

# InterConnections

A Report on Interdisciplinary Computing at the  
University of Maryland Institute for Advanced Computer Studies

## University Forges a Major New Partnership with the Laboratory for Telecommunications Sciences

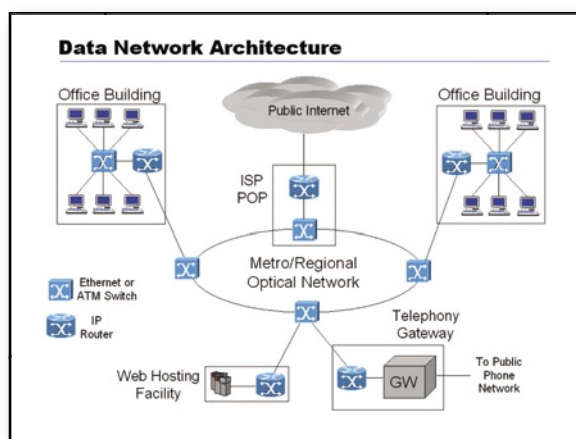
The University of Maryland, through UMIACS, has entered into a new partnership with the Department of Defense Laboratory for Telecommunications Sciences (LTS), which will enable major research collaborations between the Maryland faculty and the LTS researchers in the general area of networking and telecommunications. These collaborations will also include active participation of researchers from the private sector in various research programs, and will be complemented with outreach activities that include the organization of workshops and seminar series in focused topical areas to be selected annually.

The initial collaborations will be structured around five major projects in active network management, active systems security management, economics of communications technologies, wireless networking, and optical networking. These projects will draw on the talents of researchers from UMIACS, Computer Science, Electrical and Computer Engineering, Business School, Institute for Systems Research, and the University of Maryland at Baltimore County. Prof. Joseph Jaja (UMIACS/Electrical & Computer Engineering) will be the overall PI of this partnership. Brief outlines of next year's projects are given next.

### Active Network Management

As IP networks grow larger and more complex and the number of services and applications continue to increase at a very high rate, network management is becoming an extremely challenging problem whose solution seems to be well beyond current techniques and methodologies. Research in this area is organized under

the following efforts: (1) development of active network management techniques led by Professors Mark Shayman (Electrical & Computer Engineering/ISR) and Bobby Bhattacharjee (Computer Science/UMIACS); (2) use of stochastic control techniques to obtain good policies for traffic engineering led by Professors Mark Shayman and Steven Marcus (Electrical & Computer Engineering/ISR); (3) development of a simulation and experimental testbed led by Prof. Bobby Bhattacharjee; (4) development of integration strategies with the optical layer led by Prof. Ray Chen (UMBC); and (5) investigation of the interactions between active network management control actions and multiprotocol label switching network stability led by Prof. Richard La (Electrical & Computer Engineering/ISR).



### Active Systems Security Management

Led by Professors William Arbaugh (Computer Science/UMIACS) and Virgil Gligor (Electrical & Computer Engineering), this project will develop techniques to quantify the risks associated with operating a given system at a specified level of

*continued on Page 2*

## UMIACS Faculty win Two ITRs

Two projects led by researchers in UMIACS were among the few projects that the National Science Foundation (NSF) selected for its medium-sized Information Technology Research awards. Faculty in the Human-Computer Interaction Laboratory will develop an International Children's Digital Library, while researchers in the Perceptual Interfaces and Reality Laboratory will focus on a customizable audio user interface for the visually impaired.

More information about these two projects can be found on pages 6 and 7 of this issue of *InterConnections*. ☺



### Inside this issue

2	Message from the Director	9	Faculty News
3	UMIACS in the Media	10	In Short . . .
4	Research Updates	11	Workshops & Conferences
6	Highlights of New Projects	12	Awards
8	New UMIACS Faculty		



## Welcome to the Spring 2002 Issue of *InterConnections*

I am especially pleased to welcome you to this particular issue of *InterConnections*, which covers a number of new major research programs recently established in UMIACS. These programs significantly broaden the scope of our activities and illustrate the new synergies that UMIACS continues to foster between computer science and other disciplines across the College Park campus.

Our front-page article describes a new multifaceted long-term partnership between the University of Maryland and the DoD Laboratory for Telecommunications Sciences (LTS). I am quite excited about this partnership that also involves collaboration with researchers from the private sector. In fact, the broad set of collaborative research activities undertaken under this partnership alone are broader than those covered by a typical university center! In addition to the UMIACS faculty in Computer Science and Electrical and Computer Engineering (ECE), a significant number of other faculty from ECE, ISR (Institute for Systems Research), Business, and UMBC (University of Maryland at Baltimore County) will also be involved in the joint activities under this partnership.

I am pleased to report on the establishment of a new laboratory in UMIACS, Perceptual Interfaces and Reality Laboratory (PIRL), which will broaden our already very strong HCI and computer vision activities to encompass human computer interaction using all modalities of human perception. The initial focus of the lab will be on the auditory modality. The Director of the lab will be Dr. Ramani Duraiswami. I would like to take this

opportunity to congratulate Ramani on assuming this new role and also on receiving a new NSF ITR (Information Technology Research) award aimed at creating audio user interfaces for the



visually impaired. Some details about this project are included in this issue. Congratulations are also in order to Dr. Allison Druin who will be leading another new ITR project aimed at establishing an international digital library for children. This new exciting project will develop new technologies, especially tailored for children, to build a digital archive consisting

of a rich collection of children's books from a large number of countries.

I am delighted to welcome our two new computer science faculty, Drs. Lise Getoor and Liviu Iftode, who joined us this past January. I am confident that you will be hearing some wonderful news about their accomplishments in future issues of *InterConnections*.

I hope that you will enjoy reading this issue of *InterConnections* and look forward to your continued interest in the UMIACS' activities.

Joseph Jaja

---

## Partnership with Laboratory for Telecommunications Sciences

*Continued from Page 1*

security. In particular, the investigators intend to develop models and methods for quantifiably assessing the resources, ability, and motivation of an attacker, and to design and implement an independent auditor running on an embedded processor.

### Wireless Networking

The faculty involved under this research area include Professors Ashok Agrawala (Computer Science/UMIACS), William Arbaugh, A. Udaya Shankar (Computer Science/UMIACS), and Joseph Thomas (UMBC). This project covers a broad range of research topics including the following: (1) ad-hoc network protection; (2) wireless local area networks; (3) traffic engineering across the wireless core network; and (4) development of efficient techniques for achieving reliable multimedia packet transmission.

