



Published by the Integrated Media Systems Center, a National Science Foundation Engineering Research Center at the University of Southern California

Director's Message

State of California increases support to IMSC

It is my pleasure to report that the State of California has increased its support to IMSC. We recently received a \$250,000 grant from the State Trade and Commerce Agency to bolster our technology transfer activities. Our Director of Industry and Technology Transfer Programs, Isaac Maya, and I traveled to Sacramento last month to brief the head of the agency, Secretary Lon Hatamiya, on IMSC's latest initiatives.

Technology transfer is at the top of the agenda for our upcoming Scientific Advisory Board (SAB) meeting on October 22. We plan to showcase IMSC technologies that are ready for commercialization with presentations from IMSC key investigators. We are convening the meeting in the heart of Silicon Valley at the Sunnyvale headquarters of Lockheed Martin's Interactive Technology Center, and we are inviting SAB members to bring along those in their companies who handle business development, marketing and technology licensing. See page 2 for an article on our technology transfer process.

In another initiative, I traveled with Prof. C.-C. (Jay) Kuo and Prof. Gerard Medioni, two IMSC key investigators, to Taipei, Taiwan, last month to speak at a workshop on "Technology and Market Trends of the Multimedia Industry"

sponsored by the Institute for Information Industry (III), one of the largest research centers in Taiwan. IMSC collaborates with III on multimedia research.

I spoke on the impact and future trends of multimedia, Prof. Kuo described the interaction between media representation and networking management and Prof. Medioni presented on the technolo-

gies, systems and applications of IMSC's Media Immersion Environment. We also participated in a panel discussion and press conference. More than 120 multimedia specialists from Taiwanese companies attended the workshop, which was a great success.

Additionally, we are pleased that

(Please turn to page 5)

Augmented reality technology chosen by Boeing and NASA

IMSC's augmented reality technology was flying high last month—Boeing licensed it for aerospace use, and NASA awarded a contract to IMSC investigator Ulrich Neumann to develop the technology further for space applications.

Boeing, the world's largest manufacturer of commercial jetliners and military aircraft, licensed the technology to evaluate its prospective use on

the factory floor in aircraft assembly, and NASA awarded a contract for developing it for use by astronauts in carrying out spacecraft repairs and for training purposes.

Dr. Anthony Majoros, Senior Engineering Scientist for Boeing's Phantom Works Division in Long Beach, CA, and member of IMSC's Scientific Advisory Board, said of the

(Please turn to page 7)

Inside IMSC News

- HP names new SAB member 2
- Tech transfer process bolstered 2
- Interdisciplinary trend seen 3
- 3D modeling research progresses ... 4
- Two new degrees planned 6
- New IMSC Press Editor named 7
- DARPA awards contract 7

Visit us at <http://imsc.usc.edu>



NEW BOC MEMBER—Caroline Kovac, Vice President, Services, Applications and Solutions, IBM Research, was recently named a new member of IMSC's Board of Councillors. IMSC Director Chrysostomos L. (Max) Nikias briefed Ms. Kovac on IMSC's latest work when she toured the Center in July.

New Hewlett Packard SAB member praises IMSC

IMSC's work in streaming media will continue to be of interest to Hewlett Packard in the future as the company moves forward into the area of consumer-oriented information applications, according to Dr. Fred Kitson, HP's new representative on IMSC's Scientific Advisory Board (SAB).



Fred Kitson

"I'm enthusiastic about collaborations with IMSC," he said. "There's a great deal of research interest overlap and a mutual understanding of emerging trends and applications. We deal with many universities, and IMSC has one of the strongest programs of industry collaboration." He praised IMSC

investigators as being top in their fields and said IMSC research facilities are excellent. Kitson is no stranger to IMSC, having supported the Center since its founding three years ago. He is the Director of the Clients and Media Systems Laboratory at HP

Laboratories in Palo Alto and has been with Hewlett Packard since 1981.

Kitson said HP will be particularly interested in tracking IMSC's progress in research on streaming media over networks. He pointed to the great promise of IMSC's Immersive Audio™ technology, which generates a true three-dimensional sound field that immerses the listener in a much more realistic aural field than current 3D sound.

