The Institute for Creative Technologies

SELECTIVE FOCUS

A Newsletter of Activities at the ICT

Lynda A. Strand, Editor

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ICT Demonstrates Training for "Universal Observer"

Lawton, Oklahoma, September 8
ICT, working on behalf of Ft. Sill, the home of US Army Artillery, today unveiled the Joint Fires & Effects Trainer System Demonstration. This system reflects the best current thinking about a capability termed the "Universal Observer". Its goal: to turn every Soldier, Sailor, Airman and Marine into a Forward Observer – a warfighter with the ability to call for a broad range of fires, effects and munitions, both non-lethal and lethal.

MG Michael Maples, Dr. Paul Mayberry, Richard Lindheim and Dr. Cornelius Sullivan Officiate at JFETS'D Ribbon Cutting Ceremony

The heavily-attended inaugural event marked the opening of a facility that serves as a "demonstration of concept" while the first test-bed system is under development. Hosts MG Michael Maples, Ft. Sill Commanding General and Richard Lindheim, ICT Executive Director, welcomed a group including Deputy Under Secretary of Defense Dr. Paul Mayberry, Carolyn Hanna of the Senate Armed Services Committee and John Bonsell, Military Legislative Assistant to Senator James Inhofe (R-OK). Also on hand for the opening was Dr. Cornelius Sullivan, USC Vice Provost for Research.

The demonstration showcases Universal Observer trainees in a range of environments. A Humvee mockup mounted on a motion platform surrounded by a thirty-six foot screen simulates a scout crew finding targets with a laser designator.

An Air Force Enlisted Terminal Air Controller is featured in an urban setting supporting a Special Forces assault team. Finally, a Battalion Command Vehicle with a twist: the Major, Captain and Sergeant on board are part of a distributed learning exercise. Although their interaction is vivid and immediate, the participants are in different cities. All three environments are part of a single operation; typical of the kind of fast-moving "maneuver warfare" US defense has advanced to in recent years.

Humvee in Open Terrain Module

The Ft. Sill project represents a significant milestone for ICT: it is the first integration of the ICT's core technologies – graphics, artificial Intelligence and sound – in a functional Army training center. It is the developmental and technology transition nexus for all the key ICT research areas.

Urban Terrain Module

The project signals the start of a transition process whereby research will begin to move from the laboratory into a training environment where soldiers can train under conditions that are not achievable in the current generation of simulators. As soldiers begin to interact with training system and learn how to make better decisions, the research teams will also learn, by collecting data that will help them identify how to improve the system. By embedding the training facility in an Army training center, the transition process will be accelerated by user feedback, enabling spiral model of development.

The success of the Fort Sill project to date is a direct consequence of the fulfillment of the ICT mission to foster collaboration between the entertainment industry and academia. The training system concept demonstration fuses FlatWorld, Mission Rehearsal Exercise, Hollywood stagecraft, story design, and game-style interaction. The combination of immersive display and audio technologies, high-dynamic range lighting and reflectance modeling, realistic set design, virtual humans who can engage in a conversation with the trainee, and a mission with a dilemma, create a level of engagement unlike what can be found in the current generation of simulators. This unique training experience is being made possible by successfully teaming computer scientists, set designers, story writers, and game developers.

ICT research efforts currently represented in the facility include two "Virtual Humans" in the urban module who both work with and challenge the Air Force trainee. The After Action Review component, an essential part of military training, includes an advanced "Explainable Artificial Intelligence" feature, first seen in ICT's Full Spectrum Command and Full Spectrum Warrior PC and Xbox training aids. The high definition visual content, produced especially for the demonstration, ran on new, low-cost video servers featuring control software developed especially for Ft. Sill.

After Action Review

Project Leaders James Korris, ICT Creative Director and Dr. Randall Hill, ICT Deputy Director of Technology acknowledged the extraordinary effort spearheaded by Deputy Project Leader David Hendrie and the entire production and research crew. The team is moving on to the project definition phase in the interactive test bed version of the demonstration that aims to train soldiers by August 2004.

ICT Graphics Lab Light Stage 2
Technology Soars

The Graphics Lab (GLAB) Team recently took to the skies in the making of a documentary, entitled "Unsolved History: Roswell", which aired October 15th on the Discovery Channel. The show attempted to provide scientific answers to unsolved UFO sightings, and posed questions as to whether or not these sightings were in fact real. The GLAB was commissioned to scientifically recreate how weather balloons might be mistaken for UFO's, by simulating how the balloons would appear at various altitudes and in a variety of natural illumination conditions.

