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National Treasure Of The Living Dead

Oct 1, 2005 12:00 PM

The dead live again in the City of Brotherly Love! No, this isn't another George Romero movie; it's a new exhibit in historic downtown Philadelphia that lets people seemingly converse with the ghost of Ben Franklin. The exhibit, called Ben Franklin's Ghost, was developed by Carnegie Mellon University Entertainment Technology Center (ETC), after Pennsylvania's Governor Edward G. Rendell visited ETC and thought the project could help celebrate the founding father's 300th birthday. Ben Franklin's Ghost is an educational and entertaining diversion located in the free Visitor's Center of the Lights of Liberty show, an evening sound-and-light walking tour, and across from the Liberty Bell and Independence Hall.

Of course, "edutainment" is a primary goal of applications developed by ETC. The university, known for its Drama Department and advanced computer sciences, has combined these disciplines in the ETC — which has a graduate program in building interactive entertaining and educational experiences. Projects at the ETC combine the expertise of many disciplines — joining fine arts with science — imagination with logic.

Ben Franklin's Ghost uses the Carnegie Mellon-patented keyword search technology, called Synthetic Interview, to control Franklin's responses. The keyword search software allows guests to ask Franklin thousands of possible questions, whereby his Ghost then comes "alive" to answer appropriately. The software matches input to a pre-constructed list of possible questions a visitor may ask, then returns the corresponding answer. If an exact match isn't found, the database question with the highest matching keywords will be chosen, and then the appropriate video answer will be played. Similar technology has been used by CMU researchers to give life to a myriad of characters, including Albert Einstein.

Franklin's Ghost appears as an old fashioned "Pepper's Ghost" effect, which is, as every design student knows, a simple reflection-based holographic-type

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projection. To create the effect, video of actor Ralph Archbald portraying Franklin is projected onto a Stewart Film Screen GrayHawk RS Front Projection Material and reflected in a large water white glass, causing the image of the actor to appear to float in front of a painted backdrop that depicts an imagined Franklin's study. More than 100 hours of video of Archbald — who has been portraying Ben Franklin for over 25 years — performing nearly 800 possible answers was recorded.

For the Ben Franklin project, ETC worked with Kevin Lee Allen Design (KLAD), which was brought in to design and produce the physical structure. KLAD teamed with blackwalnut, a fabricator of scenery and environments. The challenge for KLAD and lighting designer, game developer, and ETC professor Chris Klug was to design a structure that supported the exhibit's physical needs and was appropriate to the interior space of the historic Public Ledger Building where the exhibit is housed. The structure had to appear inviting and open to groups of school children, while at the same time not allow any adults to see how the effect is achieved. Much of the modern elements in the lobby are made of simple birch plywood and plastic laminates. KLAD specified that the exhibit be manufactured in 11-ply Baltic Birch plywood, with exposed edge detailing. This look does not detract from the elegance of the historic structure and stands out from the existing stock ticket counters.

The area that is inhabited by the Ghost is stained to a darker and warmer tone that is inspired by historic wood detailing. In addition to masking the source of the effect and the reflection, the structure had to be designed to control the many sources of light in the lobby. A roof over the area where the ghost appears serves multiple duties, shrouding morning light from windows and a reflection from the main entrance doors, in addition to housing some of the electronics.

When visitors enter Franklin's "study," they use touchscreen interfaces made to look like open books to enter their questions. The "book" shroud that covers the screens was made by an ETC student programmer who is a former props craftsman. Those who cannot congregate directly around the "books" can see the projection over Franklin's desk.

When a question is asked, the question is repeated aloud, heard from speakers emanating from the area of the book. Franklin's voice appears to come from the ghost several feet in the air. For simplified programming and reduced hardware, one stereo card powers two mono channels, with two speakers from each channel.

The exhibit uses new and old theatrical technology. Allen painted the backdrop using a period source material and the latest in Adobe® Photoshop® and Painter® software and digitally printed the results on canvas. To transition from the reality of the book interface, desk, and backdrop, KLAD populated a desk area that masks much of the exhibit's inner workings with actual prop books and an oil lamp.



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Klug opted away from theatrical fixtures and selected a few simple, high-end architectural units. The backdrop is illuminated by a series of Elliptipar fixtures, chosen for their unique reflector design that permits an even wash along the surface of the printed canvas. Elsewhere in the structure, Xenon strips, typically used in jewelry cabinets, provide accenting and reinforcement. The entire lighting system is controlled by a proprietary show control package.

Lighting of the backdrop is a critical part of the ghost illusion. Without a detailed background and control of the light tied to the computer programming, much of the illusion would be lost. For a Pepper's Ghost effect to be effective, the audience must see something through the ghost. Simple changes in cueing synchronized to the appearance of the ghost shifts focus to the ghost when he appears.

As many as 250,000 people pass through the Lights of Liberty Visitors Center each year, and with more than 160 prepared questions available and 800 answers, Ben Franklin should have words of wisdom to entertain all of them.

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