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Director's Message

National Science Foundation renews IMSC

I am extremely pleased to announce that the National Science Foundation (NSF) has approved the five-year renewal of IMSC as an NSF Engineering Research Center. NSF approved base funding for the Center of \$14.2 million over the next five years and supplemental funding of \$500,000 for equipment and \$415,000 for a new research project in the area of collaborative engineering education environments.

I would like to congratulate IMSC's faculty investigators, staff and students for their unswerving commitment to excellence and determination to succeed that have resulted in IMSC's five-year renewal.

We are moving forward rapidly with a reenergized commitment to lead in the fast developing multimedia industry.

Last month, our work was spotlighted by Cable News Network for its worldwide audience on its Moneyline program in a report on the future of the Internet. For the taping, correspondent Willow Bay spent several hours touring our labs and talking with me, IMSC investigators and students. CNN camera crews spent a day and a half taping IMSC demonstrations.

I would like to welcome two new

faculty investigators—Dr. Mathieu Desbrun, Assistant Professor of Computer Science, and Dr. Joao Hespanha, Assistant Professor of Electrical Engineering-Systems. Prof. Desbrun comes from the California

Institute of Technology, where he was a post doctoral fellow. He received his Ph.D. from the National Polytechnic Institute of Grenoble, France. His area of expertise is computer graphics, and
(Please turn to page 8)



CNN SPOTLIGHTS IMSC—Correspondent Willow Bay (center) reported how IMSC's technologies will affect the future of the Internet on CNN's Moneyline on January 19. IMSC Director Chrysostomos L. (Max) Nikiakos (right) hosted her visit. IMSC key investigators demonstrating the Center's technologies included (from left) Prof. Gerard Medioni, Prof. Ulrich Neumann and Prof. Chris Kyriakakis.

Motorola will develop IMSC technologies at headquarters labs

In a major technology transfer success, IMSC will supply immersive technologies to Motorola for developmental use at its headquarters laboratories in Schaumburg, IL.

Technology for generating head and face models from stereo image pairs, for performance-driven facial sensing and animation, and for Immersive Audio™ will be used by the giant information technology firm, a new IMSC senior partner.

“Motorola has a very concrete vision of how these technologies could evolve into the products of the future. They have an established interest in it,” said Dr. Ulrich Neumann, IMSC Associate Director for Research in computer interfaces.

“The core work at IMSC in these areas overlaps very well with our interest in developing systems for creating visually realistic communication environments,” according to Kevin Jelley, Director of Motorola's Visual Communication and Display

(Please turn to page 8)

Inside IMSC News

- FCC grants experimental license 2
- Compaq sees benefits 2
- Hatamiya speaks to MUA grads 3
- IMSC uses NXT's technology 4
- IMSC assists armed forces 4
- Commercialization pursued 5
- IMSC welcomes new partners 5

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FCC grants experimental UWB radio license

In a major step to move ultrawideband (UWB) radio technology forward, IMSC key investigator Dr. Robert Scholtz was granted an experimental license by the Federal Communications Commission (FCC) in November to conduct tests outside the confines of the laboratory.



Robert Scholtz

At the same time, several companies, including IMSC partner Time Domain of Huntsville, AL, were granted waivers to further experiment with the technology.

The license and waivers were the first approvals that the FCC has given for expanded use of new UWB technology.

“The FCC is giving all involved a

chance to prove this new technology,” said Scholtz, who is also Chair of USC’s Electrical Engineering-Systems Department and heads the UltRa Lab, which investigates UWB technology.

IMSC has been in the forefront of developing UWB technology, which uses pulses of radio energy rather than radio waves to transmit information wirelessly in a digital form, offering a broad range of possible applications, from wireless voice and high-speed data communications to advanced radar systems. Ultrawideband radio could offer extremely low-power communications systems that tend to penetrate physical objects, are almost immune to eavesdropping, can tolerate significant levels of interference, and can eliminate many forms of multipath fading.

In 1998, IMSC organized a workshop on UWB technology that

served as a catalyst for focusing private industry concerns on restrictive regulations by the FCC. A working group of firms in the field was formed after the workshop and has been lobbying to change restrictive FCC regulation that has hindered research and commercialization of UWB systems.

Under the four-year license, Scholtz will report his results to the FCC every year. He plans to conduct propagation tests, ranging tests and radio communications experiments.

