THE LAB FOR CREATIVE ARTS & TECHNOLOGIES
2008 STUDIO REPORT

Stephen David Beck, Ph.D.
Louisiana State University
Center for Computation & Technology
School of Music

ABSTRACT

The Laboratory for Creative Arts & Technologies (LCAT) is an interdisciplinary research center that explores the intersections of creativity, technology, and human expression. A part of LSU’s Center for Computation & Technology (CCT), the lab has become the university’s focal point for research and creative activity in digital media, computer music, scientific visualization, and human-computer interface. This paper will discuss recent activities, both research and creative, at the lab.

1. INTRODUCTION

Since our last studio report, the Lab for Creative Arts & Technologies has begun several research efforts that reach beyond the traditional boundaries of computer music. Some of these efforts have involved other researchers at CCT in the Core Computational Science group, and others have established partnerships with teams at other universities. With our ICAST audio sound theater, we have been able to present 3-4 concerts per year, including serving as the afternoon concert venue for the 2006 ICMC in New Orleans. And we have had several key visitors come for concerts, lectures, and residencies over the past few years.

While we were not able to develop additional faculty positions specifically within the lab, we were able to recruit a post-doctoral researcher in computer music in the Cultural Computing focus area. David Psenicka, a graduate of the University of Illinois Urbana-Champaign, joined CCT as a Distinguished Post-Doctoral Student in the Fall of 2007. In the past, his work has focused on algorithmic composition technologies built on the Common Music system by Rick Taube. His work will be discussed later in this paper.

2. RESEARCH ACTIVITY

Research at LCAT has centered mostly around digital media applications, with a large emphasis on computer music. The computer music research group has looked at several projects that try to integrate computational and networking technologies with music applications, both in its creation and performance. The Computer Music group at the lab consists of faculty member Stephen David Beck, post-doc David Psenicka, graduate students Joseph Patrick, Brian Willkie, Corey Knoll, Amaro Borges, and undergraduate student Benjamin Eckel.

2.1. Sound Spatialization and Diffusion using ICAST

The Immersive Computer-controlled Audio Sound Theater (ICAST) was first conceived in 2004 as a portable, modular sound diffusion system for the performance of electroacoustic music [1, 2]. The 27-channel system has a client-server architecture that enables us to vary the interaction metaphors and interfaces. While most performances use a traditional mixing console metaphor, we have been exploring new and novel interfaces to simplify control and provide new modes of performance and expression.

ICAST has become a robust environment for performance. We have produced on average three concerts per year with the full complement of speakers, and are able to install the system in a performance space in roughly 24 person-hours. ICMC attendees may remember that ICAST was used as the afternoon concert venue for the New Orleans conference in 2006. Since then, we have produced concerts at the LSU School of Music Recital Hall as well as the Manship Theatre’s Studio Theatre in downtown Baton Rouge.

Research on ICAST has consisted primarily of streamlining existing code and simplifying the configuration and operation of the system. We found that while the existing application works very well, it took too much effort to train new users to the system. We realized that it was important to make the instantiation and initialization process of ICAST more turnkey so that a single command would bring the system to operational status. To that end, we needed to design new middleware to enhance and simplify communication between the client and server computers.

ICASTRemote is a fully-functional Java-based SSH client we developed to monitor and run the server machine for ICAST. In previous versions of ICAST, users had to run a separate SSH client application to launch SuperCollider and monitor the traffic between the client and server computers. ICASTRemote (Figure 1) includes a simple user interface, a fully functional SSH client, and runtime capability within Max/MSP, which is the main framework for the ICAST client.
The SSH backend for IcastRemote was constructed using Java Secure Channel (JSch) [5]. JSch is an open-source, pure Java implementation of the SSH2 protocol. We had to make a few adjustments to the library source code to allow for longer time-outs due to our machine responding slowly. The GUI was assembled in Swing, and the main elements in the GUI were a monitor window for the output of SuperCollider and command buttons to send commonly used commands to the remote bash shell. A text field to send additional commands provides full SSH access and debugging.

Future revisions of IcastRemote will include configuration files to simplify the customization of the GUI. Here, commonly used commands can be easily added to the GUI through the addition and placement control of buttons and parameter boxes. Not only will this make adjustments to our system easier, but it will also allow others to customize the buttons for their own applications.

