Speculating with Voyant: Designs for Data Walls

Bennett Kuwan Tchoh, Milena Radzikowska, Stan Ruecker, Gerry Derksen, Kaylin Land, Jingwei Wang, Andrew MacDonald and Geoffrey Rockwell

In recent years, there has been an explosion of data (Mayer-Schönberger & Cukier, 2013). This is driven by an obsession to record and archive information with the expectation of future use. With the increased availability of storage technology and the dropping price of storage, data is being stored in the present day more than ever before. The challenge is how to access it and how to understand scales of data beyond human reading.

One approach to big data is visualization. Data can be transformed in aesthetic ways to reveal its truths and to make it appear accessible to humans (Halpern, 2015). Visualisations are not simply about presenting information in a way most easily understood by humans. They also involve making the information beautiful to see such that visualisations could sometimes be considered as works of art. Another aspect of visualisations is their rhetorical use. We see in board meetings and political communications data converted into different types of graphs to defend decisions, to convince people, and to justify actions.

What often gets ignored in visualization is the context of consumption of visualizations. We think of visualizations as being printed in publications or viewed on the personal computer, but increasingly visualizations are showing up on data walls in public spaces (Rockwell et al., 2010). The scale of data walls and the types of spaces where they are installed change the interpretation and rhetorical affordances of visualization, and that is what this paper is about: exploring the new visual space of data walls through speculative design prototypes.

Visualization is interpretation, even if visualizations are often treated as some objective view on the data. All along the process of data collection, transformation and visualisation, decisions are being made about the data that can be called interpretative and these decisions are often hidden from the final consumer of the visualization. As Johanna Drucker (2014) has pointed out, the data really would be better called the "capta". It is not given over by the phenomena, it is captured and massaged into visual matter. The resulting visualizations are also the result of all sorts of decisions. To take simple graphs as an example, you can modify the slope of the graphs to defend a position, the scale can be manipulated, the data could be logarithmically transformed, rate of increase and not actual numbers can be plotted against time, etc. Visual features like the colours of the lines in the graphs, the shadings of the bars in bar charts and other visual characteristics can all be used rhetorically.

Data Walls and Voyant

What's new is the affordability and ubiquity of large-scale displays. What university does not put high resolution flat-screens up in public places? What university doesn't have "smart" classrooms with data walls now? This raises the question of how these new display contexts can be used? In particular this paper looks at how Voyant Tools could be redesigned to take advantage of data walls.

Figure 1: Default View of Voyant

Voyant (www.voyant-tools.org) is a free suite of tools used for the analysis of textual data. Its default view (Figure 1) is made up of five panels which can be set to display different visualizations and text analysis outputs. This default view was designed for a personal computer and it is not well adapted for use on touch surfaces (touch tables) and data walls. Data walls are huge displays that typically have a different aspect ratio. They tend to be much wider by comparison to screens. They are commonly built by stacking many bezel-less screens and using hardware and software to make them work as a single large visual field.

Method

Data walls are not just larger and installed on walls. Some are also touch sensitive which means they can be controlled by groups of people at the wall. Each new product brings its affordances that have the potential to change the user and her/his way of life. And, as they use the tools in a variety of ways, the product itself changes (Latour, 1990). This circularity of the new affordances

changing use and user which in turn can change the affordances made available means that designing for a data wall is not just a problem that has to be solved. Designs can suggest new use cases or problems which is why we took a speculative design approach (Dunne, & Raby, 2013). Our process was to generate speculative designs through design charettes and then choose a few of those to prototype. This study was part of the Visual Matters project originally led by Stéfan Sinclair and funded by SSHRC, that is interested in imagining ways we can collaborate in the analysis and visualization of textual data on data walls.