“The license allows us to transmit low-power UWB signals in a fairly complete variety of environments in the Los Angeles area since we can work anywhere within 24 kilometers (about 15 miles) around the USC campus. We can find out how the signals propagate in the mountains, fields, suburbs and the ocean.”

Compaq benefits from IMSC’s FCC UWB license initiative

IMSC’s inroads in wireless communications, including the Federal Communications Commission’s (FCC) recent issuance of an ultrawideband (UWB) radio experimental license, are of special interest to IMSC senior partner Compaq Computer Corp., according to Dr. Bob Iannucci, Compaq’s Vice President of Corporate Research.

“I think IMSC has made important gains. We believe that research on fundamental issues in wireless data communications is critical,” he said.



Bob Iannucci

Based in Palo Alto, Iannucci directs Compaq’s Corporate Research Division, which includes the firm’s Systems Research Center, Western Research Laboratory, Palo Alto Advanced Development Group, Cambridge Research Laboratory and Software Engineering Group in Australia.

IMSC key investigator Dr. Robert Scholtz said of the UWB radio work for Compaq, “We are formulating propagation tests to determine the ability of this technology to support a large number of radios operating simultaneously in a campus environment.”

Iannucci, a member of IMSC’s Scientific Advisory Board, praised IMSC’s efforts in convincing the FCC to agree to increase the experimental use of UWB technology.

In regard to IMSC’s planned propagation tests, Iannucci said, “We are interested in the fundamental research issues of how UWB technology deploys on a large scale and in considering issues that arise when it is broadly deployable.”

Iannucci also pointed out that IMSC researchers are working on developing an infrastructure to simulate, construct and test small ultrawideband antennas for Compaq.

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Demetrios Boutris (center), Secretary of Legal Affairs and Counsel to California Governor Gray Davis, met with IMSC Director Chrysostomos L. (Max) Nikias (left) and School of Engineering Dean Leonard Silverman (right) when he visited the Center in January to present a commendation by Gov. Davis to Dr. Nikias. Gov. Davis lauded Dr. Nikias, saying that for 23 years he has set the standard for excellence in engineering design, research and teaching. He commended Dr. Nikias and IMSC for helping California successfully meet the challenge of the new millennium through cutting-edge research.

California Trade Secretary addresses MUA graduation

Lon Hatamiya, Secretary of the California Trade and Commerce Agency, gave the commencement address on November 4 to the third class of the Multimedia University Academy (MUA), an IMSC community outreach program that trains at-risk, inner-city youth in multimedia technologies.

Secretary Hatamiya warmly congratulated the graduates for their achievement and told the class: "Multimedia is a key engine for tomorrow's global economy, with applications in a number of new and emerging industries, and continued prosperity in California will require workforce training in this arena."

Eighteen students graduated from this latest 20-week, 20-hour per week program, bringing the total number of MUA graduates to 43.

"We are honored that Secretary Hatamiya saw fit to visit the Center for the second time and address our MUA graduates," said IMSC Director Chrysostomos L. (Max) Nikias.

"Under Secretary Hatamiya's leadership, the state Trade and Commerce Agency has given tremendous encouragement to the

growth of multimedia as an engine for the State's economy. He has facilitated multimedia technology transfer activities and supported the concept of programs, such as MUA, that provide employers with skilled multimedia specialists," Nikias said. IMSC is putting to work a \$250,000 grant awarded last year by the Trade and Commerce Agency.

The MUA program offers the youth an opportunity to pursue engineering and computer science careers by providing training in computing, multimedia and design and encouraging further education and career development.

This third program was funded in part by a grant from the Pacific Asian Consortium in Employment (PACE), a non-profit, community-based organization in Los Angeles that provides community development, workforce development and education. Kerry Doi, PACE's Executive Director, also addressed the graduates and praised their hard work and commitment. The National Science Foundation also contributes funding to support the MUA program.

Nearly all of the MUA graduates are working full-time or part-time for multimedia or computer-based companies and/or are attending community college.

Not only do MUA students learn to use industry-standard multimedia software to create CD-ROMs, videos, presentations and other products, but they also receive assistance to upgrade their academic skills in writing, math and other relevant subjects.

They also follow a core skills program that teaches successful strategies in learning, test-taking, teamwork, self-regulation, business management and conflict management.



