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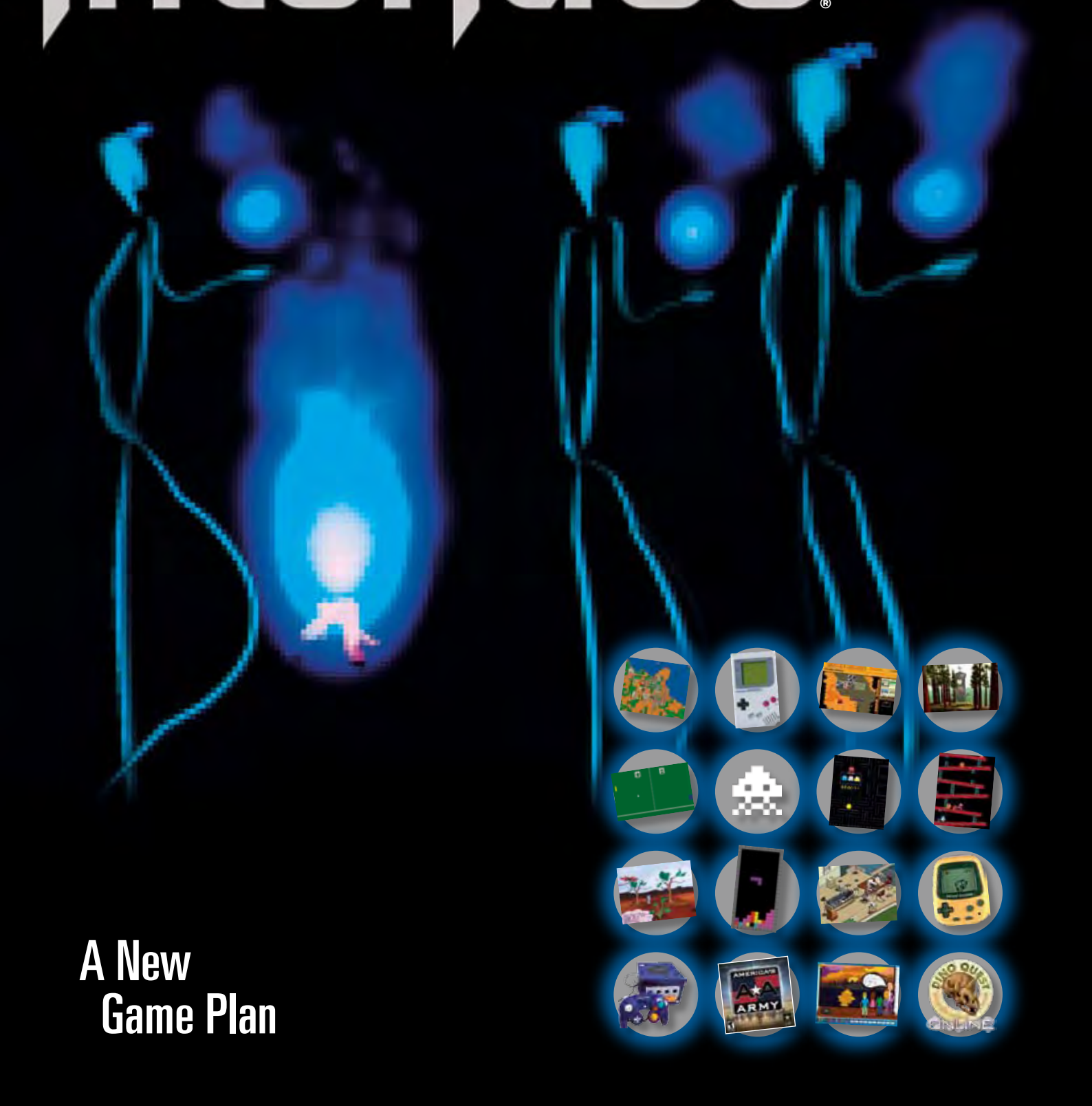

A New Game Plan

interface-2-face

Empowering Innovation

Multidisciplinary research at Calit2@UCI achieved new milestones under the leadership of former director Albert Yee. Professor Yee, who has decided to return to teaching and his own research, laid the foundation for a vital collaborative endeavor that shattered the constraints of traditional academia.

I look forward to continuing that mission, uniting researchers from seemingly disparate disciplines in pursuit of novel solutions to important problems.

In order to maintain that momentum, it is important to remember Calit2's "two campuses, one institute" approach. By working with our UC San Diego sister division, we can better advance a strong research mission that is enhanced by the individual strengths of each campus.

The Integrated Nanosystems Research Facility (INRF) is our new campus partner. We are creating a high-tech corridor by combining administrative functions of the Zeiss Center of Excellence, the Calit2 BiON facility and the INRF. This offers researchers the benefit of easy access to three different centers, thereby lowering barriers to innovation *(see article, page 8)*.

I am excited to be part of Calit2. I look forward to forming strategic alliances with other centers and institutes on campus, teaming with industry and community partners, and seeing new faculty and many wonderful projects in our institute. Among the projects we will be pursuing are "telemedicine," which can reduce the cost and increase the effectiveness of conventional medicine and health care management, and a "green world" initiative that will address important energy-consumption and environmental problems.

I invite you to join us and look forward to working with you.

Sincerely,

G.P. Li
Director, Calit2@UCI

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Spring 2007

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On the cover: *Games aren't just for kids anymore. Education, business and the military are employing them in a variety of applications, and Calit2@UCI researchers are examining their vast potential.*

The Games People Play

A New Medium Emerges

Computer games don't affect kids. I mean if Pac Man affected us as kids, we'd all be running around in darkened rooms, munching pills and listening to repetitive music.

– Marcus Brigstocke, British satirist and comedian

by Anna Lynn Spitzer

Not quite true, Marcus. Research in game play theory and practice indicates that computer games do affect children – and adults, as well – helping them to learn, socialize, surmount cultural differences, conduct business and, believe it or not, make the world a better place.

This is not news to researchers and professors at Calit2 and UC Irvine, where studies of computer games and their vast potential have been underway for several years. In fact, UCI's Game Culture and Technology Lab, established in 2000 in the Claire Trevor School of the Arts and affiliated with Calit2 since 2002, was the first in the University of California system. With nearly 20 affiliated researchers spanning fields from anthropology to education, and from studio art to history, it has become a UC hub for computer game research.

Since their debut nearly 60 years ago, video games and their progeny – computer, console and web versions, and online virtual worlds – have made contributions to society in surprising ways.

Social Value

While millions of consumers spend billions of hours just playing – Microsoft Xbox Live has more than 6 million members worldwide – millions more are turning to games for more than entertainment.

Take the U.S. military. As many as 100 video games currently are used in military training programs, and in 2006, the Department of Defense reportedly allocated $120 million for the

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timeline

1948
Computer game forerunner *Cathode-Ray Tube Amusement Device* receives U.S. patent.

1958
Tennis for Two – First video game introduced to the public. Creator William Higinbotham previously worked on Manhattan Project at Los Alamos National Lab.