HP is also interested in IMSC's inroads in the imaging area. "There's been an explosion in business in HP's printing area so we have more interest in imaging than ever before," Kitson said. IMSC has conducted research in the imaging area for HP over the last three years, directed by IMSC key investigator Prof. C.-C. (Jay) Kuo. Research topics have included content-based retrieval of compressed images and videos, a new color indexing approach that integrates multiple color features, content-based audio classification and retrieval and the coding of images and animated graphics for wireless applications.

IMSC establishes new technology transfer process

As IMSC moves forward rapidly toward its goals of technology transfer and commercialization, the Center is putting in place a process that is ideally suited for a university setting, according to Isaac Maya, Ph.D., P.E., Director of Industry and Technology Transfer Programs.

"Traditionally, engineers have been content with creating great technologies, but we are breaking this mold by combining IMSC's technological capabilities with the entrepreneurial capabilities of USC's Marshall School of Business in a process to identify technical innovations that also offer the greatest opportunities for commercial success," Maya said.

For IMSC investigators, the process began in July with a workshop on how to write a technology-related business plan given by Tom O'Malia, the Director of the Lloyd Greif Center for Entrepreneurial Studies in USC's Marshall School of Business, and Kathleen R. Allen, Associate Professor of Clinical Entrepreneurship, at the Center.

IMSC technologies were then presented to a panel comprised of faculty from the Marshall School and the School of Engineering Technology Transfer Center (ETTC). The most promising candidates were matched with MBA students from the Marshall School, who

were tasked with conducting feasibility analyses and preparing business plans for commercialization of the technologies. Those plans and the technologies were then rehearsed in front of IMSC and ETTC personnel before they were presented for review by the USC School of Engineering's Commercialization Advisory Board (CAB) last month.

Maya said that CAB members were well suited to provide practical business world advice and feedback. "They have excellent credentials, coming from major financing and venture capital firms that represent a variety of industries, including multimedia," he said.

Next, IMSC investigators will present the selected technologies to IMSC's Scientific Advisory Board (SAB) at its fall meeting on October 22, which is being held in Silicon Valley this year at Lockheed Martin's Interactive Technology Center in Sunnyvale. Due to the commercialization focus of the meeting, SAB representatives will bring along others in their companies with responsibilities in business development, marketing and technology licensing.

Maya said IMSC has also stepped up its efforts in facilitating the launch of new companies and in licensing technologies to SAB companies. As an example, he cited the most recent licensing of aug-

mented reality technology to Boeing. (See Boeing article, page 1.)

"Since our SAB partners have a strong development and commercialization focus, we are bringing that focus to the engineering/university setting by involving them in the process, with IMSC's faculty and students benefiting as they are exposed to business perspectives," Maya said. And, he pointed out, "We're also giving our industry partners a better chance to come up with that next great application."

BOC meeting set

Members of IMSC's Board of Councillors (BOC) will come together for their second annual meeting November 18 to once again provide strategic counsel for the Center as it moves forward as a leader in the dynamic field of multimedia.

Bringing to bear their visionary leadership skills, these high-level executives from key industries will discuss and evaluate IMSC's new Strategic Research Plan and provide advice on strategic directions.

The keynote address will be given by BOC member Adam Clayton Powell III, Vice President, Technology and Programs of The Freedom Forum.

McLeod sees IMSC as leader in interdisciplinary trend

Prof. Dennis McLeod, IMSC's Associate Research Director for Information Management and Professor of Computer Science, has seen the computer science field mature over the past 25 years to come to recognize the importance of an interdisciplinary approach to research.



Dennis McLeod

No longer are computer science researchers focused on addressing problems solely from the point of view of a single discipline, he said, but rather they understand the importance of taking

a wider view, drawing on relevant work in other disciplines. "For instance, we don't create information models just for the sake of it anymore," McLeod said.

And, he said, IMSC has positioned itself to take advantage of the new trend by championing interdisciplinary investigations. "One of the key things we promote is the integration of technologies and concepts to develop solutions to problems not only in the traditional electrical engineering/computer science area, but also in a wide variety of other areas, such as communications, fine arts, cognitive science, journalism, education and many others," he explained.

