Project 02 Proposal: Info Vis Paper Reviews

Emmitt R Johnson, Makiah Merritt, and David Shingai Ntuli

Abstract— The projects that looks interesting to us were *VisDock*, *HindSight*, and *PROACT*, and they all brought something a bit different to the table. We looked at several other papers, but there were various challenges that would make them difficult to pursue.

1 Related Papers

1.1 Paper 01: *VisDock: A Toolkit for Cross-Cutting Interactions in Visualization* [4]

1.1.1 Paper Description

Prepared by Jungu Choi, Deok Gun Park, Yuet Ling Wong, Eli Fisher, and Niklas Elmqvist, Senior Member, IEEE; this paper reviews a tool the team created to provide "a core set of cross-cutting interaction techniques for visualization" [4, p. 1]. The tool, VisDock, was created as a plugin library using JavaScript to interact with visualizations based on SVGs; upon completion of the tool, the team released it as Open Source. A qualitative study with four developers and 11 end-users "found the tool usable and efficient" [4, p. 2].

1.1.2 Project Value

In their future work section, one area of interest is the implementation of data-level interactions for "filtering, searching, and drilling down into the data" [4, p. 12]. Along these lines we could investigate ways to provide interactions allowing quick manipulations of the graph based upon data selections of the user. For example, supposing the user would like to find similar elements in the data set based upon a selection, we could look into developing a way to generate visual changes to make those elements stand out. Problems we may encounter mainly surround picking up and applying the VisDock. Although documentation and examples will be available, being open source there is no guarantee that it will be plug and play. Furthermore, the implementation of VisDock is that of a plug-in, meaning we will need to start the visualization another visualization tool such as D3 and figure out the extent of VisDock's manipulation capabilities.

In their future work section, one area of interest is the implementation of data-level interactions for "filtering, searching, and drilling down into the data" [4, p. 12]. Along these lines we could investigate ways to provide interactions allowing quick manipulations of the graph based upon data selections of the user. For example, supposing the user would like to find similar elements in the data set based upon a selection, we could look into developing a way to generate visual changes to make those elements stand out. Problems we may encounter mainly surround picking up and applying the VisDock. Although documentation and examples will be available, being open source there is no guarantee that it will be plug and play. Furthermore, the implementation of VisDock is that of a plug-in, meaning we will need to start the visualization another visualization tool such as D3 and figure out the extent of VisDock's manipulation capabilities.

1.2 Paper 02: *HindSight: Encouraging Exploration through Direct Encoding of Personal Interaction History* [9]

1.2.1 Paper Description

In this paper, HindSight is a term used to denote the technique where a user's interaction history with a data visualization is visually encoded [9, p. 1]. The authors, Mi Feng, Cheng Deng, Evan M. Peck, and Lane Harrison, studied how HindSight designs impact user exploration and interaction with a visualization. HindSight principles are designed to ease the burden on a user's short-term memory, as exploration of data visualizations are limited by a user's ability to remember recent interactions. To examine the impact of HindSight designs, the researchers conducted studies using three different visualizations. Four hundred participants were tasked to explore a visualization, some of which had HindSight applied. The studies found that visualizations with HindSight applied appeared to allow users to explore more and different parts of the data.

1.2.2 Project Value

The purpose of this paper was to show how a simple low-barrier technique like HindSight might be able to change a user's exploration behavior. Possible work we could cover for a project includes examining how active design properties might benefit from passive design properties and vice versa. For instance, how bookmarking might benefit from HindSight. Another avenue for project work includes how more a more detailed history might be beneficial or detrimental when taking into account implementation complexity. Some challenges might include finding sources of data visualization that are openly available to us.

1.3 Paper 03: *PROACT: Iterative Design of a Patient-Centered Visualization for Effective Prostate Cancer Health Risk Communication* [5]

1.3.1 Paper Description

PROACT (PROgnosis Assessment for Conservative Treatment) is a tool created and tested by Anzu Hakone, Lane Harrison, Alvitta Ottley, Nathan Winters, Caitlin Gutheil, Paul K. J. Han, Remco Chang to communicate risk information to individuals suffering from prostate cancer. "PROACT utilizes two published clinical prediction models to communicate the patients personalized risk estimates and compare treatment options" [5, p. 1]. With a primary goal of transmitting information across to emotionally charged individuals, the tool's design is backed by user studies of prostate cancer survivors and urologists from the Maine Medical Center. Through their study, they found an appropriate design required a easy to read bits of information that could likewise be easily comprehended with little effort. Specifically, listed in their *findings* section, the team found a **temporal visualization** with **narrative sequence** worked best to communicate with varying **emotional state**s [5, p. 8]. This led the initial designs to use simple visualizations, such as pie and bar charts, minimal labeling, and present the data in a positive lens; noting "adding interactions to either simple or complex visualizations had an adverse effect" [5, p. 2].