### The Economics of Communications/Networking Technology

The research programs in this area are led by Business faculty Professors Larry Gordon, Martin Loeb, Joseph Bailey, and S. Raghavan and will be focused on developing methodologies to gain insights into the economic pull for telecommunications and networking technologies. These efforts will be enriched by a sig-

nificant number of case studies to better understand the business case for these technologies to exist. Some of these studies will analyze the impact of pricing strategies and the economic effect of information security breaches. We should note that earlier work by the investigators along these lines has received almost immediate national attention because of the novelty of the approach and the timeliness of the overall topic.

### Optical Networking

Data and channel rates in point-to-point laboratory demonstrations have reached impressive values over long distances. The challenge is to realize these rates in operational networks especially high performance optically switched networks. The goal of this project, led by Professors Gary Carter and Joel Morris, both at UMBC, is to identify, characterize, and mitigate where possible the impairments that limit the data rates on real networks. A combination of experiment and theory will be used to help identify robust network designs at higher data rates. ☺



## Washington Post Focuses on HCIL

**A** May 9, 2002 *Washington Post* story about the Human-Computer Interaction Laboratory (HCIL) began a push of coverage about the lab in the paper. The article, which focused on the importance of visualization in interface design, featured Professors Ben Shneiderman (Computer Science/ISR/UMIACS) and Ben Bederson (Computer Science/UMIACS). The story pointed to many tools developed in the lab, including PhotoMesa, TimeSearcher, and Fisheye Menus.

Also on May 9, Shneiderman and Bederson joined Prof. Allison Druin (Education/UMIACS) as part of an online chat on [washingtonpost.com](http://washingtonpost.com). The faculty members answered readers' questions about their work and the future of HCI.

On May 12, Bederson co-authored an op-ed about the future of electronic voting in Maryland. Based on research with new voting systems, the piece urged officials to fine-tune these tools and educate voters on their use. 📄

## Hendler on MPT and in BusinessWeek

**O**n November 27, 2001, Maryland Public Television's "Direct Connection" interviewed Prof. James Hendler (Computer Science/UMIACS) for a special program on artificial intelligence. Hendler answered questions from the host and viewers about a wide range of topics, including defining artificial intelligence, robots, and HAL from *2001: A Space Odyssey*. The program aired in conjunction with the broadcast of "2001: HAL's Legacy" on the PBS television show "Nova."

Hendler also was featured in an article about the Semantic Web in a March 4, 2002 *BusinessWeek* article. The next step in the evolution of the World Wide Web, the Semantic Web will feature pages tailored to give "meaning" to the data available on the Internet. Intelligent agents will be able to scour the Semantic Web and improve locating pertinent information. 📄

## Weinberg and Doermann Discuss Machine Translation on NPR

**O**n May 3, 2002, National Public Radio's "All Things Considered" interviewed Prof. Amy Weinberg (Linguistics/Computer Science/UMIACS) and David Doermann (UMIACS) about the state of the art in machine translation. Weinberg and Doermann are co-directors of the Language and Media Processing (LAMP) Laboratory.

In the interview, Weinberg pointed to the difficulty in obtaining more precise translations since current programs do not understand a foreign language's syntax. Doermann noted that difficulties also occur with documents, as tears and dirt can confuse the character-recognition systems. 📄

## Arbaugh Uncovers More Wireless Security Issues

**A** number of recent news stories covered Prof. William Arbaugh's research, which has uncovered serious flaws in the newest wireless security protocol, 802.1x. First appearing in an article in *InfoWorld* and CNN.com (February 14) Arbaugh's research was also the topic of a February 21 article in *BusinessWeek*. A May 21 article in *Internet.com* also cites Arbaugh's work in discussing decisions by retail stores to suspend the use of mobile cash registers due to security concerns.

With graduate student Arunesh Mishra, Prof. Arbaugh (Computer Science/UMIACS) published a paper analyzing the new security standards. Their research points to two potential methods of attack which exploit weakness in the 802.1x security protocol. 📄

## New York Times, Wired Feature Oard's ITR Project

**B**oth the *New York Times* (October 25, 2001) and *Wired* (October 22, 2001) have covered a new project that aims to improve access to large, multilingual collections of recorded speech in oral history archives. Prof. Doug Oard (Information Studies/UMIACS) is the Maryland PI for the Multilingual Access to Large spoken ArCHives (MALACH) project.

Working with researchers at the Survivors of the Shoah Visual History Foundation, IBM, and The Johns Hopkins University, the Maryland team will develop speech recognition technology to speed the cataloging and indexing of the more than 116,000 hours of videotaped testimonies in the Visual History Foundation's archives. More details about the project can be found in the fall 2001 issue of *InterConnections*. 📄

## Shneiderman in Federal Computer Week and on National Public Radio

**P**rof. Ben Shneiderman (Computer Science/UMIACS) was featured in a recent *Federal Computer Week* article about the possible implementation of a national identification card system. As a representative of the Association for Computing Machinery (ACM), Shneiderman testified before the House Government Reform Committee about the complex issues surrounding existing proposals, such as usefulness, stability, and security.

Prof. Shneiderman also appeared on the April 18 edition of National Public Radio's popular program "All Things Considered" to weigh in on the growing trend of companies using customer service phone lines that feature "deceptively human" computer voices. He questioned the value of such systems and cited the failure of previous attempts. 📄



## Language And Media Processing Lab

Our shrinking global village bombards us with information in multiple languages, presented in multiple formats, including text, audio, image, and video. There is a critical need for accurate and timely access to this information. The Laboratory for Language and Media Processing (LAMP) is developing state-of-the-art technology to make this information rapidly available.

Founded in 1996 under a contract from the Department of Defense, the LAMP lab recently received \$2.2 million for a three-year contract to expand its efforts. The current contract extends previous efforts in both low-level analysis and conversion of document image and video content and in multilingual applications.

The core document image and video analysis work remains focused on the problems surrounding access to large, heterogeneous collections.

Document images scanned from low-quality hard copies provide a challenging task for conversion systems, including page segmentation, labeling and optical character recognition. LAMP researchers' recent work has focused on developing a layered representation of a document image that can effectively separate out various layers of the document—including the underlying document content, handwritten annotations, and noise—allowing specialized processing to be applied. Content-based enhancement seeks to further develop technologies by bootstrapping systems into learning about the specific format and layout characteristics and consistencies of each document to improve segmentation and recognition.

