Visualizing Laws over Time

CPSC 547: Project Proposal

Knomos Knowledge Management Inc.

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1   Problem Description

Domain

The motivation for our project comes from the ideas generated from the startup company Knomos, an interactive web application leveraging data visualization and entertainment software design to make law data more accessible and easier to understand for everyone. One of their goals they emphasize, which we will focus on, is the need within the law community to visualize the structure of changes within a law over time.

Data

Our data is provided online by Queen's Printer of BC [1] in an XML format, through the BCLaws API. For this project, we are focusing specifically on the changes that occurred in the Statutes and Regulations section of the BC Laws site which includes over 700 laws. For each law the corresponding XML file contains the current copy of the law, as well what each subsubsection was before a given update at a specified date.

Task

Considering only the current version of the law is available, determining what the law looked like at a given date is a tedious task as it would entail looking through the dozens to hundreds of updates of different sections of that law . In many cases, the same section will be updated multiple times. The current website only supports easily identifying what a given section of a law was before an update. Even simple tasks such as comparing two versions of a subsection is not easily supported, as this requires manually searching through a table of all updates to a given law to determine which updates to the section of interest would be in effect at the two given dates, and then manually reading each version of the section to identify what was changed. The simplest goal of our vis tool will be to easily support the ability to compare two versions of the law at selected dates. We plan to augment this with scented widgets and additional views to help users explore a law over time while providing them with hints of where to look for interesting changes that have occurred within that law.

2   Previous Work

Related literature can be broken down into two main categories: vis idioms for visualizing changes in documents over time, and tools for showing differences between to document versions. The History Flow Vis idiom presented by Viegas et al. [2], was used to visualize edits made to Wikipedia articles over time. The horizontal axis was used to represent time, and the vertical axis was used to encode the height of the document and each section of the document was colour coded by author. This view allowed users to see how the document structure grew, shrank, and shifted over time.

File difference tools are used to compare changes between two text files. In some cases [3, 4], two versions of a file are given as input to the tool, which then displays each side-by-side using colour-coded mark-ups such as green highlights in one file, to indicate an added section of text, and red highlights in the other, to indicate a deleted section of text. Other tools, such as the "Track Changes" feature in Microsoft Word 2013 [5], only show the document in one view, and embed the changes made to it, i.e., inserted and deleted text, within the single view. In this case, changes in text are encoded with a font colour change, with deleted text represented using a strike-out mark and added text underlined. One clear advantage of this representation is that reduces the amount of screen space needed for the vis idiom. On the other hand, when extensive edits are made to a document, this technique may become more cluttered, and the user may have more difficulty in piecing together the individual edits to build a mental model of each document version. When two side-by-side views are used to display each version of the document, it is easy to see

what is contained in each version of the document, however unnecessary additional screen space is needed to encode regions of the documents that are identical in each document.

