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Linking Images and Sound in a 3D Museum Exhibit Demonstration

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Linking images and sound in a 3D museum exhibit

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1. Introduction

This experiment is the result of the need to develop a functioning exhibit at the Seacoast Science Center (SSC). The Data Visualization Research Lab located at the Center for Coastal and Ocean Mapping (CCOM) at UNH was contracted to create a computer-based 3D interactive exhibit that would combine real data (bathymetry) collected by CCOM with informational landmarks (images) that would describe things happening in the area local to the data.

As the exhibit was being built, questions arose regarding how to effectively link visual 3D images with recorded spoken descriptions while a user is navigating. Moreover, we wanted to investigate active vs. passive methods for activating audio. Therefore, we designed and tested 5 methods of audio activation before choosing the most effective one for the exhibit.

2. Design

The exhibit software, GeoExplorer 3D, was developed using a visualization system for viewing geographic data spaces with a Geographic Zooming User Interface in 3 dimensions, called GeoZui3D (Ware et al., 2001).

The main content of the exhibit consists of a 3D scene built around an accurate 3D data representation (bathymetry) of the bottom of the Piscataqua River, NH (Fig. 1). A person explores the river by using an arcade-style flight yoke to drive a dive sled around, constrained by areas where bathymetry is present.

Movie clips and images lie throughout the length of the river at various locations. Associated with each image/movie clip is an audio clip that gives a short narrative. In Figure 2, an overhead view of the layout of the virtual environment shows an *ixi* at each location with an image and its associated sound clip.

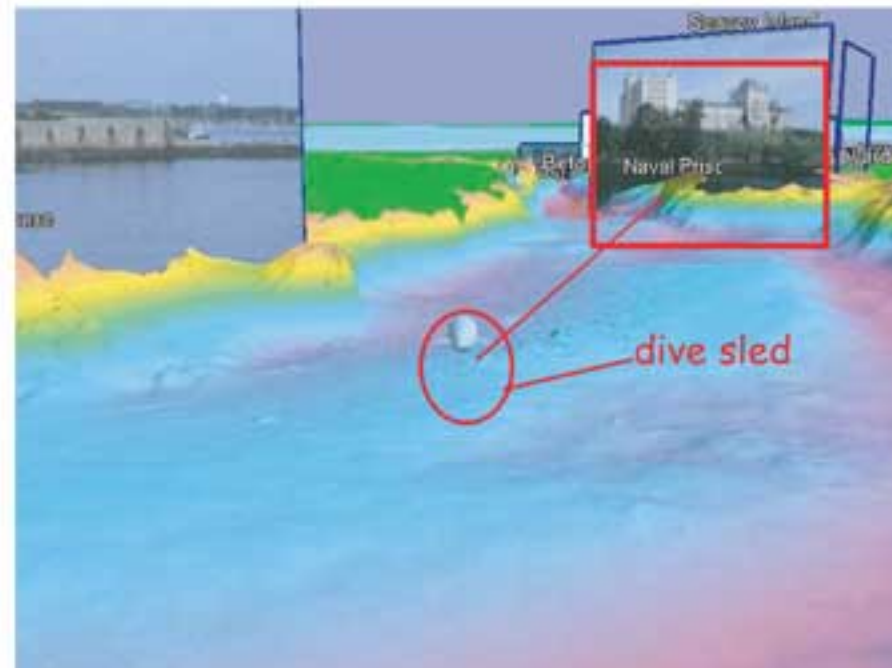


Figure 1. User's view of the virtual Piscataqua River.