Testing Phase

The project had three phases. In the first phase of the project we tested the use of Voyant on a variety of different displays including touch tables and touch sensitive data walls. At the end of 2019 before the restrictions due to the COVID-19 pandemic, we had access to the Digital Scholarship Centre (DSC) at the university of Alberta which had a touch table and a data wall. The dimensions of the data wall is 7.3m by 1.4m with a 12k resolution and the touch table is 55'' diagonally. Both ran on windows 10. We encountered similar difficulties when using Voyant on touch sensitive screens (touch table and data wall). The first of the difficulties encountered was the inability to mouse-over items—which is very useful in resizing Voyant panels— and to use sliders—which are common in Voyant tools. On both touch surfaces, group use was difficult because only one virtual keyboard was available to be used by all users. These issues were even more problematic on the data wall because of its size. Users on different sections of the data wall had to constantly drag the keyboard to their section when they needed it. If a user clicked the full screen icon on the upper right edge of his/her window, the window enlarged to fill the entire data wall, putting the other user's windows in the background. We documented the limitations of the interface and proposed some changes to the Voyant interface to address these issues faced.

These solutions included replacing the range selector slider with other types of selectors (for example drop down with different levels as clickable options), using dedicated icons at the edges of Voyant Panels to resize the panel, making to appear a mini keyboard each time an input area is selected to avoid the need of sharing single keyboard. These solutions were just surface fixes to the Voyant interface and didn't bring any innovation to how Voyant was used.

Design Charettes

The second phase involved design charrettes led by design academics (Radzikowska and Ruecker) to generate design ideas that could be used with Voyant. The goal was not to generate designs that would be easy to implement or even implementable at all. The idea was to explode our preconceptions of what a screen might be and how text analysis might be controlled. Ultimately some of the designs did lead to ideas that could be implemented, but we also generated a number of paper and foam board ideas like Figure 2 and Figure 3.

Figure 2: Mushroom Visualization Idea

Figure 3: Paper Theatre Idea

We ran two charrettes online due to Covid-19. The first took place over two days and the second was one day. The 2-day workshop used "making" and "thinking through making" to explore the intersections of design and digital humanities. Though IDEO's 6-stage design thinking process was used as our primary point of departure, our objective was not to carry a problem or project from understanding through to materialization (or launch). Instead, we set out to traverse two territories: human-centred design and ideation, while situated in digital humanities concerns and practices.

In the second charrette, we wanted to focus on design ideas for the Voyant interface that had, as a use scenario, group collaboration using large data walls for the analysis of text. We were thinking of use in a classroom, public library, or public presentation setting, involving remote or direct control of the large display. We hoped to come up with a set of scenarios and prototypes from which one could be, subsequently, chosen and prototyped. In preparation, we invited participants to: familiarize themselves with the use of Voyant, choose a tool and have some data to analyze, print out a copy or two of the tool to mark on it (alternatively they could make a screenshot and digitally edit the image).

In order to challenge our participants to think outside the box of the existing version of Voyant, we divided the workshop into two parts. The first was based on user-centred design methods and prioritized function and task-completion: I bring a text to Voyant; then pick a tool that's appropriate for my data. What could this tool do that it doesn't now, that would be useful for my work? The second part of the workshop prioritized personal or cultural values as guides in the design process: How does the design communicate its commitment to [value]? We provided the following sample values as potential starting points: multiple interpretations, fun, the unexpected, low barrier to entry, collaboration, conversation, comfort. According to Terranova (2004) we are so bombarded by stimuli that we can't expect everyone to consider all these stimuli to make rational choices and the power of the image—or visualization in our case—acts through affect. Starting our design thoughts with values which have a strong affective component was a way to produce designs that could make the use of Voyent even more popular than how it is today.

Additionally, we asked participants to consider the affordances of a big screen—what a big screen makes possible—for example, what if I thought of the screen as a giant fish? Considering the big screen to be a living organism permitted us to think of ways to replicate the living organism's properties in the data wall and also ways to interact with the data wall as we would with an organism. The design ideas from the participants in the charter were recorded and they helped us come up with prototypes which we built and we have presently integrated one into the beta version of Voyant.

