

Introduction

We present a work-in-progress visual analysis prototype to support domain experts in their understanding and analysis of the processes that have written modern constitutional law. In accordance with digital humanities domain, constitutional data is rich in **relational**, **hierarchical**, **temporal**, and **text** features. Data have complex implicit network structures and event-based dynamics and as such they have always posed a challenge to visualization. Through ongoing discussion with experts in constitutional law, we design a prototype with **paralleled ThemeRiver** and **hierarchy tree** to support the understanding of constitutional data by showing the hierarchical structures and trends of selected attributes through their temporal development, and making values and trends of different attributes comparable.

Objectives

Our research question is defined as **enhancing the ability of domain experts to reason about the process of complex, multi-author negotiations through visual design**.

To clarify the research question based on domain experts' needs, we split into three objectives:

- The visualization requires to identify moments/trends of data that span events across months, while preserving the overall structure.
- A single view helps to compare different dimensions of the dataset using a common visual language is needed.
- The visualization should be developed as an exploration tool, giving a general view of several dimensions of data and covering the overall time span of a convention.

Prototype



Figure: (a) Hierarchy Tree (b) Paralleled ThemeRiver (c) User-defined sets

- **User-defines sets** enable users to select events through intuitive interactive tools: **checkboxes** helps filtering certain type of events; **time range slider** helps focusing on a particular period; and **radio buttons** allow users to choose the level of keywords.
- **Tree structure navigator** shows the structure of how people and delegations are related. It also allows navigating through the hierarchical structure to the paralleled ThemeRiver. Association between the tree structure and the paralleled ThemeRiver are created through the consistency of color encoding.
- **Paralleled ThemeRiver** is an overview depicts the events in time at a high level of abstraction from different angles: the attendance statistics, text features from the legal text, and the descriptive text. This compression allows users to understand the entire convention at a glance and making comparisons.

Visual Design

Based on domain experts' need, we devise the following tasks to achieve:

- To visualize the event data of three dimensions with single visual encoding.
- Enable comparisons among temporal developments of different dimensions of the data.
- Embedding hierarchical structure of data in the visual design.
- Allow user to explore the huge and multi-data typed dataset in a general view.