1962
Group of MIT students program *Spacewar,* the first widely available video game. It is eventually distributed with new DEC computers.

1966
Chase, first game to display on a standard television set, is created.

development of new versions. Computer simulations and immersive virtual reality games effectively create combat or terrorist scenarios for soldiers to hone their skills in a near real-life setting.

Computer games also have the capability to manipulate time and space in a way that is not possible in reality, a characteristic that intrigues Calit2 researcher Bill Tomlinson. The assistant professor of informatics studies human-computer interaction and computer-assisted learning. He teamed up with Lynn Carpenter, professor of ecology and evolutionary biology, to design EcoRaft, a computer game for teaching restoration ecology to children.

EcoRaft is a hands-on, engaging way for kids to learn about restoration ecology. EcoRaft is one of several projects under development in the Calit2 Interactive Animation Lab.

"In the real world, it would be impractical and immoral to wipe out a species to see how the rest of the species react, but you can do that in a virtual world," says Tomlinson.

Ideal Instructors

For children, the interesting sounds and colorful graphics make computer games perfect teachers. They "possess infinite patience, and increasingly can be modified to match the learner's interest," says Kimberly Burge, senior lecturer in UCI's Department of Education.

Burge is an ardent advocate of using computer games in teaching; she requires her master's degree students to build their own. "That way, they will be much more likely to integrate the technology in their own classrooms," she says.

Her students utilize a game platform called "Imagination," which lets the teachers-to-be design games that address relevant issues and include problem-solving scenarios. They can easily incorporate pertinent news stories, pictures, maps or characters. The first group of students developed a game around saving the Hetch Hetchy Valley in Yosemite National Park.

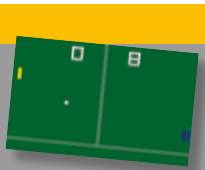
"This is a prototype that future teachers might employ … to achieve their own learning goals," says Burge.

ICS researcher Hadar Ziv's software engineering students in a UCI informatics class helped design the game platform. "People learn through communication, collaboration

The Imagination platform, developed by UCI students, lets teachers design their own computer games.

1970
Budding industry splits into new areas: arcade machines, university computers, handhelds, home computers.

1972
Atari founded by Nolan Bushnell and Ted Dabney. Company releases *Pong*.



1972
OXO, first hand-held electronic game, released.

1975
Atari releases home version of *Pong* – spurs home video game industry.

1976
First controversy: *Death Race* released in arcades. Players try to hit pedestrians with cars.

1978
Space Invaders and *Asteroids* released.

1980
Pac-Man is first game to achieve widespread popularity in mainstream culture.

and interaction," Ziv notes. "Games can be played across users, across nations, across boundaries; this seems to have a very profound effect on the learning experience."

Adds Tomlinson: "Games can be very engaging. When designers understand the elements that contribute to their appeal, they can make games that connect people with many different bodies of content."

"One wonderful possibility for games is the ways in which they can be used to change the world."

The John D. and Catherine T. MacArthur Foundation announced plans last year to commit $50 million over five years to building the emerging field of digital media and learning. The foundation will fund research and innovative projects focused on understanding the impact of the widespread use of digital media on youth and how they learn.

From the Mouths of Babes

UCI Professor Patricia Seed first realized the potential of computer games when she saw her then 8-year-old son engrossed in a game set in the Middle Ages.

"His vocabulary included words like 'arquebus' and 'paladin.' Watching him and seeing how much he was learning, I thought, 'this is clearly working. He's learning and I'm not forcing it down. He thinks it is great fun to learn all these interesting things.'"

She began incorporating the computer games "Civilization" and "Age of Empires" to teach her undergraduate history classes. "They really fit into the syllabus because students get a broad sweep of history," she says. "And you don't have to worry about student engagement or the desire to learn about the past."

Seed currently teaches World History through Games, a class in which students choose a historical period, research it and design their own game. Everyone – even the non-history majors who comprise the majority of the class – is engaged and motivated, she says. "I have had very few slackers or people who don't take interest."

Socializing through Gaming

Critics have labeled computer games isolating and anti-social. To the contrary, some researchers credit the genre with improving socialization skills by rewarding

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Concentrating on Games

Numerous multi-million dollar computer game companies know firsthand: games are serious business.

Orange County is home to several of those companies, including Blizzard, Shiny, Red 5, Quicksilver and GameSpy.

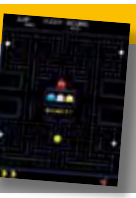
Research into what makes the computer game industry tick is serious business, too.

To help prepare interested students for jobs in research and industry, UCI recently established a Game Culture and Technology undergraduate concentration within the Claire Trevor School of the Arts and the Donald Bren School of Information and Computer Sciences.

The program, which began last fall and accepted 12 students into its inaugural class, offers the concentration to students majoring in arts or computer science. It encompasses classes in gaming studies, computer game development, interactive digital media, interdisciplinary digital arts, software engineering, artificial intelligence and computer graphics, among others.

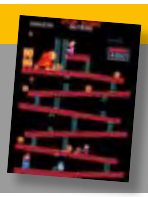
The program, first proposed in 2000 and approved by the university in 2005, was the first interdisciplinary academic program of its kind to be recommended at a top-tier North American research university, says founding director Robert Nideffer.

"For the study of games and gaming to reach its full potential, we must cultivate a deeper appreciation not only of their economy, but of the ideas that drive them, the experiences they offer, and their cultural and social implications," he says. "Games share features with other forms of media and culture, yet have many distinctive characteristics as well. We must develop a more refined and critical vocabulary for articulating those characteristics, and that's precisely what the concentration aims to do."



1981

Donkey Kong introduced. Game has four levels – three more than most games.



1984

Sierra King's Quest, first modern adventure game, released.

1984

First IBM-compatible computer becomes technically competitive game platform with release of IBM's PC/AT.

1985

Atari ST and Commodore Amiga debut.

1985

Tetris developed by computer scientist Alexey Pajitnov.

collaboration and connecting people from different cultures.

UCI Professor Bonnie Nardi is interested in theory in human-computer interaction and computer-supported collaborative work. She studies World of Warcraft (WoW), a massively multiplayer online game (MMOG) with more than 8.5 million subscribers.

"What you played yesterday is different from what you will play tomorrow."

Players create online personas that move through the role-playing game.

UCI students learn a variety of skills by building games on Second Life's Anteater Island.

They explore, develop skills, make money and socialize, advancing through 70 levels by mastering certain tasks called quests. The game is complex, and players learn from and support each other.

Nardi says that social spaces like WoW prepare players to form relationships, bond and collaborate with people they don't know. "These are people we may never see, but we form common ground quickly. It's actually the opposite of what traditional culture does, which is cut us off from people who are different from us."