Prototypes

In the final phase we built three main prototypes: BookMap, Handheld Voyant and lastly the Embedder.

BookMap

Figure 4. BookMap displaying the locations mentioned in the novel *Gone With the Wind*.

BookMap is an interactive visualization developed from Voyant Dreamscape that traces the geographical locations of the mentions in books in the order in which they appear with an animated path (see Fig 4). It uses named entity recognition (NER) to identify the names of locations and geographical location data to identify the locations on a map. BookMap was one of the first prototypes created and was presented in detail in our paper in CSDH 2020 (Rockwell et al., 2020).

The idea prototyped by BookMap is that it can be controlled by more than one person from their smartphones. To use BookMap, the user scans the QR code on the data wall with a mobile device and is taken to a webpage where he/she can select a book. The geographical locations mentioned in the book are then displayed on the data wall as a path tracing visualization. BookMap was imagined for use in a public library where patrons might come in and want to play with where they might travel through books. BookMap permits easy interaction with the data wall and it includes values of fun and interaction as the visualisation is viewed in public and can lead to interaction among the users and viewers. BookMap also has an editor page which can be used to edit the location list generated by the NER software. BookMap has potential for further development—for example better tracing animation, comparison of books, etc.
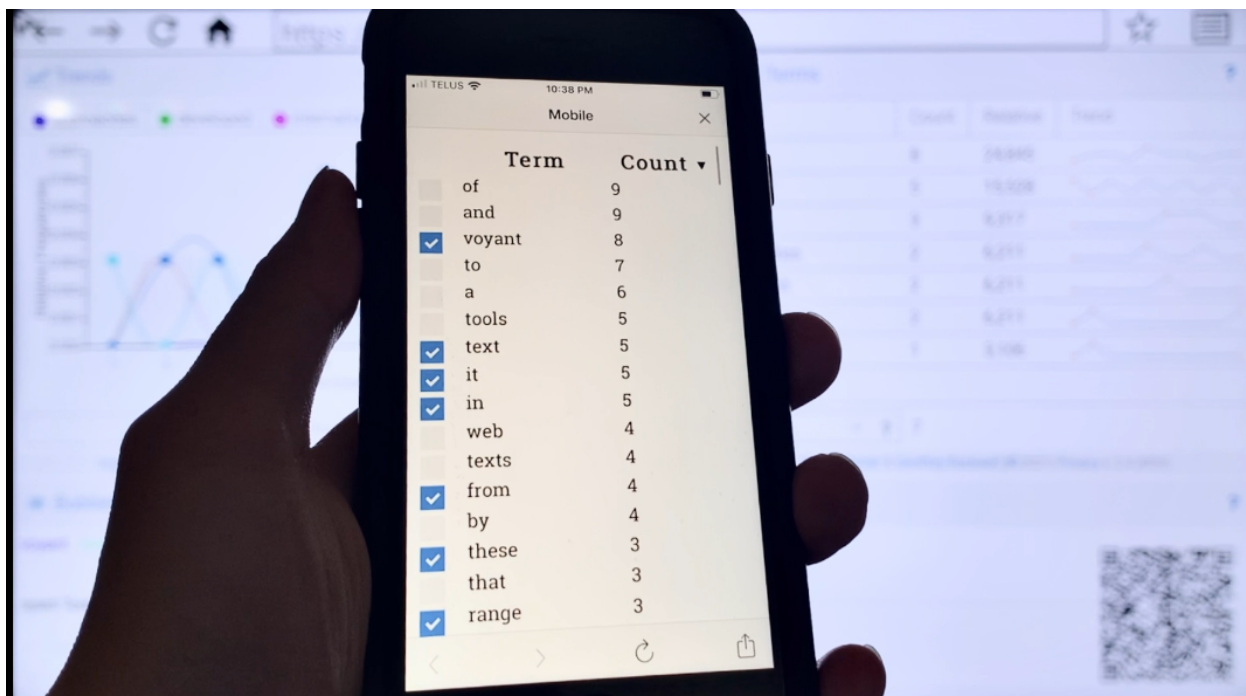
Handheld Voyant