McLeod joined the Computer Science Department in 1978 after receiving B.S., M.S. and Ph.D. degrees in Computer Science from the Massachusetts Institute of Technology. His principal research interests include database system modeling, design and evolution; database system interoperability and networking; information protection and security; knowledge management; applied machine learning; personal information management systems; and information management environments for digital libraries, scientific and engineering data, computer-integrated manufacturing and computer-supported cooperative work.

McLeod has more than 90 refereed publications in the areas of database

systems, knowledge management and information systems. His work on semantic data modeling and federated databases is particularly well-regarded.

He has served as chairman and member of program and organizational committees for numerous technical conferences and workshops. He is also an editor of the "International Journal on Very Large Databases," the "International Journal of Intelligent and Cooperative Information Systems," and the "International Journal of Intelligent Systems in Accounting, Finance, and Management."

McLeod received the USC School of Engineering's Outstanding Teaching Award in 1994, 1995 and 1997. He has consulted for such major companies as Xerox, IBM, Unisys and TRW.

McLeod directs IMSC's research in the four Information Management sub-areas of content representation and extraction, distributed information integration and fusion, user-customized information selection and presentation, and storage and access for continuous media. He explained that IMSC's Information Management research seeks solutions to the complexities, scale and heterogeneity that impede the effective access, sharing and management of multimedia information and databases.

McLeod pointed out that the Personal AudioCast (PAC) project presents a good example of an initiative that draws from the Information Management research area as well as from IMSC's other two research areas, the Computer Interfaces area and the Media Communications area. He is co-principal investigator for this new Demonstration Technologies project that focuses on the delivery of a real-time, customized, three-dimensional audiocast of selected information from a dynamic multimedia news and information database.

PAC will incorporate IMSC's Immersive Audio™ technology from the Computer Interfaces research area for vastly improved sound, and novel perceptually-based audio compression techniques from the Media Communications research area to reduce the required bandwidth for mobile applications. Other technologies from all three research areas will be harnessed to achieve a tightly integrated media system. "The development of PAC should demonstrate how IMSC focuses on integration at the systems level in building a robust, user-friendly integrated media system," McLeod said.

Weber receives achievement award

Allan Weber, an IMSC Research Scientist, recently received the annual Staff Achievement award of the USC School of Engineering for his outstanding work with faculty, staff and students.



Allan Weber

Weber administers computer networks for IMSC and assists IMSC faculty, staff and students in computer operations. He has been instrumental in establishing the networks for IMSC's Media Immersion Environment. He is also involved in recommending purchases of IMSC computers and multimedia equipment and working with vendors.

In addition, Weber has been responsible for ensuring that all IMSC computers comply with standards addressing the Year 2000 problem.

He has taught an Electrical Engineering course in Logic Circuits for the past five years.

In presenting the award, Dean Leonard Silverman praised Weber's exceptional efforts in preserving electronic data from numerous university servers during the disruptions caused by the Northridge earthquake and 1992 Los Angeles riots.

Weber holds a B.S., M.S. and Ph.D. in Electrical Engineering from USC. He has been on staff at the university since he received his doctorate in 1987.

3D modeling important in advanced teleconferencing

Three-dimensional models play an important part in IMSC's development of advanced teleconferencing and other projects, according to Prof. Gerard Medioni, an IMSC key investigator who is directing research in the "Modeling from Images" area.



Gerard Medioni

Medioni, a Professor of Computer Science, is investigating methods of generating 3D models from 2D images in the most efficient and cost-effective fashion, performing

calculations on PC workstations and relying on uncalibrated cameras.

His research areas include the reconstruction of 3D models from several uncalibrated images, interactive generation of 3D models from a single image, reconstruction of 3D models from sequences of stereo image pairs and analysis of video streams.

Medioni demonstrated this technology to U.S. Army Secretary Louis Caldera when he visited the USC campus in August to announce the establishment of the USC Institute for Creative Tech-

nologies. He and his students took two pictures of Caldera's face and processed the photos in about 15 minutes, transforming them into a three-dimensional model.