WoW, which was launched by Irvine-based Blizzard Entertainment in November 2004, incorporates live chat into its format, allowing even more interaction than other sites. "When you're online and listening to voice chat, you hear different accents. I believe that has the potential to carry over into real life and break down cultural barriers," Nardi says.

Some critics also condemn the violence inherent in a number of games. But UCI's Peter Krapp, who studies media history and theory, disagrees that violent computer games desensitize players.

"I see no academically respectable way to maintain that they do," he says. "Humans have had violent games for thousands of years. If players are able to fully digest and comprehend the role of force, violence and brutality in these games, then there is no worry about it translating into violence in society."

Many games are even socially redeeming, addressing society's ills. Presenters at Living Game Worlds III, a recent conference in Atlanta,

1989

Sim City creator Will Wright self-publishes game when he can't find a company to produce it.

1989

Game Boy debuts.

1990s

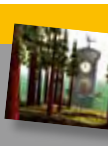
Rise of 3D graphics, multimedia capabilities and Internet games.

1992

Real-time strategy game *Dune* released. Sets the standard for RTS games like *World of Warcraft*.

1993

Myst published. One of the first computer games to use high-capacity CD-ROM storage format.



shared their development work on specific games built around difficult topics like Darfur and Columbine. Tomlinson presented the EcoRaft project at the conference.

"One wonderful possibility for games is the ways in which they can be used to change the world," says Tomlinson. "They can help bring communities together, and help people learn about new concepts and engage with new topics in new fields."

A New Reality

Virtual worlds, a first cousin to computer games, offer other surprising opportunities.

> **"... games are in the same spot films were in 100 years ago."**

The most popular virtual world on the Internet is Second Life with 5.6 million residents. It differentiates itself from competitors by facilitating the transfer of currency into and out of the game. Players purchase Linden dollars with U.S. or foreign currency to buy and sell property and consumer goods, and purchase services from other citizens.

In March 2007, more than 31,000 residents experienced a positive monthly cash flow. And some players have traded in the day-to-day drudgery of real-world jobs, making a living by designing, buying and selling virtual goods in Second Life.

A welcome message on Second Life's site states: "We are a global community working together to build a new online space for creativity, collaboration, commerce and entertainment. We strive to bridge cultures and welcome diversity. We

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Showcasing UC Game Research

Dino Quest Online was a hit at this year's Game Developers Conference.

UCI game researchers shared their work-in-progress with industry leaders at the 20th annual Game Developers Conference held in San Francisco in March.

After receiving an invitation from the UC Office of the President, the group joined colleagues from other UC campuses, including UCSD, UC Santa Cruz and UC Riverside at the week-long gaming conference.

GDC features more than 300 lectures, panels, tutorials and round-table discussions on a comprehensive selection of game-development topics. The conference's Web page says it continues "to define market innovations and future vision, providing insight into the future of gaming."

UCI representatives demonstrated Dino Quest Online to the conference's 12,000-plus attendees, and UCI representative Walt Scacchi said the game attracted a lot of attention. "Several corporate executives were very interested in the whole physical environment/online game concept. We started discussions with at least one group that is interested in licensing the content."

Scacchi said that while several other educational institutions were represented at the conference, the UC contingent was the only one focused on research. And UCI's group in particular stood out. "We have more faculty involved in game research than any other campus or school in the U.S." he said.

Scacchi and Game Lab co-director Robert Nideffer presented the group's research and accomplishments again to the UC Board of Regents May 10 meeting in Oakland. Scacchi said the University of California is particularly interested in gaming as an up-and-coming research area, and board members were impressed by the depth of UCI's work.

1993

U.S. Senate launches an investigation into video game violence.

1994

Entertainment Software Rating Board established.

1994-95

PlayStation and Sega Saturn – the first console with a built-in modem – released.

1996

Nintendo 64 hits the market, selling more than 1.5 million units in three months.

1998

Nintendo releases *Pocket Pikachu*, a virtual pet with a built-in pedometer.

Developing a Global Network

Researchers at Calit2's Computer Game Culture and Technology Laboratory are embarking on a new partnership with Korean researchers that will advance information sharing and digital gaming technology.

The three-year, $1.3 million grant from the Center for Digital Industry Promotion (DIP) in Daegu City, Korea was announced in April. It will allow Calit2 researchers to work hand-in-hand with their Korean counterparts over a high-speed digital network.

A new unit, the Daegu Global R&D Collaboration Center, will be created in Daegu City to serve as a hub for the trans-Pacific research project.

The project will begin with participants improving the long-distance communications link that will allow them – and eventually many other researchers, developers, educators and students – to interact effectively. With a high-speed broadband communication infrastructure established, participants in both countries can communicate via high-definition Internet videoconferencing and related information-sharing environments.

Then they will collaborate on heterogeneous game networks, new game devices, and tools and techniques for developing beyond-next-generation games.

Investigators will examine assorted game networks – on mobile devices and personal computers, for example – that will facilitate playing the same game with similar graphics on different devices. They also plan to investigate new methods that facilitate massively scalable approaches to both game development and game play.

The joint venture is managed by UCI Game Lab Director Robert Nideffer and Associate Director for Research Walt Scacchi. Scacchi and Nideffer have been developing stronger ties to DIP and the Korean game industry for more than two years.

"We are looking forward to growing our productive relationship with our Korean friends and colleagues," Scacchi said. "Our goal in this project is to develop improved concepts, techniques and tools that will support highly effective information sharing and collaborative work practices."

believe in free expression, compassion and tolerance as the foundation for community in this new world."

Entertainment, media, apparel and automotive brands, including General Motors, Reebok, Toyota and Adidas, have bought in. They make their products available to purchasers with Linden dollars and some utilize cross-promotional tactics, giving players who buy an item in the virtual world a discount on real-world purchases.

In addition, blue-chip companies like IBM, Intel and Hewlett-Packard are experimenting to determine how virtual worlds can help them interact with distant customers and employees.

They are conducting meetings in the virtual space, as well as using it for training, private collaboration and outreach. News bureau Reuters has an office in Second Life where its journalists interact with each other, and the Swedish embassy has an office there where actual business transactions occur.

Bonnie Nardi sees this as just the beginning. "Absolutely, without question, in the future I think more businesses will participate this way," she states.

The UCI Library recently purchased a Second Life island, and Tomlinson, along with colleagues Peter Krapp and Dan Frost, are using it to teach an undergraduate course called Computer Games as Art, Culture and Technology. Students are required to build a game on Anteater Island as a way to understand different elements of technology and how people interact with it.

"They learn about programming, geometric modeling, animation and game design. In addition, it lets them explore the social aspects of the creation of interactive experiences in a massively multi-player virtual world," says Tomlinson.

