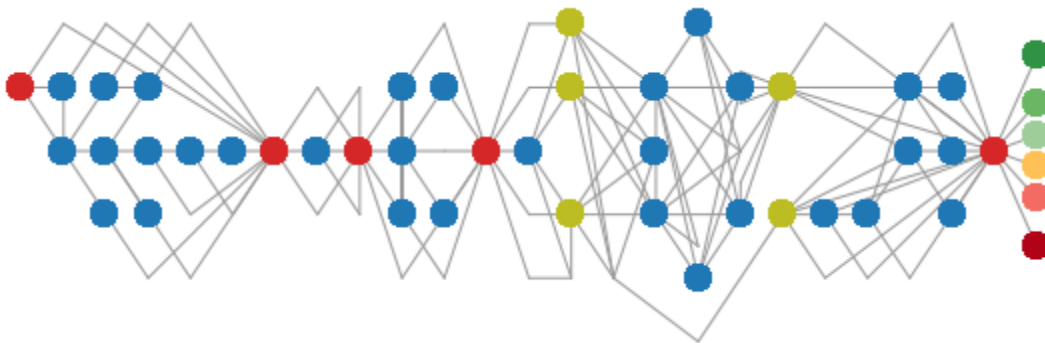


Maggie Faber Project Update

Progress and Obstacles

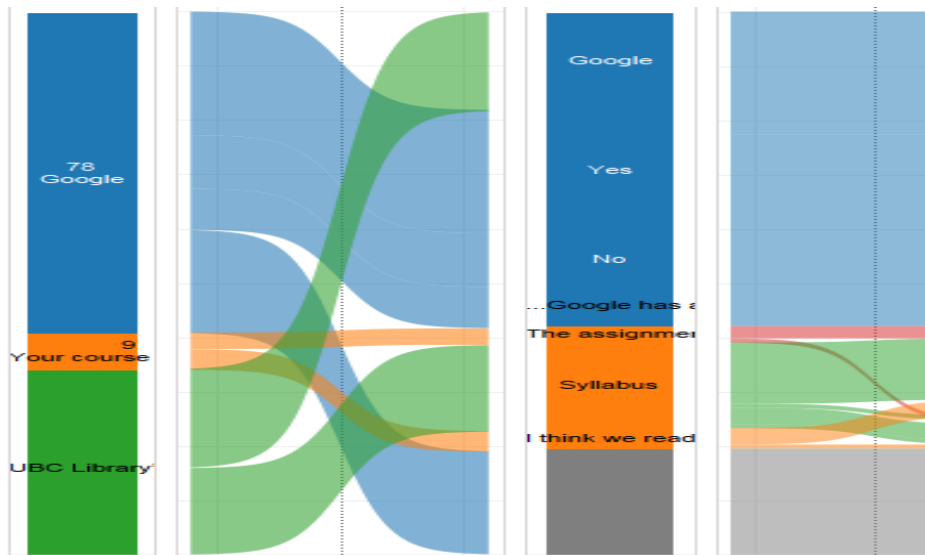
The tutorial content overview and student sentiment have been the highest visualization priorities for the other members of this team. The basic tree structure of the tutorial has been laid out and programmed into Tableau. Red nodes indicate required content that is seen by all students, blue indicates optional content that is visible by the selections the student makes, and yellow nodes indicate mandatory content that is customized based on the previous choice—either expanding on concepts that were missed earlier or showing the results of an action in the previous node.



Currently, the structure reflects a design decision to reflect in each level of the tree (each row of nodes) the number of selections the user has made—so that by the 4th node, you know the user has made 4 selections. However, because of the “branch and bottleneck” structure, this encoding is not sensible after the first bottleneck node. In many of the popular “Choose your own adventure” visualizations, the strict ordering by depth is ignored in favor of symmetry and visually pleasing arrangements—reflecting the design principles established by HOLA.

However, because the data for the tree has to be generated by hand to display properly in Tableau, revisions to the structure are incredibly time intensive. While I would like to continue revising this layout, especially because it is supposed to be a central element of the dashboard, it may be deprioritized until the remaining visualizations have been developed and linked appropriately in the dashboard.

Along the far right, the color scheme changes to reflect the sentiments expressed by students, with grey indicating an incomplete session. Because volume is not a recommended encoding for precise comparisons and the close proximity of each node makes occlusion a real possibility,



The Sankey diagram dramatically emphasizes the flow of students' choices over the course of the tutorial, whereas the node and link tree provides a better overview of the structure of the tutorial. We are interested in the relationships and transformation of "flows" of students, an encoding that the Sankey is particularly suited for (Riehmman). However, because the Sankey diagram is relatively space-intensive, I am considering breaking it up into parts, visualizing only key parts of the tutorial, or clustering together certain answers that are relatively similar to reduce the number of steps needed.

