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3D Visualization of Legislative Relationships

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Keywords

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Digital Democracy Project

Launched in 2015, the Digital Democracy project aims to increase transparency in state legislatures.



The platform provides searchable and indexed professional-grade transcriptions of state legislative proceedings. Anyone can use the system (www.digitaldemocracy.org) to find, analyze, set alerts for and study legislative hearings on topics of interest.



Figure 1: Broad view of all concepts and nodes. Lobbyists (orange) are connected to bills (blue) and organizations (gray).



We use a data set by Digital Democracy (<u>www.digitaldemocracy.org</u>) in the study. The data set consists of bills, lobbyists and organizations in the California legislature. The connections in our data are lobbyists influencing bills and organizations hiring lobbyists.

<u>User Study</u>

The participants of the study were selected to have as little prior experience as possible with the Digital Democracy platform, and none could have had any prior experience with the graph exploration

Legislative Relationships

Government relationships can be complex and difficult to understand. The relationships between members of a legislature, bills, votes and lobbyists who promote various causes are important to understand in representative democracies, but difficult to retrieve using current methods. We propose a **3D visualization system** to explore such legislative relationships for users. We use real data from California state legislature obtained from the Digital Democracy project. We also conduct a 20 person user study to gauge the differences between traditional ways of looking up information versus our graph based methods. While not being as comprehensive, most users found our interactive visualizations intuitive than more regular web-based information retrieval.

3D Visualization hypothesis



Figure 2: Subselection of a node with color-coded connections.



application. The participants performed different quantitative tasks to answer the same questions with the graph exploration application and the website.



Figure 4: Plot of the percentage of correct answers for the different tasks and overall using the 3D graph exploration application and the Digital Democracy website. N=20. Task 1: "Name all lobbyists affiliated with a specific organization". Task 2: "Name all the lobbyists that tried to influence a certain bill". Task 3: "Put the given lobbyists in order of the amount of bills they are associated with". Task 4: "Pick the organization hiring the most lobbyists from a given list of organizations"

3D visual representations can be used to gain knowledge more efficiently in complex data sets, when compared to current 2D methods, for certain kinds of political information.

Implementation

We can display up to 4500 graph elements while maintaining an interactive frame rate (25fps). Our graph exploration application is implemented in C++ and OpenGL and is completely cross-platform (Windows, MAC and Linux). The graph layout is generated offline before the application starts with the Open Graph Drawing Framework and can be easily switched out to use another algorithm or library for layout generation. Figure 3: Color coding of connected nodes (bill pass/fail) and edges (position support/oppose/none).

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