

An Interactive Poster Exhibit Puts Visitors in the Picture, in Real Time

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ABSTRACT

This describes the usability and interaction challenges in creating a unique museum exhibit which utilized real-time compositing, and sought to hide complex computational and networking tasks behind a simple user interface.

Keywords

Museum, exhibit, cowgirl, interactive, poster

INTRODUCTION

The National Cowgirl Museum and Hall of Fame opened in June 2002. The exhibits were designed by West Office Exhibition Design, with whom I produced several audiovisual exhibits. One of these, an interactive poster exhibit, provided unique HCI and usability challenges.

CONCEPT

The museum seeks to immerse visitors in the culture, history, and spirit of the cowgirl, and the exhibits present stories, artifacts and images, using various media. In the popular culture gallery, there are video presentations, a set of music stations, and fashion displays.

For this exhibit, the goal was to provide an immersive activity which draws the visitor into this world, and we decided to place them onto their own cowgirl movie poster.

IMPLEMENTATION

In the exhibit, the visitor chooses one of five posters, then is photographed and composited into that poster. The completed poster is displayed on a large screen, and the visitor has the option of purchasing a printed version in the museum's shop.

We had a fairly small space (about 10 feet square) in which to place this exhibit. The interaction had to be simple, and the exhibit had to be self-running and maintenance-free. We designed a large greenscreen to be placed against the wall, in front of which is a digital video camera, encased to look like an old portrait camera. The video camera is connected via IEEE 1394 (Firewire) to a Powermac G4, whose SVGA output is shown on two monitors, one facing the visitor and one facing outward.

At the entrance to the exhibit (through a low gate), a large panel shows the poster choices, with lighted buttons beneath each choice. A button press initiates a countdown (aural and on-screen) and the visitor is instructed to pose in front of the greenscreen. The screen in front of them acts as a mirror, and they are composited in real time onto the chosen poster background.

After the countdown, a still image is taken; a flashbulb is also fired and the computer emits a "ka-chunk" sound, for effect. A layer of text and graphics is laid on top, completing the poster image. This is displayed on the screen for 10 seconds, and during this time a small receipt is also printed which contains a thumbnail-sized version of the poster. This can be taken to the shop to exchange for a glossy print. After showing the poster for 10 seconds, the screen goes back to the live, chroma-keyed video feed and waits for the next button press.

USABILITY ISSUES

We began testing the software right away. West Office is fortunate to have a large former warehouse space, and we made a full-sized mockup for testing. This proved invaluable for refining the interaction, instructions, and general visitor flow.

Interaction

We determined, with the museum, that visitor interaction with the computer should be as simple as possible so as not to detract from the immersive nature of the exhibit. We considered various sensors and such to determine that a person was in front of the greenscreen. But testing argued for giving the user control over when they were ready to begin the experience. So a simple push button and countdown were decided upon.

It was important for visitors to be able to position themselves with respect to the poster graphics in order to create the best composition. To facilitate this, we used software which enables real-time chroma-keying. However, a video feed displayed on a monitor does not act as a mirror; moving in one direction causes your on-screen representation to move in the opposite direction. Therefore, we had the software modified to enable flipping the live video feed horizontally or vertically. (Because the monitors in the exhibition were mounted in portrait orientation -- turned 90 degrees -- this provided an added challenge.) Once the still image is taken, we flip the image back to its proper orientation, lest anyone's printed t-shirt appear backward. In software, this meant keeping two versions of each poster background, one backward.

A related problem was the lag caused by live compositing. Even with the fastest Mac available, there was a noticeable lag in the video feed caused by the computation involved in complex chroma-keying. In user testing, we found that people tended to notice this lag and play with it, moving

quickly and waiting for their on-screen representation to catch up. We had the software modified to accept native DV input (in addition to analog video), and to use frame-buffering or frame-dropping to maintain an acceptable speed. These two changes worked well, and the 37" plasma screen directly in front of the visitor does indeed appear as a mirror. It is placed as near to the camera as possible to avoid spatial discontinuity.

The entire compositing and flipping process is near-instantaneous.

Instructions

Testing dictated that we limit the instructions to three simple steps: (1) Choose a poster image; (2) Pose while the photo is snapped; and (3) Take the printed ticket on the way out. We tested with steps 2 and 3 reversed, but this resulted in the visitor spending more time at the instructional panels while the countdown was ticking. It also did not enable printing a thumbnail-sized image of the visitor onto the ticket, which would help later in identifying the proper poster for printing. Also, if the ticket was taken first, it was likely to appear in the poster. The final graphic panels instruct the visitor to pick a poster, then go immediately to the greenscreen, and indicates that a countdown has begun.

After the photo is snapped and the visitor remains standing in front of the greenscreen, looking at his/herself on-screen, the visual and aural action of the printing ticket on the periphery of the visitor's awareness is enough to draw them toward the printer, and to the exit; entrance and exit are the same, due to space limitations.

PRINT STATION USABILITY

Once a poster snapshot is taken, it is immediately copied over the network onto the Gift Shop computer for printing. We take advantage of the time that the still image is displayed on the screen to do this.