Other, simpler, vis approaches I have been experimenting with have been a histogram of duration of the tutorial, a bar chart of student group (undergraduate, graduate, and public) who have accessed the content, and a various lookup tables. Some of the visualizations I am interested in developing are a modified state transition diagram popular in MOOC visualizations, and a graph comparing number of questions answered to the students' final response to the tutorial. Because I am working on this tutorial as part of a larger team, I have been generating an array of simple graphs to show my supervisor to see which visualizations are answering the relevant questions and which are more comprehensible/useful. These consultations have taken place in our regular meetings as a casual check in and we have been drawing preliminary conclusions as we develop the dashboard—a model strongly recommended in Medler.

Previous Work (Draft)

One of the challenges for applying metrics to the design and analysis of interactive storytelling is developing appropriate visualizations to facilitate designers in developing insights about player experience-- Using information visualization to understand interactive narrative

I started my research by looking for Choose Your Own Adventure visualizations—a popular topic among hobbyists and an obvious point of departure for this project. Despite not being an academic publication, Swineheart’s “One Book Many Readings” visualizations are the most widely cited and recognized in this community. Swineheart’s work on the original printed Choose Your Own Adventure materials primarily focuses on the possible story endings, which is not an aspect of my project, but he also provides a roadmap for identifying patterns and standardizing visual encoding. His visualization techniques include chronological story maps, color lines, trees, arc diagrams, and node-link graphs, techniques I intend to use for the high-level overview of the content, but—as I’ve mentioned above—am less inclined to use for analysis of student use.

Ashwell builds on Swineheart’s work by identifying standard patterns in choice-based games, and characterizes the “branch and bottleneck” structure used in our tutorial as one that is used most often “to reflect the growth of the player-character.” Fabulich and Strong-Morse, co-founders of the Choice Of games, call this delayed branching, where “at the end of Chapter 1, you always go on to Chapter 2, no matter what choices you made in Chapter 1. But your choices in Chapter 1 can affect Chapter 2.” None of the work in Interactive Fiction/Interactive Narrative/Interactive Storytelling has approached the concept of delayed branching in their assessments—indeed, the space for assessment and visualization techniques in this domain is huge.

In “Visualizing interactive narrative” Andrews says “One of the recognized problems of evaluating interactive stories is that the conclusions may not be applicable beyond the texts being analyzed,” and in “Measuring user responses to interactive stories: Toward a standardized assessment tool,” Vermeulen says “Quantitative measures of user responses to [Interactive Storytelling] systems are thus an important yet missing tool for generating more empirical and conceptual knowledge on audience reactions and preferences.” However, neither of these papers offers vis techniques to begin the analytical process—they attempt to identify preconditions of meaningful user responses and validate their results (Vermeulen) and identify patterns heightened reader comprehension within a narrative. “Using Information Visualization to Understand Interactive Narrative” adds a squarified treemaps to the vis solutions offered, as

a “compact and concise representation of many different possible player actions,” but this, like Swineheart’s initial work, fails to distinguish between categories of users or user choice through the narrative.

As another point of comparison, then, I turned to game analytics. Much of the visualization focus in game analytics is on geospatial analysis (players moving through videogame environments), which is not a concern in a text-based game. However, designing a system that “enables comparisons of behaviors across different play styles, allowing analysts to see how their game fairs to different tastes and styles” (Moura) is essential for both domains. The DataCracker team provide a detailed template for collaboration between vis designers and game designers, and—crucially—consideration of the “‘live’ team” dynamic, the “portion of the development team that supports a game after it is released.” The need for the analysis tool to stand alone and support additional development that may change the type of data being collected (by changes to the game environment or tutorial structure) is a huge priority for my project. The DataCracker team provide a branded dashboard using simple but effective visualizations as part of their effort to make data analysis in games more accessible. They recommend developing the analytical tool with the game designers and alongside the development of the game itself, a process I have attempted to adopt by ensuring the LFS team is comfortable interpreting the visualizations I suggest.

Although we don’t have access to student grades and class performance, which is the standard data in Learning analytics, I did find some analogous vis techniques surrounding MOOC data. “Visualizing patterns of student engagement and performance in MOOCs” modified a state transition diagram to explicitly encode information about students’ paths through non-linear course content, which Kizilcec further modified to reflect the four identified categories of MOOC learners identified. In “Monitoring MOOCs: Which information sources do instructors value?”, the authors identified key metrics in educational dashboards—particularly where grading rubrics are deprioritized—to suggest future curriculum development, such as “individual student performance, per-student performance compared to the class as a whole, common misconceptions shared by many students...and activity patterns such as what material students look at, how many times, for how long, and whether the material viewed is consistent with the course schedule.” Kizilcec says the goal with instructional dashboards is “to provided educators, instructional designers, and platform developers with insights for designing effective, and potentially adaptive, learning environments that best meet the needs of...participants,” a benchmark shared by researchers in the game analytics and interactive storytelling domains as well.

Finally, the techniques I’m using in Tableau are based on Oliver Catherin’s work on dynamically generated polygons for Sankey diagrams, with modified aggregation calculations to

condense the number of required steps, and Michael Martin's Network Graph tutorial, modified (and then unmodified) to show line width links instead of pie chart nodes.

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