3   Proposed Solution

Design Mockup

If time permits, the final visualization will contain two major views: diff view and the history flow view. Our primary focus will be on the diff view which will show the exact changes between the law at any two specified dates. This view will be separated into 5 sub views which can be seen in Figure 1 below. Given two specified dates, the main view will contain the text of the law from from the most recent date selected along with any changes that have been made since the earlier date. Changes that will be shown will include additions, deletions, and replacements of text. To give the user context, an overall view of the law, broken down into sections and subsections will be shown in another view to the left. Using this view, the user should be able to see what sections have been changed and therefore easily select and navigate to a specific section to get further details in the main diff view described above. A time line control view will also be included to allow the user to choose which two dates they want to compare. This time line will be scented to allow the user to get an overall impression of what points in time had the most significant changes. To represent further details, our vis we also include a fourth view which will focus on a specific section and how it has individually changed over time. Finally, a small overview view will be included which will lead to the history flow view (described next) when clicked.
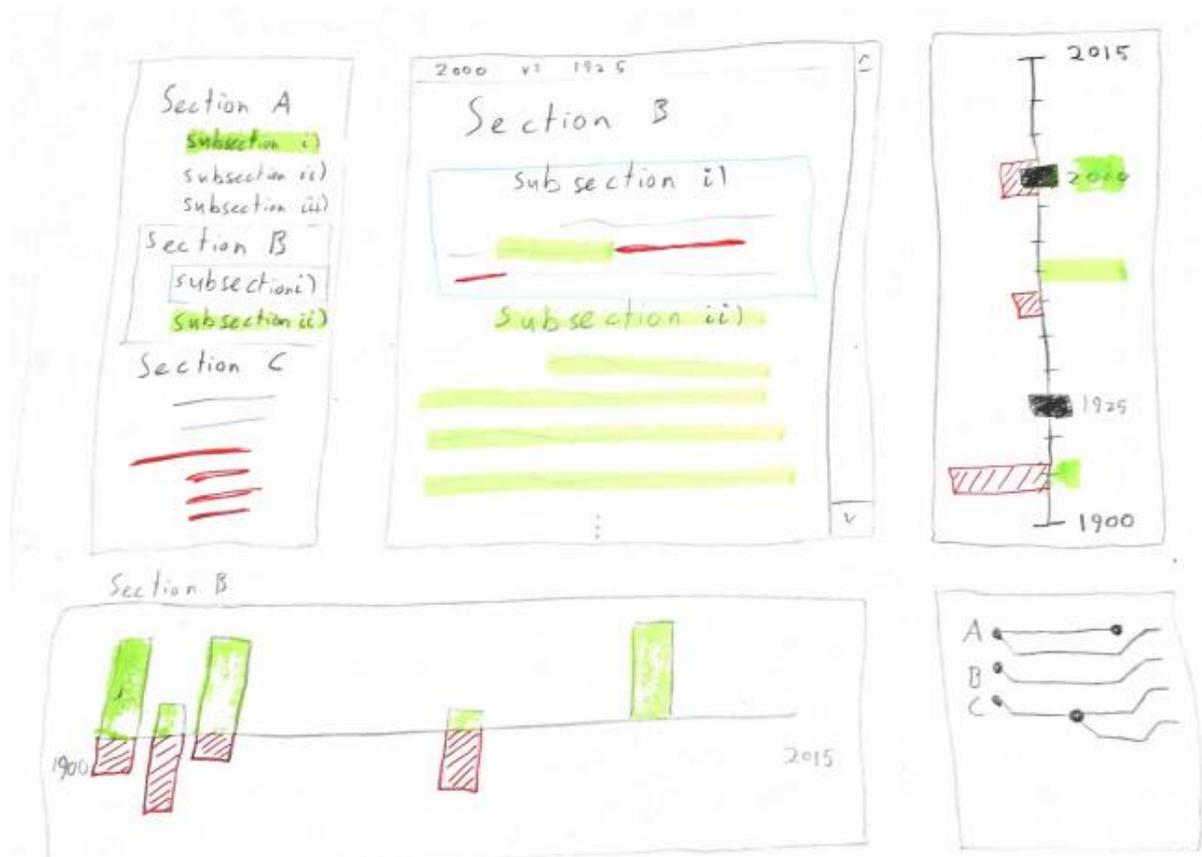

Figure 1: A sample mockup of our proposed infovis solution. Top left: table of contents; middle: main diff view; top right: scented time line slider; bottom left: detailed section view; bottom right: adapted history flow view.

If there is enough time we will implement the history flow view which will represent the overview of all the changes in a particular law over time. It will be implemented using an adaptation of the history flow visualization idiom from Veigas et al. [2]. Rather than encoding author information with colour, we will use this visual channel to distinguish between different sections of the document. We wish to augment this tool with additional features that allow users to hover over a change in a section to see the difference in the text of the law in a pop-up view. The full diff view can be accessed from the history flow view by selecting to view more details at a point of interest.

Scenario of Use: Legislator

A user who is a legislator will want to be able to compare the current version of the law with a previous one. This will be done by selecting a law to view. Once the law is loaded, the user will use the scented time-line slider on the right to select the two dates that they would like to compare. The user may identify dates of interest by observing which years have large bars, indicating years of high activity, in the scented display. Once the years are selected, the table of contents on the left and the main view containing the law document will both be updated to encode the sections added, deleted and edited using colour highlighting and text strike-outs. The user will then click on a subsection in the table of contents to navigate to it automatically in the main view. The added lines in the subsection will be highlighted in green and deleted lines will be crossed out in red allowing the user to quickly identify the differences between the two versions of the document.

