explored several innovative chatbot concepts to enhance user engagement with the 1867 Universal Exhibition archive.

This idea evolved into a more structured and interactive experience. By clicking on a dialogue icon, users can initiate a conversation with the image, where the system generates responses based on labeled information. Users have the option to either type or speak directly to the chatbot, facilitating a natural and engaging interaction.

Chatbot: This feature allows users to engage directly with images. The system provides responses based on pre-labeled information, making interactions both informative and engaging.

Comment: A comment window enables users to type, handwrite, or record their thoughts, feelings, or questions about the image. Additionally, users can access comments left by previous visitors, which float around the image in plain text, graffiti, or multichannel sound, enriching the communal aspect of the experience.

Virtual Guide: To aid navigation, users can utilize a virtual guide (Ibanez et al., 2003) that provides directions, suggests points of interest, offers contextual information, and even presents small quizzes throughout the exhibition. This guide enhances the overall user experience by making navigation intuitive and informative.

Additionally, we considered several other concepts to broaden the interactive potential of the archive:

Chatterbots: We considered deploying multiple chatbots, each trained on various types of sources, to provide diverse and detailed responses to user queries. This approach aimed to enrich the user experience by offering multiple perspectives and in-depth information.

Palace Gallery Visualization: This idea focused on creating a virtual gallery where users could navigate through different exhibition spaces. Each space would be represented by a chatbot that offers detailed historical information and interactive experiences, simulating a guided tour of the palace gallery.

Visitor Graffiti: This concept allowed users to leave comments, thoughts, and questions around images in various formats such as plain text, handwritten notes, or audio recordings. These user contributions would float around the images, creating a dynamic and interactive layer of visitor interaction. However, we decided not to develop this idea due to potential challenges in moderating content and ensuring the quality and relevance of user contributions.

These initial chatbot ideas aimed to create a deeply interactive and engaging experience, leveraging conversational technologies to bring the rich history of the 1867 Universal Exhibition to life. By integrating these concepts, we sought to offer users a dynamic exploration of the archive, tailored to both casual visitors and specialist researchers.

3.5 Why the Chatbot?

We think that using a chatbot is an effective way for allowing audiences to 'speak with' the 1867 stereo archive. In combination with an NL-to-SQL system which allows visitors to filter, cluster, and grasp trends in the archive, a well-made chatbot that can generate summaries from a variety of textual sources and recall extracts from particular textual sources would allow visitors to access "details on demand" in relation to individual images or particular clusters as they desire (Whitelaw 2015; Schneiderman 1996).

In an immersive, interactive, visually-spectacular framework, the conversational search is an ideal way to 'non-grammatocentrically' integrate the information contained in an otherwise

inaccessibly large amount of textual material – thousands of pages of visitor accounts, government reports, as well as secondary sources and other, related items.

3.6 Building on Initial Work

Building a chatbot required us to complete the same work required for Initial Ideas 1 and 2. We still had to manually curate and annotate an 82-image sample of the dataset according to our vision for thematic clustering. We also had to conduct in-depth research, and amass detailed information related to individual images and particular image clusters.

This work is not lost. In the event that existing LLM technology is not able to generate suitable responses to viewer questions, the archive is still organized in such a way that, even without the chatbot, a generous interface integrating Discovery Search (c.f., Initial Idea 1) and Layered Image (c.f., Initial Idea 2) capabilities could still be feasibly created.

3.7 Target Audience

The immersive archive experience within the Panorama+ visualization framework is designed for both non-specialist visitors and theoretically-informed specialists, catering to the needs of a broad audience with diverse backgrounds.

For the general public, we aim to provide an engaging and accessible way to explore the 1867 Universal Exhibition. Within a dynamic and interactive 3D environment, complex historical narratives become more approachable and intriguing. While for specialists, the archive also offers a rich, critically-informed resource for in-depth research and analysis. Combining advanced technologies with historical research, the project facilitates deeper engagement with the material. Specialists can critically analyze complex themes, benefit from augmented image information from multimodal resources, and efficiently filter, cluster, and analyze trends within the archive.

Moreover, considering the wide target audience, the needs of younger generations who are accustomed to using chatbots, and future generations who will likely continue to prefer this mode of interaction, have been taken into account. This ensures that the experience is not only engaging and informative but also aligns with the evolving preferences and technological fluency of newer audiences. In this way, the project bridges historical content with modern interaction techniques, making it relevant and accessible to a broad spectrum of users.

3.8 Golden Circle

We crafted our Design Argument as follows:

WHY: Our Vision

Recombined and augmented images get to tell new stories – to complexify and deconstruct the narratives they were designed to tell, according to users' interests.

HOW: Our Method

By constructing a critically and historically-informed annotation code (c.f., Arnold and Tilton 2019), augmenting images with multimodal resources, and building an NL-to-SQL system...

WHAT: Our Objective

...we aim to create a voice-searchable “generous interface” (Whitelaw 2015) that allows users to overview, search-by-cluster, and zoom into stereo images for rich information.

In this system, users will be able to visualize and reconfigure the archive according to critical and intersecting themes – effectively ‘sculpting’ the data with the help of a virtual agent (c.f., Kenderdine et al. 2011).

3.9 Guiding Questions

Two primary considerations oriented our approach. Our decision to pursue the chatbot idea prompted the following question 1:

How to sculpt the data using a chatbot?

How to sculpt the data using a chatbot in a way that suits the archive and allows for new knowledge production?

How to create a chatbot-based interactional framework that emerges from the archive collection?

This question focuses on the practical and theoretical aspects of using a chatbot to interact with the archive. It involves developing a method to effectively organize and present the data through conversational interactions. The goal is to ensure that the chatbot not only serves as a guide but also enhances the user's understanding and engagement with the archival material. This requires a thoughtful approach to data structuring, annotation, and the integration of user queries with meaningful responses that generate new insights and knowledge.

We also questioned how a chatbot would fit within the aesthetic framework of the Panorama+ answering the following second guiding question:

How to use Panorama+ as a Chatbot?

How to marry the Panorama+ system and the conversational capabilities of a chatbot?

How to build a chatbot-based experience that can only be had within the Panorama+?

We began to think of the Panorama+ space as a ‘living space’ or dynamic host realm for the image archive – a kind of data cloud home of wisping and wonder, in which visitors can shape the cloud and speak the questions spurred by their visualizations.

4 TECHNICAL FLOW

4.1 Restoration

The restoration of stereographs for 3D viewing involves a meticulous process using Photoshop (Figure 10). The images are first cropped and saved in a format that supports right-left viewing. Restoration tools then address any damage: the History Brush combined with a Dust and Scratches Filter removes general wear, while the Spot Healing Tool is specifically used for larger imperfections and challenging areas. This detailed restoration process ensures that each stereograph is optimally prepared for three-dimensional display.



Figure 10: Sample Restoration Process

4.2 Manual Annotation

Training a robust LLM model that can cluster data and generate contextually relevant responses requires well-annotated datasets. Initially, we focused on understanding the capabilities, defining category headers, and developing the dataset for required tasks. We annotated a selected sample of images using Air Table, chosen to represent the diversity of the entire dataset.

For this project, we curated a sample of 82 images. We chose images that resonated with various themes: images of animals, plants, landscapes, and natural resources inspired ecocritical reflections, while images showing colonial displays and representations of Indigenous figures spurred questions about the colonial belly of early global capitalism.

