IssueBrowser: Knowledge Acquisition via Multimedia Data

Jonathan Ventura
Dept. of Computer Science
University of California
Santa Barbara

Angus Forbes
Media Arts and Technology
University of California
Santa Barbara

Benjamin Adams
Dept. of Computer Science
University of California
Santa Barbara

Swapna Joshi
Dept. of Electrical and
Computer Engineering
University of California
Santa Barbara

Karl Grossner
Dept. of Geography
University of California
Santa Barbara

Monica Bulger
Dept. of Education
University of California
Santa Barbara

Tobias Höllerer
Dept. of Computer Science
University of California
Santa Barbara

B. S. Manjunath
Dept. of Electrical and
Computer Engineering
University of California
Santa Barbara

1. INTRODUCTION

One can hardly overestimate the pervasiveness of digital multimedia in the 2008 United States presidential election. Anyone seeking to learn more about the election has at their disposal a plethora of digital media content such as online news articles, blogs, 'informational' and public candidate videos. These data not only originate from traditional sources of media "translated" to the web but also come from an increasingly large web campaign presence of candidates themselves and supporters. Navigating through all these data can be difficult for users as the information in various media formats is scattered across the web. In addition, each of these sources of data has implicit information (such as temporal or semantic relationships) that is not readily available to a casual consumer, but which nevertheless could be of interest to someone seeking a more nuanced understanding of the data. Furthermore, these data are connected in ways that only become apparent when analyzed together. For users wishing to combine the available data into a fuller picture of a candidate and his or her position on particular issues, methods for mining the multimedia data becomes more and more important.

Towards these ends, we propose "IssueBrowser," a multimedia data mining application that accumulates and allows for exploration of multimedia data about the 2008 U.S. presidential election. A novel interactive visualization installation is designed to aid users' understanding of the complex, shifting tapestry of candidates and issues involved. The analysis and unique combination of multimedia content presented by IssueBrowser help give the user insights into the various presidential candidates and their positions on issues in a manner that might not be possible when observing the constituent media *in situ*.

Data is in the form of text, including speeches, debate transcripts, news reports and blog entries, as well as relevant video clips, all harvested automatically from various web sources. This stored data is then analyzed for issue relationships and presented in a navigable weighted spring graph visualization spanning four large plasma screens in a public setting. We use a Nintendo Wii remote to point and click on the screen.

2. TEXT ANALYSIS

We created a list of 34 issues that were important (according to the candidates) in the 2008 election. All forms of text are analyzed for their similarity to 34 reference documents derived from candidates' issue position papers. We use tf-idf weighting and a cosine similarity measure on the text of a speech to determine the degree to which that speech is about each of the 34 issues [3]. The resulting 34-value array, termed an "issue signature," can be aggregated by individual, party, news source, place or time, both as weights to motivate the size and position of graphical elements and a means to quantify variation in "issue aboutness" for the election according to various perspectives.

3. VIDEO ANALYSIS

With the help of speech recognition we obtain transcripts for each of the videos [2]. The transcripts are then compared against reference documents to relate the videos to the 34 issues identified. The output of this comparison supplies us with segments where particular issues were mentioned in a given candidate video. We then use shot detection as a way of bounding our results into more coherent video snippets [1].

