

Applying Virtual Reality to Commercial "Edutainment"

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Virtual Reality (VR), when defined as a computer generated, immersive, three-dimensional graphics environment which provides varying degrees of interactivity, remains an expensive, highly specialized application, yet to find its way into the school, home, or business. As a novel approach to a theme park-type attraction, though, its use can be justified.

This paper describes how a virtual reality "Tour of the Human Digestive System" was created for the Omniplex Science Museum of Oklahoma City, Oklahoma. The customers main objectives were: 1) To Educate; 2) To Entertain; 3) To Draw Visitors; and 4) To Generate Revenue. The "Edutainment" system ultimately delivered met these goals. As more such systems come into existence the resulting library of licensable programs will greatly reduce development costs to individual institutions.

In order to start the project, Avian

Graphics had to first understand what the Omniplex was trying to accomplish with the use of this attraction and VR. They basically wanted to construct a educational fly-through of the human digestive system with the rider having the independent ability to move his head while flying. The educational portion had to meet a wide audience, but mainly concentrated on a younger crowd. The audience was educated using an audio track as well as visual cues. After numerous discussions, several areas were picked as focal points of the tour, the mouth, the stomach, the villi, and the small intestines. Once these were decided upon, a script was developed. The key to the script was to write the audio portion in such a way that children would be able to understand it and adults would still enjoy, be entertained, and possibly even learn something themselves. A professional studio and narrator were employed to record the script and add appropriate sound

effects. This audio recording was then transferred to the graphics system via audio DAT tape to be digitally replayed and synced with the graphics.

To meet the second objective, modifications were made to the audio track and the graphics to provide some excitement. In the mouth you are confronted by flying bits of food while the teeth chomp down around you, while in the stomach, you are tossed about with food particles while sloshing in green acid, and while riding through the lower intestines you are surrounded with roller coaster sounds and travel through dips and turns. Finally with a loud audio sploosh, you are deposited in the toilet and the journey ends.

Omniplex's third objective was met mainly by the use of Virtual Reality. Avian Graphics first had to educate the customer on what VR is truly capable of. The general public has been tainted by Hollywood movies and media fan fare on what VR can do for you. The hard facts are that VR is an emerging technology requiring specialized software and hardware. "Off the shelf" does not exist in the VR world today. Until recently, virtual reality only existed in high dollar research and simulator facilities.

Low cost head mounted displays (HMDs), essential for VR, have poor resolutions. The resolution of typical low cost HMDs today is about like taking a Sony Watchman and placing it two inches from your eyes. Also hardware to drive these displays at high frame rates doesn't usually come from your typical PC. They require graphics engines and high speed computers to make it all come to life. After much discussion, Omniplex was convinced that the novelty of virtual reality, even at a lower fidelity because of cost constraints, would draw visitors more than a typical multi-media attraction using real footage but providing less excitement. The popularity of VR with the public provided an instant draw to the attraction. Based on VR arcade attractions, the public was also willing to spend up to a dollar a minute to experience VR. This fulfilled Omniplex's fourth objective, to generate revenue to offset the initial investment.

Due to the Omniplex budget constraints, it was finally decided that a medium fidelity simulation of the digestive system would be provided. The hardware was a Silicon Graphics Indigo² XL with video card option would provide the compute and graphics power,

a Polhemous Fastrack for head tracking, and a helmet mounted display. The original HMD required stereo left and right NTSC video channels which was provided by an IDEN Video Wall. This piece of equipment takes a single NTSC video signal and splits it into four separate quadrants. By placing our images in the proper quadrants of the computer screen, we are able to get the left and right channels required. The video wall also allowed both images to be rendered on one machine thus eliminating the need for expensive multi-headed workstations or synchronous use of multiple machines, thus saving a great deal of expense in both hardware and software. Audio was recorded onto the Indigo² and replayed digitally into the headphones of the helmet system also eliminating the need for expensive computer controlled tape recorders. To enhance the images but continue to keep the speed up on the lower end system, all software was custom designed by Avian Graphics and employed several 3D graphics "tricks", but was designed to be 90% reusable for future projects. The total cost of the project was less than \$110,000.00 which is a significant price difference from most location based VR

entertainment systems currently available to the community.

In conclusion, the Virtual Reality Tour of the Human Digestive System was designed to be a medium resolution, low cost edutainment system. Through discussion of customer objectives, price vs. performance issues, and what was feasible with current technology, the above system met the objectives of the customer and provided an entertaining piece of modern edutainment to capture the interest of today's youth.