Demonstration and discussion are used to emphasize the close evaluation of sonic characteristics within the captured sound(s). Musical elements are discussed in terms of pitch, duration, dynamics, timbre and texture. Further demonstration is used to show how sound might be manipulated by beginning to focus on specific aspects within the sound(s) and manipulating sonic properties. The stimulation of musical imagination is emphasized to generate ideas towards composing in preparation for the structuring of sound.

4.2 Pedagogically Speaking
From a pedagogic perspective the data collected shows that the technology could support effective music pedagogy. Pupils became quickly engaged by the technology in exploring sonic material. They enjoy exploring sonic parameters and learn what effect manipulating these has upon sound. This musical learning can become increasingly based on their own imagination, intentions and thematic ideas. However, beyond play and familiarity being able to imagine, manipulate and select sounds towards intentional composing most pupils found much more difficult. Yet some of their work and short compositions do show learning development, musical imagination and real intention in the way they try to structure sounds towards musical intention.

4.2 Technologically Speaking
From a technical programming perspective the revisions of SoundsTools Manipulator were successful. The software application ran over the school network with no inherent issues within the software, although individual PCs did cause some minor issues with corrupt audio driver issues early in the project. The software has been used without any issues on Apple OSX iMac machines in undergraduate and postgraduate student seminars with teacher trainees. The application requires little storage space (12MB WindowsXP, 30MB OSX 10.5.8) and low CPU usage (8-10%) depending on the specification of the computer. The GUI is reported to be easy to use, functional, less cluttered and more intuitive. There are however more revisions under consideration. These will be implemented and tested in further cycles of action research already being planned for September 2012 and beyond.

5. WIDER CONTEXT
This paper is intended to illuminate a theoretical interrelationship between modern technology, creative thinking and composing pedagogy at 11-14 years. It discusses an investigation into this issue within Regional secondary school music departments in the North of England. It presents a view of current resources within these music departments and discusses recent results from action research. This research is primarily concerned with developing pedagogic resources for 11-14 year music classrooms. Such discussion and information may prove constructively to other music educators around the world engaged in developing the use of modern technology for composing pedagogy at 11-14 years. Educators who are interested in fostering links and collaborating in such action research are encouraged to contact the author for discussion.

6. REFERENCES

GEORGIA STATE UNIVERSITY MUSIC TECHNOLOGY STUDIO REPORT
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ABSTRACT
This studio report describes Georgia State University’s (GSU) recent activities in the area of computer music and music technology. A summary of on-going and recent research will be provided as well as an overview of the School of Music, the Music Technology programs, its facilities, key personnel, and future plans in developing the graduate and undergraduate music technology curriculum.

1. INTRODUCTION
GSU School of Music enrolls approximately 450 students representing 6 countries and 21 states. Approximately 360 of the students are in bachelor’s degree programs, 70 in master’s degrees, and the remainder in other programs, including a Ph.D. in music education. 40 full-time and 30 part-time faculty serve students in concentrations including performance, music education, music management, music recording and technology, composition, and jazz studies. The music technology program currently includes faculty members Robert Scott Thompson and Tae Hong Park and approximately 30 full-time students.

The music technology program is comprised of an undergraduate concentration in music technology (B.Mus.) and a master’s program in composition with an emphasis in music technology (M.Mus.). Opportunities also exist for student-designed programs focusing on music technology within the Bachelor of Interdisciplinary Studies (B.I.S) degree track. Various courses are offered for graduate and undergraduate students including digital signal processing, computer music I/II, recording techniques I/II/III, music production, electroacoustic music composition, audio post-production and a comprehensive industry-based internship experience.

2. FACILITIES AND CENTERS
The music technology facilities at GSU consist of three recording studios, one computer music composition studio, and a ProTools-based post-production suite designed by Walters-Storky Design Group (WSDG) in 1995. The studios are housed in the historic Standard and Haas-Howard buildings in the heart of downtown Atlanta, Georgia.

All three of the recording studios are interconnected via patch bays, allowing users to record from any tracking room into any control room. Each control room contains both digital and analog hardware including Eventide harmonizers and various signal processing modules; Avalon, Universal Audio, and Grace Designs preamps; standard DAWs, a plethora of software plugins, and interactive computer music applications for all of the studio workstations; and Tannoy, Genelec, Adams, and JBL studio monitors. Studios are maintained with the assistance of advanced undergraduate and graduate students. This model serves as a pedagogical mechanism to help students learn the complexities of studio maintenance while fostering a sense of community.