Visualization

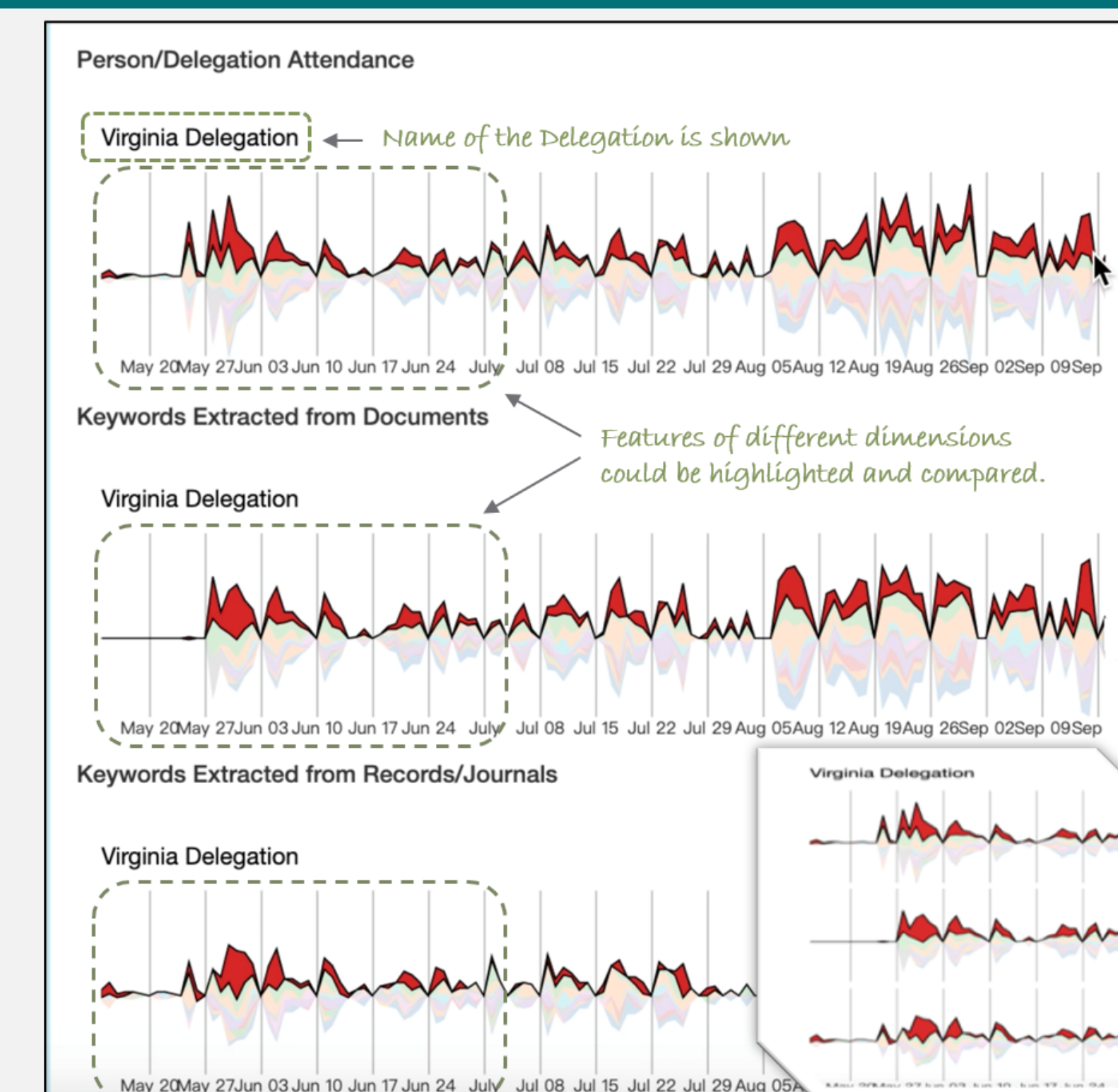


Figure: How these tasks are achieved by the prototype

Datasets

This prototype is built on top of the Quill Platform [1] and Database. The database is network-structured with multiple tables.

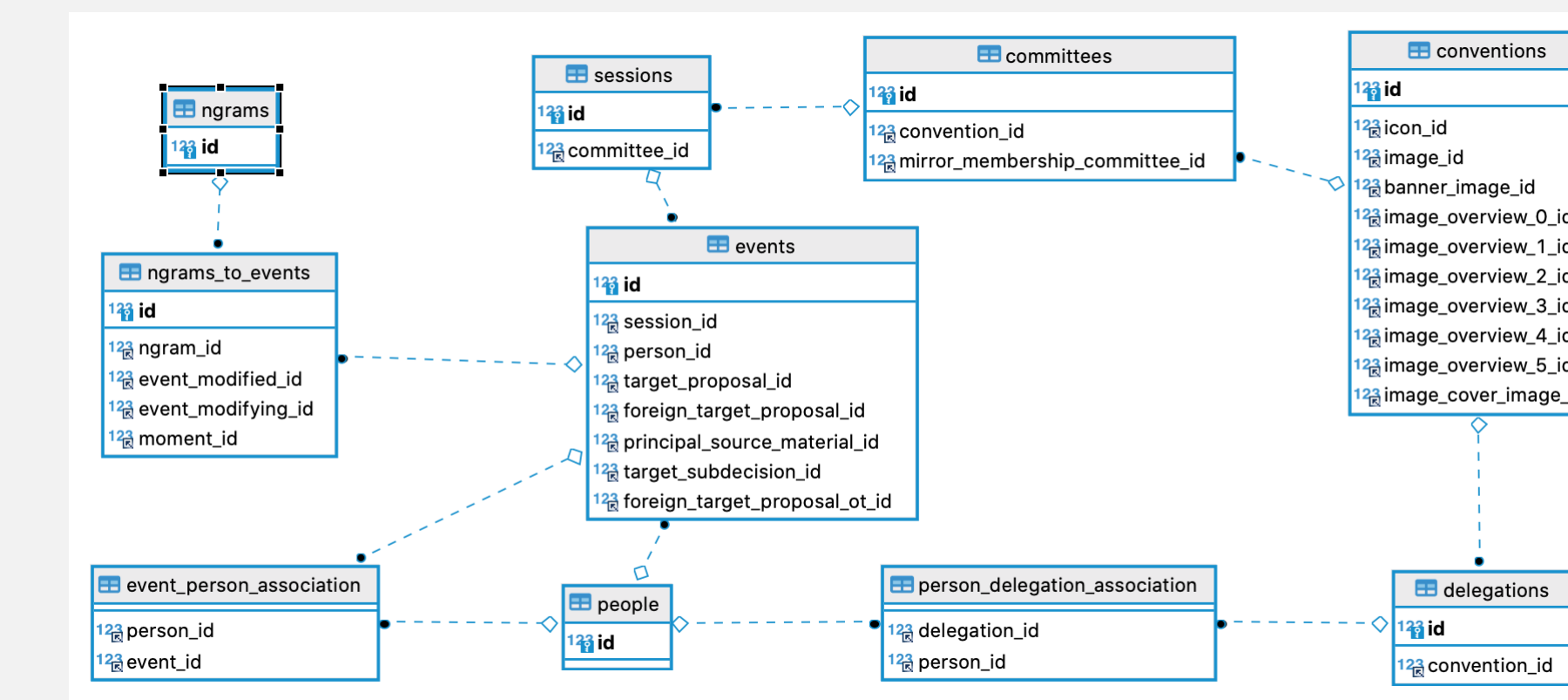


Figure: Entity-Relationship diagram of the database

- Time is included in 'sessions' table.
- Participants' data is in 'people' and 'delegations' tables.
- Text data is stored in 'documents' related tables and are categorized into two – the content of the legal text law and the descriptive records.
- 'Event' is the basic unit in the dataset.
- A document processing layer translates the sequence of events into the document texts agreed or proposed for any given moment.

Conclusion and Future Plan

We introduce a prototype for supporting the exploration and understanding of constitutional convention process. The prototype offers a multi-views visualization – combining the tree structure navigator and a modified version of ThemeRiver to present the temporal evaluation of the contribution of participants to the whole convention from different angles.

- Evaluation and user study on specific cases will be conducted in the future.
- We will continue to improve the design and interaction for the prototype.

References

- [1] N. Cole, A. Abdul-Rahman, and G. Mallon, "Quill: A framework for constructing negotiated texts - with a case study on the US Constitutional Convention of 1787," in *ACM/IEEE Joint Conf. Digital Libraries*, pp. 1-10, 2017.