Views									Grid view	Hide fields	Filter	Grouped by 1 field	Sorted by 2 fields	Color	Share and sync	Search												
	Glass Pl...	Text-in-Fra...	Text-in-Image...	Associated Excerpt(s)	Excerpt Image...	Excerpted Sourc...	Source File(s)	Associated Imag...	Links																			
4	✓	Exposition Universelle de 1867. Cristaux de Baccarat. Section Française.	Baccarat	Baccarat, Its Workers, and Its 'Monumental' Fountain: Baccarat exhibited crystals that had cost the company 450,000 francs to manufacture, but had a ...		Exposition universelle de 1867 à Paris. Exposition universelle de Paris en 1867: documents et rapports. Bruxelles: Imprimerie ...																						
5	✓	Exposition Universelle de 1867. Galerie des Beaux-Arts. Section Italienne.	Marie Antoinette au Temple 1795	Statues and busts by Marcello, rue Neuve-des-Capucines, 16, Paris. In the image, we see the following works: Hecate: 'The goddess, ...		Exposition universelle de 1867 à Paris. Commission impériale. Exposition Universelle de 1867 à Paris. Catalogue général, ...																						
6	✓	Exposition Universelle de 1867. Section Belge.	Sculptures et Ameublements d'Eglise - Goyers Frères à Louvain Belgique																									
+ Add...		972 tags																										
Lawn																												
Pavillion		Ecocriticism	Exotica	Plant	Imperial Commission																							
				Ornamental	Orchid																							
Country Section		Coloniality	Ecocriticism	Animal	Famous Art	✓	✓	Dog																				
		Extractivism	Indigeneity	Monument																								
		Political Aesthetics		Person - Represented	Mythology	Sculpture																						
Pavillion		Coloniality	Ecocriticism	Industry																								
		Political Aesthetics		Animal Product																								
		Consumerism	Exotica	Architecture																								
				Raw Material																								
Text-in-Frame																												
Section Wurtembergoise		Successeurs de G. C. Kessler & Co. à Esslingen Neckar.	Prize Information: G.-C. Kessler and Company Successors from Esslingen, Wurtemberg, was awarded a Silver Medal for their sparkling wine in the Group ...			Exposition universelle de 1867 à Paris. Jury international. Catalogue officiel des exposants récompensés par le Jury international. Paris: Dentu, 1867. Internet Archive, http://archive.org/details/gri_catalogueoff00exp_0...																						
Canon Krupp, Section Prussienne.			Visitor Eugene Rimmel on Imagining Dead Bodies: Unfortunately it is not all "peace and good-will among men on the earth," to wit, Krupp's exhibition which ne...			Rimmel, Eugene. Recollections of the Paris Exhibition of 1867. United Kingdom, Chapman and Hall, 1868.																						
Canon Krupp, Section Prussienne.			English Visitor Eugene Rimmel on Imagining Dead Bodies: Unfortunately it is not all "peace and good-will among men on the earth," to wit, ...			Morford, Henry. Paris in '67. New York, G. W. Carleton & co., 1867....																						
Exposition de Krupp, Essen			English Journalist George Augustus Sala on the Culpability of Arms Producers:			Sala, George Augustus. Notes and Sketches of the Paris Exhibition. London, Tinsley brothers, 1868. HathiTrust, https://catalog.hathitrust.org/Record/006587856																						
Palace Gallery Section Name																												
Palace Gallery 1		Galerie I des Oeuvres d'Art	Palace	Country Section	Gender - Masculinity																							
					Political Aesthetics																							
Palace Gallery 3		Galerie III du Mobilier	Palace	Country Section	Consumerism	Extractivism	Existing Company																					
					Interior Decor																							
Palace Gallery 1		Galerie I des Oeuvres d'Art	Palace	Country Section	Gender - Femininity																							
					Political Aesthetics																							
Palace Gallery 1																												
+ Add...		972 tags																										

Figure 11: Samples of the manual annotations in our Airtable database

The complete Manual Annotation Table contains detailed annotations for all 82 images. It can be consulted at the following link:

<https://airtable.com/appkyFwfp7CjWtlkj/shrlZFcNeEeEVLhap>.

The Commented User Experience in Section 7 details how the manual annotation tags factor into the user experience.

4.3 Automatic Annotation

The goal of our automatic annotation process is to augment additional information about the dataset, enhancing its richness and accessibility. Initially, we conducted research to explore various tools necessary for deep semantic annotation. This included evaluating tools such as Mirador Annotation and Protégé for Hybrid Deep Semantic Annotation. Through experimentation and trials, detailed in footnotes, we tested these methods using specific models to understand their capabilities and effectiveness in providing comprehensive and meaningful annotations. This process is crucial for developing a nuanced and informative archive that leverages advanced annotation techniques.

Method 1: Object Detection: As seen in Figure 12, while it is possible to detect simpler objects like people, birds, and ties, more complex objects pose a challenge in the initial stages.

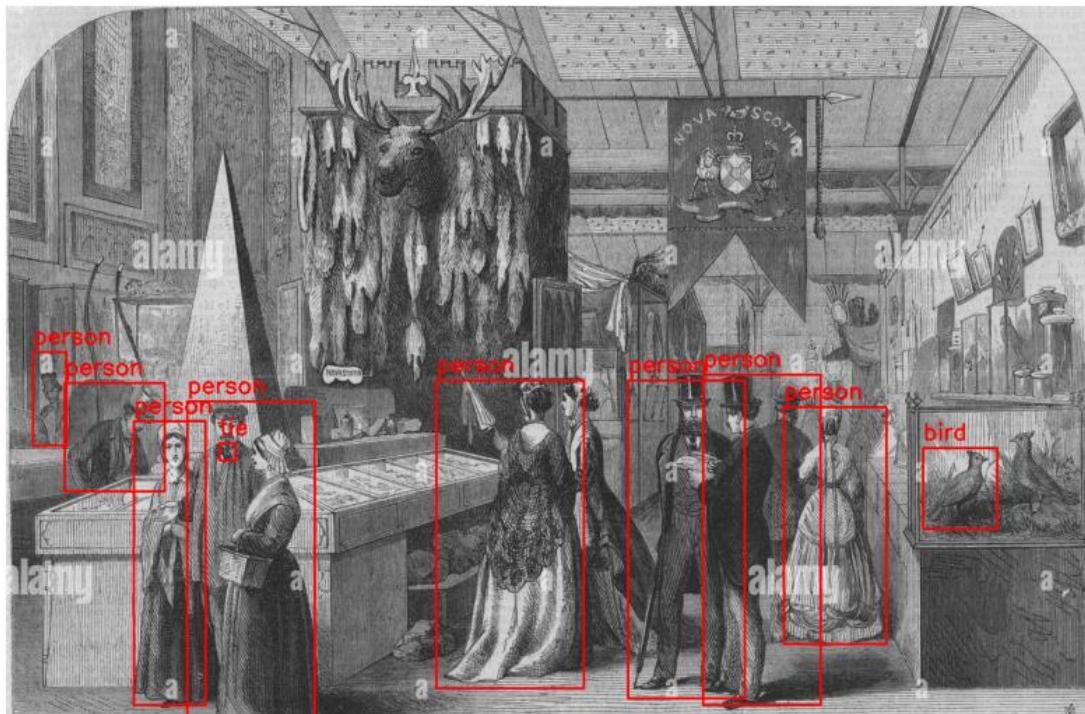


Figure 12: Sample Object Detection

Method 2: Image to Caption: Image to Caption: For this process, we employed a specific model link. The caption generated for the image in Figure 12 was determined as "Generated Caption: the fish market in London, England, engraving from the illustrated by the Illustrated magazine." Conversely, the caption for the image in Figure 13 was "Generated Caption: the factory of the German factory of the German manufacturer, the German manufacturer, in the city of." These outcomes indicate that the model does not perform well, as it generates captions based on certain assumptions. Training a VLLM model to generate captions for historical images proved to be complex and is often biased based on the trained visuals of the model.



Figure 13: Sample Image Captioning

4.4 NL2SQL

Given the complete dataset with all the metadata and additional annotations, to implement the voice-searchable function for our chatbot (i.e., retrieving relevant images based on user prompts), the next major steps would be to have the model to translate human speech queries into SQL statements and send them to the database.

Here is the detailed methodology:

Model Selection: We utilized the pretrained NL2SQL model (chavinlo/alpaca-native) to convert natural language queries into SQL queries. This model facilitates the translation of user requests such as "Show me birds" into structured SQL statements.

SQL Query Generation: User text inputs are processed by the NL2SQL model to generate corresponding SQL queries. These queries are designed to fetch relevant entries from the local database. To ensure the model understands the database schema, we predefined table names and column relationships for the model.

Executing SQL Queries: The generated SQL queries are executed against the local database, which stores all relevant metadata and annotations.

Presenting the images: We have developed a prototype interface that displays images based on their retrieved IDs.

Voice Recognition Integration: While not yet implemented, integrating voice recognition technology would complete the workflow, allowing hands-free interaction.

4.5 LLM Model

Beyond image retrieval, our chatbot is designed to answer all sorts of general and specific open-ended questions about the whole exhibition. This requires a much higher level of text understanding and generation, so we used a pretrained large language model to leverage its extensive prior knowledge. Up to now the model can provide acceptable answers to broad questions, such as "What is the 1867 Universal Expo in Paris?" though minor factual inaccuracies may occur. This is our detailed methodology:

Pretrained Model Selection: We loaded a pretrained Llama model known for its strong language understanding and generation capabilities. The model can answer general questions about the Universal Expo Paris based on its extensive training data. While the Llama model can provide fairly good responses to broad queries, it still needs additional refinement for specific and detailed inquiries.

Contextual Augmentation: To tailor the model to answer more specific questions about our dataset, we aimed to use Retrieval Augmented Generation (RAG). However, full RAG implementation is pending. In the interim, we include contextual information directly in the prompt to enhance the model's responses. This method helps bridge the gap until a more robust RAG system is in place, enabling the model to provide more relevant and accurate answers to user queries.