Likewise, video analysis efforts are focusing on the ability to provide genre classification via a series of detectors in textual, auditory and visual domains. Although the ultimate goal is to provide indexing and retrieval capabilities, low- and mid-level features are proving useful for distinguishing between both general classes of sports, news and documentaries, for example, as well as the more specific genre of a particular sport or a show with a specific format. Researchers are moving beyond simple frame-based analysis to provide spatial temporal segmentations that can be used directly for indexing. Ultimately, such features can be incorporated into content-based retrieval systems.

Ongoing support of the media analysis work also has continued to facilitate cooperation with a number of UMIACS research groups in both the computer vision and language processing

areas. The lab actively supports evaluation capabilities for activity analysis efforts and has been working with cross-language information retrieval researchers to provide access to both spoken and visual content as part of the MALACH project.

On the language side of LAMP, researchers are expanding previous machine translation work to other multilingual applications including routing of multilingual documents and question answering from source documents in multiple languages.

Routing involves translating large collections of documents in multiple languages with sufficient precision to allow a mono-

lingual English user to ascertain whether a document contains information relevant to a particular topic. Relevant documents would then be passed to either a higher-level translation system or a human for fuller translation.

Question answering involves searching collections of documents for information relevant to an analyst's needs. Finding relevant information requires information retrieval technology. Equally important is the presentation of fluent readable translations. There is a tradeoff however, between presenting something, even for languages where resources such as dictionaries or other analysis tools are scarce, and presenting something

The screenshot displays a complex interface for parsing dictionary entries. It shows multiple columns of text in different languages (English, Hebrew, Chinese, Russian). A legend on the right side of the interface defines various symbols and colors used for segmentation:
 

- Term Position:** Yellow background
- Special Symbol:** Green background
- Font Style:** Blue background
- Pattern:** Red background
- Line Layout:** Purple background

 The entries shown include:
 

- dam** [da:m] n. (dam) (על מים) (dam) (על מים)
- skyscraper** (skrajskrapa) (skrajskrapa) (skrajskrapa)
- dame** [da:m] 1. self lady (a. chert); card, chess: queen; draughts: king; ♀ (young) beetle; rammer; ~ de charité lady visitor; ♀ pl. Ladies (= toilet); ~ d'honneur matron of honor (U.S.); ~ du vestiaire cloakroom (Am. checkroom) attendant, Am. a. barcheck girl; jeu m de st draughts, Am. checkers ~. see instead of
- dague** hunt. [da:ge] m brocket.
- daigner** [de:ne] (1b) v/f. deign (to inf.), condescend (to inf.).
- daim** [de:] m zo. deer; buck; buckskin; en ~ suède [gloves];
- daine** zo. [den] f doe.
- dais** [de:] m canopy.

**LAMP researchers are developing tools to segment information from bilingual dictionaries. Through training, these systems can parse the segmented entries into relevant structures, such as pronunciation, part of speech, and translation.**

that is accurate and fluent.

One aim of this contract is to improve the quality of what is presented even for resource-poor languages by translating the most important terms (organization names, acronyms, other noun-like categories) using backoff techniques that compensate for poor word-level analysis in the foreign language. At the same time researchers leverage the rich resources found in well-studied languages like English to new cases through a technique known as annotation projection. This technique finds exactly translated English-foreign language text, and ports the analysis from the English side, using statistical and linguistic techniques to filter cases where the English analysis is wrong for the new language. This provides the data needed to build analyzers in the new language that will lead to rapid development of higher quality translation.

From its inception, the lab has sponsored collaboration between government and university researchers through colloquia and seminars, and university-led courses. In addition, the lab has fostered extended collaborations between university and government scientists on topics of mutual interest, leading to a body of joint papers. ☺





## Perceptual Interfaces and Reality Lab Established

The Perceptual Interfaces and Reality Laboratory (PIRL) was established to bring together several research activities at UMIACS which focus on perception and computer users. Perceptual interfaces are concerned with extending human-computer interaction to use all modalities of human perception, including vision, gesture, audition, and touch. Perceptual reality aims to create virtual and augmented versions of the world that produce percepts that seem identical to reality.

Humans sense their environment using five senses and can perceive an amazingly detailed scene, with multiple objects segmented from that scene. These objects are imbued with multiple attributes including the visual (color, texture, shape, and location), auditory (pitch, timbre, intensity and location), and tactile. Conventional signal and image processing techniques are hard-pressed to extract and label these attributes in the way that humans are effortlessly able to do. Biological systems that process this input have much to teach researchers.

While the lab's research goals are relatively broad, its initial focus has been on the auditory modality, in part to complement established research programs in vision at UMIACS/CfAR. The lab's audio research has focused on both the localization of a real source using microphone arrays and rendering virtual auditory spaces where sources are perceived at prescribed locations.

Using microphone arrays, researchers can record an audio scene in a manner that allows the spatial relationship among sources in the scene to be understood. They permit the spatial localization of a particular source and allow sound from one source to be preferentially enhanced via beamforming. Applications include speech interfaces to computers where the talker is not tethered to a mike. A major focus of PIRL's research has been in developing novel algorithms for source localization and beamforming in reverberant environments.

While determining the location of an audio source via a microphone array requires at least four microphones, humans can do this using just two ears. Researchers must understand the mechanisms that make this possible to create virtual worlds with prescribed auditory source locations.

Scattering of sound by the human body, especially the external ears, provides powerful monaural and binaural cues for the source location. The external ear is a very specially shaped "antenna" that presents a different shape to waves arriving from

different directions and, accordingly, has a different frequency dependent scattering cross-section to these waves. This position and frequency dependent scattering behavior is typically encoded as a Head-Related Transfer Function (HRTF), the ratio of the complex sound pressure level received at the entrance to the ear canal to the sound that would have been received at that location in the listener's absence. Knowing the HRTF, one can, in principle, reintroduce the cues created by a source at a particular location. However the HRTF exhibits significant person-to-person variation due to the individual shapes of people's bodies and ears.