In reconstructing the model of the Army Secretary's face, the researchers used a volumetric image matching method to match the images accurately and automatically. Then, they used a stratified reconstruction approach that converted the matched image pixels into Euclidian coordinates. The system allows the use of uncalibrated images, meaning that the camera's internal parameters do not have to be considered in generating the model.

In related research, Medioni and his team achieve interactive generation of 3D models from a single image by employing an approach that consists of interactive feature extraction, segmentation and grouping.

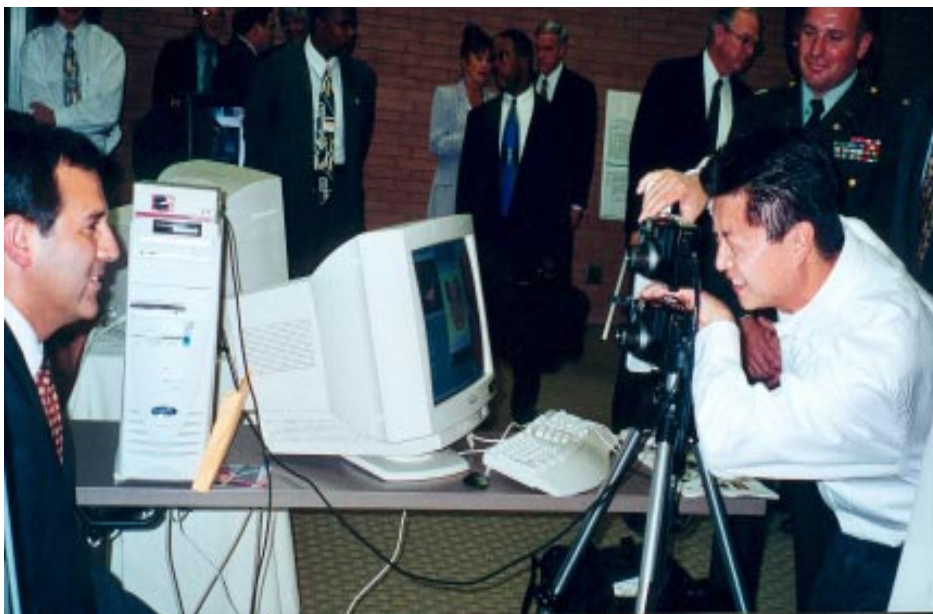
The researchers have also developed a system that generates 3D panoramic models from stereo image sequences. The system, which includes a pan-tilt stereo head, a PC and two video frame grabbers, allows rendering from novel viewpoints and the placement of computer-generated objects and

real objects in the same model for navigation in virtual environments.

In the analysis of video streams, the researchers aim at detecting and tracking objects in a video sequence. They study the problem under three scenarios of increasing complexity—a fixed camera, a pan-tilt-zoom camera and a camera mounted on a moving platform. In these investigations, the researchers produce mosaics—synthetic compositions generated from a sequence of images—that provide a wider field of view than the original images. They segment moving objects and produce them as separate layers in the mosaic. Applications that would use such mosaics include panoramic photography and image compression. The technology will be applied to IMSC's development of immersive telepresence, as envisioned in a new kind of teleconferencing system in which meeting attendees in different locations would appear and sound as if they were in the same room.

Additionally, the researchers interpret the detection and tracking of objects to infer their behavior for the

(Continued on next page)



U.S. ARMY SECRETARY SITS FOR IMSC PHOTO SESSION—U.S. Army Secretary Louis Caldera poses for photos in an IMSC demonstration of 3D modeling from 2D images as Qian Chen, an IMSC Ph.D. student in Computer Science, snaps the pictures. The photos were transformed into a 3D model (right) by IMSC key investigator Gerard Medioni and his research team in about 15 minutes.

3D modeling from images . . .

(Continued from previous page)

development of automated intelligent video surveillance systems for civilian and military arenas.

In conducting research in fundamental issues in computer vision over the past several years, Medioni has also developed a novel framework based on tensors as a representation, and voting as a computational mechanism, to address the problems of grouping and matching. He has shown the application of such a

scheme to a variety of problems such as perceptual grouping, surface inference, stereo matching, shape from shading and optical flow computation. Medioni presents the research in an upcoming book, "A Computational Framework for Segmentation and Grouping," which will be published by Elsevier later this fall. For more information on Medioni's research, go to <http://iris.usc.edu/~medioni/>.

