Simulation-Based Testing, Training and Therapy: Panoramic 360-Degree Video Application Design, Development and Evaluation

INTEGRATED MEDIA SYSTEMS CENTER
A National Science Foundation Engineering Research Center at the UNIVERSITY OF SOUTHERN CALIFORNIA

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BRIEF DESCRIPTION OF TECHNOLOGY DEMONSTRATION

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. Incorporation of immersive audio is anticipated to enhance the usability and sense of presence in these environments and this component has been integrated into investigations with this system. We have made significant advances over the last year in our technical capture and delivery of these Integrated Media Systems (IMS) environments and we continue to explore the issues for creating usable and useful 360 Degree PV environments. The issues that need to be addressed for successful PV application development were detailed in a recent paper by our lab [Rizzo et al, 2001] that was also presented at the 2001 Human Computer Interaction Conference. We currently have a number of major application projects that we are investigating in terms of the additive value for PV capture and delivery in the areas of Mental Health, ImmersiNews capture and delivery, Historical Documentation, Art and Entertainment. These application areas are currently providing test beds for further investigating the user centered science issues relevant to immersive Integrated Media Systems.

UNIQUE OR DISTINGUISHING CHARACTERISTICS RELATIVE TO STATE-OF-THE-ART

- 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. Enabling technology advancements in the areas of multimedia programming and display/tracking have allowed us to now be able to deliver our test environments by way of a laptop into a head mounted display (HMD). Exploration of the types of environments that 360 PV can deliver, along with a focus on the underlying issues for scene capture/presentation are in line with IMSCs mission to advance the creation, delivery, usability and usefulness of immersive information technology.
- We are unaware of any other research group that is systematically investigating the application of PV for the application areas that we are addressing in the areas of art, entertainment, psychology and journalism.

APPLICATIONS

- USC Football Game – Captured from various static and moving positions within the LA Coliseum, with extreme close-ups of people and massive crowd scenes (40-60 thousand people)
- Virtual Party -- These were two systematically staged shoots of a “Mock Party” that used actors to mimic interactions at a party for use in human immersipresence research and for a current social phobia application
- Anger Management in the Workplace – This 13-step set of scenarios was created as a tool for addressing anger management in the workplace or as it is commonly referred to as “Desk Rage”
- ImmersiNews Journalism project – This experiment involved the capture of a news event with the PV camera and news reporter as part of a study on the usability, preference for use and information processing issues related to this potential journalism application.
- More applications available on request

RECENT HIGHLIGHTS, LEVEL OF DEVELOPMENT, UPCOMING MILESTONES

- Development of complete system for capture and playback of 360-Degree PV environments off of low cost accessible hardware platforms.
- First to capture a PV concert with integration of Immersive Audio
- First to use PV as a method to create Mental Health applications that require more people intensive virtual environments
- First to capture a News report using PV with our ImmersiNews project entitled “You in the News”
- First to create a 360 Degree PV using stop action “claymation” methods.
- Current User Centered Sciences research program conducting human research on user preference, usability, information processing and mental health benefits
- Newly developed method for pasting in human characters captured by way of blue screen methods into PV applications.
- Collaborative relationships formed with four clinical test sites.

UNDERLYING TECHNOLOGIES

- Enabling technology advancements in the areas of digital scene capture, multimedia programming, immersive audio and display/tracking technology have allowed us to now be able to deliver our test environments by way of a laptop into a head mounted display (HMD). User Centered Science methods are now being employed to test usability/usefulness.

LIST OF PUBLICATIONS, REFERENCES, URLs

Rizzo, A.A., Neumann, U., Pintaric, T. and Norden, M. (2001). Issues for Application Development Using Immersive HMD 360 Degree Panoramic Video Environments. In: Smith, M.J., Salvendy, G., Harris, D. & Koubek, R.J. (Eds.) *Usability Evaluation and Interface Design,* L.A. Erlbaum: New York *Vol*. 1, pp. 792-796.

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