



A NATIONAL SCIENCE FOUNDATION
ENGINEERING RESEARCH CENTER

Panoramic 360-Degree Video Application Design, Development and Evaluation

User
Centered
Sciences

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PV/Journalism Project: Traditional Viewing (L) vs. Panoramic Viewing (R)



"Desk Rage" - PV Therapy for Anger Management in the Workplace

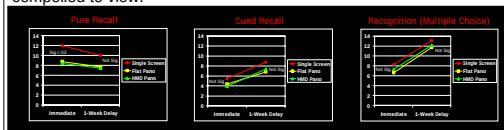
Research Goal - The acquisition and presentation of high-resolution panoramic video (PV) presents a number of technical difficulties, as well as excellent User Centered Sciences research opportunities. We are using a five-camera 360-degree PV system that acquires high-resolution (>3Kx480) panoramic video images. These images are recorded at 30Hz frame rates and played back for later viewing. During playback, users can wear a head-mounted display (HMD) and a head-tracking device that allows them to turn their heads freely to observe the desired portions of the panoramic scene. Continued user studies are planned to explore the usability and usefulness of these types of realistic virtual environments.

Role in IMSC - The advancement of engineering enabling technologies that underlie the design, development and evaluation of advanced integrated media systems (IMS) with attention to their usability and usefulness by humans is at the core of the IMSC mission. The PV projects have driven research on the enabling technologies required to support efficient and effective system development that will also serve to advance the knowledge base available to other scientists addressing IMS development, implementation and evaluation.

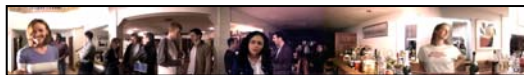
Uniqueness & Related Work - We are unaware of any other research group that is systematically investigating the application of PV for the applications that we are addressing in the areas of psychology, journalism and art. Nor are we aware of any full-scale controlled experiments (such as seen with User Directed News) being done by others that address the issues of PV immersion and it's impact on information processing within the context of this level of functional application.

Research Approach - Field-trials with the PV camera and user testing with acquired content has been conducted across a range of scenarios to explore feasibility issues for using this system with a variety of user applications. A wide range of test scenarios were captured in order to assess the PV system across a range of lighting, external activity, camera movement and conceptual conditions. Informal evaluation of users' responses to these scenarios has been conducted and controlled experiments are currently underway for some of the applications.

User Directed News Project—One area where journalism could benefit from the advances in information technology is in the use of systems that are capable of capturing and delivering news events within more "immersive" viewing formats. As opposed to traditional "fixed-camera/talking head" capture and delivery of "on-the-scene" reporting of newsworthy events, the potential now exists to produce HMD-delivered 360 PV environments that allow the user to self-select what aspects of the event that they would like to observe and promote a sense of being immersed within the ongoing event. When immersed in this context, the user has the option to actively choose what aspects of the event that they are most interested in or are compelled to view.



The data above are from our initial analysis of memory from a newstory across multiple viewing conditions. A Key finding is that users in the two panoramic conditions remembered as much verbal content one week after viewing as the single frame group. This occurred in spite of the increased exposure to more information contained in the panoramic viewing. Analyses are underway to examine memory performance in more detail and to investigate the influence of immersive tendencies and presence on memory performance and user preference. As well, users will be contacted at a 6 month follow-up to assess remote memory.



PV "Mock-Party" for Social Phobia Exposure Therapy



"View over the Edge" - Collaborative project with Matt Klickstein, Visual Arts and Technology course

Accomplishments:

- Following the previous technical accomplishments in the creation of a system for capturing PV and in the building of a media player that allows the scenarios to be delivered on a standard PC or laptop, we have redesigned our media player system. This was based on the experience we garnered with intensive use of the initial system and the limitations that were discovered.
- In addition to this ongoing iterative redesign process, we have commenced the process of conducting evaluation studies via collaborations with the St. John's University in NYC for the anger management scenarios. In the social phobia project, we have successfully experimented with blue screen single camera capture of persons to be pasted into our panoramic scenarios in order to foster a higher degree of controllable "pseudointeraction" for users.
- We have also developed ongoing partnerships with both the USC School of Fine Arts and the USC Annenberg School for Communication School of Journalism to foster multidisciplinary development of PV scenarios.
- The Annenberg collaboration is illustrated in our description of the **User Directed News** project.
- The School of Fine Arts project has evolved into Dr. Rizzo serving as a co-instructor in the "Visual Arts and Technology" course that IMSC has collaborated on over the last three years. During this time, we have put together three competitions whereby students in the course submit a proposal for how to create an art installation using the PV system. The best projects have been selected by a jury of IMSC and Art faculty with the winners having the opportunity to produce their piece using the PV system. A specific innovation that has emerged from this course is the development of the "PanoChamber". The PanoChamber was created as a part of a student project and consists of a 360 degree viewing station that users can enter to naturally observe PV content projected from 4 projectors onto a smoked Plexiglas surface. This elegantly simple solution was built for 700\$ of materials and serves as a model for future displays that, with use of a better screen surface, could become an option for museum and other forms of large scale displays of PV content. The PanoChamber is currently being used as a test device for student projects in the FA 336 course and we are now investigating the acquisition of large curved LCD screens from Panasonic to create a higher resolution, permanent display in collaboration with the School of Fine Arts.



5-Year Plan

- 2004-2005** Complete data analysis from the series of User Directed News experiments with varying event capture and perform testing with a wider range of user groups. Complete and publish findings on the Anger Management and Social Phobia user studies. Experiment with and expand our bluescreen capture/PV pasting process. Creation of large screen display.
- 2005-2007** Explore options for using more compact higher resolution cameras. Further integration of Immersidata capture and analysis with collaboration with Cyrus Shahabi's lab. Explore development of branching PV formats and internet delivery.
- 2007-2009** Fully usable and useful forms of our evolved systems as common practice for a wide range of application areas.