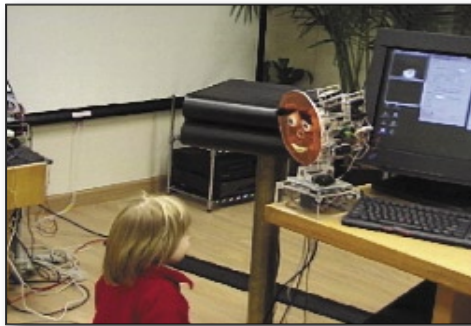
While the HRTF is usually obtained via tedious measurements in which sound is presented to the listener from different locations, PIRL researchers have developed an innovative approach. Using scientific computing, they can solve the wave equation with a discretized mesh of the surface of the person's head, torso, and ears obtained using computer vision. Recently, they have developed extremely fast algorithms based on fast multipole methods for the numerical solution of the wave equation.

The HRTF is important for "rendering" virtual audio, but it is only one component. Other unsolved problems remain. Since humans are mobile, the configuration of the scattering surfaces and their relative position from the source changes as they move. This points to two key difficulties: first, the HRTF will change as users move; second, users will expect the rendered source to remain still, even as they move. Thus, the audio scene that is rendered must involve both dynamic modification of the HRTF and tracking the location of the user's ears.

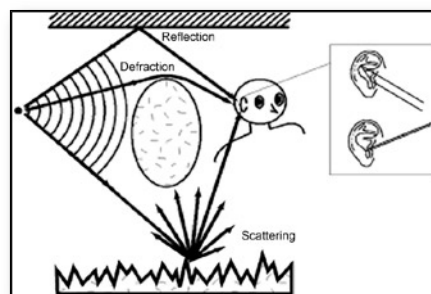
Another issue is that the sound that is received at the ears includes both direct sound from the source and sound that arrives after multi-path scattering from the walls and other surfaces in the environment. The scattered sound reaches the ears at times different from the direct sound (see figure on left). The received sound thus encodes information on the environment and the source

location, especially the range. Further, creating virtual auditory spaces requires development of smart signal processing algorithms to achieve real-time composition of time delay cues, HRTF cues, early room reflections and late room reflections. PIRL scientists have developed a system for creating virtual auditory space that accounts for all these.

PIRL investigators recently received the lab's second Information Technology Research award from the National Science Foundation (see story on page 6). For more information on the lab see <http://degas.umiacs.umd.edu/pirl>. ☺



**A child interacting with a virtual toy that was given emotion recognition and audition capabilities by PIRL researchers (joint work with IBM, Almaden).**





## PIRL Receives ITR Award to Create Audio User Interfaces for the Visually Impaired

The National Science Foundation (NSF) has awarded a medium-sized Information Technology Research (ITR) award to a team including researchers in the newly established Perceptual Interfaces and Reality Laboratory (PIRL) and the Human-Computer Interaction Laboratory (HCIL). The project will focus on developing customizable audio user interfaces for the visually impaired and the sighted.

Ramani Duraiswami (UMIACS) is the PI for the team, which includes Professors Larry Davis (Computer Science/UMIACS) and Ben Shneiderman (Computer Science/UMIACS). Others in the research group come from the Institute for Systems Research, Boston University, MIT, and the Johns Hopkins University.

A great deal of human brainpower is devoted to processing sound, and sound plays an important role in the way people interact with the world. This rich sensory resource, however, has been underutilized in the ways people interact with computers. “Compared to computer graphics, the rendering of auditory scenes and objects and the development of audio user interfaces are fields that are still in their infancy,” Duraiswami notes.

This project will build on the significant progress that scientists have made in understanding the sense of hearing. Researchers now understand more fully the ways that humans are able to extract relevant features from sound, such as determining the location and intensity of a sound source. Advances in simulating sounds that have specialized features and in understanding the way humans perceive and organize objects in and auditory scene also serve as important foundations for the work of this project. Members of the team are involved in these developments in essentially all of these areas.

The goal of this project is to uncover the scientific principles that govern the computerized rendering of artificial sound scenes containing multiple sound objects that are information and feature rich. Researchers will test, use, and extend this knowledge by creating a succession of auditory user interfaces with increasing levels of capability. Both sighted and visually-impaired users use these interfaces in applications. Researchers will perform psychophysical testing to quantify the capabilities of the human auditory system, knowledge of how humans separate sound acoustic streams into sound sources, and design rules that maximize information throughput via the user interface.

The overwhelming majority of previous user interface research using sound has focused on incorporating speech in HCI. While speech is an important means for issuing commands to a machine or receiving textual information, it does not permit the information to be naturally organized in space or time, or the ability to interactively browse information stores—both of which are important attributes of state-of-the-art (graphical) user interfaces. In the researchers’ view, an acoustic user interface

(AUI) is defined as any interface that maps data streams (images, signals, tables, etc.) into acoustic objects that occupy regions (either localized or distributed) in 3-D auditory space. The acoustical qualities of these sources are controlled along perceptually-relevant dimensions to convey information contained in the data stream. The perceptual dimensions of sound are the physical location of the rendered source, its intensity, pitch, timbre, and the environment in which it is rendered. A basic goal of the

researchers is to develop real-time signal processing algorithms that enable the rendering of sound with specified perceptual attributes. A major task of the research will be to extend a mathematical models of how the human auditory system extracts pitch and timbre percepts, and to invert this model to create sounds with specified percepts.

This ITR team brings together specialists from a wide variety of disciplines. Experts in audio perception, biomimetic auditory signal processing, computer vision, user interfaces, acoustical displays, and system development will collaborate to ensure all aspects of the problem are addressed.

In addition to developing auditory user interfaces, this project will also answer fundamental research questions. The work will examine the usefulness of mapping different types of information to the auditory axes of a virtual auditory space. These types of information range from images, such as a face or a road map, to data in tables, to temporally varying data, such as in a stock market application. Research will seek the optimal mapping for this information and whether there are neural correlates that can guide natural mappings to acoustic cues. The team will also investigate the limitations human perception places on interfaces, the computational and algorithmic issues to be overcome, and the importance of interface customizability. 🗨️

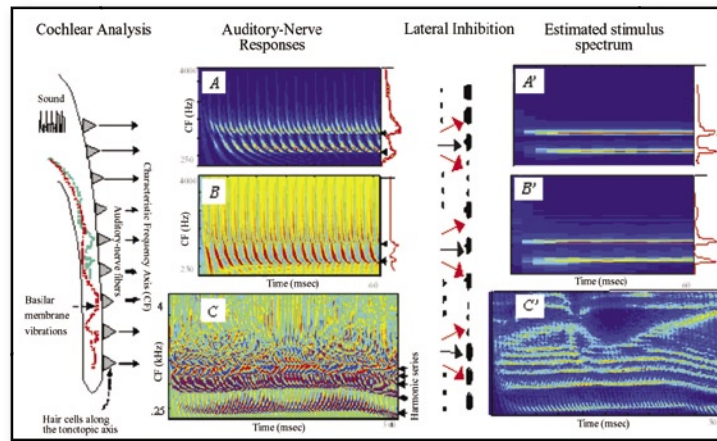


FIGURE COURTESY OF PROF. SHIHAB SHAMMA

**Researchers will use a bio-mimetic mathematical model of how sound percepts are extracted to produce sounds with specified pitch and timbre.**



