Abstract

This Studio Report gives an introduction to resources, goals, projects, research, and activities within the Music Science and Technology Programs at Tulane University. Located in New Orleans, perhaps best known for its deep history and contribution to jazz, the tMt (Tulane Music Technology) program fosters a unique and creative environment to facilitate the interdisciplinary study between music and technology whereby adding another dimension to the musically rich city of New Orleans. The tMt has been in an interesting and difficult situation brought about hurricanes Katrina and Rita in the fall of 2005 causing much destruction as well as temporary closure of Tulane University for the fall semester. Despite these setbacks, however, the tMt has continued to develop and move forward as outlined in this studio report.

1 Introduction

The Tulane MST program is interested in exploring the interaction between music and technology. It attempts to provide an interdisciplinary approach covering areas such as computer science, music, electrical engineering, cognitive science, and psychology.

The program’s inception was marked by the arrival of Tae Hong Park to head the music technology area in the fall of 2004, and in less than two years the community has grown to include a major and minor in Music Science and Technology as well as a graduate degree program. The program also has recently added visiting professor Paul J. Botelho to its tMt faculty roster to further expand and help with the development of the new programs.

The graduate program faced a unique situation in its first year, as hurricanes Katrina and Rita forced the university to close for the fall of 2005. Although there was flooding on the Tulane campus as well as the Music Department, the studio and tMt labs withstood minimal damage as they were located on the 2nd floor helping in the recovery process of the tMt programs. The situation for students and teachers was difficult being evacuated from New Orleans. However the tMt graduate students and Tae Hong Park were able to continue building the foundations of the program while continuing their work at Dartmouth’s Electro-Acoustic Music Program.

2 Resources

The tMt’s physical spaces currently consist of a number of facilities including two concert spaces, a teaching lab, HCI lab, graduate student research lab, and a studio.

2.1 Computer Music Studio

The Computer Music Studio functions both as a composition studio and as a classroom. Currently it is equipped with Yamaha 02R and 01V96 mixers, an Apple Macintosh G5 workstation, Digidesign HD 192 Interface, Digidesign PRE, media players, 8-channel diffusion system with a subwoofer, video projector, WACOM tablet, MIDI keyboards, and an assortment of software (see figure 1).

Figure 1. 8-channel studio showcasing some of the various hardware and instruments
2.2 Labs and Research Spaces

There are three main research and teaching spaces that are part of the tMt. The teaching laboratory includes a readily accessible lecture space equipped with 13 personal workstations, MIDI keyboards, audio interfaces, and a “smart board” (see figure 2). The lab is also equipped to play back various types of media as well as a projection system.

![Figure 2. The Teaching Laboratory](image)

The Graduate Research Lab is a space for tMt graduate students. This room serves as an office and work area for whatever individual projects graduate students are tinkering with.

The HCI (Human Computer Interface) lab houses essential tools such as an oscilloscope, soldering station, waveform generator, breadboards, various electronics components, and computers for course labs and research that focus on issues in music and computer/human interaction.

2.3 Concert Halls

tMt uses two main concert halls – Dixon Hall Auditorium, a 1,000 seat hall with an upper deck (figure 3) and a smaller, 180 seat recital space with built in projection system and an 8-channel sound diffusion environment. Recent concerts have involved composers including David Wessel, Mara Helmuth, Kui Dong, and electronic music composers from LSU and the University of South Alabama.

![Figure 3. Dixon Hall Auditorium](image)

3 Undergraduate Programs

The undergraduate programs include the Major and Minor in Music Science and Technology. The curriculum is structured within a multi-disciplinary framework that provides a strong foundation in mathematics, science, music practice and theory, and topics specific to the field of music technology.

To expose the student to the basics in the sciences, mathematics, and music, courses such as “Calculus I/II/III,” “General Physics I/II,” “Electric Circuits,” “Software Design and Programming,” “Object Oriented Design and Programming,” “Musicanship Lab I/II/III,” “Harmony I/II,” and “20th Century Theory” are included in the curriculum. Some of the Music Science and Technology courses include “Music and DSP”, an introductory upper-level undergraduate and graduate level course in the fundamentals of signal processing with emphasis on musical applications. The concepts are presented through the theoretical and practical – short sound examples to link the theoretical to the more practical applications of DSP. The materials of this course will be published in a book entitled “Introduction to DSP: Computer Musically Speaking” in the spring of 2007 (Park 2007). Another course provided within the program is “Music Performance Systems.” This course features topics in HCI (Human Computer Interaction) with a specific focus on designing and implementation of new instruments for musical expression. In this course the student is exposed to various sensors, basic analog and digital circuitry, and microcontroller interfacing, as well as computer music software programming systems such as Max/MSP.

Courses computer music composition include “Algorithmic and Computer Music Composition” – an upper-level computer music composition class taught in the Computer Music Studio. In this course not only does the student become familiar with the most current
compositional tools for electro-acoustic music composition but also becomes intimately familiar with the design of a the digital studio itself. Additionally students learn to produce and organize a concert as part of their final project presentation.

There are also a number of lower-level music technology-based courses such as “Computer Applications in Music.” In this course the students are introduced to the basics of MIDI, analog and digital audio, digital audio workstation software packages, recording techniques and basics in practical analog and digital signal processing. A new addition to the interdisciplinary characteristic of the program is an introductory course in “Music for Film.”