Another aspect of ICAST that has improved for the end user is additional tangible control. Using a Lemur, multiple Interface screens were designed to allow the user to easily control audio I/O as well as channel type designations (Figure 2). In the process of creating a method for ICAST to use the Lemur and the original hardware controllers simultaneously, a protocol for messaging developed, and will be available soon for users to develop personalized control systems with hardware that is familiar.

### 2.2. Historical Survey of Music Spatialization

In parallel with our efforts on ICAST, Amaro Borges, a recent Ph.D. student in composition, wrote a lengthy monograph entitled “Historical Survey of Music Spatialization” as part of his dissertation [3]. The monograph reviews the role of music spatialization not just within the past 100 years, but throughout the ages. His conclusions lead us to understanding how fundamental the localization of instrumental groups has been throughout the history (and pre-history) of the western music tradition.

### 2.3. Software Development

David Psenicka recently joined LCAT as a post-doctoral researcher at the center. His current research includes the development of intelligent software for music composition, sound design, and data sonification. Of particular interest is the notion that computers are capable of being more than artistic tools but collaborators in the design process itself. A current project investigates ways in which a computer can unobtrusively participate in an artist’s creative work by analyzing his or her decisions and using this information to generate related material. Modified sound and graphics editing applications are being used as test beds.

Another project deals with a GUI environment in which algorithmic composers can integrate code from different tools and libraries and organize them in a flexible manner. The user specifies parameters for processes and events in relative relationships to each other and the display constantly updates to reflect changes in notation or graphical representations of sonic events.

As these efforts are being developed, they are also of interest to the visualization group and the machine learning group at CCT. These groups are interested in how David’s work could be leveraged for other kinds of computational applications in data visualization, astrophysics and high-speed networks.

### 2.4. Data Sonification

Doctoral candidate Brian Willkie has been working on a data sonification project as part of his Ph.D. dissertation. The project uses GEOS-12 satellite imagery of the Gulf of Mexico from a two-year period as the primary data source, and sonifies the data relating cloud density and position to frequency, amplitude and spatial positioning parameters in sound. The project is a companion to a visual rendering of the time-varying imagery by Amanda Long, a graduate student in the LSU College of Art + Design. This project should be completed sometime in 2008 or 2009.
2.5. Second Life

LCAT has begun a research effort in the Second Life virtual world environment. Our project, just underway, involves collaboration between CCT/LCAT and the Schools of Music, Art, Architecture and the Department of Computer Science.

Our initial foray in Second Life explored the possibility of launching, monitoring and controlling compute jobs on our high-performance computing clusters through a virtual environment. Kevin Kotz and Dylan Stark, undergraduate students in computer science, created a virtual home for CCT in Second Life that included a virtual visualization cave, streaming video of previous scientific visualizations, and a gallery of visualization images.

Figure 3. LSU/CCT Virtual Campus in Second Life

Our virtual visualization cave presented 5-sided views of our previous Katrina visualizations, and other cube-projected images (Figure 4). Although it did not create the same kind of immersive reality experienced in real VR caves, it did create an impressive experience that has implications for the sharing of visualization data by researchers in distributed locations.

Figure 4. Virtual VR Cave with image of Katrina Visualization

With the early success, a full-blown effort to establish a virtual campus for LSU and the CCT was begun. The virtual campus includes a lecture hall, virtual offices, art galleries, and an amphitheatre venue to which live performances and lectures from LSU will be broadcast.

The virtual computing research center explores various virtual metaphors for representing computing jobs. The purpose of this area is to provide students with a way to visualize how distributing computing works and how they can interact with and influence large computational problems through an accessible level of abstraction. From a computer music perspective, we plan to experiment with launching Csound jobs remotely from within Second Life, and then delivering the computed audio directly to the environment.

Our virtual campus is now open to the public. A regular schedule of concerts from the LSU School of Music and streaming broadcasts of electroacoustic music will be critical parts of the experience.