Two more IMSC demos at ceremony announcing ICT . . .



HEAD OF MPAA HEARS IMMERSIVE AUDIO DEMO—Jack Valenti (sitting), President and Chief Executive Officer of the Motion Picture Association of America, listens as IMSC Director Chrysostomos L. (Max) Nikias describes IMSC's Immersive Audio™ technology. IMSC key investigator Chris Kyriakakis (background) ran the demo for Valenti.



DEPUTY L.A. MAYOR VIEWS HAPTICS DEMO—Rocky J. Delgadillo, Deputy Mayor of Los Angeles, follows the guidance of Dr. Margaret McLaughlin, IMSC key investigator on the Haptic Museum project, in using the PHANToM, a pen-like device that provides force feedback to the fingertip as the user traces the contours of an object on a computer screen.

Director's Message . . .

(Continued from page 1)

the Department of the Army has recently established the Institute for Creative Technologies (ICT) at USC. ICT will work with IMSC and other USC entities to develop virtual reality technologies in the areas of modeling and simulation to assist soldiers in mission rehearsal, among other activities. The new institute will also work closely with the entertainment industry in the area of story-telling as part of mission rehearsal scenarios.

IMSC's record of achievement in cutting-edge multimedia research is one of the main reasons that the Army chose USC for this sole source contract. I was the first person contacted on campus when the Army wanted to send a delegation for a site visit. Other important reasons for USC's selection are the contacts of the School of Cinema-Television with the entertainment industry, the work that the Information Sciences Institute is doing for the Defense Advanced Research Projects Agency and the communications research of the Annenberg School for Communication.

USC's School of Engineering will play a pivotal role in ICT, and, as Associate Dean, I will coordinate the involvement of all SoE faculty members. I foresee opportunities for involvement by faculty members not only in Electrical Engineering and Computer Science, but in other departments as well.



TRW VISITS IMSC—Steve Lunny (center), Integration and Test Center Manager for TRW in Redondo Beach, CA, visited IMSC in August. Lunny is TRW's Research Corporate Champion for USC and a member of IMSC's Scientific Advisory Board. IMSC Director Chrysostomos L. (Max) Nikias (left) and Isaac Maya, IMSC's Director of Industry and Technology Transfer Programs, briefed him on IMSC's latest activities.

IMSC News is on the Web!

<http://imsc.usc.edu/Newsletter/news.html>

IMSC developing two specialized bachelor's degrees

IMSC is developing a new Bachelor of Science degree in Electrical Engineering and a new Bachelor of Science degree in Computer Science with specializations in integrated media systems.

Members of an IMSC Education Task Force are developing the two proposed degrees during the current academic year, according to Prof. Jerry Mendel, IMSC Associate Director for Education.

Mendel heads a task force subgroup developing the EE degree, and Prof. Gerard Medioni chairs a second subgroup planning the CS degree.



Jerry Mendel

The new degrees are the latest initiatives in IMSC's degree development program, which has included creation of three Master's degree programs and two undergraduate minors.

Mendel said that IMSC wants to closely align the content of the undergraduate degrees with industry needs so that graduates will have the specific skills to meet employer expectations from the very beginning.

The new degrees will encompass multimedia education from other

perspectives besides EE and CS, since so many fields use multimedia techniques.

Mendel said that although the degrees would mostly focus on what he calls the "creative-*technology*" aspects of integrated media systems, as distinct from the "creative-*artistic*" side, students would still gain an appreciation of the artistic side. For example, he said that graduates of the programs would not necessarily be animators who might go to work for Hollywood studios, but rather they might be compression specialists, system designers or system integrators who still need an appreciation of fine arts, journalism, cinema, television or music or who might work with artists.