## HCIL to Impact Young Readers Through International Children's Digital Library Project

The National Science Foundation (NSF) recently funded a new Human-Computer Interaction Laboratory (HCIL) research project that aims to give young people around the world access to children's literature. In collaboration with the Internet Archive, HCIL researchers will develop a large-scale digital archive of books for children between 3 and 13 years of age. By the conclusion of the project, the International Children's Digital Library (ICDL) will encompass 10,000 books representing 100 books from 100 countries.

In addition to increasing access to international children's literature, the project will continue the development of interface technologies that support children using large amounts of digital information and allow a greater understanding of the issues of rights management and data acquisition for future digital libraries. Researchers will also evaluate the impact a digital collection such as this can have on children and on the collection development and program practices of librarians who work with young readers.

A leader in designing interfaces for younger users, the HCIL will build upon its success in developing visual search tools and collaborating with children. The Internet Archive—a nonprofit organization that was founded to build an “Internet library” to offer permanent access for scholars to historical collections that exist in digital format—will lead the collection development and rights management efforts.

Prof. Allison Druin (Education/UMIACS) heads the Maryland team, with Professors Ben Bederson (Computer Science/UMIACS) and Ann Weeks (Information Studies) serving as co-PIs for the project.



**HCIL Faculty Research Assistant Anne Rose looks on as younger research partners collaborate at a computer. The HCIL is a pioneer in partnering with children to design new technology.**

“We're excited about this research project,” says Prof. Druin. “We know that books are critically important in children's lives. Research has shown that children's use of books can offer opportunities to better understand the world around them as well as who they are in relation to that world. We expect that when more books are accessible digitally, more children from around the world will be able to benefit.”

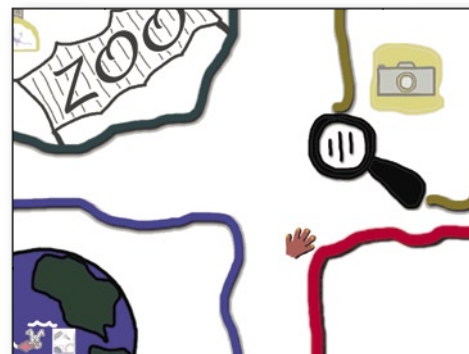
Researchers in the HCIL plan to build upon the basic interface design and code of SearchKids, a product of their previous NSF-funded research.

SearchKids employs zoomable user interfaces (ZUIs) to allow children to query, browse, and organize multimedia information. While adapting and enhancing this tool to suit the domain of books, researchers will address issues of scale, metadata, book readers, localization, and community building.

With the assistance of the Library of Congress, investigators also will address questions of rights management and collection development. The ICDL team will develop innovative approaches to copyrights and distribution with input from various stakeholders including authors, publishers, and librarians. Based on this feedback, investigators will establish fair compensation systems that encourage the best existing works to be made available, as well as motivate the creation of new works.

In November 2002, the team will launch a prototype of the ICDL interface design containing 225 books, including items selected by international librarians and the Library of Congress and new materials that publishers and authors will supply. During the development phases of the project, the ICDL researchers will test interface design, experiment with book digitalization techniques, and investigate groundbreaking storage, retrieval, annotation, and delivery technologies. Researchers will conduct needs assessment from a cross-section of libraries internationally and establish working advisory panels in a variety of areas of expertise.

Awarded through the NSF's Information Technology Research (ITR) program, the grant will total \$3 million over five years, with Maryland receiving \$2.125 million. The NSF established the ITR program in 2000 to preserve the United States' position as the world leader in information technology and its applications. ☺



**SearchKids, the result of previous HCIL research, will be the basis for the library's interface.**





# New UMIACS Faculty

## Lise Getoor

In spring 2002, Prof. Lise Getoor joined the University of Maryland as an Assistant Professor with joint appointments in the Department of Computer Science and UMIACS. Her research interests lie at the intersection of machine learning, artificial intelligence and databases. She received her Ph.D. from Stanford University in 2001.

Her thesis presented methods for learning probabilistic models directly from relational data. A patent has been filed based on this technology. Her current work includes research on representing uncertainty in semistructured data, discovery of patterns in graph structured data, and the use of structured statistical models for database tasks such as selectivity estimation. She is a leader in the new area of relational data mining.

In July 2000, she co-organized with David Jensen a successful AAAI 2000 workshop on Learning Statistical Models from Relational Data. She is on the program committee for the KDD Workshop on Multi-Relational Data Mining. She is an invited lecturer at the two day school on Relational Data Mining to be held in conjunction with ECML/PKDD. She is also an invited participant at the Machine Intelligence 19 workshop "Reasoning and Uncertainty: methods and applications." She is on several other program committees including AAAI, UAI, SARA, DMKD, and NGITS.

See <http://www.cs.umd.edu/~getoor/> for more information about her research. ☺



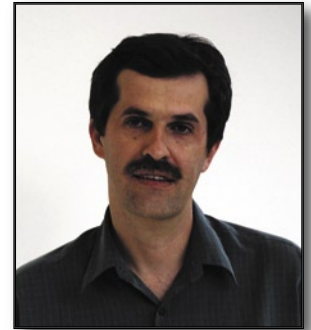
## Liviu Iftode

Prof. Liviu Iftode joined the University of Maryland as an Assistant Professor with a joint appointment in the Department of Computer Science and UMIACS beginning spring 2002. Prior to that, he was an Assistant Professor of computer science at Rutgers University.

Iftode's research interests include parallel and distributed systems, operating systems, embedded and pervasive computing systems, and mobile computing and networking. He is particularly interested in systems issue in networks of embedded systems and cluster-based servers. At Rutgers, he conducted research in the Distributed Computer (DISCO) Laboratory, where he focused on distributed embedded systems; systems support for scalable, highly-available, cluster-based servers; and a system architecture to support non-interactive transactions for repetitive activities on the Web.