Secretary Lon Hatamiya



STATE GOVERNMENT VISIT—Representatives from state government visited IMSC last September to view the Center's activities. From left are Isaac Maya, IMSC; Donna Garten, Association of Independent California Colleges and Universities; Ann Spurgeon, IMSC; Chrysostomos L. (Max) Nikias, IMSC; Kristen Soares, USC; Jeff Brown and Patty Quate, California Senate Office of Research; Buzz Breedlove, California Legislative Analyst's Office; Elizabeth Kersten, California Senate Office of Research; and Sue Lewis, IMSC.

Compaq . . .

(Continued from previous page)

He said the company is interested in the development of small UWB antennas because "increasingly computers will look more like appliances and less and less as computers do today. Part of that would be the wearable computer, an unobtrusive computer that would go in a coat pocket, for example."

Iannucci said that IMSC has also been helpful in introducing Compaq to potential partners in exploring research issues.

Iannucci praised IMSC's approach in industry collaboration and technology transfer. "I think IMSC's approach is a forward-looking, healthy and positive one that mirrors Compaq's approach of integrating the research and product development areas. Gone are the days of segregating research, product development and marketing."

IMSC uses NXT's technology for immersistation

IMSC has developed a second "immersistation" for advanced teleconferencing, using a new kind of projection panel that not only displays the picture but also projects the sound directly from the panel.

Produced by IMSC senior partner NXT of London, England, this flat panel loudspeaker system "has the unique advantage of perfectly matching picture with sound, even as local and remote participants move," according to IMSC key investigator Prof. Chris Kyriakakis.

IMSC's three-panel display allows a local participant to communicate with three remote participants at the same time.

With the new technology, the voice of a remote participant comes directly from his or her mouth as seen on the panel, rather than from the loudspeaker that is used in common teleconferencing systems, adding a much-enhanced sense of realism.

Kyriakakis said that IMSC investigators are experimenting with digital signal processing to further enhance the sound from NXT flat panel speakers.



IMSC's NEWEST IMMERSISTATION—IMSC's second immersistation uses a flat panel loudspeaker system from senior partner NXT, London, England.

Henry Azima, NXT's Chief Technology Officer, said that NXT's flat panel technology is "particularly well-suited for use in IMSC's cutting-edge research in this area." He pointed out that NXT's collaboration with IMSC

has involved "a productive exchange of ideas" that included a week-long visit by NXT's Chief Scientist Neil Harris to the Center last summer to work on modeling and implementation aspects of the new immersistation.

IMSC assists in armed forces transportation project

When U.S. armed forces are directed into action, the U.S. Transportation Command is responsible for their transportation, and IMSC has recently signed up to help develop a Command Center of the Future to make the job easier.

The joint service Command, known as USTRANSCOM, provides air, land and sea transportation for the Department of Defense in times of war and peace via the nation's Defense Transportation System.

Through USTRANSCOM, the Army, Navy and Air Force work together under a single commander to carry out transportation tasks.

In addition to providing transportation support to military operations, USTRANSCOM provides almost daily support to humanitarian efforts.

IMSC will provide assistance to USTRANSCOM in improving information technology at its headquarters Military Command Center at Scott Air Force Base in Illinois.

IMSC is conducting this project for the Center for the Commercial Deployment of Transportation Technology (CCDoTT), which is jointly sponsored by USTRANSCOM and the Maritime Administration of the U.S. Transportation Department.

"CCDoTT believes that IMSC has ongoing multimedia technology development that will revolutionize the way com-

mand and control is done in the future in both the military and commercial arenas," according to Keith Seaman, Chief of the Concepts and Technology Team at USTRANSCOM.

For the project, IMSC investigators will develop a system that integrates three-dimensional sound and visual technologies for immersive environments, media communications and interactive information management to meet the Command Center requirements.

IMSC will coordinate work with the Air Force's Rome Lab in Rome, New York, which is leading the improvement effort.

An IMSC team traveled to USTRANSCOM's headquarters in Illinois for two days late last year to view Command Center operations and learn about the needs. The five-month project will be completed during the first half of this year.

The IMSC team, led by Project Manager Roger Zimmermann, will develop plans for near-term improvements in two years and farther-term advances in five years. Dr. Zimmermann is IMSC's Media Immersion Environment Research Coordinator.

The team will provide an overall vision of the Command Center of the Future, prepare technology development roadmaps, ensure that the information technology can be integrated with other DoD systems and prepare plans for the necessary operational hardware, among other tasks.