Mendel said IMSC will use experience gained from its development of the five multimedia degree programs at USC to shape the two new undergraduate degrees. The five programs currently in place at USC's School of Engineering were developed under the leadership of IMSC and cover such technologies as digital media processing and hardware design, graphics and visualization, interconnection networks, and multimedia information management, as well as applications developed in other fields besides electrical engineering and computer science. Faculty in the Departments of Electrical Engineering and Computer Science and the Schools of Cinema-Television, Journalism, Communication, Music and Fine Arts have worked together to develop the programs. He stressed the interdisciplinary nature of all the programs.

The two Master's degree programs—Electrical Engineering and Computer Science—with the specialties in Multimedia and Creative Technologies were developed as part of IMSC's work in retraining dislocated aerospace engineers and others in recent years. Mendel said IMSC was able to move quickly in developing these two degrees because the Center could add the Multimedia and Creative Technologies specialization to the two established,

traditional degrees of Electrical Engineering and Computer Science.

The Master's degree in Integrated Media Systems was launched last fall and offered in cooperation with both the Computer Science and Electrical Engineering Departments. Mendel said the new degree gives much more flexibility to students to fully explore the interdisciplinary nature of the integrated media systems field. He pointed out that directed research opportunities with IMSC researchers offer the students a unique experience and provide a conduit for the flow of IMSC research into the curriculum. In this program, students are required to take a course on multimedia production tools for integrating audio, graphics, video, animation and data and to create a portfolio of work that is expected by prospective employers.

The multimedia minor for Engineering undergraduates offers courses from Electrical Engineering, Computer Science, Cinema-Television and Music, and the minor for non-Engineering students offers courses from Electrical Engineering, Cinema-Television, Journalism, the Information Technology Program and Fine Arts.

Mendel said that the specializations in the new bachelor's degrees will provide a much more intensive study of integrated media systems than that required by the current undergraduate minors.

Mendel stressed that assistance from industry in planning the new bachelor's degrees will be crucial to their success, saying that IMSC's ties with industry partners provide a ready avenue for their participation. Members of IMSC's Scientific Advisory Board and Board of Councillors have already participated in a survey on the new degrees. He urged interested industry representatives to contact him. His email address is mendel@imsc.usc.edu.

Detailed information on the IMSC degree development program is available at <http://imsc.usc.edu/Education/edprog.html>.

IMSC News

October 1999

**Integrated Media Systems Center
School of Engineering
University of Southern California**

Chrysostomos L. (Max) Nikias, Director
Rick Keir, *IMSC News* Editor and
Communications Manager

© 1999 Integrated Media Systems Center
University of Southern California
3740 McClintock Ave., Suite 131
Los Angeles, CA 90089-2561
(213) 740-9813
E-mail: rkeir@imsc.usc.edu
<http://imsc.usc.edu>

Tescher named new IMSC Press Editor-in-Chief

Dr. Andrew G. Tescher, Technology Advisor to the Interactive Technology Center of Lockheed Martin Mission Systems in Sunnyvale, CA, was recently appointed Editor-in-Chief of IMSC Press.



Andrew Tescher

He plans to develop IMSC Press as a major forum for academic publishing in multimedia. "IMSC Press will provide the highest degree of professional recognition for investigators conducting research in this burgeoning field," said Tescher, who is also Chairman of IMSC's Scientific Advisory Board.

The IMSC Press is a partnership between IMSC and Prentice Hall. "We anticipate high visibility for authors because of IMSC's reputation as a preeminent multimedia research center in the nation and Prentice Hall's reputation as a

major scientific publisher," he said.

"IMSC is investigating all the critical technologies in this new field. We expect IMSC Press to cover many of the exciting new areas of multimedia technologies, including interactivity, Internet applications, emerging standards and broadband applications in the entertainment field, to name just a few," he added.

Tescher brings impressive credentials to the position. Since receiving his Ph.D. in electrical engineering from USC, he has spent more than 20 years in the image and signal processing field as well as in the multimedia field.

His extensive publication record includes compression technologies for commercial and space applications as well as other areas of signal processing. Tescher is co-inventor of several teleconferencing systems and co-author of related key patents, which define in part the Joint Photographic Experts

(Please turn to page 8)

DARPA contracts for augmented reality development

IMSC's augmented reality technology will be further developed and refined for the nation's armed forces under a new contract with the Defense Advanced Research Projects Agency (DARPA).

