Journal of Visualization and Interaction

Reviews for 2024-pomerance-flowcharts-round1

Review #1

Completed: 31-07-2024 14:43

Recommendation: Resubmit for Review

Conflict Declaration

I declare that I have no known conflicts of interest with the authors.

Review

The paper presents a new visualization technique aimed at facilitating the exploration of flowcharts in a multimodal way and fostering two types of fruition: narration-driven and exploration-driven. After briefly presenting a theoretical background about flowcharts, interactivity, and multimodal approaches, the authors describe the selected case study and delve into an in-depth description of the UI that enables the interactive exploration of the flowchart, including the definition of 4 design goals (DGs). In conclusion, they present the results of two studies, one conducted in a design classroom, aimed at evaluating the conducted work against the design goals and in particular the capability of the technique to "encourage shifts between linear narration and open-ended exploration" (DG2). Flowcharts, whether static or interactive, are not commonly researched in the field, so the paper certainly progresses knowledge in this regard, bringing attention to the topic. In addition, the authors presented a beautifully developed interactive prototype, which is an impressive result to share. The paper's results are positive regarding the possibility of supporting the aims of DG2 and are formulated upon two evaluation methods: a survey and a quantitative analysis of logs.

Openness

The first evaluation method is documented quite well. A more precise description of "logs" would be useful to understand how the evaluation is actually conducted. How are visitors made aware of the data collection? The website presents a brief paragraph in the sidebar, but the authors could better describe how the collection is performed and how it complies with GDPR. The second evaluation (in-class activity) requires a better description of the outcomes, since "generally positive" feedback is not sufficient. What did the authors learn from the activity? Is it related to results presented in Section 6 (Discussion)? If it is impossible to state this clearly, the authors could remove the paragraph because the previous

evaluation appears to be already robust enough to provide meaningful results. Some comments about the required coding (if applicable) could be interesting. The last paragraph of section 4 ("While most visitors were already familiar…") needs to be rephrased to better connect with the "Nothing really…" comment that is cited immediately before.

Classification

Empirical Research - Quantitative

Classification

Emprirical Research - Qualitative

Recommendation

Major Revisions

Revisions Requested

The paper presents some weaknesses in the definition of key terms and in the methodology used for developing the research. The phrase "open-ended", fundamental for the presented results, appears ill-defined. Although it is a commonly used phrase in the context of infovis research, the paper would benefit from better framing of the term and the implications that are entailed in designing for an open-ended fruition (for example, in comparison to a narrative-driven one). The authors could include theories and examples (which I believe they must have at their disposal) as a subsection of Related Work (e.g., 2.4 or something similar). The paragraph about Multimodal Approaches only includes examples of the usage of sound to complement visual exploration. I suggest either adding other forms of multimodal exploration modes or renaming the section to fit its content, focused on sonification and narration. To "convey a personal character through audio narration (DG4) […] to imbue a sense of vitality and personality" is a key aspect of the design project that needs further explanation. What is meant by "personal character"? Why is it needed to introduce "vitality and personality"? The authors should clarify the rationale of their intention in using sound/voice to complement the fruition of the flowchart in a more scientific fashion. More generally, the definition of DGs requires clarification since it is not clear how the authors defined them. It may be possible that they are derived from the "collaborative research and design process" conducted with the author of the original flowchart, but this is not stated, and more explanation could benefit the paper. In addition, DGs are missing the definition of a target group of users that should benefit from the implementation of the visualization technique, and the DGs should be evaluated accordingly. It may be that it is still too early for the technique to be addressed to a specific group; in this case, I encourage the authors to introduce this doubt as a question underlying their research, which can be addressed with results from the survey (i.e., P93, P34, P38, P125 on page 16). The description of the prototype UI is well done but it is missing a step-by-step description of how to build on the technique to create your own flowchart. I assume this is possible from the conduction of 5.2 Authoring, but no explanation is provided. I recommend the authors include it, for example