Figure 1. Studio A control room
Other related facilities include the Music Technology Lab and the School of Music Media Center, the latter housing numerous student workstations, a music technology seminar room, a 19-station multimedia teaching lab with a dedicated teaching station, together with a large collection of recordings and reading material. The School of Music also possesses several performance venues including the 400-seat Florence Kopleff Recital Hall, with a built-in recording booth and...
Graduate student Johnathan Turner is conducting research into algorithmic composition using IRCAM's Open Music software and Python with the aim of applying sound analysis results to drive and organize musical gestures. He is currently focusing on using highly transient portions of acoustic signals to generate pitch and rhythm materials.

Graduate student Alex Marse is developing software tools for interactive exploration of serial compositional techniques exploiting graphic interfaces. The software framework uses a programmable matrix interface to generate rows that can be utilized for formal designs and other various musical parameters including pitch, rhythm, and timbre. The interface, implemented in Max, uses a “drag and drop” paradigm to create modular blocks of musical material that can be organized, ordered, layered, and arranged to facilitate exploration of musical and compositional possibilities.

Marse is also engaged in HCI research which focuses on capturing gestures to drive compositional elements and processing algorithms for interactive live percussion performance. The sensors that are currently being investigated include 3-axis accelerometers and Microsoft Kinect.

The goal of the 2CI is to build a comprehensive archival module, and (3) an analysis of products and human-computer interaction (HCI), electro-acoustic music production suites, and a small performance stage. In addition, DAEL houses a professional video studio, green room, audience response theater, video and audio production suites, and a small performance stage. In 2011, the music technology program also collaborated with the Second Century Initiative New Music Ensemble (DAEL) to research cluster faculty hires to the GSU campus.

The GSU music technology program also collaborated with Atlanta’s Bent Frequency, an ensemble dedicated to performing new music compositions. This included a concert featuring the neoPhonia New Music Ensemble, inaugurating the ensemble’s 17th season.

Continuing a new tradition of featuring student works together with established guest composers, the music technology program held the second end-of-semester computer music concert programming seven student compositions, with guest composer Jason Freeman of Georgia Tech, Robert Scott Thompson, and Tae Hong Park were also performed by the neoPhonia New Music Ensemble.

The music technology program also collaborated with the University of Appleton, Wisconsin. The work was also presented at the 2012 SEAMUS National Conference at Lawrence University in Appleton, Wisconsin. The work was also presented at the 2012 SEAMUS National Conference at Lawrence University in Appleton, Wisconsin. The work was also presented at the 2012 SEAMUS National Conference at Lawrence University in Appleton, Wisconsin. The work was also presented at the 2012 SEAMUS National Conference at Lawrence University in Appleton, Wisconsin.
professional sound reinforcement system; the historic 833-seat Rialto Center for the Performing Arts refurbished in 1995; and two large recital spaces in the Aderhold Learning Center, which have sound reinforcement capabilities.

The music technology program has strong affiliations with GSU’s Digital Arts Entertainment Laboratory (DAEL). DAEL houses a professional video studio, green room, audience response theater, video and audio production suites, and a small performance stage. In 2011, the music technology program has also developed a partnership with the Second Century Initiative New and Emerging Media (2CINEM) research cluster with the recent hiring of Tae Hong Park as part of the core 2CINEM faculty. The goal of the 2CI is to build internationally recognized scholarly strength in research themes with national significance to enhance GSU’s quality, interdisciplinary richness and competitiveness. This initiative which has brought the first group of cluster faculty hires to the GSU campus in 2011, is part of an “ambitious faculty hiring initiative to recruit 100 additional faculty members to the university over the next five years”[1].

3. RESEARCH
A number of students and faculty are involved in ongoing research in the areas of composition, human-computer interaction (HCI), electro-acoustic music (EAM) archiving, EAM analysis and visualization, acoustic ecology, and sound synthesis. Student-based research is closely linked to pedagogical frameworks in the various courses offered emphasizing theoretical and practical mastery of the subject matter. These courses range from techniques of software synthesis to programming for audio signal processing and HCI providing a broad framework for students to develop elaborate research projects with faculty support and guidance.

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Figure 2. EASY Toolbox screenshot

Tae Hong Park is leading a research project entitled Electro-Acoustic Music Mine (EAMM) which focuses on creating a comprehensive EAM preservation and exploration portal based on: (1) a filtered-crowd-sourced music collection module that is curated according to a credentialed peer-reviewing system, (2) a comprehensive archival module, and (3) an analysis module based on the timbre-centric Electro-Acoustic Music Analysis (EASY) Toolbox [2] providing tools for interactive visualization, navigation, and discovery of musical works. This third module exploits Music Information Retrieval (MIR) and content-based analysis research to extend and enhance traditional text-based indexical discovery and delivery systems. EAMM is one of the projects that has been developed in collaboration with the 2CINEM cluster, the GSU Special Archives and Collections, ICMA, and GSU’s computer science department.