During our testing of the use of Voyant on the data wall, in addition to the difficulties previously discussed, we also noticed that using the large data wall directly was physically exhausting. Users had to occasionally step back to have a better view of the wall and what others were doing. We realised that the experience of using the data wall was best when we had the whole data wall

constantly in view. This meant that we needed a way to remotely control what is displayed and

for many users to be able to contribute to what was happening on the data wall. Inspired by the

BookMap, we created a prototype which we call Handheld Voyant which consists of a new

'summarised' Voyant control interface designed for a mobile phone through which multiple

people could control analysis on Voyant. As a proof of concept, we created a webpage that

connects to Voyant's backend engine and retrieves data for visualisations. We chose three tools—

the Trends tool, the Document Terms tool and the Bubblelines tool—to test this prototype.

Similar to BookMap, we added a QR code on the website such that the user just has to scan the

QR code to be taken to the Handheld Voyant interface on his/her mobile phone (see Figure 6).
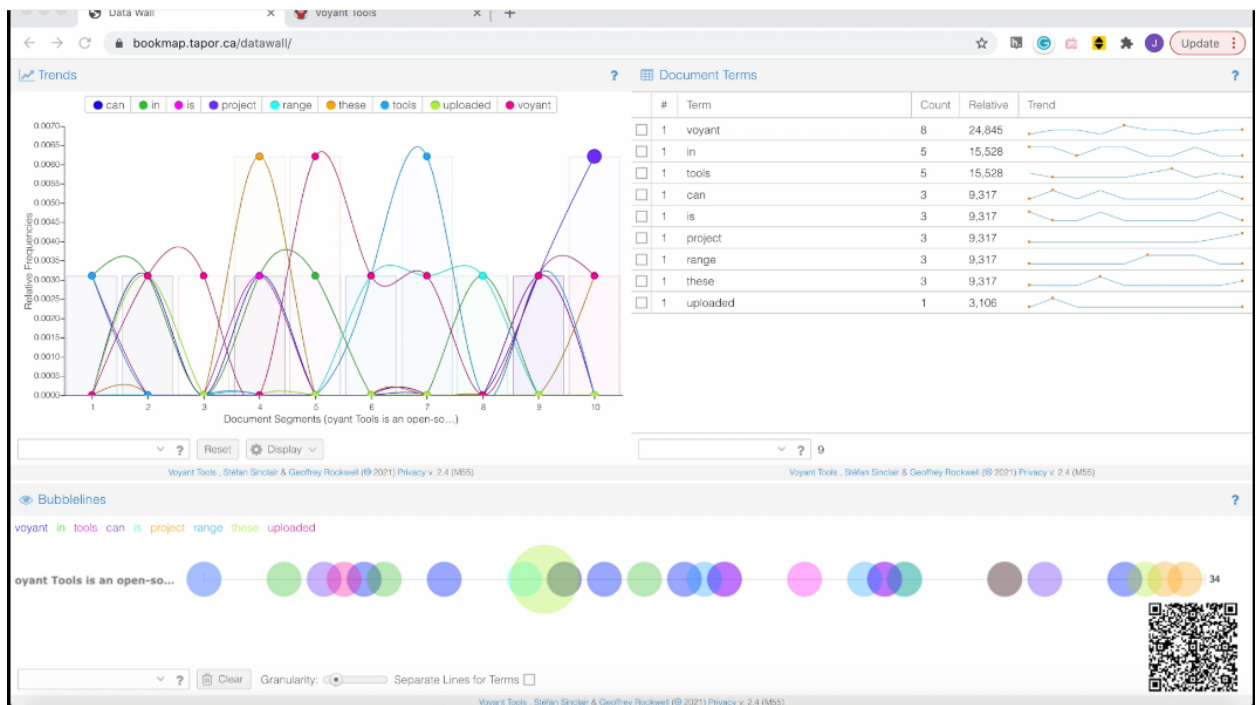
(a)

(b)

Fig 6: (a)Visualisation projected on the data wall for Handheld Voyant and (b) the mobile phone view of Handheld Voyant.