Corpus Compilation: We compiled a corpus from historical excerpts, reports, commentaries, and other relevant documents to provide the necessary context for the model (**See Annex**). This corpus focuses on significant related topics and includes detailed information that can aid the model in generating more precise responses. By leveraging this curated collection of documents, we ensure that the model has access to pertinent background information that enhances its understanding and response generation.

Prompt Engineering: For specific questions, we include relevant paragraphs from the compiled corpus directly in the prompt. This approach provides the model with additional context that is essential for generating accurate and contextually relevant answers. By carefully selecting and including this contextual information, we help the model better understand the nuances of the user's query, leading to more precise and informative responses.

4.6 Chatbot Excerpts

As previously mentioned, information from visitor accounts, government reports, secondary sources, and related literature was excerpted and specially coded in our Manual Annotation Table.

Visitor accounts are preceded with a title that announces the visitor's name and nationality so that the LLM can recognize and retrieve textual citations.

The screenshot shows a digital interface with a table of visitor accounts. The columns include 'Image' (with a dropdown arrow), 'Associated Excerpt(s)' (with a dropdown arrow), and 'File(s)' (with a dropdown arrow). A modal window is open over the table, titled 'Associated Excerpt(s)'. It contains two sections: 'British Visitor George Augustus Sala on the Culpability of Arms' and 'Visitor Hippolyte Gautier on the Phallic Canon, Death-and-Desire, or, 'Size Matters''. The 'British Visitor' section includes a 'Producers:' heading and a quote about rewarding the society which prides itself on assuaging the sufferings of wounded soldiers. The 'Visitor Hippolyte Gautier' section includes a 'Bodies:' heading and a quote about the age of needle guns and deadly inventions. Below the table, there is a thumbnail view of several documents and images, with one document from 'Hathi Trust' visible.

Image	Associated Excerpt(s)	File(s)
; de G. C. o. à eckar.	<p>Prize Information: G.-C. Kessler and Company Successors from Esslingen, Wurtemberg, was awarded Silver Medal for their sparkling wine in the Group</p> <p>Visitor Eugene Rimmel on Imagining Dead Bodies: Unfortunately it is not all "peace and good-will among men on the earth," to wit, Krupp's exhibition which next meets our view, and which is ...</p> <p>Bodies: Unfortunately it is not all "peace and good-will among men on the earth," to wit, ..</p>	
English Journalist George Augustus Sala on the Culpability of Arms	Sala, George Augustus. Notes and Sketches of the Paris Exhibition. London, Tinsley brothers, 1868. HathiTrust,	

Additional Information – like that pertaining to prizes – is also prefaced with a title.

The screenshot shows a digital interface with a table of visitor accounts. The columns include 'Text-in-Frame' (with a dropdown arrow), 'Text-in-Image' (with a dropdown arrow), 'Associated Excerpt(s)' (with a dropdown arrow), and 'File(s)' (with a dropdown arrow). A modal window is open over the table, titled 'Associated Excerpt(s)'. It contains two sections: 'the proportions, the lightness, none of this touches the visitor any more. The ladies themselves no longer want to hear about anything other than gigantic, dizzying works of modern artillery; they need, for example, immense breech-loading rampart guns such as the one coming out of Mr. Krupp's great molten steel factory in Essen. With its imposing mass and novelty, it steals the attention of the less bellicose; impulsive and unshakeable, it poses as a dominating sovereign in the midst of the industrial machines it seems intent on intimidating and silencing. (Gautier 78-79; translated with DeepL.com (free version))' and 'Prize Information:
The Krupp company was awarded an Honourable Mention for the 'Establishments and Localities Characterized by Social Harmony and the Well-Being of the Population' category.
The Krupp company was awarded Grand Prize for the Group 5, Class 40 category.' Below the table, there is a thumbnail view of several documents and images, with one document from 'Hathi Trust' visible.

Text-in-Frame	Text-in-Image	Associated Excerpt(s)	File(s)
Section Wurtembergoise	Successeurs de G. C. Kessler & Co. à Esslingen Neckar.	<p>Prize Information: G.-C. Kessler and Company Successors from Esslingen, Wurtemberg, was awarded Silver Medal for their sparkling wine in the Group</p> <p>Visitor Eugene Rimmel on Imagining Dead Bodies: Unfortunately it is not all "peace and good-will among men on the earth," to wit, Krupp's exhibition which next meets our view, and which is ...</p> <p>Bodies: Unfortunately it is not all "peace and good-will among men on the earth," to wit, ..</p>	
Canon Krupp, Section Prussienne.			
Canon Krupp, Section Prussienne.			
Exposition de Krupp. Essen	English Journalist George Augustus Sala on the Culpability of Arms	Sala, George Augustus. Notes and Sketches of the Paris Exhibition. London, Tinsley brothers, 1868. HathiTrust,	

Additionally, we prepared a Chatbot Excerpt document containing excerpted paragraphs from a range of textual sources. This will serve as training data for our LLM.

The document is included in the Annex.

It can be consulted at the following link:

<https://docs.google.com/document/d/1IkY6lhOIWPm2nzinV20CubJlba-rvG1Sp24ksh3zn-c/edit?usp=sharing>.

The 'Excerpted Sources' column in our Manual Annotation Table contains bibliographic references for the many sources we reference.

4.7 Development of Questions

TECHNICAL DESIGN

Theory Building to Dissemination:
Constructing an Annotation Code and Crafting Effective Questions



Curator David Honeyman on the Obelisk:

On entering the room we are confronted by ... the gilded obelisk exhibited at Paris, representing the quantity of gold extracted from the mines of Nova Scotia...

The exhibit was organized by curator David Honeyman.

He displayed an obelisk, prize-winning minerals and fossils,

The gilded obelisk represented gold extracted from the colony's mines. It weighed over 5 tons!

Here you see an excerpt from the Nova Scotia catalogue as it appears in our metadata. A title - Curator David Honeyman on the Obelisk - announces information about the gilded obelisk representing the quantity of gold extracted from Nova Scotia's mines.

We anticipate simple questions from non-specialist visitors - for example: 'Who organized the display?'; 'What did they display?'; or 'What was the obelisk?'. As such, we wanted to provide information about visible objects in the frame like the obelisk, the birds, and the rock samples.

At the same time, because critical and thematic keywords contextualize answers to simple questions, visitors interested in critical theory may detect the answers as hints pointing to the underlying critical innuendo.

The LLM used for this project must be able to generate summaries based on source extracts in the metadata. It should also be able to directly cite visitor accounts.

4.8 Conversational Style

We wanted our bot to generate responses using relatively short sentences for two principal reasons.

Firstly, we did not want to overload the visitor with a flood of words in an interactional context that is meant to feel responsive and move quickly. Responses should match the fragmented, airy quality of the data cloud sphere with its floating images and hovering avatar.

Secondly, because we wanted responses to appear on the Panorama+ screen for all to see (the Panorama+ is, after all, a social viewing framework), sentences needed to be short – i.e., maximum 70 to 80 characters – for optimal screen-based reading. Long sentences overload the eye.

5 DESIGN PROCESS

5.1 Why the Panorama+?

The reason we chose Panorama+ is to make complex historical narratives more accessible and engaging within a dynamic and interactive 3D environment. This interface excels particularly in providing an immersive experience. The 360-degree screen of Panorama+ offers users an experience as if they were actually present, allowing them to engage with historical events and exhibits not merely as observers but as participants. This makes complex historical narratives more approachable and allows for a deeper understanding and exploration of the content. As a result, users can actively seek out information and have personalized experiences based on their individual interests, rather than passively receiving information. In this way, the Panorama+ interface becomes the optimal means to realize our vision: "Reconstructed and augmented images tell new stories, complicating and deconstructing narratives according to users' interests."

5.2 Immersivity

The immersive space inside the Panorama+ echoes back to the Paris Exhibition and other World's Fairs, characterized by White et. al (2008) and Maciunas (1966) as early immersive

environments – forbearers of expanded cinematic frameworks like that of the Panorama+ and its earlier iterations (cite: c.f., Jeffrey Shaw's EVE).

Viewing stereoviews in a 'panoramic' setting also stems from once-popular frameworks like that of the Kaiserpanorama.

Like the Kaiserpanorama, the Panorama+ allows visitors to view digitized and reconfigured stereo views in their intended 3D format. However, unlike the Kaiserpanorama, and unlike isolating Virtual Reality headsets, the Panorama+ socializes the stereo viewing experience.