Technologies showcased to SAB for commercialization

IMSC's rapidly developing technologies were showcased at the Center's Scientific Advisory Board (SAB) fall meeting last October at Lockheed Martin's Interactive Technology Center in Sunnyvale.

As part of IMSC's technology transfer and commercialization process, the Center's investigators presented selected technologies to SAB members and others in their companies with responsibilities in business development, marketing and technology licensing.

The SAB is composed of representatives of IMSC's corporate partners who meet semi-annually to review the Center's research, education, industry and outreach programs.

Highlighted at the Board's meeting were Immersive Audio;TM X-Stream Studio, a powerful object oriented, open-source system for interactively analyzing, editing, compositing and rendering visual media; ILearn Technologies, interactive three-dimensional visualization software for education; and data compression technologies.

SAB members had praise for the commercialization thrust of the meeting. "The meeting was excellent," said Doug Smith, Manager of Eastman Kodak's System Concepts Center in Palo Alto. "The integration of technology presentations with representative business case assessments was most valuable and provided a good means of calibration. It helped me understand how the technologies being presented could be leveraged into potential market opportunities."

Anthony Majoros, Senior Engineering Scientist for Boeing's Phantom Works Division in Long Beach, pointed out that the presentations by IMSC investigators geared to potential commercialization were "practical and salient."

Warren Sterling, Director of Multimedia Projects, Parallel Systems, of NCR in El Segundo, said that he was "particularly impressed by the emphasis on commercialization and business planning" since NCR "looks to IMSC

for innovative technology to enhance our parallel object relational database technology." He said the presentations demonstrated to him that IMSC investigators "keep commercialization in mind as they complete research studies, greatly improving the prospects of successful technology transfers from IMSC to industry."

Carolina Blake, Chief of the Commercial Technology Office of NASA's Ames Research Center in Moffett Field, characterized the presentations as "very informative."

NASA Ames has offered to host the fall SAB meeting in Silicon Valley again.

Isaac Maya, IMSC's Director of Industry and Technology Transfer Programs, said that IMSC's successful industry-researcher collaborations in technology development have been a cornerstone of the Center's success as a National Science Foundation Engineering Research Center and a key to its continued success in technology transfer. He said that technology transfers to member companies provide a measure of success in this area, pointing out that 22 significant technology transfers during the Center's first three years have resulted in significant benefits for IMSC's partners.

IMSC welcomes nine new partners

IMSC welcomes the following nine new partners coming on board these past few months, according to Isaac Maya, Director of Industry and Technology Transfer Programs.

—Geometrix, a Silicon Valley company focused on developing and marketing software-based systems that automatically generate 3D simulation models of real-world objects and scenes, that is working on automated reconstruction of complex urban scenes from imagery of the scene.

—The Global Theatre, a Los Angeles broadband entertainment-on-demand service company, that is investigating IMSC technologies for network architecture and video server optimization.

—Hitachi, the worldwide consumer electronics company, that is investigating low cost implementation of emerging video compression algorithms applicable to multimedia consumer products.

—in4network, inc., a Seattle-based Internet entertainment and information company, that has licensed Immersive AudioTM for use on the Internet.

—Motorola, a global leader in providing integrated communications solutions and embedded electronic solutions, that is interested in technology transfer in the areas of head and face models from images, performance driven facial expression sensing, modeling and animation, and Immersive Audio.TM

—Procom Technology, Inc., a leading manufacturer of server appliances and a pioneer in the development of Network Attached Storage technology, that provides some of its advanced technology products for use in IMSC's Media Immersion Environment.

—Rockwell Science Center, a world leader in industrial research for over 35 years and Rockwell's corporate research laboratory since 1962, that is interested in collaborating with IMSC on defense projects.

—SciTekMedia.com, a San Diego-based educational program company focused on delivering fundamental science and technology courses for decision-makers in today's fast paced technology business climate, that is interested in working with IMSC researchers to bring multimedia concepts and technologies to its non-technical audience.

—U.S. Transportation Command (USTRANSCOM), the Department of Defense command that provides air, land and sea transportation, that is working with IMSC researchers to develop a Command Center of the Future for efficiently managing its transportation assets.

BOC provides counsel at second annual meeting



BOC member Adam Clayton Powell III, The Freedom Forum, gave the keynote address at the BOC's annual meeting.