A New Medium Emerges

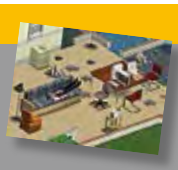
Love 'em or hate 'em, video/computer games have made their mark on society. In fact, Walt Scacchi, co-director of the Calit2 Game Lab, compares the genre to radio, television, cinema, print media and the Internet in its cultural pervasiveness.

2000

Sony releases Play Station 2, the first console with better graphics than a PC and the first to use DVD technology.

2000

The Sims debuts. Becomes the best-selling computer game of all time.



2001

GameCube, the first to allow wireless phone connection for Internet access, is released by Nintendo. Microsoft releases Xbox.

2002

G4, the first TV network devoted to only online and wireless games, debuts.

2002

U.S. Army makes an effort to attract recruits with release of *America's Army,* which is distributed free of charge and becomes the No. 1 online action game in the country.

Dino Quest Online, created by Calit2 researchers, teaches children about dinosaurs' digestive systems, food-chain relationships, physiology and more.

"These games represent the first new medium of the 21st century," he says. "They can be seen as a cultural medium, a technology, a system of commerce, a literary form – they have the potential to be all these things."

Tomlinson concurs. "I think games are in the same spot films were in 100 years ago," he says. "Just as films have become the medium for more interesting human expression, games have the potential to flower into something much more interesting."

Gaming's popularity is influenced by its fluidity. "Part of what people like is the interaction, the immersion, the play. What you played yesterday is different from what you will play tomorrow," Scacchi says.

Games are still evolving, he adds, but one thing – a fact that game researchers and developers know firsthand – will never change. "The key to a successful game is fun, and fun is really hard work."

Gaming by the Numbers

- The current size of the game industry – including hardware, consoles, software, networking, telecommunication and online services – is estimated to be $11.5 billion annually.
- The figure is forecast to grow to $30 billion annually within the next five years.
- Research shows the average player is 33 years old and has been playing games for 12 years.
- Forty-four percent of gamers are age 18 to 49.
- Thirty-eight percent of all game players are women.
- Twenty-five percent of gamers are 50 years old or older.

2003

Virtual online environment *Second Life* is created.

2006

PlayStation sells 103 million consoles in the first three months of the year.

2006

PlayStation 3 is released on Nov. 17 and Wii is launched Nov. 19. Wii outsells its competition by a 2:1 margin before the end of the year.

One-Pass System Creates Unique Research Opportunities

Photo: Paul Kennedy

Joining Forces for Innovation

Since its inception in 1999, the Integrated Nanosystems Research Facility (INRF) at The Henry Samueli School of Engineering has provided a platform for researchers in traditional technological fields to join together in an integrated, multidisciplinary environment.

by Erin Knapp

"We want to empower our researchers and bring faculty from engineering, life sciences and physical sciences together to work on new projects."

Based on the vision of Dean Nicolaos G. Alexopoulos, and led by G.P. Li, professor of electrical engineering and computer science, and biomedical engineering, the INRF has fostered collaborative research among engineers and scientists from across the UC Irvine campus, neighboring academic and government institutions, and participating companies in the high-tech industry.

Now, the INRF is taking another step towards eliminating barriers to innovation by joining forces with the UCI division of Calit2 and the Carl Zeiss Center of Excellence.

The three-lab collaboration will create one united micro- and nanotechnology resource facility – a one-stop shop for fabrication and research.

The INRF will continue to offer the inorganic capabilities researchers have come to expect, but the new partnership adds access to micro- and nanosystems resources for organic, biologically based materials, such as those used for biomedical applications. And the Zeiss Center enables all researchers to characterize their work with the center's three electron-scanning microscopes.

The INRF, which develops and promotes technologies for engineering inorganic nanoscale systems, features an 8,600-square-foot, class-1,000/10,000 clean room facility, including class-100 work areas with major semiconductor fabrication equipment.

The Bio-Organic Nanotechnology (BiON) clean room facility at Calit2, which is scheduled for completion this summer, will offer equipment for building and conducting research on micro- and nanosystems

Photo: Paul Kennedy

Semiconductors and other nanosystems are constructed in the INRF clean room.

comprised of organic materials.

The Zeiss Center of Excellence, a partnership between Calit2@UCI and Carl Zeiss SMT, a global semiconductor and nanotechnology instrument manufacturer, opened in April 2006. It contains three state-of-the-art electron microscopes – considered leading-edge technology in their respective fields – which scientists use to build and/or characterize nanosystems, regardless of whether they're organic or inorganic. The center has become a Southern California regional hub for nanotechnology and biotechnology research, as well as advanced materials development and innovation.

"This cooperation represents a new step in micro- and nanofabrication for UC Irvine," said Mark Bachman, associate director of the INRF and coordinator of the back-end integration process among the three centers. "It enables us to take a leadership position in the area of integrated organic and inorganic micro- and nanosystems research, and will be a great resource for the campus, Orange County and Southern California."

Bachman explained that because the INRF and Calit2@UCI share the same vision for leadership in advanced technology development, and their missions and strengths complement each other, they can partner easily to encourage innovation.

"This cooperation represents a new step in micro- and nanofabrication for UC Irvine."

Each of the three centers will maintain its own focus and agenda, but the collaboration will enhance access and coordination among them. Organization, information technology, billing and a consistent set of policies will be merged into one infrastructure. To facilitate use, a "one-pass" system that allows access to all sites with just one key will enable faculty, researchers and affiliated industry to move seamlessly from one center to another.

"The Henry Samueli School of Engineering prides itself on continually raising the level of excellence in engineering education and research, and I look forward to the integration of three outstanding centers," said Alexopoulos. "This will continue to encourage innovative research, and support student and faculty technological advancements. Our school is an enthusiastic partner with Calit2, and the combination of these centers is truly dynamic, supporting and promoting the spirit of interdisciplinary collaboration."

"Lowering barriers to innovation and providing easy access to technology and research is important to all of these centers," added Li, the newly appointed director of Calit2@UCI. "We want to empower our researchers and bring faculty from engineering, life sciences and physical sciences together to work on new projects."

More information on all three centers is available at *www.inrf.uci.edu* or *www.calit2.net*.

Surrounded

Monks shop for computer equipment at Pantip Plaza, Bangkok's technology mega-mall.

By Amanda Williams

Ubiquitous computing is the creation and deployment of computing technology in such a way that it becomes an invisible part of the fabric of everyday life. Its technologies are deployed into diverse social, cultural, political and geographic settings, and incorporated into many different forms of personal and collective mobility. The varied mobilities of the jet setter, migrant worker, goat herder or university student lend different uses and meanings to computational devices and technological infrastructures.

I explored this idea last summer while interning with the People and Practices Research Lab at Intel Research in Portland, Ore. I conducted a three-month multi-site ethnography on the particular mobile practices of transnational Thai retirees. The study included 19 retirees and four of their children. Most own a home in both countries and travel between the two approximately yearly, maintaining important ties in both locations.