Capturing Incident Illumination at Altitude

The project came about after Douglas Martin, a digital artist working on the show, attended an evening lecture that the GLAB's leader Dr. Paul Debevec gave at the Gnomon School of visual effects in Hollywood. Debevec had described the GLAB's Light Stage 2 process, which uses a rotating arc or strobe lights to record digital images of how people or objects appear under every possible direction of illumination. From this data, GLAB algorithms can simulate the appearance of the object under any complex form of illumination, such as in a forest, on the beach, or just after sunset.

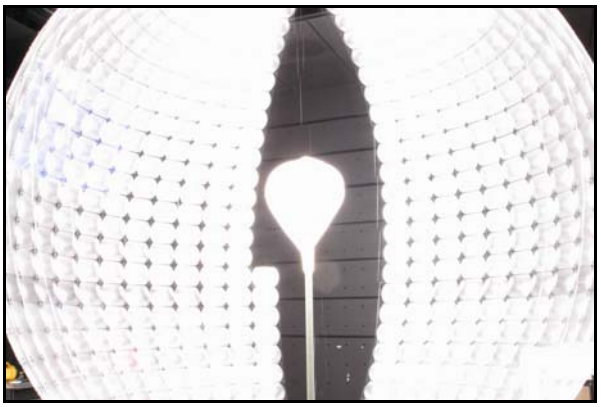
GLAB Designed Light Probe System
Mounted on Pitts Biplane

Part of the problem was to capture measurements of incident illumination at high altitudes. GLAB art director Marc Brownlow and Paul Debevec worked to design a version of the lab's light probe system that could safely be attached to an airplane. Accomplished aerial cinematographer Mehran Salamati designed a camera mount which was fitted above the front seat of stunt pilot Tony Moradian's open cockpit Pitts biplane.

On the evening of September 8th, Moradian took off from Van Nuys airport and flew at high altitudes in order to capture the incident illumination over the Fillmore area. Salamati followed in his own small plane along with Debevec, who used a radio link to speak with Moradian and direct the lighting capture. The light probe system uses multiple shutter speeds like that of a camera with a fisheye lens, and captures 180˚ of illumination at a time. To capture the whole 360˚ of incident illumination, Moradian took photographs of the sky looking upwards and then performed an 180˚ roll to record the other half of the lighting while flying upside down. In this manner the team was able to take incident illumination measurements while flying at 10,000 feet!

Light Probe Taken Just At Sunset

The decision was made to capture the illumination in the period just after sunset, since this is a time that high-altitude weather balloons would most likely be mistaken for something otherworldly. When you are higher up, the sun drops below the horizon later in time than when you are on the ground. For approximately six minutes after sunset, an observer on the ground can view a weather balloon at 10,000 feet as it is still lit by the sun; and a weather balloon at 50,000 feet would still be in direct sunlight after 30 minutes. Set against a darkening sky, high-flying objects might appear to be self-luminous.



A Weather Balloon Captured Within LS2

Back at the ICT, Tim Hawkins, Graphics Lab Supervising Producer, captured Light Stage II datasets of small models of the model balloons made from the same materials as full scale weather balloons. These datasets allowed the appearance of the balloons to be simulated under any desired lighting condition. With this data, Chris Tchou, GLAB Research Scientist, was able to simulate the balloons' appearance under the lighting captured at 10,000 feet. He then used a mathematical sky illumination model to extrapolate these results to see how the balloon would appear at 50,000 feet.

He composited the data set with photographs taken one-half hour after sunset into a dark midnight blue background to simulate the appearance of an object located high in the sky just after sunset. The balloons lit by this method were made of a translucent luminescent plastic material which gave the appearance of being ethereal and mystical when lit in this manner.

Weather Balloon Modeled Illuminated Using Captured Illumination & Light Stage 2 Data

"The nice thing about contributing to the show is that we are able to study how light varies up in the atmosphere," said Debevec. "We've learned more about different types of light scattering and why sunrises and sunsets look the way they do. The data we acquired helps inform our ongoing lighting capture and simulation research."

Renderings from the GLAB's investigations as well as an explanation of the Light Stage 2 (LS2) technology were interspersed throughout the final program. When watching the program, the viewer is given the opportunity to decide if they wish to believe in the scientific explanation, or if the romantic Roswell spin is more to their taste. LS2 weather balloon innovative research images can be seen at: http://www.debevec.org/Pix/TermiteArt-UFOs/LightStage2/

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ICT and Singapore: What a Match!