Scenario of Use: Academic

A user who is an academic will first load a law of interest. Before using the main view to identify regions of interest, they will click on the overview in the bottom right corner to maximize this display. This overview will show them a summary how subsubsections have been added, removed and edited over time. The user will be able to hover over points where subsubsections have changed to view in a pop-up the text of that subsubsection, with the added lines highlighted in green and deleted lines crossed out in red. The user can then choose to switch to the main view which will allow them to drill down and see the entire document at the selected dates and section. Users can switch back and forth between the two views as they explore the law document.

Implementation Tools

Current Knomos software is implemented online using HTML, Javascript, jQuery, D3.js, among other server-side platforms. We also plan to use HTML, Javascript, jQuery, and D3.js as this will easily mesh with their existing environment. We believe that an online vis tool is the most appropriate as it will allow users from around the world to have access to the Law History Vis tool for personal use. Currently we are planning to implement everything from scratch in D3.js. However, if we find an existing, open source implementation of the History Flow idiom [2], or something similar that we can use, we may choose to use it as our summary view.

4   Timeline

We outline our proposed time line in Table 1, with a short desciption of each task. For each task we have indicated our perceived difficulty on an arbitrary scale. In particular, we believe these to be the relative weights of how difficult and time consuming each task will be. In the final column, we have also indicated which tasks we hope to have completed each week. We note that, for example, while task 1 logically proceeds task 2, they are also separable tasks and can be completed in parallel, which we plan to use to our advantage to help us divide the work.

Number	Description	Difficulty	Date
1	Parse data so we can see the law at a given date	5	2015-11-16
2	Encode changes between two dates in main diff view	3	2015-11-23
3	Create time line slider to choose which two dates to compare	1	2015-11-23
4	Table of contents to summarize changes across the document	2	2015-11-30
5	Add bar chart to time line slider to scent widget	3	2015-11-30
6*	Derive data for history flow view	3	2015-12-07
7*	Create history flow view to summarize all changes in law over time	8	2015-12-07
8*	Create view for summary of a given section over time	3	2015-12-07
9	Prepare final presentation	3	2015-12-15
10	Final writen report	5	2015-12-15

Table 1: A short description of each task, our estimation of their relative difficulty, and our proposed date of completion. Tasks marked with * will only be completed time permitting. We will only begin work on tasks 6 and 7 if everything else is proceeding ahead of schedule, in which case, we would likely drop task 8. If we are behind schedule, then we will skip tasks 6-8 entirely.

5   Personal Expertise

Kimberly Dextras-Romagnino

I have no previous experience working with law data. However, the fact that it is real data that every day people interact with sparks my interests and motivation to work on this project. In terms of information visualization, I have no concrete experience but I am currently taking a related course, Human Computer Interaction which allows me to understand the importance of understanding the user's requirements and needs before creating a tool. This idea will help in creating a visualization that is both useful and entertaining.

Yasha Pushak

I have a small amount of domain experience with law, dating back to my last couple of years in high school where I participated in two province-wide mock trial competitions. While this does not give me much experience with law terminology, it does give me a bit of familiarity with understanding some of the structure of how laws are written.

I do not have any previous experience in infovis from before taking this course. I have some relevant experience from a course I took in Human-Computer Interaction. This course and other experience in user-centered design and building several websites will be useful assets both for the initial design phase of the project, and later in the implementation of the web-based vis tool.

References

[1] Queen's Printer BC. http://www.bclaws.ca. Accessed: 2015-11-08.

[2] Fernanda B. Viégas, Martin Wattenberg, and Kushal Dave. Studying cooperation and conflict between authors with history flow visualizations. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '04, pages 575–582, New York, NY, USA, 2004. ACM.

[3] Diff Checker. https://www.diffchecker.com/. Accessed: 2015-11-07.

[4] CanLii. http://www.canlii.org/en/bc/laws. Accessed: 2015-11-08.

[5] Microsoft Office Word 2013. https://products.office.com/en-ca/word. Accessed: 2015-11-07.