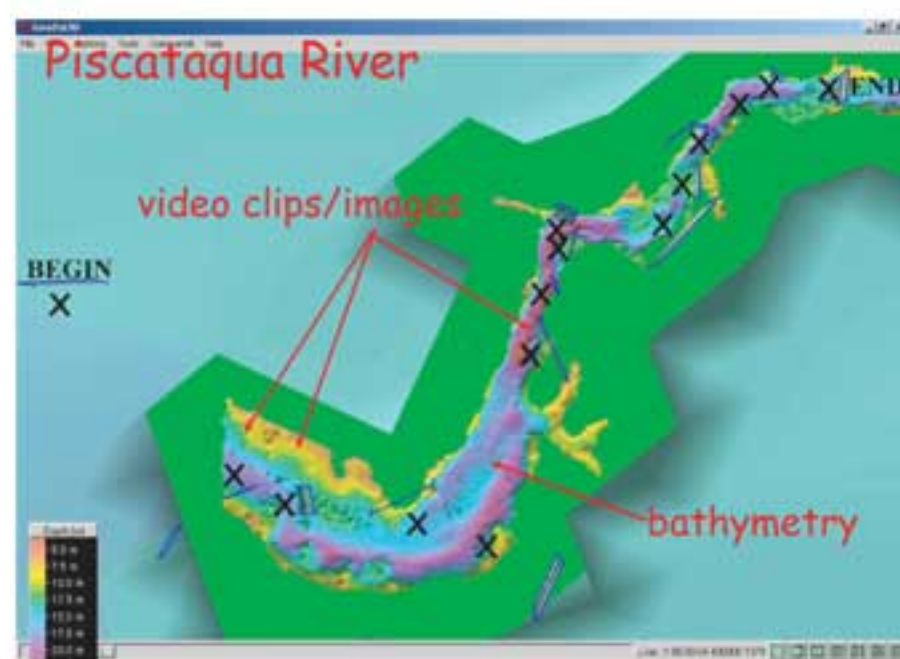


Figure 2. Overhead view of the virtual Piscataqua River.

5. Conclusion

The key issue in the ultimate success of the exhibit is solving the problem dealing with how to activate audio to best capture the user's attention. This research has shown that users appear more interested in exhibit content the more interaction there is. From this research, the Tractor Beam Method (method 5) was chosen as the technique for linking images and sound in the Seacoast Science Center exhibit.

Method 5 TRACTOR BEAM

The 5th method activates audio in the same way as the 4th method does, however after the button is pressed (3), the user temporarily loses control of the vehicle as it smoothly translates and rotates (4) to the optimum viewing position. When the vehicle arrives (5), the sound clip is activated and the blue line cue appears (the blue line disappears as it did in method 3). Control of the vehicle returns to the user after the tractor-beam animation is complete.

Method 4 BUTTON PRESS

In the 4th method when the user is in the activation zone and facing the image (2), a thick yellow frame appears around the image, which is normally outlined in blue. If the user presses the button (3), then the audio begins to play and the blue line cue appears (4). The blue line disappears the same as it did in method 3.

Method 3 HEADING

With the 3rd method, audio begins to play when the vehicle is within the activation zone and facing the image. The vehicle is considered facing the image when the center of the image is within 17.5° of the vehicle's heading (the view angle - red dashed lines). The blue line audio cue becomes visible the moment the vehicle faces the image (3) and disappears the moment the vehicle leaves the zone (5).

Method 2 VISUAL CUE

The 2nd method activates audio exactly like the 1st method but it adds a visual cue to help the user associate the narration with its image. The visual cue is a blue line from the center of the vehicle to the center of the image. The blue line appears as soon as the vehicle has entered the activation zone (2) and disappears the moment it leaves (5).

Method 1 PROXIMITY

In the 1st method, the vehicle (1) triggers the audio attached to an image when it enters a specific activation zone (2). The activation zone is defined as a 3D area in front of the associated image that has a 120-degree sector emanating from the center of the image with a radius that is proportional to the height of the image.

6. Literature cited

Sullivan, B., Ware, C., & Plumlee, M. 2006. Linking audio and visual information while navigating in a virtual reality kiosk display. *Journal of Educational Multimedia and Hypermedia* 15:2.
Ware, C., Plumlee, M., Arsenault, R., Mayer, L.A., Smith, S., & House, D. 2001. GeoZui3D: Data fusion for interpreting oceanographic data. *Proceedings Oceans* 2001 3:1960-1964.

7. Acknowledgments

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3. Solution

Five audio activation methods were developed (Sullivan et al., 2006) and tested by presenting them to children and adults, to determine which method best captured and held the users attention, as well as encouraged interaction with objects in the exhibit.