The poster computer automatically tries to mount the Gift Shop computer as a remote server, if it is not already mounted. It tries this every time an image is snapped, to account for situations where the Gift Shop might not be available when the program starts running.

To maintain a seamless visitor experience, all error messages and dialog boxes are disabled, and if the computer cannot copy a file to the remote server, it simply saves it locally, and the next time an image is snapped, it tries again and if the server is found and there are multiple images to copy, it copies two or three at once. Any other dialog boxes are immediately dismissed using a piece of shareware which simulates pressing the "OK" button on any message after a preset time.

In the shop, a new iMac serves as a single-purpose print station, and has the additional benefit of attracting people by its unusual design, (being placed next to the beige-box PC controlling the cash register). It was chosen to take up minimal countertop area, and in lieu of a keyboard and mouse, we designed the software to work with a barcode scanner and entry from a small keypad (which was velcroed

to the base of the iMac to further save space). The swiveling monitor of the iMac also allows the cashier to turn the monitor to face the customer to verify that the image is correct and acceptable.

Designing this software was a technical and usability challenge almost as daunting as the poster exhibit itself. We chose barcode entry because retail employees are familiar with it, and scanning a ticket instantly brings up the associated poster image for printing.

This is the ideal case, and indeed the most frequent. But we had to build in several fallback capabilities. A ticket may be scanned but no image found; a visitor may have lost the ticket; the barcode may be unreadable; a visitor may take the ticket home, then later decide to purchase the poster.

To address these, we added a field to accept a barcode number typed into the keypad; the barcode scanner itself is configured to send its data as keyboard input into this field.

More importantly, we built in visual search capability. Using the thumbnail-sized poster images, a cashier can quickly scan the day's images (using "+" and "-" keys on the keypad) to match the thumbnail on the ticket. Each thumbnail – printed and on-screen – is paired with a time/date stamp and unique identification number (which matches the barcode), to aid in searching. Typing a special character on the keypad allows searching other days in the same manner.

The software checks for new images every 30 seconds. (On-site, we determined that it takes at least 30 seconds to walk from the poster exhibit to the shop.) Poster images are kept for 30 days, and every night, the software automatically archives the day's images, and deletes images more than 30 days old. The interface design was kept minimal, with prominent instructions.

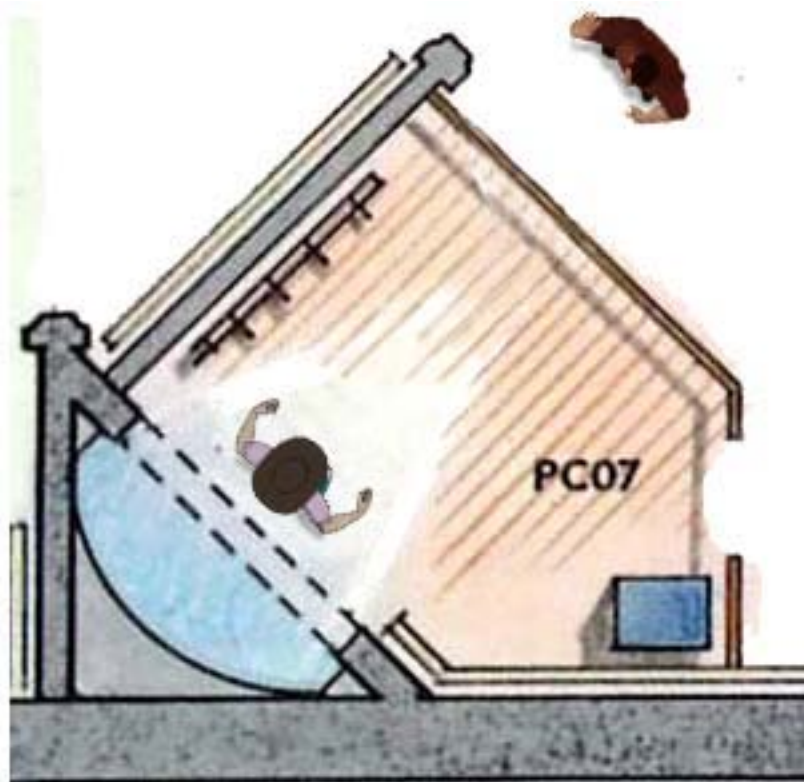
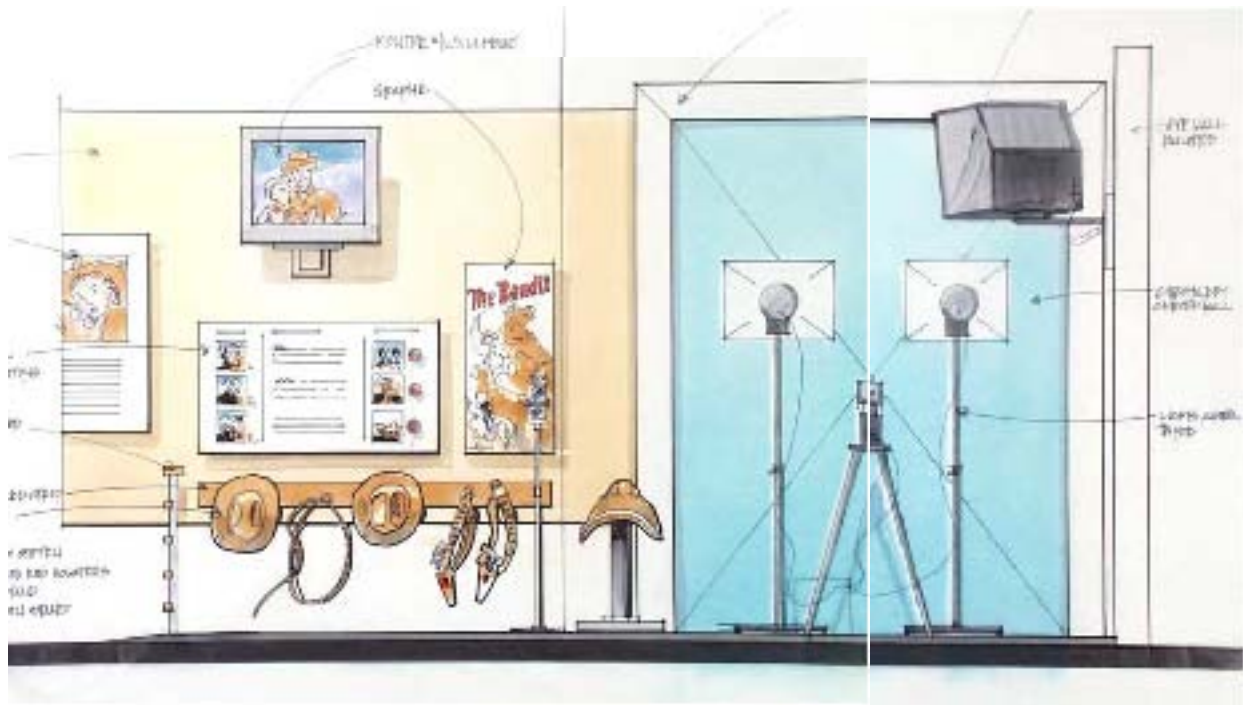
Once the proper poster image is chosen, the cashier need only press the ENTER key to send it to the printer. A text field defining the number of prints contains a "1" by default, and is highlighted so that pressing any other number replaces it.