IMSC's Board of Councillors (BOC) provided visionary and strategic counsel to the Center at the Board's second annual meeting in November.

The day-long gathering was convened by BOC Chairman Dr. Karl Weiss, Vice Chairman of the Massachusetts Technology Park.

The BOC, which is comprised of high-level executives chosen for their extensive experience and expertise in the multimedia field, provides assistance to IMSC in identifying new

developments in current multimedia application areas and technologies. BOC members come from many diverse organizations in such areas as computer software and hardware development, manufacturing, research and development, aerospace, film making, journalism and academia.

BOC member Adam Clayton Powell III, Vice President of Technology and Programs at The Freedom Forum, a major journalism foundation headquartered in Arlington, VA, gave the keynote address. In his speech, entitled "News in 3D: Free Expression in New Media as New Media Go Immersive," Powell said that news organizations should be careful to ensure that the news in upcoming 3D immersive environments is produced by those well grounded in the issues of ethics and free expression. He warned that, unless news organizations take care in preparing these "information architects" they hire to produce the news, First Amendment considerations could be subordinated.

In discussing multimedia issues, BOC members each attended one of three breakout sessions, "IMSC Research and Current Technology," "Human Factors in Integrated Media Systems Development and Applica-

tions" and "Arts, Social Science and Entertainment as Seedbeds of New Integrated Media Research Thrusts and Applications."

The deliberations were summarized in a panel discussion by the breakout discussion leaders—Dr. James Baker, President of FX Palo Alto Laboratories, and Dr. Arthur Chester, President of HRL Laboratories for "IMSC Research;" Dr. Sheldon Baron, BBN Systems, and Ms. Barbara Sampson, President and CEO of TERC, for "Human Factors;" and Mr. Jeff Galnick, Executive Vice President of CNN Financial News Network, and Dr. Ronald Jones, Professor at Columbia University, for "Arts, Social Sciences and Entertainment."

Discussion in the "Research" session included such ideas as IMSC sponsoring a meeting of multimedia researchers from across the nation to discuss their work and the Center using the Media Immersion Environment (MIE) testbed to become a neutral tester and honest broker to test technologies of the others in the integrated media systems area.

In the "Human Factors" session, it was suggested that IMSC consider both the broad issues of experimental

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BOC BREAKOUT SUMMARY PANEL—Breakout discussion leaders presented discussion summaries at the end of the BOC's second annual meeting. From left are Dr. Ronald Jones, Columbia University; Mr. Jeff Galnick, CNN Financial News Network; Dr. Sheldon Baron, BBN Systems; Ms. Barbara Sampson, TERC; and Dr. James Baker, FX Palo Alto Laboratories. Dr. Arthur Chester, HRL Laboratories, was also a panelist.

IMSC News

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IMSC participates in Science & Technology Week

IMSC actively participated in California's first Science and Technology Week in November.

IMSC Director Chrysostomos L. (Max) Nikias was a panelist on two discussion panels, one hosted by IMSC on the USC campus on "Cross-Border Partnerships for Growth of High-Tech Industries" and the other at the California Science Center in Los Angeles on the emergence of Southern California as a leader in new media.

The two panels were organized by the California Council on Science and Technology (CCST), a leading partnership of academia, industry and government that identifies ways the fields of science and technology can contribute to the improvement of the state's economy. Nikias is a member of CCST.

The panel on cross-border partnerships was co-chaired by Susan Hackwood, CCST Executive Director, and Fernando Niebla, Chairman of Infotec and CCST Fellow. Other panelists on the international panel were Gordon Bourns, President, Bourns, Inc.; Alejandro Cruz, President, Costa Rica Institute of Technology; Fabian Garcia, Chief, Automation Division, Research Institute in Applied Mathematics and Systems (IMAS), Ensenada; Guillermo Fernandez de la Garza, Executive Director, U.S.-Mexico Foundation for Science, Mexico; Francisco Mendieta, Director, Scientific Research Center, Ensenada; and Luis Pineda, Chief of Sciences, Computation Division, IMAS.



PANEL ON NEW MEDIA—IMSC Director Chrysostomos L. (Max) Nikias (second from left) discussed how Southern California is emerging as a leader in new media on this panel during Science and Technology Week in November. The panel was moderated by Rohit Shukla (at podium), President, Los Angeles Regional Technology Alliance. Other panel members were (from left) Jon Goodman, Executive Director, EC2, Annenberg Center for Communication; Al Pappano, Manager, Commercial Development, Jet Propulsion Laboratory; Paul Jennings, CCST Council Chair and Professor, California Institute of Technology; Charles Harper, President, Sierra Monolithics, and IMSC Scientific Advisory Board member; and Lee Harrington, President, Los Angeles Economic Development Council.