Commanders will be able to track the exact location of individual troops in the field once the technology is fully developed, according to Prof. Ulrich Neumann.

And the soldiers in the field could see very specific, computer-generated overlays that relate spatial information about enemy position and firepower.

While augmented reality technology development at IMSC has focused on indoors applications, DARPA wants the technology to function outdoors—a much more complex undertaking, according to Neumann. He pointed out that motion-tracking challenges are much greater outdoors than indoors due to the

range of motions possible and the unprepared and unpredictable nature of the environment

Additionally, through a six-month feasibility demonstration project, DARPA is interested in further development of IMSC's facial animation technology.

Neumann said the goal of this project is to extract human facial emotion and appearance as expressed on a two-dimensional video and convey it faithfully on a three-dimensional human facial model or avatar.

The avatar face would deform automatically. When the person smiles or frowns on the video, the avatar would closely mimic the observed facial skin movements. A two-dimensional video would be transformed into a startlingly lifelike, three-dimensional avatar that fully resembles the person and faithfully recreates the emotions expressed in the video.

Boeing and NASA choose augmented reality . . .

(Continued from page 1)

technology, "There is significant potential for the eventual development of applications for the assembly and maintenance of Boeing products."

When fully developed in several years, the augmented reality technology would allow a worker to see an aircraft fuselage covered with "virtual" markings, or annotations, that indicate where to drill holes, how to place different assemblies in position, and other instructions, according to Prof. Neumann, an IMSC Research Associate Director and Assistant Professor of Computer Science.

"A future worker using augmented reality technology will spend less time poring over unwieldy blueprints or studying voluminous, detailed written instructions describing such things as the proper sequence of fitting together parts of an assembly. The worker will just look at the fuselage and see virtual annotations appearing in the correct position for drilling or assembly," Neumann said.

The annotations would be projected on the fuselage with exacting precision using tracking technology while allowing a worker to view the fuselage from different angles. The technology could even show an animated graphic of pieces fitting together to produce a finished assembly, thus vividly demonstrating the proper step-by-step assembly sequence of when each part should be put in place.

NASA envisions using augmented reality technology to assist astronauts in carrying out maintenance tasks on the spacecraft. Boeing will also be involved in this project for NASA, working as a subcontractor to IMSC as the prime contractor.

As envisioned in the NASA project, astronauts would videotape the parts of the spacecraft needing repair and transmit the video data back to earth. Boeing would then use the augmented reality software to add annotations, and the enhanced video would be sent back up to the astronauts. NASA would also use the technology for crew training exercises.

IMSC Press . . .

(Continued from page 7)

Group (JPEG) and Motion Picture Experts Group (MPEG) transmission standards.

He serves as U.S. Head of Delegation to SC 29, the international standards body for the coding of audio, picture, multimedia and hypermedia information. SC 29 and its subgroups are the premier industrial groups developing the entire range of compression/multimedia technologies for broadcast, mobile, Internet and related major application fields.

Tescher has received the Edward Rhein Prize from Germany's Edward Rhein Foundation and the Gold Medal and Governors' and President's Award of the International Society for Optical Engineering (SPIE) in recognition of his contributions to image and video compression technologies.

He is a Fellow and Life Member of SPIE as well as a Past Director and Past President of that organization. He is also a Fellow of the Optical Society of America.

Tescher invited contributions to IMSC Press and said he can be contacted by



IMSC RESEARCH FAIR ATTRACTS CROWD—In parallel with SIGGRAPH '99, the annual conference of the Association for Computing Machinery's subgroup for graphics, IMSC sponsored a Research Fair on August 10 attended by about 200 people who viewed 18 demonstrations of IMSC's latest technologies. SIGGRAPH was held at the Los Angeles Convention Center, just a few miles from the USC campus.

email at andy.tescher@lmco.com or by phone at (408) 734-6725. He stressed that contributions are not limited to

IMSC investigators, but can be submitted for consideration by any specialist in the multimedia field.

Integrated Media Systems Center
University of Southern California
3740 McClintock Ave., Suite 131
Los Angeles, CA 90089-2561

First Class
U.S. Postage Mail
University of
Southern California

