

# Comment Clouds

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The prototype and report are also accessible at [JACOB-HALOGEN.GITHUB.IO/CCT/](https://jacob-halogen.github.io/cct/).

## Overview

In the University of Nottingham Museum of Archaeology, the experience is very focused. Each artifact is presented with a small plaque of pragmatic details, and each glass case is accompanied by a few paragraphs to describe the artifacts' place in history. These traditional measures present visitors with plenty of information on the facts and timeline, but unless the visitor comes with an existing group, the museum is experienced individually and generally isolated from other visitors' thoughts, feelings and opinions about the subject. The space between these features is, for the most part, completely blank, so as to not distract from the artifacts.

There is a contrast in the museum. One one hand, there are these homely ancient objects full of detail that were clearly once part of everyday life. On the other, is the stark, colourless background and shiny glass panels that detach the artifacts from their place in space and time. This contrast leaves visitors to wonder what the people associated with such objects throughout time must've thought about them. To make the visit more user-oriented and integrated with further context, I present Comment Clouds, a novel interactive system for fostering visitor feedback and discussion, as well as presenting this engagement with intuitive and interesting visualisations. The system falls into the "different time same place" box in the time-space matrix.

This system allows visitors to leave brief comments pinned to a specific spatial location in the museum, especially the locations of artifacts. When creating a comment, the visitor uses their phone camera to select the point, and the software uses indoor positioning with AR spatial anchoring to determine where that is. Visitors can also reply to comments, like them or report them if offensive. Once created, the comments are displayed via project onto the nearest possible surface in a way similar to a word cloud, and comments slowly fade in and out to make room for other comments and add visual interest. Liked comments are shown more frequently, and selected replies to comments are shown alongside the original. All comments and replies can be seen or made in the app, to allow users to see the full context of discussion if interested. Overall, the system makes use of location-aware communication in a way similar to Dynamo (Brignull et al, 2004) or Plasma Posters (Churchill et al, 2004).

Projecting the comment clouds would require many projectors, and bespoke software to render the text. Word cloud visualisation (Burch et al, 2013) is a straightforward method of data visualisation, and several tools for it already exist, and our use case is only a slight extension of that. My prototype uses HTML/CSS/JavaScript with some use of the Bootstrap

CSS library, and the extra functionality needed can certainly be made with these tools. In the UI for writing a comment, the system could use prompts like "What detail surprised you?" to encourage more high-quality contributions.

As well as visitor-written comments, relevant quotes from real academic and historical sources across the timeline are shown. These comments can be curated by historians, and are intended to improve the immersiveness of the system while adding further historical information. For example, this quote from the philosopher Epictetus provides vivid detail on contemporary opinions on Roman coins, and would nicely accompany such artifacts:

What is the stamp of this sestertius? *The stamp of Trajan*. Then give it me. *The stamp of Nero*. Fling it away—it will not pass, it is bad.

People today and throughout history have no doubt expressed their thoughts about simple items like the ones in the museum, as Epictetus did, and placing these thoughts adjacent to one another, along with the object of these thoughts, can quickly convey a wealth of history in a way that's more interesting to look at than a block of text.

## Roles of the Museum

To determine how the system supports the museum, it's important to consider the roles that the museum aims to perform, and how the system supports or detracts from those aims. Several roles have been outlined by previous researchers (e.g. Keene, 1998).

The most obvious role of the museum is to educate. Without the system, the museum already presents a great deal of information, more information than the average visitor is likely to consume or remember. However, the information is presented in a static and uninteractive manner, which makes it less engaging than is possible. People are talked about formally in the third person (in secondary sources), but their personality and much common ground is not conveyed. With the system, the exhibition is more connected to the real people it represents through history, and visitors can pin reactions to specific features. The system shows primary sources as well as secondary sources, which is intended to more effectively convey the historical people's thoughts. The exhibition can better reflect public opinion of the topics.

With the system, the exhibition can also now show visitors what other visitors think of the artifacts - something the museum can't do without it. The expected museum experience is often a social one, and as well as learning about the topic itself from the proper channels, visitors also learn by discussing it with their companions, and possibly learn something about each other in the process. Such discussion can provide surplus knowledge from outside the museum, and can also prompt visitors to look more closely at under-noticed or poorly communicated details in the museum. This extra learning is lost on individual visitors without the system.