BOC meeting . . .

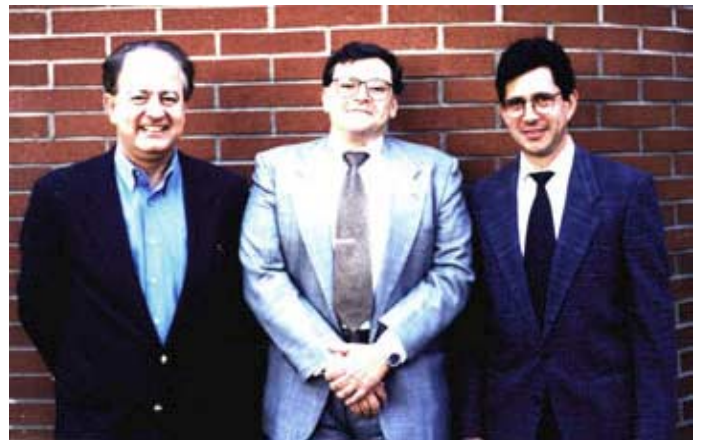
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psychology as well as the narrow issues, such as how to acquire useful data on human interaction. The MIE was seen as a valuable testbed in psychological research because it is integrated and the levels of perceptual stimulation can be controlled.

In the "Arts, Social Sciences and Entertainment" session, discussion focused on several ideas, including suggestions that IMSC develop immersive storyboarding for movie making and television in which the director and writer could walk through scenes in a virtual environment and that the Center set up studios for hobbyists in the field to evaluate IMSC's technologies and make recommendations.

Dr. Andrew Tescher, the new Editor of the IMSC Press and Chairman of IMSC's Scientific Advisory Board, told BOC members that he plans to develop IMSC Press as a major forum for academic publishing in multimedia.

BOC members also toured IMSC labs and spoke with IMSC investigators and students.



NEW SAB MEMBER—Marius S. Vassiliou (center), Director, Information Technology, Rockwell Science Center, Thousand Oaks, CA, visited IMSC in December and delivered the firm's annual contribution. Rockwell Science Center recently became an IMSC partner. IMSC Director Chrysostomos L. (Max) Nikias (left) and IMSC Director of Industry and Technology Transfer Programs Isaac Maya met with Dr. Vassiliou.

IMSC participates in workshop



IMSC IN TAIWAN—IMSC participated in a workshop on multimedia in Taipei, Taiwan, last September sponsored by the Institute for Information Industry (III). From left are Dr. Jyh-Sheng Ke, Vice President, III; Prof. Gerard Medioni, IMSC; IMSC Director Chrysostomos L. (Max) Nikias; Gen. Yun Kuo, President, III; Prof. C.-C. (Jay) Kuo, IMSC; Dr. Chien-Kuo Lo, Science Advisor, Ministry of Economic Affairs; and Dr. Frank Lin, Director, Communication System Division, Industrial Technology Research Institute.

Director's message . . .

(Continued from page 1)

his research interests include discrete surfaces, computer animation and simulation. Prof. Hespanha, who received his Ph.D. from Yale University, specializes in tracking methods for augmented reality and haptics.

We are making excellent progress in our industry collaboration and technology transfer programs. In the past few months, nine new partners have joined IMSC, and we have signed nine more licensing agreements. The new partners are Geometrix, The Global Theatre, Hitachi, in4network, Motorola, Procom Technology, Rockwell Science Center, SciTekMedia.com and the U.S. Transportation Command. (See page 5 for details on IMSC's new partners.)

At an IMSC retreat on January 28, we discussed a restructuring of IMSC's research program to respond to the fast-evolving multimedia industry. This restructuring will be reflected in IMSC's Annual Report to NSF this spring.

I anticipate this next year as a particularly active one for IMSC, and I am enthusiastic about the Center's momentum to continue a leadership role.

Motorola . . .

(Continued from page 1)

Laboratory. Jelley pointed out that "with the IMSC technology, we get a baseline capability the first year—a virtually shrinkwrapped package—to use as learning tools and for demonstration to our management and potential customers."

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