To use this prototype, the main user—who might be a lecturer teaching a class—just has to upload the text to be analysed into the main Voyant website, then copy the corpus ID from the address bar of the webpage with the generated visualisation panels and append it to the end of the webpage address of the webpage we created. Once loaded other users will have the opportunity to contribute to the analysis which will now be done jointly. Currently the mobile interface of Handheld Voyant only has the function to select the words to include in the analysis and whether or not to include a stopword list.

In this prototype we sought to include the values of comfort, dialogue and multiple perspectives. The users will be able to sit at a distance they choose from the data wall to enjoy the full view of the data wall while controlling the visualization from their phone and discussing the results. Another way to address the issue of subjectivity in working with data is to engage multiple perspectives on the data and the analysis process.

Handheld Voyant is a proof of concept and could be developed further by adding more functionalities and connecting it directly to the main Voyant servers such that all Voyant functionalities could be controlled remotely. New functionalities that could be added are: A way for the main user to manage the access of the other users, a way to track the usage to know what each user did, a way to compare the analysis process and output of different users.

Skin Builder and Embedder

The default view in Voyant is made up of five panels which display five preset tools. The Skin builder is a tool in Voyant that allows the user to modify the default view of Voyant by developing their own "skin" of panels. With the skin builder, the user can add and remove panels, set the size of each panel and the tool to be displayed in the panel. In Rockwell et al. (2020) we presented a data wall use scenario in which a lecturer was teaching a class. The lecturer divided the data wall into different sections with some sections displaying Voyant and other sections displaying other websites. The goal was to include information from many sources to both contribute to and challenge the analysis. It might not be an easy task to divide a data wall into a number of sections and perfectly align the different windows into each section of the datawall by resizing each of them.

To address this, we created the **Embedder** tool that offers a panel in the Voyant interface into which users can load other web pages. When combined with the skin builder, the user can design an interface in the skin builder and assign the embedder tool to the panel where he/she plans to load their own web page into (Figure 7).
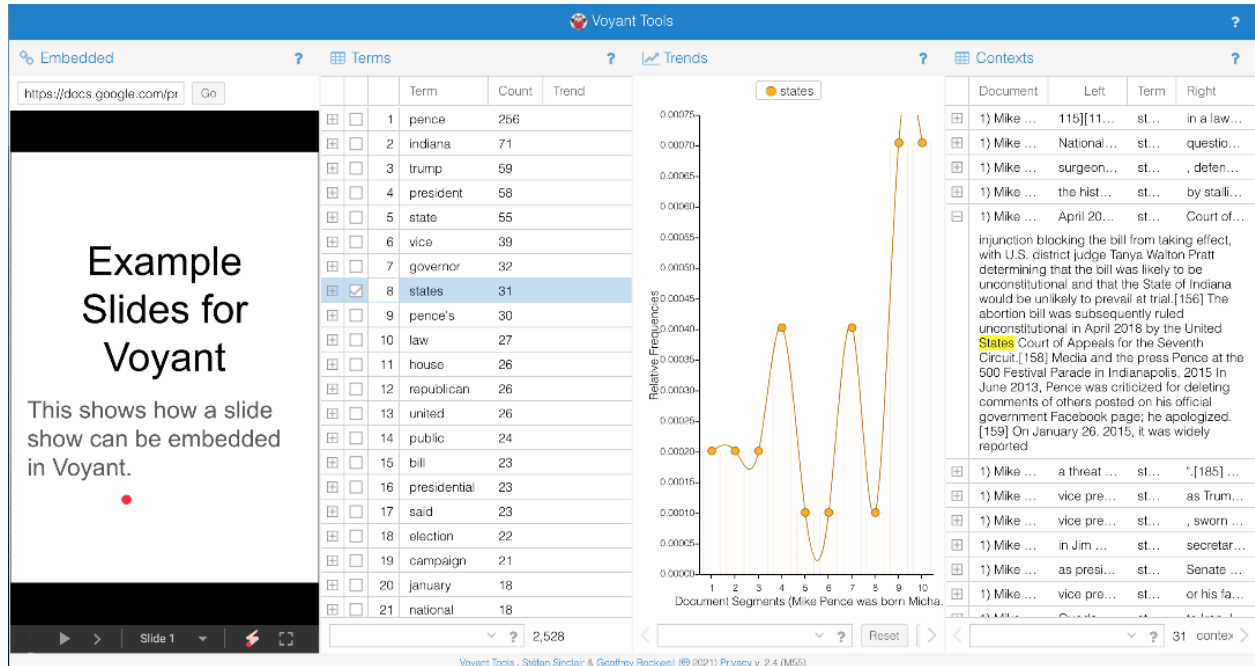

