Cave Writing: Toward a Platform for Literary Immersive VR

| Sascha Becker | Shawn Greenlee | Dmitri Lemmerman | Morgan McGuire | Nicholas Musurca | Noah Wardrip-Fruin [*] |
| Brown University | Brown University | Brown University | Brown University | Brown University | Brown University |

Abstract

"Cave Writing" is a nationally recognized interdisciplinary workshop course offered annually at Brown University. In this sketch we describe significant educational improvements enabled by improved technology in our VR platform. These include: (a) faster development and more support for iterative design; (b) greater involvement by students from different disciplinary backgrounds in full breadth of project development, increasing cross-disciplinary learning; and (c) diverse media rendered at high performance (e.g., high quality animated text, embedded video, and more devices) that facilitate creation of literary experiences specific to the bodily presence and physical space of the Cave.

1 Background

Our workshop course—initiated by novelist and hypertext expert Robert Coover in 2002—uses a 4-wall Cave and spatial audio system to research next-generation literary experiences with interdisciplinary teams of students. The course was recognized by the National Research Council's 2003 report *Beyond Productivity* for its successful shared creativity between computer science and the arts. Initial projects explored new paradigms for virtual experiences, including narrative (in addition to spatial) movement (*This is Just a Place*) and bodily interaction with text (*Screen*) [Carroll et al. 2003]. However, while students operated as interdisciplinary teams, high barriers to entry for each element of our development platform (e.g., immersive graphics coded in C++ with WorldToolKit) restricted students' work to their areas of specialty. Further, communicating project ideas was frustrating for non-technical artists, as programming skills were needed to show ideas in the Cave. This semester we addressed these issues.

2 Platform and Results

Cave Writing projects have two primary elements: immersive 3D imagery (used for text, objects, and worlds) and spatialized sound (used for effects, music, and voiceover). For sound, we found Max/MSP met our needs. Our main visual needs, unmet by available software, were to make authoring—particularly of spatial texts and graphical worlds—more accessible and powerful.

Of these two, particular challenges were presented by spatial, animated text. In our prior work on *Screen* we had been forced to limit the number of simultaneously-animated words by the loss of interactive framerates. Even with reduced wordcounts, slow response times could still compromise the feeling of text's presence in the user's space. Standard solutions from 3D graphics are aimed at rendering a small number of detailed objects, while standard text rendering produces small flat bitmaps. Our current solution overcomes these problems—producing text that remains readable, smooth-edged, alpha blended, and animated at interactive framerates (~60 fps) in a Cave scene with ~600 independently animating words (figure 1). We employ FreeType2, FTGL, OpenGL, and G3D. A simple XML file format was defined that allows students to place text in the Cave space, perform effects on the text (e.g., fading sections in and out,

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[*] nwf@brown.edu

peeling part of a section loose), send messages to our sound server, and alter the environment over time. Students were able to create high quality textual projects as one-week assignments, and subclassing this code has enabled rapid development of textual projects with new behaviors.
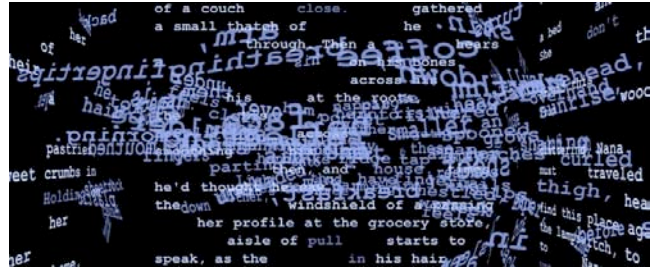

Figure 1. Alpha-blended text animating at >70fps.

Our approach to sketching graphical worlds rests on rendering Quake3 BSP levels. We support 3DS, OBJ, skyboxes, video textures, and two-way communication with Max/MSP. Students were taught the game level editor GtkRadiant, and created worlds as one-week assignments. The rapid development of spatial texts and graphical worlds has enabled project ideas to be presented more quickly, by a wider group of students, and enabled iterative design in response to workshop critique and user evaluation.

Integration of the improved text and world rendering with spatial audio is enabling a next generation of projects. In one, a library, late at night, collapses into a maze—the traversal of which culminates in a live performance of the Ophelia sections of Eliot's *Wasteland* and Shakespeare's *Hamlet*. In another, co-created by a student who teaches writing workshops in a local prison, Foucault's notion of internalized surveillance (the *panopticon*) is communicated through poetic space, as cloth cubicles become cement cells. Two other projects create museum spaces—one of 3D spatial poetry (composed symmetrically to be legible from many angles), the other a natural history museum in which the dark silhouettes obscuring the dioramas exhibit emerging choreography (they are animated using tracking data from earlier Cave visitors). In another project, Japanese Noh poetics are used as the basis for VR drama (rather than more familiar Aristotelian poetics [Laurel 1991]). The fact that the Cave is a room-sized display—in and around which performers and audience can be bodily co-present—is utilized so that one performer operates in the Cave (navigating the world using head tilts monitored by the 6DOF tracker) while another, on the other side of the audience, causes sound and text to appear *in situ* using a midi performance device monitored by Max/MSP. These and other projects—that would have been slow or impossible to develop before—were created, critiqued, and revised in 7 weeks and exhibited to more than 200 Cave visitors during the 2005 Boston Cyberarts Festival.

References

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