User Interaction Visualization for Design Synthesis
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Introduction
During design synthesis, the interaction designer makes sense of the data collected during user research and it can be considered a decisive point in the design process.

Recording mouse/keyboard/etc., events during user’s interaction with a graphical user interface could be a rich additional source of insights. Comprehending such logged data files could benefit greatly from visualization.

We present results from a case study of visualizing logged user interactions of a tumor contouring task.

Case Study
Tumor contouring is a complicated clinical task. The aim of the study was to comprehend user behavior and identify requirements for an improved design.

- Manual tumor contouring (GTV, and CTV) of 3 patients was done by 8 participants (radiation oncologist)
- Mouse and keyboard events together with contextual meta-data were logged during the study
- The log data entries were clustered into meaningful software interactions (e.g., a cluster of mouse-drag events could be “drawing”, “zooming”, or “panning” interaction)

Interaction Visualizations
We developed browser based visual interaction log exploration tool, consisting of two timeline visualizations.

- Each interaction was presented as a rectangle
- The width of a rectangle represented duration of the interaction
- There was an interactive time range selection possibility
- Quick switching between cases

Timeline of interaction sequences (Viz-Seq)
- To support grasping shifts between interactions
- Each interaction had a dedicated horizontal lane with a predefined order
- Connecting lines to support easier tracing of interaction sequences

Timeline of interactions on slices (Viz-Slice)
- To observe which interaction occurred on which slice
- Each horizontal lane represented a slice within 3D dataset
- Interactions distinguished by color
- Possibility to select which interactions to display

Results
Based on the visualizations, it was possible to explore individual task processes both in a holistic and detailed way.

- Enabled visual comparison of the task process between cases
- Faster than analyzing video recordings would be, while still allowing qualitative exploration
- Enabled building in-depth understanding of the main task phases of tumor contouring
- Three contouring strategies were identified
- Enabled identifying re-occurring interaction patterns that gave further insights into typical software user
- In total four scrolling patterns and five interaction sequence patterns were identified

Conclusion
The two developed interaction log visualizations were supportive for the designer during synthesis phase, enabling getting a holistic view of the task processes as well as getting in-depth detailed understanding.

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