Iftode earned his Ph.D. in computer science from Princeton University in 1998. He received his master's degree in computer science also from Princeton in 1993 and his bachelor's degree from the Polytechnic Institute of Bucharest in 1984. He currently serves as the vice-chair of the IEEE Technical Committee on Operating Systems and is a member of the editorial boards of *IEEE Pervasive Computing* and *IEEE Distributed Systems Online*.

More information about his research can be found at <http://www.cs.umd.edu/~iftode/>. ☺



## UMIACS Faculty Participate in CASE News Media Fellowship

In early February, UMIACS faculty members participated in a news media fellowship that brought science and technology journalists to campus to meet with senior faculty. Sponsored by the Council for the Advancement and Support of Education (CASE), the program "Where is HAL? Today's Computers and Robots Are Doing Less and More Than Ever Imagined," focused on the state of the art in artificial intelligence, robotics, and related areas. UMIACS faculty members shared their expertise on the history, latest trends, and future of these technologies.

Highlighting the university's cutting-edge research, sessions featured both discussions and demonstrations, many of which took place in UMIACS laboratories such as the Human-Computer Interaction Lab and the Keck Laboratory for the Analysis of Visual Motion.

The UMIACS faculty members who participated were Professors John Aloimonos (Computer Science/UMIACS), Rama Chellappa (Electrical & Computer Engineering/UMIACS),

Larry Davis (Computer Science/UMIACS), Allison Druin (Education/UMIACS), James Hendler (Computer Science/UMIACS), Dana Nau (Computer Science/UMIACS), Azriel Rosenfeld (UMIACS), Ben Shneiderman (Computer Science/UMIACS), and Amy Weinberg (Linguistics/UMIACS).

Four science journalists participated in the fellowship, coming from media outlets such as National Public Radio, the *Baltimore Sun*, the *New York Post*, and Belo Broadcasting. ☺



PHOTO BY CYNTHIA MITCHEL

**CASE fellows Mike Stroh and Mike Goldfein join Prof. Allison Druin and young researchers in the HCIL.**





## William Arbaugh

- NSF CAREER Award: "Active System Management."

## Victor Basili

- Invited Talk: "Implementing the CeBASE Method on the Future Combat Systems (FCS) Program" (with B. Boehm), Software Technology Conference, Salt Lake City, Utah, April 2002.
- Invited Talks: "Experimentation in Software Engineering," University of Rome Tor Vergata and University of Sannio, Rome and Benevento, Italy, March 2002.
- Invited Talk: "Building an Experience Base for Software Engineering: A Report on the First CeBASE eWorkshop," University of Sannio, Benevento, Italy, March 2002.
- Invited Talk: "Implementing the Experience Factory Concepts as a Set of Experience Bases," University of Sannio, Benevento, Italy, March 2002.
- Invited Talk: "Experimentation in Software Engineering" (with R. Tesoriero, P. Costa, M. Lindvall, I. Rus, F. Shull, and M. Zelkowitz), 5th Workshop on NSF-CNPq Readers Project, Salvador, Brazil, January 2002.
- Invited Talk: "Software Measurement Implementation and Practice," A Professional Development Seminar sponsored by the Data & Analysis Center for Software (DACS), Sandia Labs, Albuquerque, N.M., November 2001.

## Sharat Chandran

- Invited Talk: "Recent trends in Radiosity," Center for Advanced Studies Distinguished Speaker Series. Lafayette, La. April 2002.
- Invited Talk: "Calculus of variations for computer vision," Popular Lecture Series in Mathematics, Mathematics Association of IIT Bombay and Bombay Mathematical Colloquium, January 2002.

## Bonnie Dorr

- CMPS Postdoctoral Alumni Award, 2002.

## Ramani Duraiswami

- Invited Talk: "Creation of Virtual Auditory Spaces," Artificial Intelligence Lab at the Massachusetts Institute of Technology and the Department of Computer Science, Boston University, April 2002.

## James Hendler

- Associate Editor, *ACM Transactions on Internet Technology*, April 2002.
- Invited Talk: "The Business Case for the Semantic Web," Banquet talk, Research for the Internet Society, Berlin, Germany, April, 2002.
- Invited Talk: "The Semantic Web: KR's Worst Nightmare," Plenary talk, Knowledge Representation 2002, Lyons, France, April 2002.
- Invited Talk: "The Semantic Web," National Library of Medicine, March 2002.
- Invited Talk: "The Semantic Web," Distinguished Lecture in Artificial Intelligence and Cognitive Science, University of Brighton (UK), March 2002.
- Invited Talk: "The Semantic Web," National Science Foundation Distinguished Lecture Series, March 2002.
- Invited Talk: "The Semantic Web," Invited Talk, E-book 2001, Washington D.C., Nov 2001.

## John Horty

- Workshop on Logics for Action. Uppsala, Sweden. November, 2001. April, 2002. "A Logic for Indeterministic Action."

## John Horty (cont.)

- Ninth International Workshop on Nonmonotonic Reasoning (NMR-2002). April, 2002. "Skepticism and Floating Conclusions."
- Program co-chair: The Sixth International Workshop on Deontic Logic in Computer Science (DEON'02), London, England, May 2002.

## Joseph JaJa

- Invited Talk: "Efficient Techniques for Exploring Geospatial Data," Distinguished Lecture Series, University of New Mexico, Nov. 2001.
- Editor, *International Journal of Foundations of Computer Science*.

## Samir Khuller

- Invited Talk: "Algorithms for Data Placement and Movement," Workshop on Current Practices and Future Challenges in Computer Science; IIT Kanpur, India; January 2002.

## Sarit Kraus

- Elected as an AAAI Fellow.

## Jack Minker

- Inducted into the University of Maryland Academy of Excellence in Teaching and Learning (AETL).
- Invited Talk: the Technische Universitat of Wien, Vienna, Austria, May 2002.

## Michael O'Donovan-Anderson

- Editorial Position: Cognitive Science Area Editor of the *Internet Encyclopedia of Philosophy*.
- Invited Talk: "Embodied Cognition: Threads and Overview" at the University of Memphis, January 2002.

## Aravind Srinivasan

- Invited Talk: "Distributions on Level-Sets with Applications to Approximation Algorithms," Carnegie-Mellon University, February 2002.
- Invited Talk: "Approximating the Domatic Number" at the Special Session on Probabilistic Methods in Combinatorics and the Internet, Annual Meeting of the American Mathematical Society, San Diego, Calif., January 2002.