in section 4. Given the high quality of the work, I expect there are very smart solutions that can be valorized in this way. "Our understanding OF could be": it seems there is a typo on page 18. In 6 Discussion, the authors are reporting directions for further development. Although the reported ideas appear interesting, it is not clear how they are produced, and I recommend the authors, even in this case, to be more scientific in communicating outcomes of the research. The necessity to identify ideas for further developments is never mentioned before. In the same paragraph, they state that "there is a danger of presenting a linear narrative in an overly prescriptive manner". The sentence requires more in-depth elaboration and the support of literature to avoid appearing as the authors' point of view. I believe this idea is central to the entire research, and I encourage the authors to give it more space and connect it to the presentation of "open-ended" explorations that is needed in section 2.

Reviewer Name

Anonymous

ORCID

N/A

Review #2

Completed: 06-08-2024 00:06

Recommendation: Revisions Required

Conflict Declaration

I declare that I have no known conflicts of interest with the authors.

Review

This JoVI submission describes an approach to constructing multimodal flowchart-based interactive articles for the web, with a particular focus on flowcharts as journalism for communicating complex issues, rather than as a personal service menu or decision-making tool. The authors argue that despite flowcharts' utility with respect to communicating relationships, their typically static presentation format can be overwhelming, requiring a motivated reader to engage with the flowchart in a focused manner in order to eventually achieve the desired level of understanding intended by the author. To address this challenge, the authors augment flowcharts with interactivity, progressive disclosure, and multimodality (in the form of an accompanying spoken narration paired with the nodes of the flowchart). They demonstrate these aspects in a case study relating to the climate emergency. In addition to this case study, they provide a template that can be used for similarly-presented non-linear flowchart narratives. Finally, they describe an exercise conducted with students who used the template as part of an assignment.

The topic of this article is relevant to the information design + HCI communities, as well as for those specifically focused on information visualization in scenarios of storytelling, communication, education and journalism. With respect to the question of whether the paper advances our knowledge of InfoVis or HCI, I would appreciate seeing a more explicit statement regarding the research contribution and novelty of the work. On the one hand, the case study is very well executed and documented, and the template made available by the authors is certainly commendable. However, on the other hand, the work is specific to a single form of visual representation (flowcharts), and prior research (including some cited by the authors, and more discussed below) has already provided evidence in the context of various visual representations that support the choice to add interactivity, multimodality, and the ability to transition between a linear narrative and open-ended exploration. Perhaps what is missing is a reflection at a higher level than flowcharts, and rather on the use of interaction and multimodality to communicate complex / controversial / divisive narratives. Another question worth reflecting on is how interactivity and multimodality as applied here to flowcharts could be applied to representations where the number and placement of visual elements are dependent on structured data rather than according to the author's creative impulses.

With respect to prior research on multimodality, I recall that Robertson et al showed that audiences were more receptive / engaged by an animated visualization when it was accompanied by a spoken narration in their 2008 InfoVis paper "Effectiveness of animation in trend visualization". With respect to interactivity, Boy et al's CHI 2015 paper "Storytelling in information visualizations: Does it engage users to explore data?" asked whether interactivity promotes subsequent exploration in data storytelling; this also seems relevant and worth reflecting on given the authors' results from the deployment of the case study on the web and the telemetry they collected. Lastly, Roberts' et al's 2021 VIS paper "Explanatory journeys: Visualising to understand and explain administrative justice paths of redress" is relevant for its use of interactive flowcharts, not as a narrative tool, but rather as a personal decision-making aid.

This submission also recalls a trend among data journalism practitioners in the mid 2010s dedicated to producing interactive articles with novel branching structures, such as those inspired by choose-your-own-adventure fantasy books (whether this trend is ongoing, I'm unsure). There was a good summary of this trend presented at NICAR 2017 by CUNY's Sandeep Junnarkar and the NYT's Scott Blumenthal: https://docs.google.com/presentation/d/1UNk8zwalEJtt83SqGAEvMs2Y70e9dwsxFhlALktxW-0/edit?usp=sharing.