Not only will visitors experience stereo views in 3D, they will also experience these expo remnants in a fitting social context. Just as visitors to 1867 Expo were swept up and immersed in the fair, its sights, and its crowds, visitors in the Panorama+ are immersed in an encompassing cloud of fragments, in the company of other visitors.

5.3 Framework

Throughout the design process, various possibilities were discussed, including necessary tools, methods for enhancing user experience, and components such as environments and buttons. These elements are fundamentally categorized into the display environment, navigation tools, and buttons and options for user interaction. Decisions were made considering all aspects of the user experience, guided by detailed scenarios. The framework leverages the Panorama+ system for its immersive 3D capabilities and the iPad for ease of use and intuitive interaction, supported by a comprehensive computing system to integrate these elements seamlessly.

5.3.1 Panorama Screen

Panorama+ allows users to view a large number of images and information simultaneously, thus expanding the range of choices for the images and information they seek. Notably, Panorama+ effectively utilizes keywords, making it easy and quick for users to search for information. Additionally, the screen design of Panorama+ can transform 2D objects into 3D, making the display of information more dynamic and engaging.

These approaches make complex information more intuitive to understand, allowing users to interact with the content on a deeper level.

Detailed design decisions pertaining to the Panorama+ screen are outlined in the Commented User Experience section below.

5.3.2 iPad Screen

The iPad was chosen to operate Panorama+ because it is intuitive and easy to use. The iPad's large screen makes it easy to visually check information input and display, and the placement of the "Go back" button, chat history saving function and Yes/No buttons.

Using a chatbot on the iPad allows users to easily scroll back and review past conversations, conveniently rechecking necessary information. The iPad also displays selectable images, which can then be displayed on the Panorama+ as required, allowing users to easily select images and see the details on the larger screen. The iPad also has a convenient carrying handle. These features make the interactive experience even more pleasant.

5.4 Angelus Novus: Conceptual Development

Given our use of a chatbot and our emphasis on the idea of 'host space,' we decided to create a virtual agent. After hefty deliberation we decided on Walter Benjamin's Angelus Novus or Angel of History, based on Paul Klee's eponymous painting. The idea of stereo view fragments as a kind of debris visualized in the Panorama recalls Benjamin's *Arcades Project*. As such, Angelus Novus seemed like an appropriate choice.

Just like the Angel, visitors in the Panorama face the past and the fragmented wreckage of global capitalism. At the same time, they are caught up in the storm of progress, "irresistibly propel[led] into the future to which [their] back[s] [are] turned." With the help of Novus, visitors sift through the fragments to encounter dialectical images that break the myth of progress and "bring the present into a critical state." Using voice to 'move' images on the Panorama screen, 'chatting' with the bot, and being followed by the uncanny, floating agent work to create a phantasmagoric feel well-suited to the Expo, described by Benjamin in his *Arcades Project* as the event in which "[t]he phantasmagoria of capitalist culture attain[ed] its most radiant unfolding."

As such visitors are primed for dialectical encounters with images of stuffed birds, Chilean Pines, cannons, and Kessler Sekt.

5.5 Prototype

This prototype, utilizing Unity, Chatbot (HTML, CSS, JavaScript), Amazon AWS, and Chat-GPT, enables users to engage in conversations with Angelus Novus while experiencing interactive elements through Panorama+. Users interact with a chat application on an iPad, built using HTML, CSS, and JavaScript. The messages sent by users are transmitted to GPT-3.5-Turbo via the Amazon API Gateway. GPT-3.5-Turbo responds to user messages, and the chat data and corresponding image numbers generated by GPT-3.5-Turbo are stored in Amazon DynamoDB. This storage allows users to utilize the iPad's "Go Back" button to access earlier chat interactions and image numbers. This feature facilitates easy reference to past conversations and associated images. Additionally, Panorama+ leverages Unity to display images and Novus's responses to the user. Panorama+ retrieves image numbers and Novus's responses from Amazon DynamoDB via Amazon API Gateway and presents them to the user, ensuring a seamless and interactive visual experience.

By implementing the following technologies, we can achieve our product. To enhance the generation of image numbers, we will use NL2SQL technology. Currently, the prototype relies on simple conditional branching to reference numbers, but with NL2SQL, the system will be able to translate user messages into SQL statements, making image retrieval from the database more natural. Moreover, we will employ a local LLM (Large Language Model) based on Llama to improve security and performance. This local model will be pre-trained with information about the Paris Exhibition, ensuring it provides accurate responses. Running the model locally reduces the risk of external data transmission, thereby enhancing security.