My study focused on concepts of distributed "home," collaboration between family members across continents and within a city, and how ordinary people use technology to achieve personal and cultural values. Besides interviewing my subjects, I visited their homes, staying overnight or for several days when possible, and occasionally traveled with them. Interviews and home visits took place in and around Seattle, St. Louis, rural Illinois and New York in the United States, and Bangkok and Chantaburi in Thailand.

One of the major conclusions I

Amanda Williams is a third-year graduate student in information and computer sciences and a Calit2 student researcher at UCI. In 2005, she was the recipient of a prestigious three-year NSF Graduate Research Fellowship that funded her travel to Thailand to investigate ubiquitous computing. She plans to return this summer for 10 months to complete her research.

Besides interviewing my subjects, I visited their homes, staying overnight or for several days, and occasionally traveled with them.

drew from this study is that *distance matters,* but not always in the ways we think it does. Rather than thinking about how communication technologies solve (or don't) the problem of distance, a more productive framing might focus instead on *distribution,* and how certain locations can help people better fulfill a role they have taken on, or help their family or make certain resources available. For example, having a relative in Bangkok or New York may be as valuable as good grades or high income in opening up opportunities for higher education.

Another finding: *location matters.* Identical devices in different social settings take on very different meanings and are appropriated differently into people's practices. Our participants regarded mobile phones as a natural fit for a *Thai* lifestyle in a way that is not quite true of the U.S. lifestyle. The key to this fit lies in the differences between social infrastructures in the two locations.

In Thailand, local networks of exchange were denser and more readily available, constantly in the background, an important resource for navigating the world, and a major source of authoritative knowledge. Communication technologies like cheap telephony and email make that social infrastructure even more readily available, and mobile phones make it available even when one is about town, allowing people to cope with unreliable urban infrastructure, chronic traffic jams and missed transit connections.

Mobile phones were a crucial coping mechanism for the unpredictable and often heavy traffic in Bangkok (much like L.A.) and were used not just to call friends to tell them you're running late, but also to get expert opinions on what route to take and where to find good parking.

In June, I will return to Bangkok for 10 months to continue exploring ubiquitous communication technologies and urban mobility *in situ.* Design and development of a mobile technology system informed by my ethnographic work will be done in collaboration with a pervasive computing research group at Sripatum University.

Dancing to a Different Beat

Photo: Gregory Gallardo

What does a free-spirited dancer think when she looks at the confines of an office? In the case of Lauren Thompson, she sees an interesting place to stage a dance film.

By Lori Brandt

"... dance for the screen gives you another dimension where you can suspend time, combine images ... perform 'magic' in a sense."

That's why Calit2 became the set for the UC Irvine MFA dance student's choreographic thesis, "9-5." Thompson filmed her 30-minute, narrative dance-for-camera piece on the fourth floor of the high-tech building and then presented it on the first floor in early May along with a four-channel, wall-mounted video presentation and a photo exhibit.

"I wanted to put dance in a place where it doesn't belong, and I liked the idea of shooting and premiering my film in the same location," says Thompson. "I had this concept for a day at the office with an unusual group of co-workers."

Atypical Workday

Some day, indeed. With a crazy mailroom guy, an erotic fantasy scene in the copy room, cubicle yoga and more, this day at the office unfolds to reveal Thompson's edgy sense of humor. Quirky characters express themselves through dances, set to an eclectic score of music ranging from big band to electronic.

"9-5" starts with a staff meeting – bored, sleepy employees sit listlessly around the conference table with notepads, donuts and coffee, while a boss drones on like Charlie Brown's teacher. Two interns arrive and one of the office workers (Carlina Villaverde), is told to train them. Mail delivery is a lively swing dance to big band; lunchtime is a gloomy, sluggish modern dance solo set to electronic music.

The office nerd (Marc Sicignano) has a crush on the workplace recluse (Courtney Zimmerman), leading to the copy room fantasy scene in which lingerie-clad women surround and tease him with a calculator and post-its, all to the beat of rock and roll. Meanwhile, the interns are inept and end up locked in the closet. The mailroom guy sneaks into the file room where he strips to his

underwear. He obsessively flicks and licks voodoo dolls of his co-workers.

In the final scene, the boss leaves early and the whole office erupts into party mode. The receptionist pulls out the boom box and everyone dances. Marc works up the courage to ask Courtney for coffee. She agrees, and the wacky day ends on a happy note.

Setting the Stage

The field of dance for camera, or dance film, is a growing art form, and UCI's dance department is at the forefront of integrating technology with dance. With Calit2 as a research partner, it has developed a highly regarded program in dance media, using current digital media technology to augment and preserve dance practices.

"Choreography made specifically for the camera embraces film technology's potential to transcend the ephemeral nature of a dance performance, creating new perspectives of bodies in motion," explains John Crawford, UCI assistant professor of dance, and faculty advisor for students pursuing dance and technology research. "Lauren's piece is a great example of the work being created by our dance media students."

> **"I wanted to put dance in a place where it doesn't belong."**

Thompson had been working in the Calit2 digital arts lab on projects with Crawford so she was familiar with the new building. For her choreographic thesis, she wanted to show a different way to look at something, like an office, and explore what could be done in that space. She served as producer, choreographer, writer, director, videographer, editor and sound designer.

"Lauren's cast members were all talented dancers but most had very little experience with portraying characters on film," Crawford says. "She shows her skill at directing by drawing out strong performances from each of them."

Big Screen Dancing

Many of the dancers had never performed in an unusual setting before. "It is becoming more popular to stray from the stage and bring creative performances to various settings, making dance more accessible to people who may not want to attend stage performances," says Zimmerman, a UCI graduate who plans to pursue a career as a professional dancer.