2.6. Distributed Classrooms Across High-Speed Networks

Over the past three years, CCT and LCAT have been experimenting with real-time transmission of uncompressed high-definition video (1080i resolution) over optical networks. Demonstrations at the 2005 iGrid conference in San Diego, and at SC06 and SC07 showed how these technologies can link multiple sites with one another using video sources as well as computer-generated sources (i.e. visualizations, slides) [4].

In 2007, we began to leverage these technologies for the purpose of distributed education. Thomas Sterling, developer of the Beowulf cluster and a new faculty member at CCT, offered an “Introduction to HPC” course that was distributed through a multi-way network to classes at LSU, the University of Arkansas, Louisiana Tech and Masaryk University in Brno, Czech Republic. With the success of this class, CCT was awarded an NSF grant to continue this work, developing new technologies and continuing the class in subsequent years.

In the fall of 2007, we adapted the same technology and collaborated with the Electronic Visualization Lab (EVL) at the University of Illinois-Chicago to teach a “Video Game Design” course with Professor Jason Leigh at UIC, and Professors Gabrielle Allen and Stephen David Beck at LSU. This course was so popular that it was repeated in the spring of 2008.

The Music & Dramatic Arts building at LSU is undergoing a major renovation. Upon its completion, we will install a high-definition classroom so that we can produce and receive HD courses and master classes, collaborating with universities and schools throughout the state. The state’s LONI network (40Gb optical network) is now in full operation, and links LSU to 5 institutions at 10Gb speeds and many affiliated schools at 1 Gb speeds. We intend to deploy multiple HD sites so that LSU can provide educational and cultural outreach to its citizens.
3. CREATIVE ACTIVITY

LCAT has played host to several visiting composers over the past few years. In 2006-2007, Tae Hong Park, Jeffrey Stolet, Elainie Lillios, and Scott Wyatt all presented works on our High Voltage and Cinema for the Ears concerts, each using our ICAST audio sound theater.

In the fall of 2007, we hosted Elainie Lillios and Michael Thompson for a one-month residency at the lab. During that time, they worked in our ambisonic sound lab, with Michael working on ambisonic mixing software, and Elainie composing a new work for ambisonic decoding. The work, Listening Beyond... was premiered in December 2007.

Unfortunately, our creative activity in the lab has been disrupted by a reallocation of space at the center. LCAT recently moved its entire facility from its previous location in the campus computing center to Johnston Hall, where the rest of CCT is located. This caused a three-month closure of our video and audio labs, as well as our research spaces. That said, several new works are now in production, including music by graduate students Michael Berthelot, Jude Traxler and Nick Hwang. Stephen David Beck has completed a new work for Wiimote controller and Kyma, which was premiered in a Cinema for the Ears concert in March 2008.

LCAT also plays host to the Red Stick International Animation Festival, now the largest animation festival in the country with 3500+ attendees in 2008. This year’s festival marks the first appearance of a visual music category for submissions.

4. FUTURE DIRECTIONS

LCAT is poised to expand its research faculty over the next two years. CCT has decided to create a digital media mini-cluster with projected hires in computer graphics, computer music and computer art. The position in computer graphics has been filled, and we anticipate searches for the computer music and art positions this fall.

The lab is also working with the Baton Rouge Area Digital Industries Consortium (BRADIC) to support the development of new digital media companies. Louisiana has very competitive tax credits for film, music, video game and digital media production. As a founding member of the consortium, we want to help students create new companies and enterprises in digital audio, film, and media applications.

Finally, LCAT is the driving force behind AVATAR, the Arts, Visualization, Advanced Technologies and Research Initiative [6, 7], a multidisciplinary hiring program that will bring at least six new faculty positions in Computer Graphics, Interactive Systems, Computer Music, and Digital Art & Design to the LSU campus. While these faculty positions would not reside directly in CCT, all of them would be directly affiliated with LCAT.

The impact of AVATAR is already being felt across the campus. The School of Music, in anticipation of at least one new hire in computer music, has created a new concentration for its Ph.D. in music in experimental music and digital media. Between the CCT joint appointments and the AVATAR Initiative, there should be nine new research faculty affiliated with LCAT by the beginning of the Fall 2010 term, with as many as two of the nine in computer music. We anticipate that digital media graduate programs in art, computer science and engineering will follow shortly.

5. REFERENCES