4 Graduate Program

The master’s program in Music Science and Technology is a two-year degree program dedicated to exploring the interrelationships among music, mathematics computer science, and cognitive science. The program is dynamic in nature, often reflecting the specific areas of interest that each student brings to the program. Students are encouraged to pursue and develop individual goals and their work may be directed towards theoretical work, composition, as well as technical research topics.

Currently our graduate program consists of 4 full-time Graduate Students (as of Fall 2006) who receive tuition waivers and also help with teaching undergraduate courses. The graduate students receive additional financial assistance including technical assistantships – overseeing the studio, managing the labs, and supporting faculty and staff with technical assistance such as laboratory and student maintenance, upgrading, and a number of other tasks that are designed to help the student experience topics within a practical and real-world environment.

Because students bring a wide variety of background and experience to the program, it has quickly become common, for example, for a student with a strong computer science background to assist a composer on a highly technical project. Conversely, experienced composers often guide and assist students with less compositional experience.

Some of the graduate courses include “Electro-Acoustic Music Composition,” offered each semester, “Musical Timbre: Multidimensional Analysis,” “Analysis of Electro-Acoustic Music,” the aforementioned “Music and DSP” and “Music Performance Systems” as well as other seminars and special topic courses.

5 Research Activities

Some of the on-going research at tMt includes topics in information retrieval, HCI, and computer music composition. Park (Park 2004, 2005) is continuing his research in timbre and automatic timbre recognition using salient feature extraction techniques in conjunction with pattern recognition techniques and RBFN/EBFN BP artificial neural networks. Some of the research, especially that concerning salient feature extraction techniques has become a collaborative research project between faculty and graduate students. This research is part of an electro-acoustic composition seminar where the members of the seminar investigate the utilization of existing features and development of new salient feature extraction techniques in the context of a compositional tool. In essence the goal is to design, implement, and build a software system to extract salient features of audio signals, manipulate and edit specific dimensions of timbre and re-synthesize the original sound with those altered timbral dimensions. The initial goal of this graduate seminar is to develop a rudimentary non-real-time working system, prototyping in Matlab and composing a series of etudes using this new software tool.

Students are also actively involved in many of their own projects. One such example is the Mididexterous, designed and implemented by current graduate student Conner Richardson who built it as his final project for the Music Performance Systems (figure 4). The Mididexterous is a glove-based interface for musical expression. The glove transmits MIDI data based on both finger movements and the hand’s angular behavior. The glove interfaces in real-time to computer applications that support the protocol and can be used to map movements of the hand to any arbitrary MIDI function. However, the current focus is a series of pieces composed specifically for the glove and are meant to explore its unique approach of MIDI parameter mappings. Other projects have included the “Electronic Shakers” using tilt-sensors and distance sensing circuitry to determine the distance between two egg-shaped “shakers” held in each hand. Mididexterous for example has been featured in both academic events at institutions including Tulane University, Dartmouth College, University of South Alabama, and within the local New Orleans artist community at venues such as the Zeitgeist, The Big Top, and Circle Bar.

Figure 4. Richardson’s Mididexterous
6 Other Activities

6.2 Hogan Jazz Archive Project
Along with classes, research and composition, the graduate students of Tulane are also involved in digitally archiving analog media from the Hogan Jazz Archive. The archive features one of the largest collections of historic interviews, music, and audio materials.

The Hogan Jazz Archive is a research center devoted to the collection, organization, and preservation of materials concerning traditional New Orleans jazz and related music (including gospel, blues, rhythm and blues, and zydeco). Its collection holdings are vast: nearly 2,000 reels of taped oral history interviews with jazz musicians, family members, and observers. This collaboration was established as the Jay Pritzker Foundation Fellowship in Music Science and Technology by Tae Hong Park and Bruce Rayburn at the Hogan Jazz Archive.

The Archive's facilities are used regularly by a variety of scholars publishing with trade and scholarly presses (including Oxford, Illinois, Norton, Random House, LSU and others) and media programmers from around the world (Florentine Films, WGBH-Boston, Tempo Media-Germany, BBC Radio/Television, WYES TV12-New Orleans), as well as scholars from Tulane and other institutions of higher education.

6.3 Community Involvement
The Tulane University MST program seeks not only to contribute to the academic electro-acoustic community, but also to collaborate and work with the New Orleans local music community with presentations, demonstrations, and talks at events like "Modulations: an evening of experimental electronic music" and "N.O.I.S.E: the New Orleans Independent Sound Experience," as well as a Bob Moog tribute concert planned in September 2006 at the Dixon Recital Hall. Additionally Tulane MST students have been featured on local music releases including "WTUL's Songs from the Basement" – an annual release which features up-and-coming local artists.

Other involvement includes hosting AES events, organizing free concerts - including the Women Composers Series in the spring of 2005 which featured Mara Helmuth and Kui Dong as the inaugural composers and giving lectures at the NOCCA (New Orleans Center for Center for Creative Arts)

6 Future Plans
Post-Katrina life has been tough not only for New Orleans but also for Tulane and the tMt program. Amidst this challenging environment of having to readjust to a new environment and landscape that has affected the tMt community academically, socially, and culturally (at the writing of this report), we are continually moving forward to fine-tune our programs, adapt to the environment, actively engage in musical and research projects. We are also currently moving the studio to a more spacious room, setting up a new and larger HCI lab and looking into wiring the main Dixon Concert Hall to the studio for direct access to audio and video signals from the hall in order to facilitate recording of performances.

References