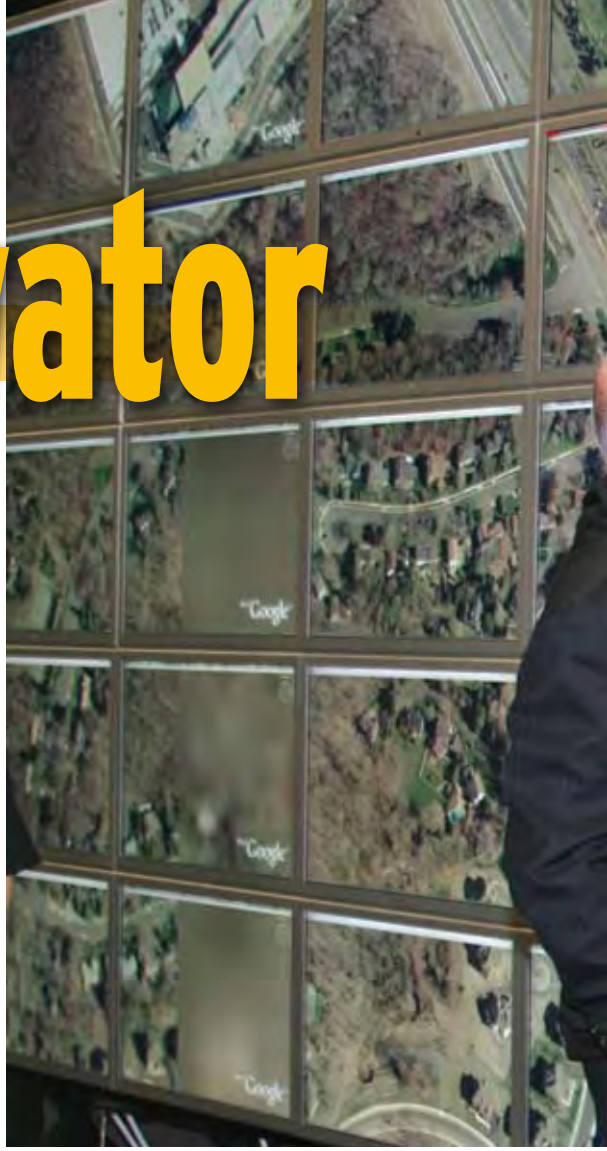
This is Thompson's first 30-minute film. She's produced shorter videos, notably "Racquetball" (four minutes), which was shown at the 2007 Newport Beach Film Festival in April and at new Slate, the fall UCI graduate choreography concert.

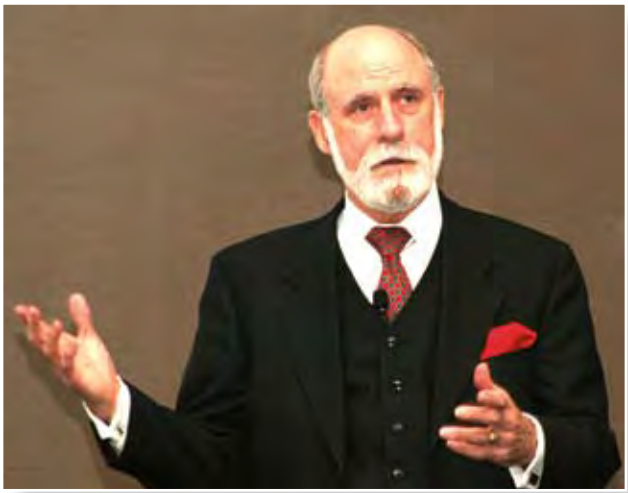
Thompson started dancing as a young girl. She attended Orange County High School of the Arts, then went to college in New York to study dance. It is the choreographer in her that makes filming dance so attractive. "I like being able to choose what the audience sees in each frame," says Thompson. "Creating dance on the stage gives you many options for creativity, but dance for the screen gives you another dimension where you can suspend time, combine images … perform 'magic' in a sense."

Photo: Gregory Gallardo

Internet Innovator

Cerf Takes Calit2 Audiences into the Internet's Past, Present and Future





Internet pioneer Vinton Cerf made a two-stop visit to Calit2 in April. The Calit2 Advisory Board member, who currently serves as Google's Chief Internet Evangelist, gave presentations to standing-room-only audiences at the UC Irvine and UC San Diego divisions, attracting faculty and staff from across both campuses, as well as industry partners and community members.

"We didn't know what telecommunication technologies would be invented and we wanted the Internet to work on them even though we didn't know what they were."

Cerf told the overflow crowd at Irvine, that when he and colleague Robert Kahn were working on the design of the Internet in 1973, they decided whatever blueprint they came up with had to work on new telecommunications systems that would not be invented for years. "We didn't know what new telecommunication technologies would be invented and we wanted the Internet to work on them even though we didn't know what they were," he told the group.

The forward-thinking pair decided to build the basic design criterion for the protocol independent of the underlying physical transmission media. "So when optical fiber came along, and satellite links became available, or Wi-Fi or ATM or frame-relay, all those things were made to carry Internet packets," he said.

The TCP/IP protocols that Cerf and Kahn designed utilize information packets that don't know or care what

Cerf locates his Virgina home on the HIPerWall, during one of several stops he made on a post-lecture tour of the Irvine Calit2 Building.

kind of information they're carrying. "All the packets know is that they're carrying bits," Cerf explained. "That could be email or a piece of video or audio or a Web page. This has probably been the single most fundamental design decision that we made, because it stimulates unlimited innovation." He added that the openness and freedom to explore the network "is the most important property we can preserve on the Internet as the future unfolds."

"Users are becoming the center of the universe."

Cerf's talk, "Tracking the Internet into the 21st Century," kicked off Calit2@UCI's IT Matters breakfast lecture series, which examines current trends in technology policies affecting business practices, investment considerations and funding opportunities. The inaugural presentation was sponsored by Carpenter & Company, an Irvine-based investment banking firm.

Cerf pointed out that although the Internet emerged in the United States, it has grown into a global communication medium. Ten years ago, most users were in North America. Today, North America accounts for 232 million users, while Asia and Europe have more (389 million and 312 million, respectively) – statistics that will impact the content of the network and the languages that are used to interface to it.

He also addressed unfolding social and economic effects on the network. For example, consumers of content are now becoming producers – think Wikipedia, YouTube, Facebook and MySpace. This has led to the Internet becoming a completely democratic system, both for access and production. "Users are becoming the center of the universe," Cerf stated. "They are in charge. They are in control."

The next day, Cerf addressed a packed house at the San Diego Calit2 Auditorium in Atkinson Hall, where he discussed "Internet Research Challenges."

Cerf is widely recognized as one of the founding fathers of the Internet. He worked on the ARPANET, the earliest packet-switching computer network, then collaborated with Robert Kahn to connect multiple packet-switching networks, co-designing TCP/IP protocols and the basic architecture of the Internet. He also developed (at MCI) the first commercial email service to be connected to the Internet.

Cerf received the U.S. National Medal of Technology in 1997 and the Presidential Medal of Freedom, the nation's highest civilian honor, in 2005. He is also a recipient of the 2004 Turing Award, the computing field's equivalent of the Nobel Prize.

FUNDING NOTES

by Stuart Ross

Improvisation in Emergencies

Emergency planning cannot anticipate every possible scenario, so in every crisis, first responders must cope with the unexpected. UCI sociologist **Carter Butts** is among researchers who study such improvisation – can we learn enough to enable more successful improvisation in future emergencies? This question is addressed in a new NSF-funded subcontract awarded to Butts, a Calit2 Project ResCUE participant. He received a three-year, $250,000 award as part of a larger project conducted by the New Jersey Institute of Technology. The researchers hypothesize that the most effective emergency improvisation occurs when there has been prior planning and preparation because less time and effort is required for recall and prediction – just as jazz improvisation is easier for a familiar tune than for a new one. Butts will also study patterns of leadership in communication and improvisation. Project researchers are working from transcripts of emergency communications in the World Trade Center attack in 2001 and the Oklahoma City bombing in 1995.