While the design goals are reasonable for the case study and template, the corresponding (unstated) research questions associated with these goals have not been comprehensively answered, particularly because the case study combines interactivity, multimodality, and the ability to transition between author-driven and reader-driven narratives. A comparison with the experience of reading the original static flowchart, and / or comparisons between variants of the web-based flowchart with different features removed could bring us closer to answering these questions. However, this critique would entail another (more rigorous) evaluation than what was reported here.

The release of the template and the gallery of student-produced examples was a nice complement to the case study. However, a discussion of the production process is very brief and could be expanded with respect to the four design goals, and, if possible, a discussion of students' comments contrasting their process with past experiences in information design.

Finally, in interacting with the case study interactive flowchart myself, it is difficult to ignore the role that humor and visual whimsicality play in the effectiveness of the piece, from the pacing and phrasing of the spoken narration to the deliberately messy connecting lines leading from the "wicked problem" node. There could very well be more to discuss and reflect on with respect to the use of humor in interactive and multimodal information design and presentation.

Openness

The case study interactive flowchart is accessible and useful for seeing the design goals realized. Similarly, the template is provided with a clear license and in a reliable Git repository. There are evaluation materials provided in an OSF repository, though the authors state that the open-ended visitor survey data is withheld as it contained PII; additionally, the page indicates that this content is still archiving, prompting the question of whether it contains the anonymous visitor telemetry data. Also unclear is whether the students' 14 flowchart projects are available for viewing (four thumbnails are shown in Fig 6).

Classification

Emprirical Research - Qualitative

Classification

Systems or design research

Recommendation

Major Revisions

Revisions Requested

State research contribution(s) and novelty explicitly.

Discuss and situate with respect to prior work mentioned in full review.

Comment in greater detail on students' production experience.

Reflect on the roles that multimodality, interactivity, and humor play in communicating complex / controversial / divisive information-rich narratives.

Reflect on how design goals could be applied beyond flow charts.

Reviewer Name

Matthew Brehmer

ORCID

https://orcid.org/0000-0001-5524-2291

Review #3

Completed: 13-09-2024 09:21

Recommendation: Revisions Required

Conflict Declaration

I declare that I have no known conflicts of interest with the authors.

Review

This work contributes interaction techniques for augmenting flowcharts to aid reader-driven exploration and author-driven narration simultaneously. These techniques include progressive disclosure of flowchart elements with animation, switching between exploration and narration modes via "jump" actions, and synchronized narration. Results from an online survey and user activity logs reveal interesting differences in reading behavior (e.g., survey participants favored narration mode over the larger activity log sample).

Overall, this work was fun to read and presents useful results for the visualization community. In particular, the new ideas supporting interactive flowcharts (progressive disclosure, synced narration with the ability to "jump" between different flowchart notes) are interesting and helpful for researchers working on storytelling or communicative visualization. The authors also provided a link to their system code, allowing others to create their own interactively narrated flowcharts, which is much appreciated!

I visited the online prototype ("I Want a Better Catastrophe"), and the integration of exploratory interactions with narration was polished and fun! I could see this prototype being useful for educational purposes as well, e.g., running an algorithm flowchart with different input states to see how they affect the output. I liked being able to explore the flowchart at my own pace and engage with narration wherever I was currently located in the flowchart. However, I was surprised not to see the following features: + I dislike that zooming is not supported. Despite the rationale given in the paper (to not dislocate from the reader's current perspective), the repetitive panning became tedious, especially while trying to explore such a large canvas. There should be a way to support zooming while maintaining current information (e.g., change the color of the last clicked / narrated node, which serves as a "beacon"). + Related to the previous point, more context would have been nice for understanding where I was in the flowchart relative to the end. I could imagine having the full flowchart painted as "teased" nodes initially that are then progressively filled in, or a

percentage explored indicator displayed on the screen. + The animation is not smooth between nodes. Although this issue is discussed in the paper, I am not sure why basic linear transitions (even fast ones) are not used between successive nodes when needed. The lack of smooth transitions made the narration feel jumpy and unpleasant. + The authors cite narration as an added benefit to support accessibility, although they did not include closed captions during the narration. Transcription would have been helpful for following along, given that the narration typically included much greater detail than the flowchart displayed.