## Uzi Vishkin

- Invited Talks: "What to do with all this hardware? Could the PRAM-On-Chip architecture lead to upgrading the WINTEL performance-to-productivity platform?" Microsoft Research, Redmond, Wash., and Intel Microprocessor Research Lab, Santa Clara, Calif., January 2002.

## Min Wu

- NSF CAREER Award: "Signal Processing Approaches for Multimedia Security and Information Protection"
- Elected to IEEE Multimedia Signal Processing Technical Committee for Term 2002-2005.
- Invited Talk: "Recent Progress on Multimedia Data Hiding," Hughes Network Systems, Germantown, Md., Dec. 2001.
- Patent Issued: US 6,285,775 "Watermarking Scheme for Image Authentication" (issued Sept. 4, 2001).
- Patent Issued: US 6,282,300 "Rotation, Scale, and Translation Resilient Public Watermarking for Images Using a Log-polar Fourier Transform" (issued Aug. 28, 2001).



## HCIL Holds 19th Annual Symposium and Open House

More than 250 people attended the 19th Annual Symposium and Open House of the Human-Computer Interaction Laboratory (HCIL) on May 30 and 31, 2002. The first day of the event featured tutorials and workshops. The event's second day consisted of sessions on a variety of topics related to human-computer interaction and demonstrations of the results of recent research in HCI at the University of Maryland.

The event's keynote speaker, Prof. Ben Shneiderman (Computer Science/ISR/UMIACS) delivered a talk entitled, "Ending User Frustration (ENUF)." ☺



Prof. Ben Shneiderman leads a workshop on Bioinformatics visualization.

## Computational Biology Seminar Series

The Computational Biology Seminar Series continued to bring top researchers in biology and computer science to the University of Maryland during the spring 2002 semester. Sponsored by the Center for Bioinformatics and Computational Biology, the series featured the following internationally recognized researchers: Stephen Freeland (UMBC), S. Chen Sahinalp (Case Western Reserve University), Dan Brown (University of Waterloo), Michael Galperin (NIH), Austin Hughes (University of South Carolina), Xun Gu (Iowa State University), Joe Nadeau (Case Western Reserve University), Thomas Kepler (Santa Fe Institute), Eugene Koonin (NIH), Laxmi Parida (IBM), Scott Federhen (NIH), and Antonio del Sol (University College, London). ☺

## Basili Honored for Achievements in Systems and Software Engineering

The October 2001 *The Journal of Systems and Software* featured a paper naming Prof. Victor Basili (Computer Science/UMIACS) as the number two scholar internationally in the field of systems and software engineering. The same study ranks the University of Maryland as the fifth top institution in the field. A five-year study of scholars and institutions, the rankings are based on the quantity of papers published in journals associated with the field.

The World Technology Network also noted Basili's achievement in software research as part of the 2001 World Technology Awards. He was selected as one of five finalists in the category of Information Technology-Software, an award that recognizes the programs which have impacted information technology. ☺

## UMIACS-Affiliated Departments Achieve High National Rankings

In the latest edition of the *U.S. News & World Report's Best Graduate Schools*, a number of University of Maryland programs, including those affiliated with UMIACS, are ranked among the best in the nation. The university now includes 65 programs among the top 25 nationally, up from 61 last year.

Among the UMIACS-affiliated departments, Computer Science is ranked 12th, Electrical Engineering is 20th, Management Information Systems is 9th and the College of Education is 21st. Also ranked among the best in the nation are specialties within computer science and engineering, including Artificial Intelligence (ranked 11th), Systems (11th), and Computer Engineering (18th). ☺

## Microsoft Supports Bederson's Work

Microsoft Research has awarded a \$100,000 gift to Prof. Ben Bederson (Computer Science/UMIACS) to support research in mobile device interfaces and .NET. Bederson has developed FishCal, a novel calendar interface for PDAs, which allows users to see overviews and to easily navigate the calendar structure, and to discover patterns and outliers. The supported research will include updating and porting Piccolo Jazz, Bederson's zooming toolkit, to .NET.

FishCal joins other programs developed by Bederson which have been very popular with users. His zoomable image browser, PhotoMesa, has been downloaded more than 25,000 times since its release a year ago. ☺

## Local Students Compete at UM High School Programming Contest



Thirty area schools participated in the annual High School Programming Contest on March 16, 2002 at the University of Maryland University College. The event was sponsored by the Department of Computer Science, with support from Microsoft, UMIACS, the Office of Information Technology, and UMUC.



## Seventh Annual Research Review Day a Big Success

**O**n March 1, 2002, more than 400 people attended the seventh annual Electrical Engineering, Computing, and Systems Research Review Day at the University of Maryland's Inn and Conference Center. Sponsored by UMIACS, the Department of Electrical and Computer Engineering, the Department of Computer Science, and the Institute for Systems Research, the event showcases many of the current research activities of the four units for attendees from local industry and government agencies.



**Prof. Amy Weinberg discusses research with a Research Review Day attendee.**

The morning session consisted of four informative talks from faculty members of the sponsoring units, including Professors Adam Porter (Computer Science/UMIACS) and Amy Weinberg (Linguistics/Computer Science/UMIACS). Defense Advanced Research Projects Agency Director Anthony J. Tether delivered the keynote address. In the afternoon, guests enjoyed a reception featuring research demonstrations and posters on a broad range of subjects. ☺

## Distinguished Seminar Series in Vision in Honor of Prof. Rosenfeld

**I**n the spring of 2002, UMIACS sponsored the Distinguished Seminar Series in Vision in Honor of Prof. Aziel Rosenfeld. Prof. Rosenfeld, a pioneer in the field of computer vision, recently retired from his position as director of the Center for Automation Research (CfAR).

The series brought many top researchers in computer vision to discuss topics ranging from visual grouping and object recognition to the role of immersion in the office of the future. Speakers included Prof. Jitendra Malik of the University of California at Berkeley, Prof. Shree K. Nayar of Columbia University, Prof. Henry Fuchs of the University of North Carolina at Chapel Hill, Tony DeRose of Pixar Animation Studios, Prof. T. S. Huang of the University of Illinois at Urbana-Champaign, and Prof. Tomaso Poggio of the Massachusetts Institute of Technology.