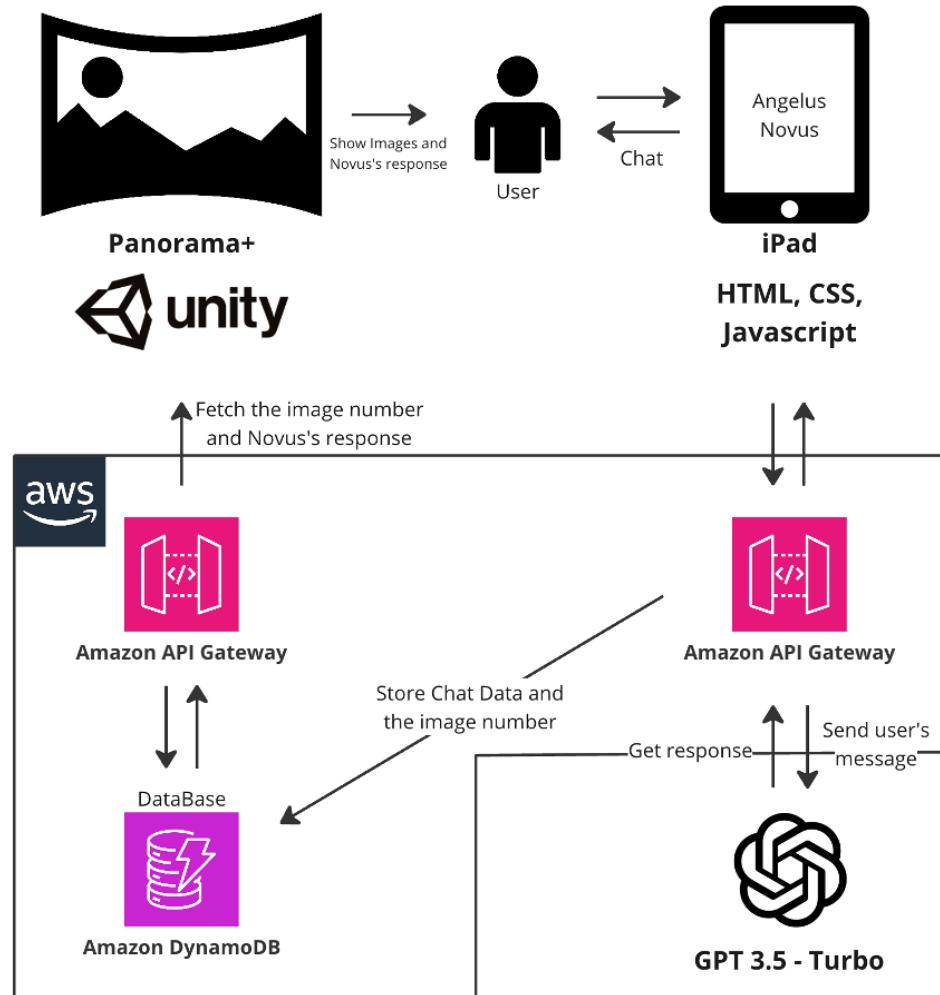


Figure 14: Overview of our prototype

6 USER FLOW

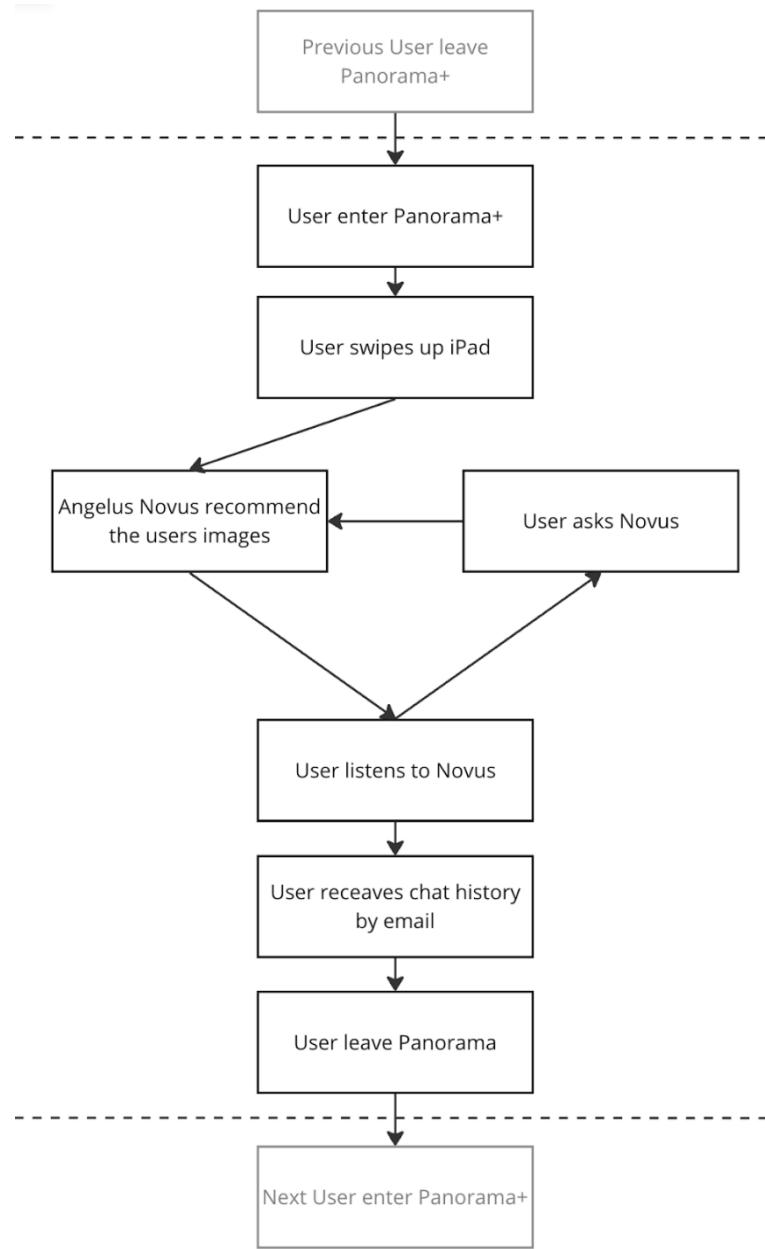


Figure 15: Basic User Flow

6.1 User Flow Sample Scenario

[1] A user enters Panorama+.

- Panorama+ shows images floating on the screen.
- There is an iPad that allows communication with Angelus Novus.



Figure 16: First view of Panorama+

[2] The user swipes up on the iPad screen to start to talk with Angelus Novus.

- Angelus Novus appears on Panorama and asks if the user wants to start with Novus's recommendation.

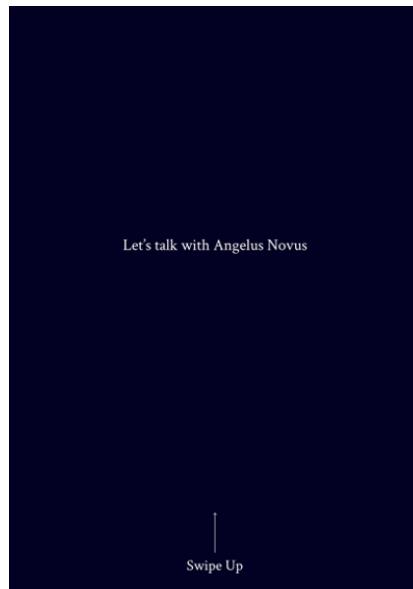


Figure 18: First view of Chatbot

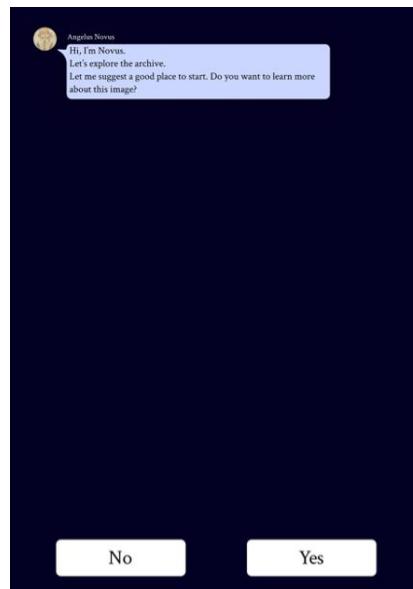


Figure 17: Yes or No button

[3] The user answers the question using the Yes-No button that appears on the iPad.

- A Yes-No button appears on the iPad if the question is a Yes-No question.

[4] The user listens to his explanation of the images shown on Panorama.

[5] The user asks Novus to show all the images.

- Novus shows all the images and asks the user to tell Novus user's preference.

[6] The user answers the user's preference (Show me birds) using the recording button on the iPad.

- Novus shows us bird-related images and asks what the user wants.



Figure 19: Related Images from Dataset

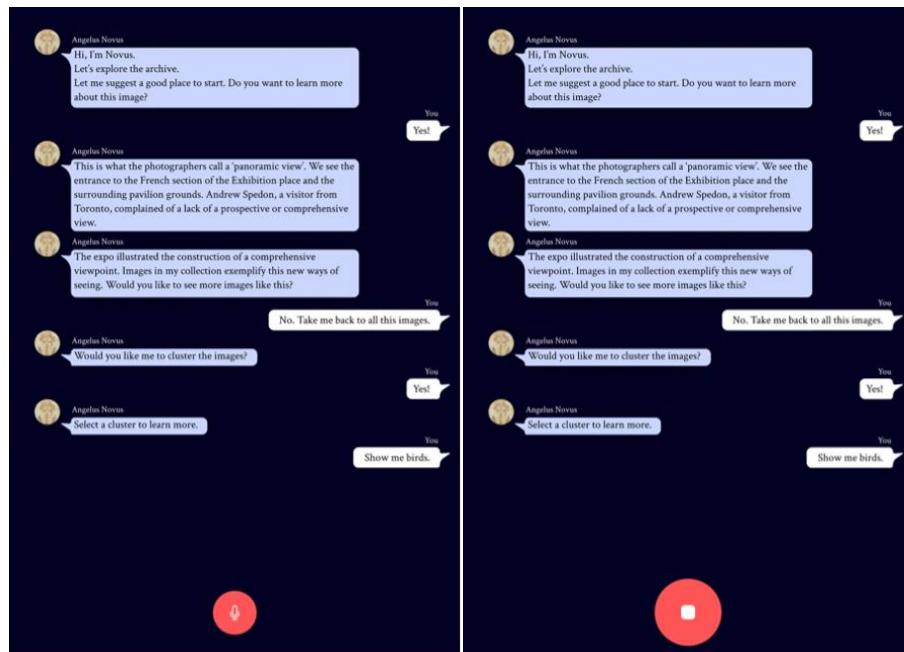


Figure 20: Recording Button

- [7] The user asks Novus for some details of the images.



Figure 21: Detailed Related Information

- [8] The user returns to one of the earlier screens by using the iPad's "Go Back" button.



Figure 22: Go Back Button

[9] The user asks random images to explore more.

- Novus shows random images and explains the images.

[10] The user terminates the user's chat by tapping the "End" button on the iPad.



Figure 23: Go Back Button

[11] The user receives the chat history by email.

[12] The user drops the iPad and leaves the Panorama+.

[13] The exhibition is reset for the next user.

7 USER EXPERIENCE – COMMENTED

7.1 I. Scenario



1. Generous Interface overview

a. **Reason(s):**

- i. Provide users with a comprehensive view of the archive
 - ii. Similar function to establishing shot in film theory: allow visitors to orient themselves at the threshold of a cloud-to-be-penetrated/explored

2. Randomly distributed images appear in an (eventually layered) datasphere cloud-like configuration

Our images appear in one monotonous layer, but they should take the form of a constellation, 'radiating' outwards into the infinite space of the Panorama+ screen

a. **Reason(s):**

- i. Create a hypnotizing sense of depth, thereby heightening the visitor's sense of presence
- ii. This strategy capitalizes on the phantasmagoric, otherworldly 'magic' of the Panorama+ framework and evokes, at the same time, the massive arena of the 1867 Paris Expo

b. **Considerations:**

- i. Add function to redistribute or 're-shuffle' images in the randomly distributed overview