Details from the Methodology section and activity logs raise questions about any features users requested, which are not described adequately. In particular, the median session time was 2:24 minutes, which seems quite low, and makes me wonder if (and why) some users exited early (e.g., interactions need to be improved, flowchart was too large / audio too long, etc.).

Thanks for your work!

Openness

This work is well-documented and should be easy to build on. The authors provide links to their prototype, online source code, and interview questions with detailed descriptions.

Classification

Systems or design research

Recommendation

Minor Revisions

Revisions Requested

- Explain terms when they are used. For instance, progressive disclosure is used several times before it is actually defined in the Design Goals section.
- Place figures after they are referenced (e.g., place Figure 4 after Section 4.2).
- Provide more analysis / details regarding what you learned from the online surveys and activity logs. Specifically, did you make any changes to the interactions or prototype design based on user feedback? If so, what were they? Are you able to provide any details on why session time was low based on user feedback?
- The organization of Sections 3.2, 3.3, 4, and 5 is confusing. You introduce aspects of the methodology used in your evaluation in Section 3.2, but do not discuss the evaluation until Section 5. Consider reorganizing the content of these sections for clarity: for instance, discuss the case study details in Section 3.2, remove Section 3.3, keep Section 4 as is, and provide all evaluation details in Section 5.
- In Section 3.2, you say, "In addition to the exchanges during the collaborative research and design process, we drew upon regular feedback exchanges with visualization scholars and designers from our research group." Can you describe some of these changes? Related to the third point in this list, it would be great to have more detail on what

feedback you received from designers and prototype users, including how this feedback changed your prototype design.

Reviewer Name

anonymous

ORCID

N/A

Metareview

Completed: 2024-09-24

Recommendation: Major Revision

Conflict Declaration

I declare that I have no known conflicts of interest with the authors.

Review

This paper explores the creation and use of narrative flow charts as a means of communicating complex issues, such as those appearing in journalism. This is done through development an interactive prototype system for creating such flow charts and is the centered on a specific case study, which is subsequently evaluated through a log analysis study and a class room activity.

This paper received reviewed by three experts in visualization. Reviewers were slightly divided in their opinions, with two asking for major changes and one for minor changes. This suggests a consensus that this work would do well with another round of reviews, for which they have offered a number of useful and actionable areas for concrete adjustment. Here I summarize several of them (order roughly by importance), but the authors should engage with the reviews directly for a full understanding of the feedback.

I believe that addressing these issues is clearly within the scope of a major revision and that the authors should have little problem addressing them. Some of them, particularly the improved reflection, necessitate additional reviewer input and so my recommendation is aligned with the majority: Major Changes/Revisions required.

Revisions Requested

1. Evaluation Reflection: All three reviews asked for greater details on the effect of the evaluations—what was learned and what are the consequences? R2 suggested another evaluation which would improve the work.

2. Definitions: R1 and R3 suggest that more precise definitions should be used. For instance for parts of the study (R1, "logs") and for more general terms (R3 "progressive disclosure")
3. Related work: R1 and R2 suggested the work could be situated among prior work (for which R2 has a number of useful suggestions), particularly theoretical work (R1) and other forms of multi-modality (R1)
4. Conclusions: Continuing from the suggestions on evaluation, R1 and R2 had a variety of suggestions on useful areas to reflect on and expand in the discussion of the work
5. Textual Clarifications: beyond definitions, some textual clarifications were highlighted by all three reviewers. For instance R1 suggested that the presentation of design goals could be improved. R2 stressed that the research contributions should be listed more clearly. R3 offered some suggestions on how to improve the flow of the text. R2 and RT (the transparency review) both noted that the PII redaction should be better explained. (In addition RT includes a number of points to address)

Reviewer Name

Andrew McNutt

ORCID

0000-0001-8255-4258