In ICT's continuing efforts to develop projects in new areas, one partner stands out: Singapore. In the spring of this year, ICT and Singapore's Defence Science and Technology Agency (DSTA) entered into a multimillion dollar collaboration to produce two game prototypes. These prototypes will build on what ICT has already developed for the U.S. Army by incorporating more cutting-edge AI research, spearheaded by Dr. Michael Van Lent, and an expanded environment of Singapore-based locales, characters and learning objectives. The ICT games projects, led by James Korris and Rob Sears, had already been prime examples of ICT's ability to blend ICT's research expertise with the contributions of many different partners such as Legless Productions, Quicksilver, Pandemic, Sony Imageworks, and Ft. Benning. And now, the Singapore collaboration will introduce even more players to the mix. The Singapore Armed Forces will provide subject-matter experts, and Singapore's DSO National Labs will provide more artificial intelligence research. In fact, DSO will be sending a

researcher to work with the games team at ICT during the course of the project.

ICT's relationship with Singapore has developed over time. In the summer of 2000, the CEO of DSO National Laboratories, Dr. Quek Tong Boon, met with Craig Cochrane, ICT's Executive Manager of Collaboration. Over the next few years, ICT hosted many visitors, including Singapore's Chief Defense Scientist, Prof. Lui Pao Chuen; Singapore's Secretary of Defence, Dr. Peter Ho; and the CEO of DSTA, Dr. Su Guaning, who is now the president of the National University of Singapore. Other visitors include the Ministry of Information Technology and The Arts (MITA), the Institute for High Performance Computing, and the Singapore Armed Forces.

According to Craig Cochrane, "During this 'getting to know you' period, ICT and Singapore became very well acquainted. The natural next step was to figure out a way to work together. Both sides agreed that we should aim to do many projects together over the long term, but that we needed one project to kick things off." That turned out to be the games project. In setting that up, both sides have successfully worked through challenges inherent in international research collaborations.

Looking toward the future, ICT and DSTA are keen to start a second project. In August, Richard Lindheim, Bill Swartout, Craig Cochrane, Mike Van Lent and Neal Sullivan, USC's Vice Provost for Research, toured various agencies, companies and institutes in Singapore to learn the landscape and discuss new projects. Singapore's DSTA and DSO National Labs then visited ICT in September to further narrow down the possibilities. Most recently, Craig Cochrane returned from Singapore at the end of October, and the next project has been unofficially identified.

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Dr. Rosanne Dutton, Craig Cochrane, Dr. Cornelius Sullivan, & Holip Soekawan at Singapore's GES Conference www.globalentrepolis.com

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MRE Team Wins AAMAS Best Paper Award

Members of the Mission Rehearsal Exercise team won a best paper award at the recent International Conference on Autonomous Agents and Multiagent systems. AAMAS, as it is known, is the premier research venue for work on autonomous agents and virtual human systems. The paper by David Traum, Jeff Rickel, Jonathan Gratch and Stacy Marsella, describes how virtual humans are able to negotiate with trainees, including the ability to reason about authority and responsibility and, as appropriate, to carry out actions, give and accept orders, monitor task execution, and negotiate options.

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Swartout Selected to Serve on Air Force Scientific Advisory Board

Bill Swartout was nominated and selected to serve on the Air Force Scientific Advisory Board (SAB). He was selected for his expertise in training and simulation. The SAB provides a link between the Air Force and the nation's scientific community, promoting the exchange of the latest scientific and technical information that may enhance the accomplishment of the Air Force mission. The SAB has a long history, dating back to the closing days of World War II.

Bill Swartout

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Andrew Gordon Published

An extraordinary book was recently published by a faculty member at USC's Institute for Creative Technologies -- "Strategy Representation: An Analysis of Planning Knowledge" by Dr. Andrew S. Gordon.

Andrew Gordon

This remarkable academic work is expected to have a significant impact on the computer science field of Artificial Intelligence and across the Cognitive Sciences, as well as popular appeal due to its interesting subject matter: the strategies that people use in their daily lives.

To celebrate this auspicious event, he held a Strategy Representation Workshop at ICT on November 14. The agenda consisted of three enlightening academic talks. Dr. Gordon provided an introduction to the research that is described in the book, and spoke about his favorite strategies among the 372 that he studied. In addition, two distinguished invited speakers presented their own work that is related to this book in one way or another. Jerry R. Hobbs from the USC Information Sciences Institute spoke on formal theories of commonsense psychology, and Jonathan Gratch from the ICT spoke about strategies and cognitive models of human emotions. A discussion about the interrelationship of each of these efforts followed.