3. Motion detector triggers Novus to speak

a. **Reason(s):**

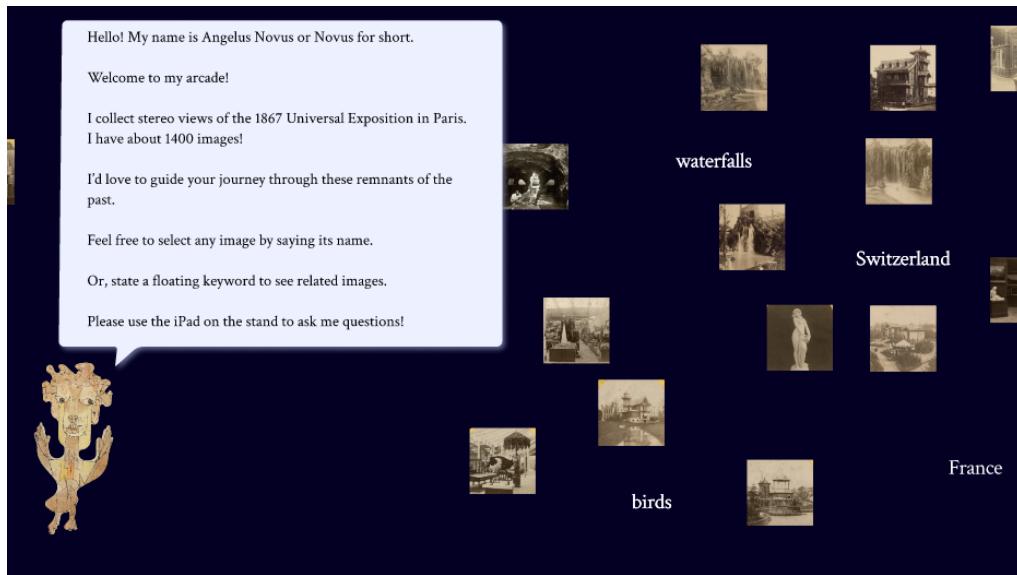
- i. Create an atmosphere of 'living space'
- ii. Surprise the visitor with an unexpected prompt: trigger an eerie "It's alive!" techno-spooky feeling
- iii. Perform the phantasmagoria of being solicited by a chatbot with a critical theory-inspired face!

4. The Panorama+ screen is an impenetrable black; images are displayed in black and white (navy blue and tan variant shown above)

a. **Reason(s):**

- i. Heighten the visitor's sense of immersion via the strategy of 'cinematic darkness'
- ii. Black and white images help create an atmosphere of ghostly remnants, haunted debris, and the living-dead past to be explored

7.2 II. Scenario



1. Novus briefly introduces the archive and provides basic instructions for interactions

a. Reason(s):

- i. Provide visitor with a basic sense of bearings in the otherwise disorienting space (e.g., "Welcome to my arcade"; "stereo views of the 1867 Universal Exposition in Paris")
- ii. Do this without shaping their experience of the archive by providing detailed historical information: encourage them to enter the archive as subjects of the here-and-now, priming them for Benjaminian-inspired dialectical encounters
- iii. "keep it light, keep it eerie"
- iv. Prompt visitor to use iPad and inform them of voice-search capabilities

2. Choice of words: "arcade," "remnants"

a. Reason(s):

- i. Allude to underlying theoretical framework; signal underlying curatorial ideology

3. Use of floating keywords, displayed in white

a. Reason(s):

- i. Maintain black-and-white ghostly atmosphere

ii. Provide visitors with ideas for clustering or 'sculpting' the data cloud

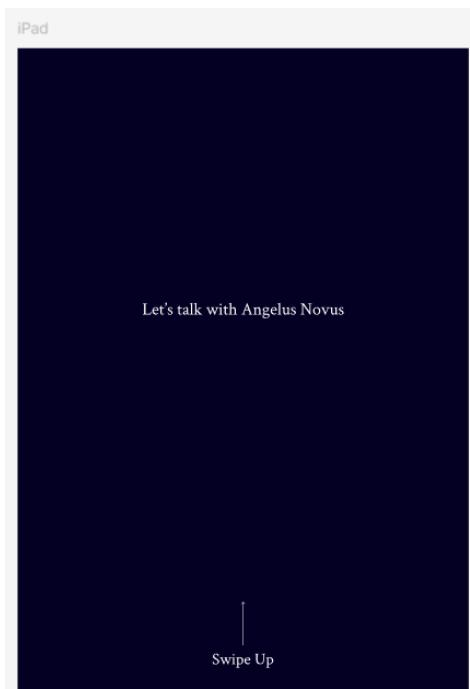
b. **Metadata:**

i. Keywords are generated from tags in the following columns in the Manual Annotation Table: Country, Group, Class, Palace Gallery Section Name, Area, Critical Theme, Topical Theme, People, Animal, Animal Type, Plant, Plant Type, Sound, Sound Type, Prize, Prize Type, Material, and Image Framing

ii. Note on Critical Themes:

1. Keywords indicating critical themes such as 'ecocriticism,' 'anthropization,' 'coloniality,' or 'social class' could be used in an installation directed at a specialist audience; in an installation that aims to introduce the general public to these ideas, simple definitions of critical keywords could be provided in an interactive manner

7.3 III. Scenario



V: Picks up the iPad and reads text on the screen.

Swipe up to unlock.

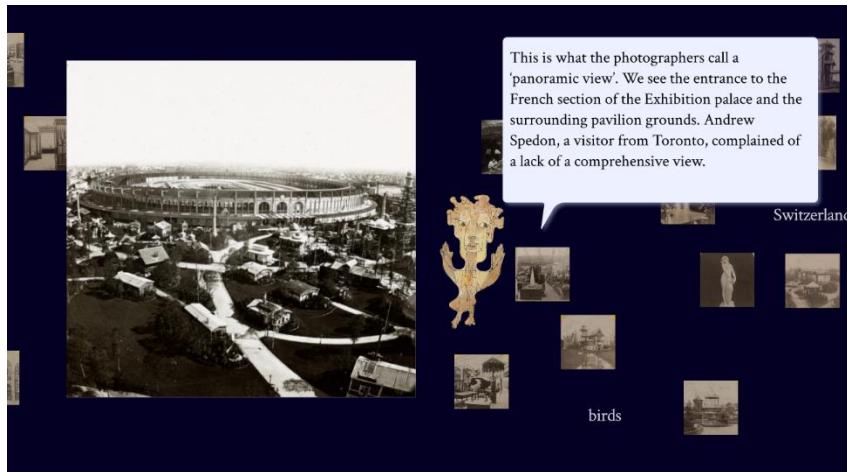
Swipes up on iPad.

1. Instructions included on iPad screen

a. Reason(s):

- i. Increase usability for all visitor profiles

7.4 IV. Scenario



1. Suggestion of 'Root Image'

a. Reason(s):

- i. Some visitors may want to say the name of a keyword that interests them; others may need a bit of help to get started
- ii. Just as the unclustered data cloud provides an overview of the archive content, the Root Image provides a visual overview of the Expo palace and grounds
- iii. Visual irony: viewing a "panoramic" image in a panoramic framework
- iv. While our scripting is less than elegant, the image provides that which actual 1867 visitors lacked: a "comprehensive view" of the expo; the pairing is meant to highlight an emerging visual culture, and to point to the Panorama+ as a development of that culture
- v. Visitors may appreciate the unstated anticipation of the Eiffel Tower and reconsider their own experiences chasing different kinds of views

2. Suggestion of 'Panoramic View' cluster

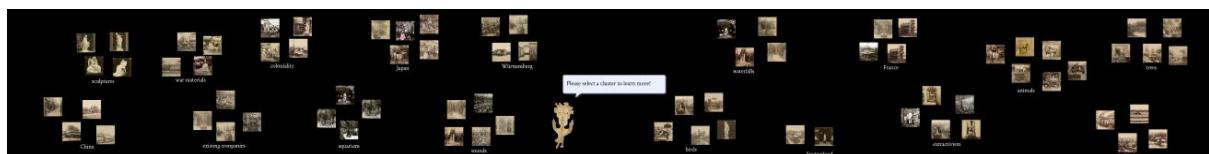
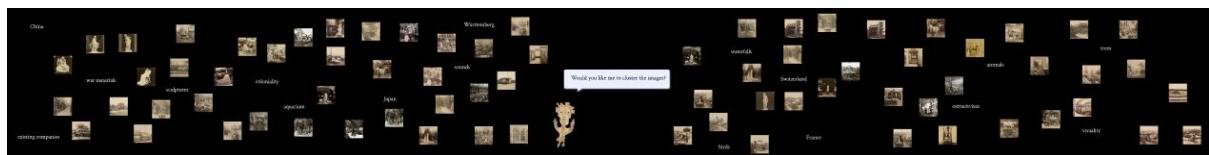
a. Reason(s):