Improving Mobile Ad-Hoc Networks

Homayoun Yousefi'zadeh, adjunct assistant professor of electrical engineering, has been awarded a $50,000 grant by the UC Discovery Grant program, matched by $70,000 from the Boeing Corporation, for a one-year study of mobile ad-hoc networks (MANETs). MANETs are increasingly common, but it is often difficult to ensure quality communication in MANETs because they are subject to frequent change; nodes can both receive and transmit, be servers and clients, and join or leave at any time. The network protocols for the fixed Internet therefore do not always work well in MANETs. Specifically, Yousefi'zadeh examines the protocols for end-to-end bandwidth estimation, which is how a node determines bandwidth space for transmission and reception. In addition, he will examine the added difficulties encountered if encryption is necessary.

Animated Agents Assist Integration

Having several electronic devices at hand is common; often these devices are networked to the Internet or to each other, typically for separate functions. Calit2's **Bill Tomlinson**, assistant professor of informatics, is developing ways to achieve greater integration – enabling collocated devices to take advantage of their physical proximity to offer joint multi-function support for various tasks. Tomlinson's approach has now been recognized by the National Science Foundation, with a prestigious "CAREER" grant of $500,000 over five years. He will use animated agents that move believably from one device to another, giving the human operator a form of interaction that works for all the devices. He began this work with the 'EcoRaft' project at Calit2, in which animated organisms are carried from one computer to another on tablet PCs. With the CAREER award he will further develop the mobile agents' capabilities so they can interact expressively with humans and with each other. He will also develop programming to improve performance across multiple heterogeneous devices as well as explore ways to apply this new paradigm to education.

Surfaces Are Important

A five-year, $400,000 "CAREER" grant was awarded to **Daniel Mumm**, assistant professor of chemical

engineering and director of the Zeiss Center LAB in the Calit2 building, for his work on surface degradation in fuel cells. Fuel cells, like batteries, are electrochemical devices, but unlike batteries, they can accept a continuous stream of fuels (usually oxygen and hydrogen, or equivalents) and thus produce a continuous stream of electricity from reactions between the fuels and the electrolytes and catalysts in the cell. As in a regular battery, the critical interactions occur where surfaces meet, when materials pass electrons along in a series of chemical reactions. This often causes surface degradation over time, an important issue that limits the potential uses of fuel cells. Mumm will use the award to continue his work to determine the micro-structural nature of surface degradation in solid-oxide fuel cells.

This list comprises recent awards the Calit2 research development office facilitated. Calit2 is particularly interested in helping faculty secure grants for interdisciplinary research. Contact stuross@calit2.uci.edu for further details and assistance.

Expert's Guide

The Smart Home

Ramesh Jain is the Donald Bren Professor of Information and Computer Sciences at UCI and a renowned pioneer in multimedia information systems, image databases, machine vision and intelligent systems. He founded three companies, including one that developed systems for media management solutions and visual information management.

What is a smart home?

A smart home is one in which the needs of its residents are automatically considered by sensor systems that employ actuators (controlling devices) to make living comfortable and convenient. This may be related to temperature, lighting, entertainment, communication or any other activity in the home. In a sense, air-conditioning systems that adjust temperature in the house are a step in making homes smart.

How does a homeowner control these functions?

Theoretically, any function that can be controlled by an electric signal can be controlled using any device that can generate the appropriate signal. This includes remote control and the Internet. Thus, as soon as you board a flight in Ann Arbor, Mich., it will be possible to send a signal to your home in Orange County, Calif. to start the heating systems.

How does it work? Are user interfaces easy to operate?

A real smart home will have many sensors that monitor the systems. The interface to the home will allow homeowners to specify in simple ways what they would like each system to do. Ease of use of any interface depends on the familiarity of users with the interface and its design. Most people can easily use a good interface but a bad design can confuse even the brightest and most sophisticated user.

How common are these systems?

Currently one can buy separate systems for separate functionality. You can buy light controls, heating systems, window controls and other equipment controls, like entertainment systems. But the idea of linking everything together to form a 'real' smart home is not yet a common thing. There are many hurdles, technical as well as business-related, in realizing a true smart home.

What are the benefits for the consumer? Is there a downside?

Benefits to the consumer may include economy, security, convenience and enjoyment. A smart home will understand your needs, including saving energy costs, and will behave accordingly. It may even remind forgetful people to do the right things at the right time.

As with any technology, there is always risk of abuse, and smart homes will be no exception. In the early stages, there will be more abuses but as technology matures, it will be refined to protect against common abuses. Brilliant criminal minds will always find ways to beat the system, however.

Where is the technology headed?

All devices are slowing getting IP addresses and new houses are being built with a plethora of sensors. Soon all homes will have multiple sensors, including video cameras and RFIDs that allow them to understand the 'situation.' Since all these devices and sensors will have wireless connectivity and IP addresses, it will be easy to check on the home's current situation and then adjust it from anywhere.

I can imagine homes that would allow you to interact with anybody in the world from anywhere, without picking up a phone. You would have all your data and information stored on a server, which may or may not be located in the home. The server would present information to you on a device of your choice. Of course the home will take care of simple, personalized creature comforts and will order all the supplies without bothering you.

Technology is headed in whatever direction you would like. It will allow you to customize the smartness in your home. It would be nice if your home could detect your desire and adjust its own smartness, but I am afraid that is going to take some time.

Will every home eventually have this technology?

The definition of "smartness" is a relative one and will keep changing. The smart home is an interesting concept. Like everything – imagine a car that can parallel-park itself better than most humans can – homes will keep getting smarter. As we install sensors and actuators and connect them using modern networks, smartness is going to continue to improve – not only in homes – but everywhere.

A Vote for Calit2

UCI Chancellor Michael Drake hosted a reception for newly elected officials in January in the Calit2 Building. During the event, four labs opened their doors, demonstrating their research projects to the lawmakers and business leaders. The more than 100 guests were impressed by what they saw and many expressed interest in returning to learn more about the institute. Lucy Dunn, president of the Orange County Business Council, and Chancellor Drake addressed the crowd, extolling the importance of the university's partnership with elected officials and the local business community. "Together we will create new frontiers of innovation and discovery, create jobs, build industries and secure a foundation of excellence for Orange County's future," said Drake.

One Step Ahead of the Crisis

Mobile, sensor-equipped robots roamed the Calit2 atrium, collecting information about temperature, noise, the presence of gas and more, and sending the data – as well as audio and video streams – to local computers. The robots were one of many cutting-edge prototypes demonstrated to intrigued guests at Calit2's fourth Igniting Technology event in March. Sponsored by intellectual law firm Knobbe Martens Olson & Bear LLP, the Igniting Technology presentation featured a panel comprised of two UCI researchers and two community/corporate partners who are participating in the research and using the project's test beds. Each panel member presented his/her latest findings and prototypes before answering audience questions.