4. INTERACTIVE VISUALIZATION

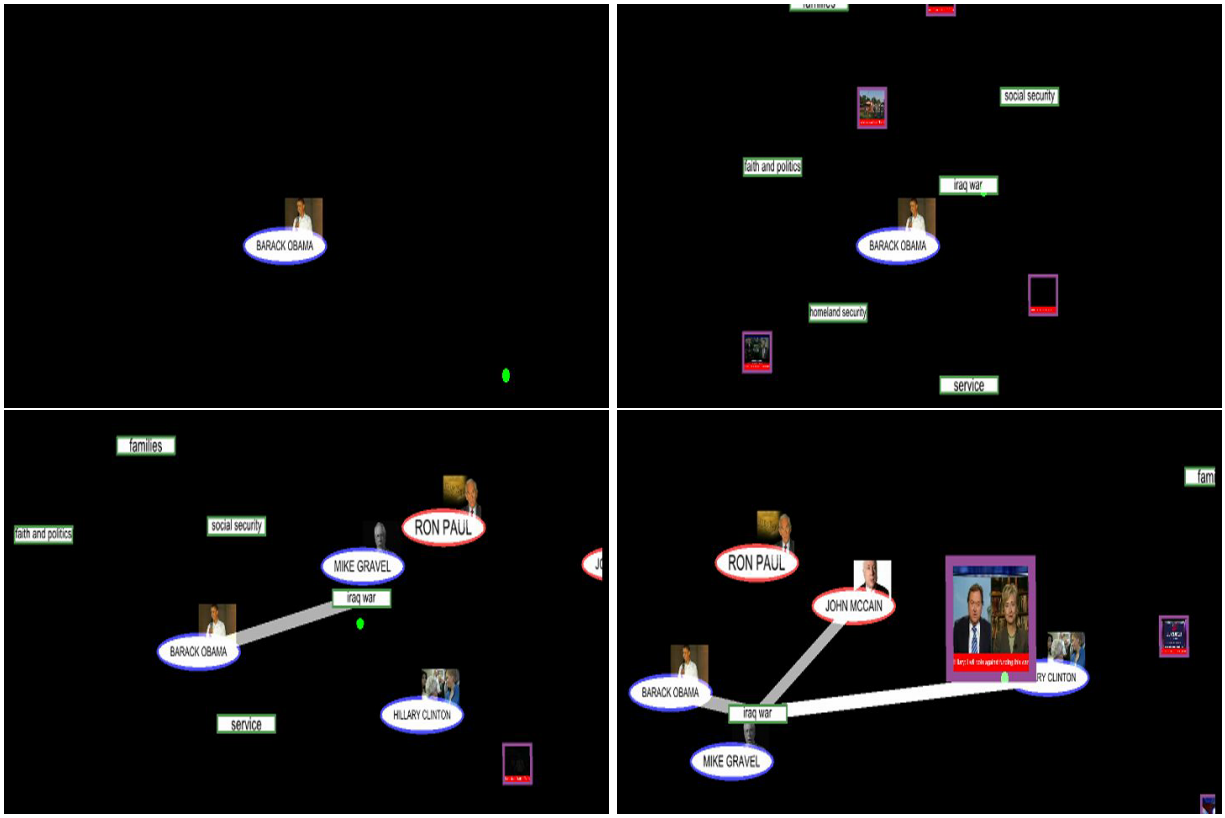

Figure 1: Example interaction sequence (left to right, top to bottom).

We developed an novel visualization system that allows users to interpret data (and connections between them) from various perspectives and from various sources – perspectives and sources to which users might not be exposed during a normal web search. Our layout algorithm is designed to help balance a broad view of a range of issues as well as increasingly detailed information about particular aspects of an issue or a cluster of issues.

Users are offered "choice points" from a variety of different sources. These choice points are filtered by the data on the screen that the user has "pinned." That is, all choice points must be related in some way to the data that is currently selected. The visualization is always offering up new data, but the theme of this new data is controlled by users pinning or unpinning choice points.

The data points available on the screen include candidates, issue topics, text articles, and video segments. Selecting a data point causes the system to introduce new, related data points, which are visually tied to the original point, We use a spring graph layout, with links between related items. Users can click through data points to progress through our database, opening and closing data points according to their interest.

Figure 1 shows a typical interaction with our system. In the top left screen capture, a single data point is available, representing a presidential candidate. The top right image shows the effect of selecting that candidate, revealing issues and videos that are generally related to the candidate. In the bottom left screen, the user has selected the 'Iraq War' issue, bringing up videos and other candidates with a relevant stance. Finally, in the bottom right, the user has selected another candidate and a video of the candidate speaking about the Iraq war.

We spread our visualization across four screens to allow enough space for a large semantic chain to unfold across the screen, or several different chains of investigation. We have experimented with placing the system in the hallway of the campus library, allowing interested passerby to easily pick up the remote and explore the connections in our database.

5. REFERENCES

[1] P. Bouthemy, M. Gelgon, and F. Ganansia. A unified approach to shot change detection and camera motion characterization. In *IEEE Trans. on Circuits and Systems for Video Technology*, 1999.

[2] K. F. Lee, H. W. Hon, and R. Reddy. An overview of the sphinx speech recognition system. In *Acoustics, Speech, and Signal Processing*, 1990.

[3] G. Salton and M. McGill. *Introduction to Modern Information Retrieval*. McGraw-Hill, 1983.