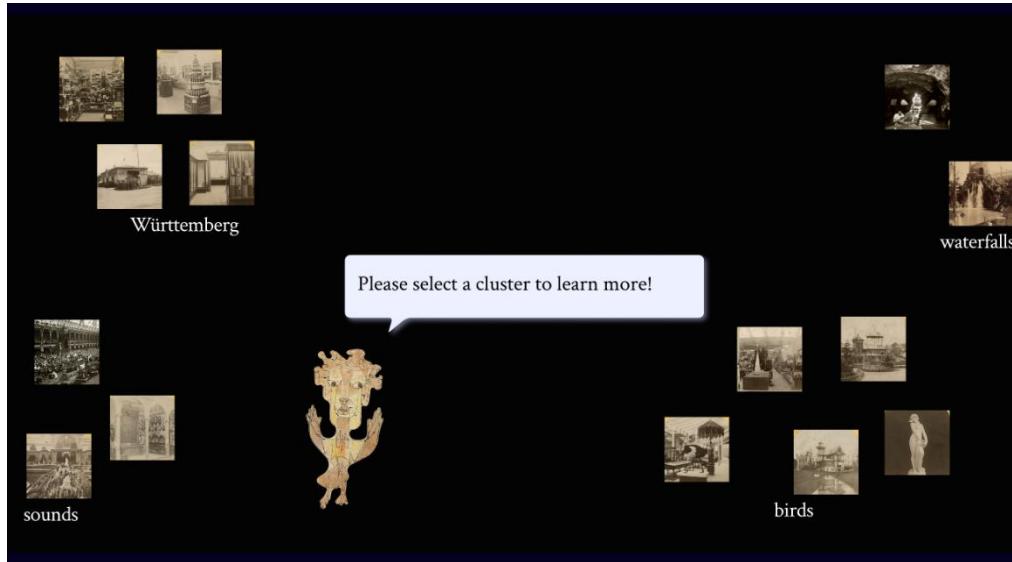
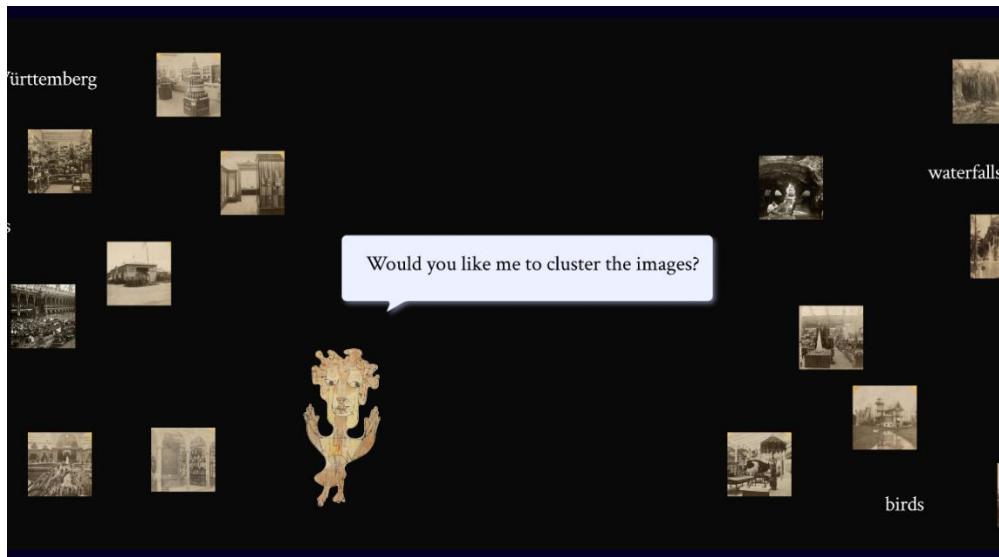
- i. Demonstrate clustering capabilities to interested visitors

b. Metadata:

- i. This cluster option comes from the 'Image Framing' column of the Manual Annotation Table; an additional 'Visual Culture/Visuality' option could recall all images with 'Image Framing' tags – namely, those labeled by the photographers as "Perspective," "Panoramic," "General," and "Bird's-Eye Views"
 - ii. While these clustering options are highly niche, they are appropriate if the archive is to be shown at a photography or film museum, such as Amsterdam's Eye; in this setting visitors may appreciate this archeological approach to the view

7.5 V. Scenario





1. Automatic clustering of images: images float around a keyword

a. Reason(s):

- i. Provide visitor with opportunity to see the 'magic' shift from distributed overview to grouped display
- ii. Keywords permit visitor to easily name a cluster

b. Metadata:

- i. Automatic clustering options to be pre-determined according to curatorial intent
- ii. Options based on tag names in the following Manual Annotation Table columns: Country, Group, Class, Palace Gallery Section Name, Area, Critical

Theme, Topical Theme, People, Animal, Animal Type, Plant, Plant Type, Sound, Sound Type, Prize, Prize Type, Material, and Image Framing

iii. For this sample, we used the following clusters:

1. China, Sculptures, War Material, Existing Companies, Coloniality, Japan, Aquarium, Württemberg, Waterfalls, Birds, Switzerland, France, Extractivism, Animals, Visuality, Trees

c. **Consideration(s):**

- i. To be determined how to display images in more than one cluster

2. Novus glides and hovers, following the visitor's gaze

a. **Reason(s):**

- i. Enhance phantasmagoric atmosphere
- ii. Encourage visitors to interact conversationally, using voice over iPad interactions
- iii. Dramatize viewer's visual navigation of Panorama+ screen
- iv. Provide opportunity for social interaction/collaborative cluster-choosing among group of visitors

7.6 VI. Scenario





1. Clusters displayed in background

a. Reason(s):

- i. Provide sense of depth; allow visitors to see other clusters to explore

2. Automatically pre-determined cluster filtering suggestion

a. Here, we chose 'coloniality' from the Critical Theme column in the Manual Annotation Table

b. Reason(s):

- i. In line with our (eco)critical curatorial project: subtle statement on the way the 'colonial' intersects with the 'stuffed' trophy (c.f., colonial stuffed bird displays in both images)

3. Cluster display

a. Consideration(s):

- i. Cluster images could be displayed in a grouped, Gestalt-inspired manner; for example, for the bird cluster, the two images of 'living birds' could appear side-by-side, with another sub-grouping of 'stuffed birds,' and another consisting of 'represented birds'; in our Manual Annotation Table, images with 'bird' tags are also tagged either as 'Bird - Living,' 'Bird - Stuffed,' or 'Bird - Represented,' making this Gestalt-inspired cluster display possible
- ii. Organizing cluster display thematically is a curatorial strategy: when visitors see the bird cluster, the 'volume' of marble bird representations will greatly outnumber images of stuffed and living birds; images of stuffed birds will

outnumber the two images of living birds; only one of these living bird images shows a discernible bird species – a pair of white swans foraging on a landscaped lawn next to an artificial water feature; the other shows a giant aviary cage; displaying the bird cluster in this manner allows us to make a subtle ecocritical statement: we highlight how the archive inadvertently tells us about ‘acceptable animal life’ in the idealized, constructed expo environment and about underlying attitudes to the ‘natural’ world

7.7 VII. Scenario



Scene III: Birds and Coloniality

SD: LEFT SIDE OF PANORAMA FOURTH VIEW

N: Images in the birds + coloniality subcluster appear on the screen. They are shown large, nearly filling the panorama from top to bottom, so that viewers can appreciate the images' rich details.

The visitor shifts their gaze to inspect each image, turning their head ever so slightly.

SD: SCROLL TO NOVUS - NO SPEECH

N: Novus follows the movement of their motion-tracked glasses. He hovers over the corresponding image and asks:

SD: NOVUS WITH SPEECH

AN: Would you like to learn more about this image?

V: Hmm... I wonder what that pointy thing is.... Show me Nova Scotia.