The biggest problem turned out to be hardware-related. We purchased an inexpensive Epson printer, which provides good print quality and is easily replaced. But during the museum's opening weekend, the print speed of 30 seconds to 1 minute (for a 5x7" photo-quality image) proved much too slow, and because the exhibit was so popular, this resulted in long lines and a wait of up to two hours to get a printout.

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Figure 1. Early concept drawings for poster exhibit



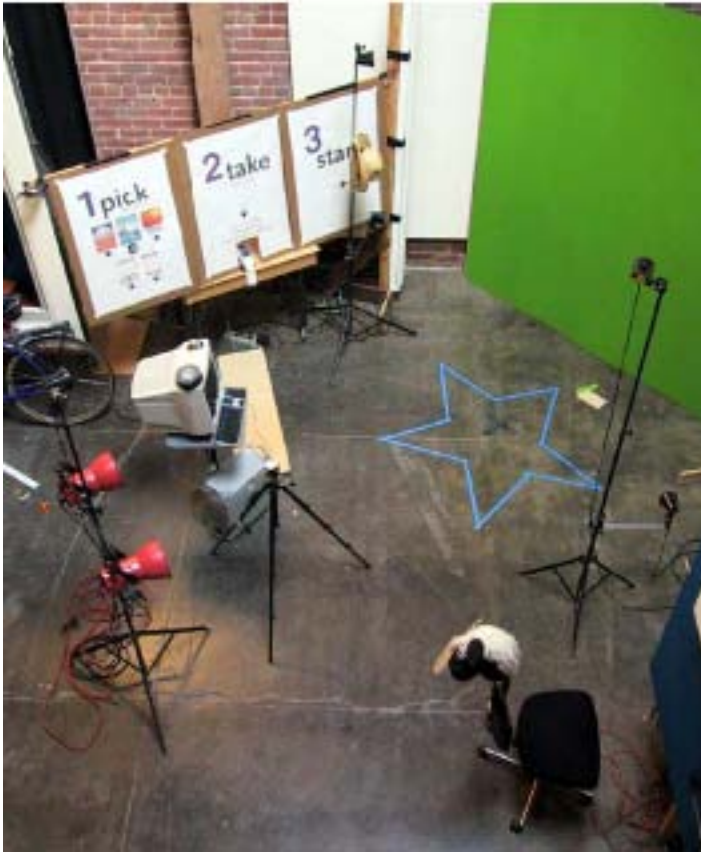


Figure 2. Full-sized mockup for usability testing

Figure 3. Final poster exhibit



Figure 4. Graphic panel layout mockup



Figure 5. Final graphic panel layout