Easy to be Green

UCI's National Fuel Cell Research Center (NFCRC) celebrated in February the grand opening of its automobile hydrogen fueling station – the first of its kind in Orange County, and the first in California capable of dispensing hydrogen at 700 bar, or 10,000 pounds per square inch, which in some cases can nearly double a vehicle's driving range. Automakers Toyota, Nissan, Honda, General Motors and DaimlerChrysler are expected to use the station to fuel demonstration vehicles that are not yet commercially available. The station provides the newest in fueling technology to meet the demands of the vehicle development programs. Calit2 is exploring "green" research collaboration with the NFCRC.

First in the Nation

After more than a year of collaboration, UCI's Calit2 ResCUE/ResponSphere research team presented its Disaster Web Portal software to the fire chief, fire marshal and department managers from the City of Ontario, Calif. The portal is a suite of applications used to disseminate information and provide situational awareness to the public and the media during and after a disaster. It is linked to the city's home Web page, making available to residents up-to-the-minute announcements, interactive maps of affected areas, donation management information and one-step family reunification messaging. "It's easy for the public to understand and use, and also easy for the city," said Jacob Green, Ontario's emergency manager, who worked closely with the portal's developers. City officials hope to formally launch the portal this summer which will be the first of its kind in the nation.

All Hands on Computer Science

UCI's Women in Information and Computer Sciences (WICS) chapter included a visit to some Calit2 labs in their annual outreach program for elementary school-age girls this spring. Orange County children from the Girls Inc. program had the opportunity to explore different fields of computer sciences. Joerg Meyer, assistant professor and researcher in Calit2's Center of GRAVITY lab, demonstrated computer graphic and visualization techniques by giving the girls a virtual tour of a pig's heart. WICS recently received a Most Outstanding New Program award from the UCI Dean of Students for a creative approach to encouraging young girls to further their interests in science.

Senator Pays a Visit

State Sen. Tom Harman (R- 35th District) got a close-up look at research taking place at Calit2@UCI when he visited the institute in April. Harman is vice chair of the Senate Judiciary and Human Services committees and is a member of the Business, Professions and Economic Development Committee, among others. UCI division director G.P. Li escorted Harman on the tour of the building's labs, which included hands-on demonstrations by the professors and students. Harman was impressed by what he saw and mentioned the visit in his online newsletter. "I was very grateful to have the opportunity to hear about the incredible research being conducted at Calit2 … It was quite remarkable to see first-hand the research and advances that are actively driving the future of telecommunications and information technology," he wrote.

International Connections

Calit2 Irvine research affiliates are discussing possible collaborations with interested parties from every corner of the world.

• In February, Assistant Professor Bill Tomlinson, manager of the Calit2 Interactive Animation Lab, hosted Yaron Gamburg, deputy consul general of Israel, who wanted to know more about the lab's various projects. The exchange was productive, according to Tomlinson. "We had a very nice discussion. Nothing concrete, but I think he would be interested in facilitating collaborations between our researchers and the Israeli academic and entrepreneur communities." Further connections are being explored. ►

• The director of the National Laboratory of Solid State Microstructures at Nanjing University, China, was the invited guest of Calit2's Jian-Guo Zheng. Professor Mu Wang spent two days in February at UCI learning more about the facilities and investigating potential research collaborations. In addition, Wang presented a talk about his research on the growth of crystalline branches in artificially controlled, diffusion-limited systems. ◄

• The Canada-California Strategic Innovation Partnership brought our neighbor-to-the-North's consul and trade commissioner for technology partnerships to the UC Irvine campus. Eric Holdrinet presented research collaboration opportunities in energy, nanotechnology, stem cell and regenerative medicine, information technology and venture capital to a group of Calit2-affiliated faculty. Holdrinet toured Calit2 labs and the neighboring Integrated Nanosystems Research Facility and National Fuel Cell Research Center. ►

• The Center for Research on Information Technology and Organizations (CRITO), a Calit2@UCI partner center, and the Indian Institute of Technology, Madras, will be hosting an international conference titled "Home/Community Oriented ICT for the Next Billion." The conference will be held in Chennai, India this August. UCI Professor Alladi Venkatesh is chairing the conference, which will focus on the development of information and communication technologies in emerging economies and rural sectors. For information, visit *http://hoit2007.com*. ►

Building Bridges

During National Engineers Week in February, UCI civil and environmental engineering students used the Calit2 atrium to build bridges – out of Popsicle sticks. The students divided into teams to see whose finished product could support the most weight. Winners were: Ratana Watabutr, first place; Milad Hashemi, second place; and Irene Chang, third place. Other Engineering Week activities included paper airplane, Rube Goldberg and catapult competitions.

Taking Privacy to the Airwaves

Privacy protection is fundamental to Calit2's ResCUE project research. Lately, however, the project has been attracting some very public attention. In March, Chris Davison, project technology manager, and a group of his student researchers were interviewed for the radio program "Privacy Piracy" that airs on KUCI-FM. Hosted by Orange County attorney and privacy consultant Mari Frank, the discussion focused on why privacy is important to the group's research and how it is incorporated into technology prototypes. "We had a very animated conversation," said Davison. "Mari is an Orange County reserve sheriff, so she has a knowledgeable background in law enforcement. It was a real pleasure to talk with her regarding the many facets of individual privacy and the privacy aspects of information technology." The interview is available at *www.kuci.org/privacypiracy*.

Songs at a Distance

Performed simultaneously at UCI and New York University, an April 28 telematic concert utilized the high-bandwidth capabilities of Calit2's Digital Arts Lab to connect performers, music and video. Choreographed and directed by lab managers John Crawford and Lisa Naugle, "Songs at a Distance" featured 25 UCI student performers and media artists interacting with professional musicians in the Loewe Theatre at NYU. The performance utilized the Active Space technology that Crawford and his research team have implemented in the lab. The interactive media system incorporates video-based motion tracking, motion capture, real-time video and audio synthesis, high-bandwidth networking, and multi-channel visuals and sound. The system continually senses, measures and responds to the movement of participants, providing an array of tools with which to engage and "play the space" as an instrument.

The California Institute for Telecommunications and Information Technology is a two-campus multidisciplinary research institute. In collaboration with UCSD, Calit2@UCI integrates academic research with industry experience to seek innovative IT approaches that will benefit society and ignite economic development.

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Next-generation solutions for improving health concerns will combine life sciences and miniature-scale technologies. The lab-on-a-chip concept is the focus of UCI's LifeChips program, one of the research programs underway at Calit2-affiliated INRF. LifeChips brings together professors, graduate students and industry partners in engineering, physical sciences, life sciences and medicine. Together, they are making new discoveries at the intersection of biology and micro- and nano-scale technology that will identify new drugs, facilitate stem cell research and improve understanding of life's basic components.

UCI students Julius Oatts (left) and Trang Bui examine a semiconductor chip before it undergoes additional bio-organic processing.

Photo: Paul Kennedy