4. Results

The results of both the objective and subjective phases of testing indicate that those audio activation methods that involve an explicit act of selection (a button click) are superior to the other more passive methods with both adults/children (fig. 3) and male/female (fig. 4). The button press and the tractor-beam audio activation methods yielded longer times facing the images with audio playing and received the highest subjective ratings (fig. 5).

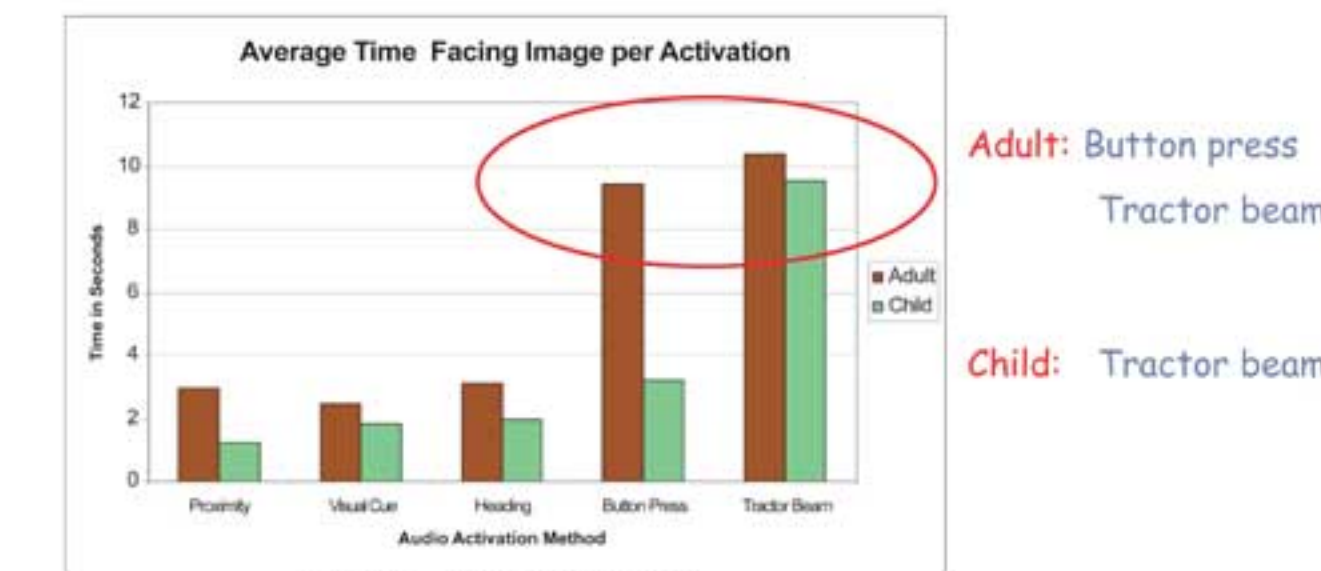


