A Test Platform for Interacting with Advanced Histories of Commands

Duration : 9 months
Team : Loki (Inria Lille – Nord Europe & CRIStAL)
Recruiter : Mathieu Nancel (mathieu.nancel@inria.fr)

The recruited engineer will implement an online drawing application with advanced command history functionalities from previous work [1], as a test platform for research in Human-Computer Interaction (HCI). S/He will be involved in the design and implementation of the underlying structure of command history, as well as of the front-end's baseline (drawing) and advanced (history control) features.

Description
Histories of commands have been an ubiquitous aspect of most editing software for the last 30 years, but the features they provide have barely evolved beyond Undo and Redo. HCI research has explored various improvements over these features, remain “point designs” that are seldom implemented in real applications because no attempt was made to make them all work together: the corresponding research papers all implement data structures designed solely for the purpose of the presented technique, which often prevents other techniques to work. In 2014, we proposed “Causality” [1], a conceptual model of command history that allows every history management and manipulation techniques to coexist, and more.

This project consists in designing and implementing a working drawing application as a test platform, with such a history structure [1] as its basis, to explore:

1. the technical feasibility of the underlying model, including questions of time/memory complexity;
2. the best visualizations to communicate the extent of the enriched command history to users of various skills and expertise;
3. the best techniques to interact with this history of commands and its various functionalities.

The painting application will have to be as reactive as possible and feature a realistic subset of painting functionalities: pixels selection, layers, varying brush shapes and sizes, opacity, blending modes, etc. The history structure should allow every command to be replayed, and come with an API that allows to access, navigate, select, filter, and replay any command or command parameter, so researchers can explore new history features as well as the best way to use them and present them to users. The recruited engineer is expected to propose and explore solutions to optimize the time-memory tradeoff.

In order to facilitate experimentation with real users, and for cross-platform compatibility, the system should be usable online. We envision WebGL for the front-end, to allow advanced graphics manipulation without introducing too much latency, but the final technological choices will be decided with the engineer. One of the core requirement is that the resulting back-end structure and drawing front-end be easily extensible later on by researchers and students.

The recruited engineer will participate in the design of the data structure—turning a conceptual model to a workable application framework—and will be instrumental in its implementation and integration to a real set of drawing and image manipulation commands. If time allows, s/he will be invited to also participate in the design of interaction techniques to navigate and manipulate the history of commands.

References

Candidate
The candidate should have experience with complex application development in web frameworks, OpenGL, software engineering, and version control. S/He should be able to work in a team and to communicate about progress and obstacles.

A good level in English, including scientific and technical writing, is a plus.