Another significant role of the museum is to curate the vast body of knowledge into a more digestible form. As curator, the institution must present enough information to spark interest and establish context without overwhelming visitors. Comment clouds provide a

concise, layered view of multiple perspectives at once; brief phrases and tags surface key points, questions, and contrasts without requiring long reading. Because comments can fade in and out and update over time, visitors who linger receive additional context incrementally, allowing depth to emerge naturally for those who want it while keeping the initial encounter simple for everyone else. Curators can also inject verified sources or highlight specific threads to guide interpretation, and analytics on which comments persist or attract interaction help refine what content should be promoted or expanded in information panels and museum activities.

The role that most benefits from Comment Clouds is that of facilitating dialogue and community engagement. The ideal museum provides a public forum for diverse voices to connect with objects and with one another. Anchoring the comments to a place makes the conversations tangible. As well as discussing an artifact at the location of that artifact, visitors could discuss the museum or the history in general at some other location in the museum that wouldn't otherwise have anything to see. Commenting being anonymous and low-barrier reduces the social friction required to participate in these discussions, so allows underrepresented viewpoints to be better heard. Overall, it enhances cohesion.

Reading the comments with other in-person visitors can provide icebreakers for spontaneous socialisation. Reactions and questions give visitors something concrete to notice and talk about, prompting spontaneous discussion between strangers, families, and school groups. Guests can point to a specific pinned remark to start a conversation, compare impressions, or ask follow-up questions, which lowers the barrier to engagement and turns solitary viewing into shared exploration. The informal nature of the comments can lower the threshold for participation: casual remarks on an ordinary commenter's thoughts might feel less intimidating than sharing impressions on the formally written plaque, which is written by an expert.

A further, often overlooked role of museums is to reflect present society and provoke introspection. With Comment Clouds, we can deliberately juxtapose modern beliefs with historical beliefs, by literally placing them side-by-side. These thoughts could concern gender, labour, the politics of the day, or really any public opinion that historians might be interested in. These comparisons could prompt critical thinking, by implicitly encouraging visitors to examine their own beliefs in the same way they judge past beliefs.

## Common Ground

Common ground theory is one of the most important frameworks in CCT, and pertains to communication across the time/space matrix. Something is common ground if everyone knows it, and everyone knows everyone knows it (Carroll 2003), and understanding it ("grounding") is essential for reducing confusion. In our case, common ground for a comment includes the intentions of commenters, the cultural knowledge they may share, and all the other context surrounding the comment. Because of the nature of the medium, grounding is very difficult. The only information shown to the reader of a comment is the name of the commenter, the date of the comment, and anything in the text itself. Compared to most communication, this gives very little common ground and it can be easy to

misunderstand the intentions of a comment. It could be written at a different time, when the language used meant something different. It could reference information completely unknown to the reader. It could assume the reader is viewing the artifact in a different context, one that is now lost. In all of these cases, it can be difficult or impossible to clarify what the commenter truly meant, which could make it confusing and frustrating, but could also make it mysterious and fascinating.

Similar to the comments, the artifacts are shown as-is, potentially deprived of important context. This is especially true of the Norton Disney Dodecahedron, a famous object at the museum with no discernable function, nor any contemporary references or depictions (Sands, 2024). Artifacts like this are considered especially interesting because of their mysteriousness. Thus, the potential lack of common ground in comments mirrors the lack of knowledge surrounding the relevant artifacts.

## Analytics

The corpus of comments would make for a fruitful dataset for visualisation.

The museum curators can aggregate the pinned locations over time to generate a heatmap of visitor attention. They could see the hotspots people like to linger at, the more interesting artifacts that spark the most discussion, or the boring artifacts that people aren't interested in. This heatmap could even be projected onto the room in the same way as the comment clouds, which makes for a much more fun representation of the data. Natural language processing techniques could be used to filter the data by their function, e.g. question, observation, or emotion. Sentiment analysis could further this by automatically scoring comments by how positive/negative they are. Clustering methods could also be applied to reveal patterns in topics across the space.

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