Figure 3. - Objective age test

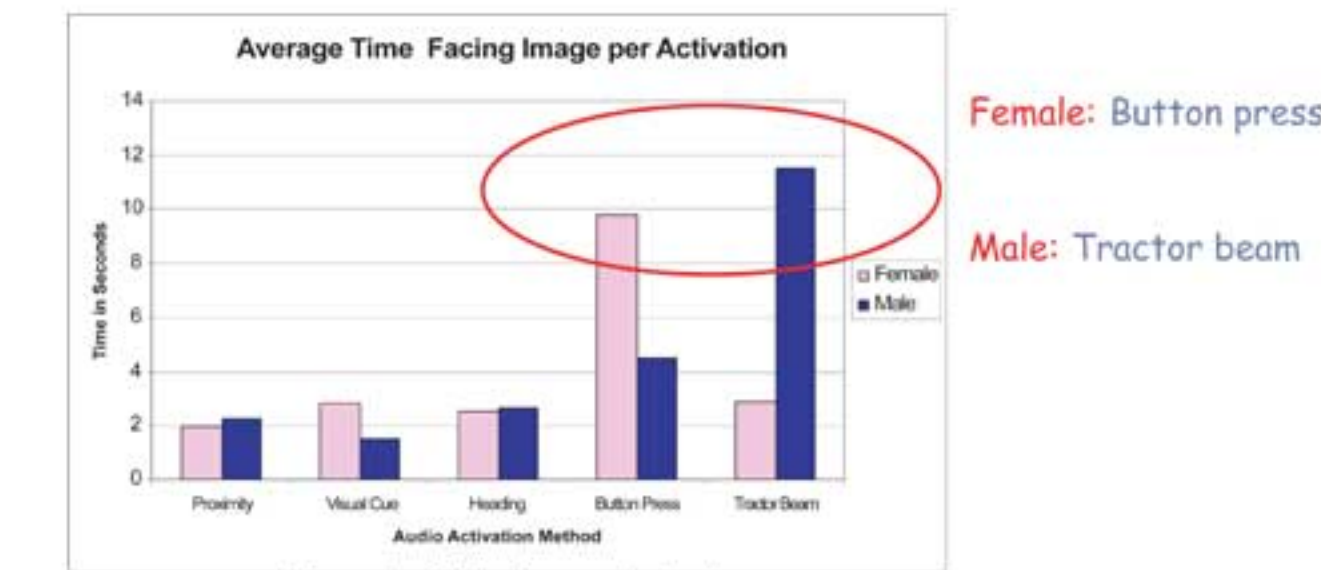


Figure 4. - Objective gender test

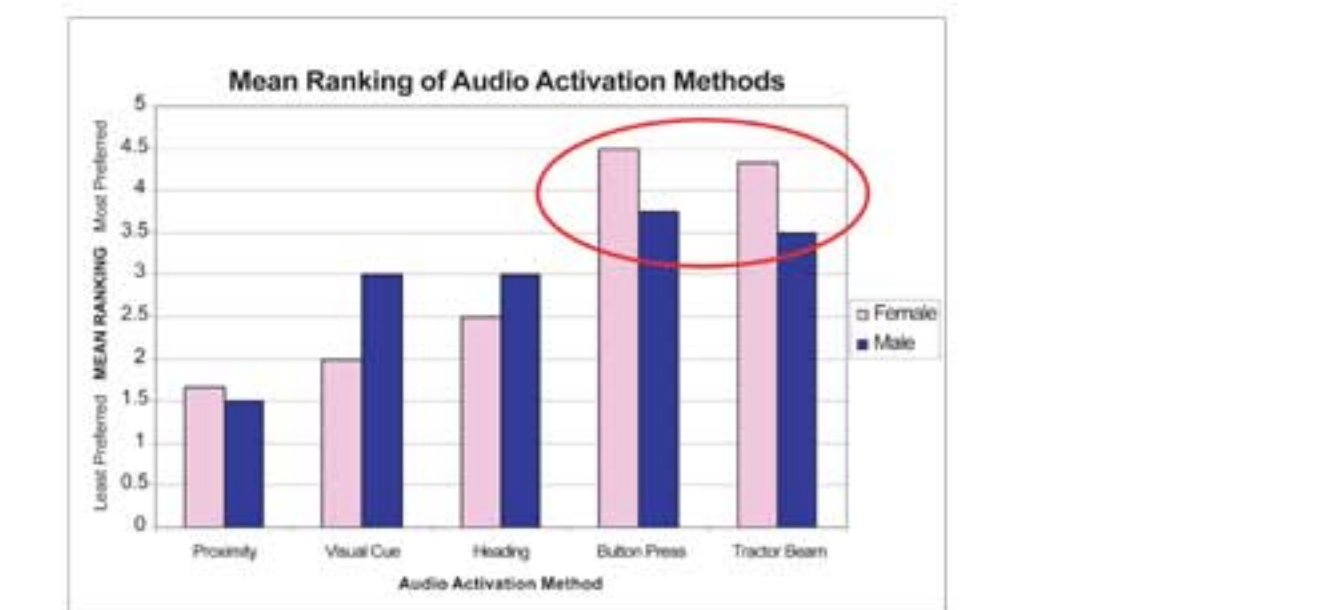


Figure 5. - Subjective preference gender test

8. For further information

Please contact briana@ccom.unh.edu. More information on this and related projects can be obtained at <http://www.ccom.unh.edu/vislab/index.html>. A link to an online, PDF-version of the poster is located at: http://ccom.unh.edu/index.php?p=26&page=image_gallery/posters.php.