Widely regarded as the world's leading researcher in the field of computer image analysis, Prof. Rosenfeld wrote the first textbook in the field, was founding editor of its first journal, and was co-chairman of its first international conference. He has published more than 30 books and more than 600 book chapters and journal articles on the subject. ☺

## Faculty Participate in Lockheed Martin – UM Technical Summit

**O**n February 1, eight UMIACS faculty members took part in the Lockheed Martin and University of Maryland Technical Summit. The event featured 36 presentations from Maryland faculty and Lockheed Martin researchers and was hosted by the A. James Clark School of Engineering, College of Computer, Mathematical, and Physical Sciences, and the Robert H. Smith School of Business.

UMIACS faculty participants were Professors William Arbaugh (Computer Science/UMIACS), Ben Bederson (Computer Science/UMIACS), Rama Chellappa (Electrical & Computer Engineering/UMIACS), Lise Getoor (Computer Science/UMIACS), James Hendler (Computer Science/UMIACS), Hanan Samet (Computer Science/UMIACS), V.S. Subrahmanian (Computer Science/UMIACS), and Amitabh Varshney (Computer Science/UMIACS). ☺

## Event Showcases Academic Careers to Women, Minorities

**T**wenty women and minority graduate students participated in a workshop organized by Prof. Dianne O'Leary (Computer Science/UMIACS), which focused on research and career opportunities in the field of computer science on November 16 and 17, 2001 at the University of Maryland.

The event, entitled "Research, Careers, and Computer Science: A Maryland Symposium," allowed these students to present their research and take part in interactive sessions about academic jobs. Session topics included research, obtaining funding, the tenure process, and distinctions between academic and other types of jobs.



**Participants enjoy an interactive session.**

In addition to participating in the formal sessions, the students were able to network with Maryland faculty and students and share experiences with peers who face similar challenges to theirs. The attendees, who came from across the United States and Canada, expressed enthusiasm about their experiences at the workshop. As one participant said, "I wish there were more opportunities like this available."

The Department of Computer Science and UMIACS sponsored the event. In addition to Prof. O'Leary, the organizing committee included Professors Bonnie Dorr (Computer Science/UMIACS), Leana Golubchik (Computer Science/UMIACS), Dana Nau (Computer Science/UMIACS), and Amitabh Varshney (Computer Science/UMIACS). ☺



# Awards

October 2001 - May 2002

- AOL Fellowship (AOL)
  - CTA: Advanced Decision Architectures (New Mexico State/ARL)
  - CTA: Advanced Sensors (BAE Systems/ARL)
  - CTA: Robotics (GDRS/ARL)
  - Customized Audio User Interface (ONR)
  - Development of a Formal Theory of Agent-Based Computing for System Evaluation and System-Design Guidance (DARPA)
  - Enhanced Metadata Extraction (NASA Goddard)
  - Evaluation and Improvement of Machine Translation Using Parallel Corpora (MITRE/DARPA)
  - Gesture-Driven Control of Spaces and Objects in Collaborative Augmented Reality (ONR)
  - Handling Contradictory Data with Metareasoning (Air Force)
  - HCIL Research (Toshiba)
  - HCIL Research (Microsoft)
  - HCIL Research (Ricoh)
  - Headline Generation (BBNT Solutions)
  - Human Computer Interface Design (Census)
  - Human Detection in Night Scenes (Honda)
  - Human Tracking and Verification in Video (ONR)
  - Improved Algorithms (NASA Goddard)
  - Infrastructure to Develop a Large Scale Experiment Testbed of Multi-modal Resources (NSF)
  - LAMP Lab (DOD)
  - LAMP Lab Research (Panasonic)
  - LAMP Lab Research (KLA Tencor)
  - MIND Lab (Fujitsu - Founding Partner)
  - MIND Lab (Aerospace Corp.)
  - MIND Lab (Lockheed Martin)
  - Model-Based Integrated Approaches for Remote Identification of Humans (ONR)
  - Multilingual Access to Large spoken ArCHives-MALACH (NSF)
  - MURI-Bootstrapping out of the Multilingual Resource Bottleneck (JHU/ARO)
  - NPACI - San Diego (California, San Diego/NSF)
  - Phase II - Crew Performance Analyzer (Foster Miller/NASA)
  - Preceptor - Phase 2 Recognition in Multi-Hyperspectral Imagery (GDRS/DARPA)
  - Real Time Distributed Algorithms for Visual and Acoustic Sensor Data Processing (DOD - Air Force)
  - A Scalable Intelligent Agent Architecture for the 21st Century Battlefield (ARL)
  - Secure Wireless Infrastructure Test Bed (NIST)
  - Sustainability of NASA EOS Products (Raytheon/NASA)
  - Textual Information Access for the Visually Impaired (NSF)
  - Translingual Information Access (Navy)
  - Uncovering and Exploiting Memory Parallelism in Pointer-Chasing Applications (NSF)
  - University Partnership with Laboratory for Telecommunication Sciences (DOD)
  - Using the Web as a Corpus for Empirical Linguistic Research (NSF)
- B. Shneiderman  
R. Chellappa, V. Subrahmanian  
R. Chellappa  
L. Davis  
R. Duraiswami
- J. Horthy  
J. Jaja
- D. Doermann, B. Dorr  
L. Davis, Y. Yacoob  
D. Perlis  
B. Bederson  
B. Bederson  
B. Shneiderman  
B. Dorr  
K. Norman  
L. Davis  
R. Chellappa  
J. Townshend
- L. Raschid, D. Doermann, B. Dorr, D. Oard, A. Weinberg  
D. Doermann, A. Weinberg  
D. Doermann  
D. Doermann  
A. Agrawala  
A. Agrawala  
A. Agrawala  
R. Chellappa, L. Davis, J. Aloimonos  
D. Oard, D. Doermann, B. Dorr, P. Resnik  
P. Resnik, A. Weinberg, B. Dorr  
J. Jaja, A. Sussman  
L. Davis  
Q. Zheng
- L. Davis, V. Subrahmanian, J. Aloimonos  
V. Subrahmanian, D. Nau  
W. Arbaugh, A. Agrawala  
J. Townshend  
L. Davis, R. Duraiswami  
D. Oard, B. Dorr, P. Resnik  
D. Yeung, C. Tseng  
J. Jaja  
P. Resnik



**InterConnections** is published by the University of Maryland  
Institute for Advanced Computer Studies, UMIACS.

For additional information, visit UMIACS on the web at  
<http://www.umiacs.umd.edu> or contact

Director: Joseph Jaja  
UMIACS  
University of Maryland  
College Park, MD 20742  
301-405-6722

Editor: Chris McCarthy