The publisher, Lawrence Erlbaum Associates (LEA) has this to say about the book: https://www.erlbaum.com Strategy Representation: An Analysis of Planning Knowledge describes an innovative methodology for investigating the conceptual structures that underlie human reasoning. This work explores the nature of planning strategies--the abstract patterns of planning behavior that people recognize across a broad range of real world situations. With a sense of scale that is rarely seen in the cognitive sciences, this book catalogs 372 strategies across 10 different planning domains: business practices, education, object counting, Machiavellian politics, warfare, scientific discovery, personal relationships, musical performance, and the anthropomorphic strategies of animal behavior and cellular immunology. Noting that strategies often serve as the basis for analogies that people draw across planning situations, this work attempts to explain these analogies by defining the fundamental concepts that are common across all instances of each strategy. By aggregating evidence from each of the strategy definitions provided, the representational requirements of strategic planning are identified. The important finding is that the concepts that underlie strategic reasoning are of incredibly broad scope. Nearly 1,000 fundamental concepts are identified, covering every existing area of knowledge representation research and many areas that have not yet been adequately formalized, particularly those related to common sense understanding of mental states and processes. An organization of these concepts into 48 fundamental areas of knowledge and representation is provided, offering an invaluable roadmap for progress within the field.

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Congratulations, Relocations, Comings and Goings

ICT welcomes **Lori Weiss** who comes to ICT as Special Project Manager for the MRE project. She has almost 20 years experience in the hi-tech industry, including over a decade as Program Manager at Apple Computer¹s Advanced Technology Group and later went on to be Director of Business Management for Walt Disney¹s Research and Development group.

Lori Weiss

She has also worked extensively in executive education. Lori has an undergraduate degree from UCLA and an MBA from Pepperdine University. She loves to snow ski at Mammoth Mountain and every summer she goes with her family to Lake Winnipesaukee in New Hampshire where she loves to spend hours reading on the dock.

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ICT Fall Birthdays

Happy Birthday wishes to the September celebrants: **Regina Cabrera, Jon Gratch, David Hendrie, Andrew Jones, Martin Salzer,** and **Josh Williams.**

October Birthdays include**: Cheryl Birch, Ramon Gonzalez, Kip Haynes**, **Martin Salzer** and **Martin van Velsen.**

November Birthdays include: **Eric Bluestein, Jay Douglas, Kumar Iyer**, **Ryan McAlinden** and **David DeSouza**

ICT Fall Anniversary Milestones

Congratulations and cheers to **Martin Salzer,** Buyer, ICT Business Office who celebrated his 11th Year Anniversary with USC in October.

Heartiest Congratulations to ICT's Executive Director, **Richard Lindheim,** and **Craig Cochrane,** Executive Manager of Operations and Collaboration, and **Trevor Hawkins,** Manager, CD/V who celebrated their 4th Year Anniversary at ICT in October. **Lila Brooks,** Business Office Accountant, **Jim Korris,** Creative Director and **Deetra Roulhac,** Business Office Accountant celebrated their 4th Anniversary in November.

Best wishes to ICT staff who celebrated their Anniversaries in September: **Jay Douglas, Changhee Han and David Traum** celebrated their 3rd Anniversary. **Andrew Gardner and Hyeok-Soo Kim** celebrated their 2nd Anniversary. **Stephan Jens** and **Martin van Velsen** celebrated their 1st Anniversary.

Congratulations to staff who celebrated their Anniversaries in November: **Laurie Swanson** celebrates her 3rd Anniversary; **Rob Groome** celebrates his 2nd Anniversary.

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Visitors to ICT

The ICT recently hosted numerous visitors. The Honorable Claude Bolton, Jr., Assistant Secretary of the Army in Acquisitions, Logistics and Technology and Brigadier General Charles Cartwright of the U.S. Army Material Command headquarters toured the ICT and visited with researchers. Other army visits included guests from the International Nuclear Safety Program, Special Operations Command and the Army Science Board.

Newseum executives visited the ICT for briefings on institute projects and to solidify plans. The new Newseum building is located in the Washington DC Mall, and is set for completion in 2006. It will include many new exhibits that feature advanced components of interactivity, utilizing ICT's technologies and expertise in interactive narrative and immersive environments.

The VIP tours included a diverse assortment of visitors from varying industries, including the Art Institute of California-Los Angeles, AI Materials, Gamebryo, Northrop Grumman, Rhythm & Hues, Visual Purple, Virtual Ventures and the USC IBEAR Executive Programs.

Fall Issue of
ICT External Newsletter

The goal of this publication is to keep interested members of the ICT community informed about what is currently happening at the ICT.

We welcome your feedback and comments. Please contact us at **news@ict.usc.edu**. Be sure to check out our online version: **http://www.ict.usc.edu/disp.php** and then click on "Selective Focus" Fall 2003 Issue.