Fig 7: A Voyant interface in which the embedder tool was used in the panel on the extreme left to display google slides.

Adding the Embedder tool to Voyant opens a new set of possibilities for those presenting Voyant in a class as a variety of content can be displayed side-by-side simultaneously with text analysis. A few examples are: the Embedder could display a Google Doc to which the users remotely connect, in order to build a corpus to be analysed together. Alternatively the Embedder could display a Wikipedia page or a news report or some results that relates to the analysis currently

being done. We have experimented with Google Slides being embedded so that an instructor can use Voyant as part of a lecture with their slides and Voyant displays together.

Conclusion

This paper documents a few of the ideas developed by the Visual Matters project, some of which have already made it into the beta version of Voyant. We have documented other ideas from the charrettes and from student contributions. Many contributed ideas involved creating a sentient space around the data wall to interact with it and could not be prototyped due to feasibility costs and also the inaccessibility of data walls in this pandemic times. The prototypes are the tangible products from the Visual Matters project but it is also important to recognise the training in design practices that happened particularly during the charrettes.

Data walls have the capacity to display a wealth of information at once and hence can be used to display different sources of information on a given subject or even different visualizations of the same data and in doing so show how much perspective matters. Visualizations that are controlled by a group of people can also show how visual rhetoric is negotiated. Unlike personal computers designed for a single user, data walls are made to be viewed by many people who can be given some control over the analysis process thereby bringing other perspectives to the analysis process.

References

Drucker, J. (2014). Graphesis: Visual Forms of Knowledge Production. Cambridge,

Massachusetts, Harvard University Press.

Dunne, A. and F. Raby (2013). *Speculative Everything: Design, Fiction, and Social Dreaming*.

Cambridge, Massachusetts, MIT Press.

Halpern, O. (2015). *Beautiful Data*. Duke University Press.

Latour, B. (1990). "Technology is society made durable." *The Sociological Review, 38*, 103-131.

Mayer-Schönberger, V. and K. Cukier (2013). *Big Data: A Revolution That Will Transform How

We Live, Work, and Think.* New York, Houghton Mifflin Harcourt.

Rockwell, G., et al. (2010). "The Big See: Large Scale Visualization." Proceedings of the

Chicago Colloquium on Digital Humanities and Computer Science, University of

Chicago, University of Chicago.

Rockwell, G., Wang, J., Tchoh, B. K., Wu, C. Azarpanah, A., & Sinclair, S. (2020, June).*Visual

Matters: Experiments in the public visualization of text* [Paper presentation]. Building

Community Online. https://hcommons.org/deposits/item/hc:30167

Terranova, T. (2004). *Network Culture: Cultural Politics for the Information Age*. Pluto Press.