1. The visitor gazes at an image for several seconds, prompting Novus to speak

a. Reason(s):

- i. Confer life-like quality to Novus; encourage visitors to respond vocally; dramatize primary viewer's visual navigation of images in the round for visitor group to see: encourage collaborative group exploration of the filtered cluster

2. Image Names displayed beneath images

a. Reason(s):

- i. Allow visitors to easily identify and voice select images

b. Metadata:

- i. Image Names are included in the 'Image Name' column in our Manual Annotation Table

7.8 VIII. Scenario



1. Radiant unfolding of detailed view elements

a. Reason(s):

- i. Create a phantasmagorical feel inspired by Walter Benjamin's quote about the "radiant unfolding" of capitalist culture at the 1867 Expo

2. Clusters still visible in blurred and faded background layers

a. Reason(s):

- i. Maintain sense of depth and datasphere cloud environment

3. Images displayed according to Gestalt principles

a. Reason(s):

- i. Convey item relationships: i.e., ruins are close to, but grouped separately from historical zoo image; i.e., stuffed birds in the Nova Scotia display case are distinct from the Oxford University case

4. Eclectic assortment of images

a. Reason(s):

- i. Evoke something of the Expo as an exercise in amassing objects to behold
- ii. Visual interest for visitor group
- iii. Provide 'details on demand,' following Generous Interface principles

b. Metadata:

- i. 22 related images in the 'Associated Images' column of the Manual Annotation Table; associated image sources included in the 'Links' column
- ii. Associated images can be used to design a fixed, 'detailed view' screen; or, they can be fed into future iterations of a sophisticated Visual LLM model capable of recalling images as well as text

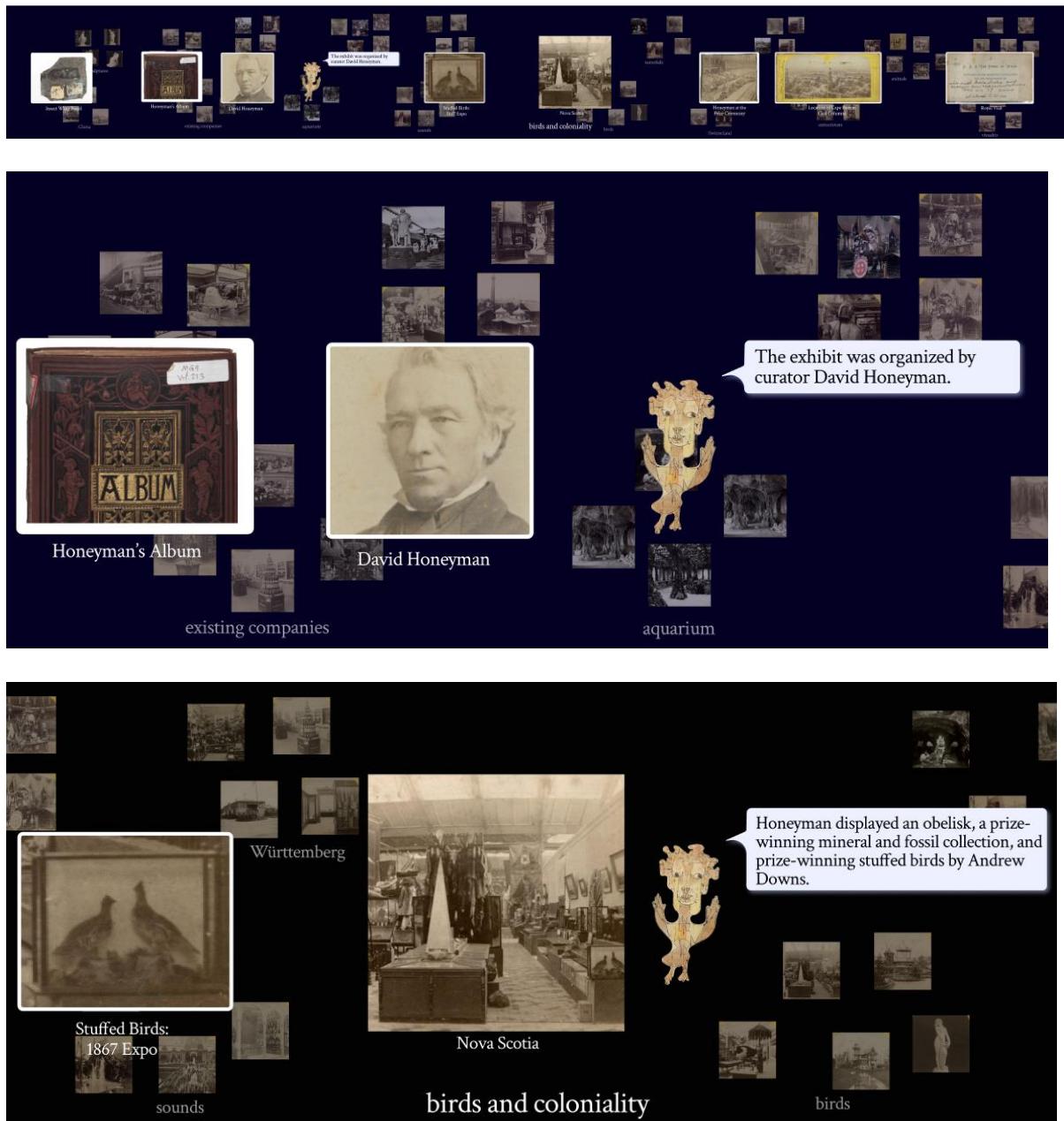
c. Considerations:

- i. These additional 2D sources will have to be converted into 3D format

5. Inclusion of images of ruins and stuffed birds

a. Reason(s):

- i. Ruins: dramatize the underpinning *Angelus Novus* theory: visitors gaze at ruins of the past, in form of the stereo view fragment and the image of literal ruins
- ii. Stuffed birds: dramatize the colonial and capitalist impulse to possess; evoke the phantasmagoria of the bloodless display of once-living creatures, stuffed and collected



Brief responses to visitor questions

7.9 Reason(s):

7.9.1 We anticipate simple questions from non-specialist visitors - for example: 'Who organized the display?'; 'What did they display?'; or 'What was the obelisk?'. As such, we wanted to provide information about visible objects in the frame like the obelisk, the birds, and the rock samples.

7.9.2 Because critical and thematic keywords contextualize answers to simple questions, visitors interested in critical theory may detect the answers as hints pointing to the underlying critical innuendo.

7.10 Metadata:

Information from textual sources (in this case, the Nova Scotia Department Catalogue) is specially coded to be recognized by the chatbot

The screenshot shows a digital interface with a light gray background. At the top left, there is a small icon followed by the text "Associated Excerpt(s)". Below this, a white rectangular box contains the following text:
Curator David Honeyman on the Curation of the Nova Scotia Exhibit:

As the Exhibition of raw material is considered to be the most important feature of a colonial display, our attention has been chiefly directed to the representation of this department. (Preface to the Catalogue of the Nova Scotian Department)

8 DISCUSSION

8.1 Limitations and Future Improvements

In addressing the limitations and potential future improvements of our project, it is important to consider biases and critiques. Daniel Foliard has highlighted the necessity for serious historical research, suggesting the inclusion of alternative avatars to better anticipate and address critiques. This discussion underscores the importance of ensuring the project remains appropriate and useful in a public context.

8.2 Steps to Completion

We have a dataset of 82 manually annotated and researched images which could be used in an installation once they are restored.

We have a functional NL-to-SQL system and excerpted textual sources ranging from prize information to in-depth knowledge for the majority of the images.

As such, we think we have the basic building blocks in place for a simple, eco-critical installation in which visitors can filter the dataset, and recall images and source excerpts. We anticipate several months of full-time work with technical assistance to adapt the display to the Panorama+.

Additional time would be needed to fine-tune a functional chatbot application, and to restore, research, and annotate additional images.

It is our vision to encapsulate all these functions including image retrieval and open-ended question answering, within a single, cohesive model. Currently, we employ different models independently for these functions. The primary challenge limiting this integration is the technical complexity of combining these capabilities effectively. Ensuring the model can seamlessly switch between retrieving images and answering detailed questions, while maintaining accuracy and performance, requires advanced model architecture and extensive training data. Overcoming these challenges remains a key focus for our future development.

While we opted to use functional iPad and clustering systems, we imagine future iterations of this project that integrate hand motion technology to allow the speaking, panoramic data cloud to be sculpted and questioned.

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10 ACKNOWLEDGEMENTS

We extend our sincere thanks to Professor Sarah Kenderdine for her insightful feedback following multiple presentations, for pointing out paths to improving our design, and for providing us access to the laboratory and its materials.

Patrick Donaldson and Giacomo Alliata were instrumental in providing detailed feedback to help us improve our designs and presentations along the way. Our project would not have been successful were it not for their guidance, and we sincerely thank them for sharing their expertise and taking the time to engage with our ideas.

Warm thanks to Dhruva Gowda Storz for guiding us through image restorations, for providing valuable advice about image annotations, and for taking the time to show us the archive in the Panorama+.

We thank Raphael Chau for his suggestions about image captioning and the use of visual LLMs.

We had the pleasure of discussing our project at length with Professor Daniel Foliard following our final presentation. We thank him for his attention, his feedback, and his interest in our project.

11 APPENDIX

11.1 Code Notebook - [Drive link](#)

11.2 Figma Link for Panorama+ View - [Link](#)

11.3 Figma Link for Ipad View - [Link](#)

11.4 Manual Annotations in Excel spreadsheet - [Link](#)

11.5 Manual Annotation Table in AirTable - [Link](#)

11.6 Chatbot Excerpts - [Link](#)

11.7 User Experience Script - [Link](#)