1.3.2 Project Value

As the team mainly focused on getting a narrative visualization in place, they left room to expand upon information communicated. Noted in their *future work* section, adding other factors - "side effects, recovery time, quality of life, localized vs. metastatic (cancer spread outside of the prostate), and other treatment options" [5, p. 9] would be of great use in taking the next step, transitioning the tool from proof of concept. The team also desired the exploration of conveying quantified uncertainties in the clinical prediction models (CPMs). Difficulties we may face are getting feedback from doctors and patients that may

- *Emmitt R Johnson. E-mail: johnemmi@oregonstate.edu.*
- *Makiah Merritt. E-mail: merrittm@oregonstate.edu.*
- *David Shingai Ntuli. E-mail: ntulid@oregonstate.edu.*

benefit from PROACT, as patients and doctors associated with prostate cancer may be hard to find. As we don't have easy access to this data, our primary desire would be the investigation of methods by which we could communicate the other factors impacting a patients decision on treatment plans. One such idea would be the application of a heat map to bodily area's that may be impacted by various treatments; where the hot spots would indicate a high likely hood for side effects. However, this is just one example. There are many other ways to communicate information; our goal in pursing this project would be to keep the teams original design considerations in mind.

2 Referenced Papers

1. *Vega-Lite: A Grammar of Interactive Graphics* (2016), Arvind Satyanarayan, Dominik Moritz, Kanit Wongsuphasawat, and Jeffrey Heer [11]

2. *Embedded Data Representations:2016* (2016), Wesley Willett, Yvonne Jansen, Pierre Dragicevic [3]

3. *The Attraction Effect in Information Visualization* (2016), Evanthia Dimara, Anastasia Bezerianos, and Pierre Dragicevic [1]

4. *Immersive Collaborative Analysis of Network Connectivity: CAVE-style or Head-Mounted Display?* (2016), Maxime Cordeil, Tim Dwyer, Karsten Klein, Bireswar Laha, Kim Marriott, and Bruce H. Thomas [7]

5. *A Study of Layout, Rendering, and Interaction Methods for Immersive Graph Visualization* (2016), Oh-Hyun Kwon, Chris Muelder, Kyungwon Lee, and Kwan-Liu Ma [6]

6. *Small Multiples with Gaps* (2016), Meulemans, W., Dykes, J., Slingsby, A., Turkay, C. and Wood, J. [2]

7. *CUBu: Universal real-time bundling for large graphs.* (2016), Matthew van der Zwan, Valeriu Codreanu, and Alexandru Telea [10]

Acknowledgments

The authors wish to thank the authors of the referenced papers for their work upon which we will attempt to expand upon.

References

[1] E. D. A. Bezerianos, and P. Dragicevic. The attraction effect in information visualization, 2016.
[2] M. W. D. J. S. A. T. C. and W. J. Small multiples with gaps, 2016.
[3] W. W. Y. J. P. Dragicevic. Embedded data representations, 2016.
[4] J. C. D. G. P. Y. L. W. E. Fisher, and N. Elmqvist. Visdock: A toolkit for cross-cutting interactions in visualization, 2014.
[5] A. H. L. H. A. O. N. W. C. G. P. K. J. Han, and R. Chang. Proact: Iterative design of a patient-centered visualization for effective prostate cancer health risk communication, 2016.
[6] O.-H. K. C. M. K. Lee, and K.-L. Ma. A study of layout, rendering, and interaction methods for immersive graph visualization, 2016.
[7] M. C. T. D. K. K. B. L. K. Marriott, and B. H. Thomas. Immersive collaborative analysis of network connectivity: Cave-style or head-mounted display?, 2016.
[8] M. Merritt. Cs458 - information visualization: Project repo, May 2017.
[9] M. F. C. D. E. M. Peck, and L. Harrison. Hindsight: Encouraging exploration through direct encoding of personal interaction history, 2016.
[10] M. van der Zwan, Valeriu Codreanu, and A. Telea. Cubu: Universal real-time bundling for large graphs., 2016.
[11] A. S. D. M. K. Wongsuphasawat, and J. Heer. Vega-lite: A grammar of interactive graphics, 2016.