Park is working on releasing EASY Toolbox 1.0 – a software system for assisting EAM analysis. The system aims to present perceptually significant features and audio descriptors via GUI-based interfaces and visual designs to help experts and non-experts gain insights into EAM works. The EASY Toolbox utilizes MIR techniques that focus on EAM – music that often emphasizes timbre rather than traditional musical parameters such as pitch, melody, harmony, and rhythm. The EASY Toolbox will be used as a starting point in developing and implementing the visualization and exploration module of EAMM.

Another project led by Park in collaboration with the 2CINEM is called Cygryam, which is a large-scale project divided into a number of iterations. The current iteration focuses on acoustic ecology, visualization, and sonification. Subsequent investigations will include other sensory data such as heat, brightness, wind speed, and humidity. For the first iteration, we are focusing on a subsection of the city of Atlanta to render time-varying, non-intrusive acoustic maps that are scale accurate, topologically oriented, and dynamic. The main goals are to (1) investigate potential avenues for capturing the flow of crowds, machines, and ambient noise; (2) automatically capture and measure mood/emotion in public spaces through analysis/pattern recognition of noise and text analytics; (3) provide clues to waves of contemplation and response in public spaces, including galleries and museums; (4) expose acoustically relevant traffic patterns; (5) provide hints into the invisible dynamics of conferences and physical spaces; and address a wider issue of urban ontology via quantitative data acquisition of dynamic and non-occurring stimuli.

Other on-going research projects include Feature Modulation Synthesis (FMS), a sound synthesis method informed by sound analysis [3]. FMS methods extract salient timbral features directly from a sound object and re-synthesize an altered sound object according to various modulations of timbral features. The FMS system performs salient feature extraction on sound objects, which is followed by feature modulation and synthesis of a new sound object based the modulated features. The goal of FMS is to synthesize a sound object by modulating only specific timbral dimensions while ideally leaving all other timbral vectors intact.

Robert Scott Thompson is engaged with compositional activities pertaining to electro-acoustic and computer music that encompass several overlapping research areas including software synthesis, compositional algorithms, sound spatialization, musical signal processing and real-time interactivity. Current commissions include works for solo instrument and electro-acoustics as well as chamber ensembles combined with fixed media and real-time signal processing and synthesis.

4. CONCERTS, EVENTS, AND OTHER ACTIVITIES
4.1. Concert Production
The GSU music technology program produced and collaborated in a number of concerts during the 2011–2012 academic year including the first computer music concert at DAEL which featured five student music concrete works as well as live performance works by guest composers Jon Appleton and Paul Botelho.

Several pieces on the concert emphasized social issues concerning capital punishment and the recent execution of Troy Davis as well as public reactions to the controversy for the first computer music concert at DAEL which featured five student music concrete works as well as live performance works by guest composers Jon Appleton and Paul Botelho.

Several pieces on the concert emphasized social issues concerning capital punishment and the recent execution of Troy Davis as well as public reactions to the controversy. The concert, was to incorporate instrumentation strategies and core aesthetics from rock/pop music – electric guitar, electric bass, saxophone, and percussion – reinterpreted through the lens of EAM aesthetics and techniques. Performers included GSU student composers and GSU School of Music faculty Brian Baker, Stuart Gerber, and Tae Hong Park.

4.2. Events
GSU music technology faculty Thompson and Park also participated in a number of national and international conferences. Thompson’s composition Passage (for clarinet and electro-acoustics) was presented at the 2012 SEAMUS National Conference at Lawrence University in Appleton, Wisconsin. The work was also presented in Ljubljana, Slovenia in 2011 by the Society for Slovenian Composers. Thompson presented the fixed media work Out of the Vivid Air (for 8-channel
fixed media) during the 2011 ICMC in Huddersfield, UK. Park presented "for trumpet and electronics and gave a lecture on his current research at the 2011 EarZoom conference in Ljubljana, Slovenia. His compositional works have also been presented at Sonic Screens in Milan, Italy, Clarke Recital Hall, at the University of Miami; SEAMUS 2011; and Northeastern State University Faculty Trumpet recital in 2011. Park presented his paper at the 2011 ICMC in Huddersfield, UK and gave a workshop on sonification and visualization using Matlab while serving as the Workshops Chair for the 2012 International Conference on Auditory Display (ICAD).

Also, composer Elaine Lillios from Bowling Green State University visited GSU during her 2011 tour of the southeast and gave a talk on her work to GSU students. Atlanta composer Jason Freeman visited as well and presented his recent work to students during our 2012 spring semester.

4.3. Other Activities

Park recently completed an encyclopedia entry in collaboration with Roger Dannenberg from Carnegie Mellon University. The entry entitled Music and the Machine is part of Music in American Life: An Encyclopedia of the Songs, Styles, Stars, and Stories that Shaped our Culture, which will be published by ABC-CLIO at the end of 2012.

Thompson is also currently writing a book for AR Editions Digital Music Series on the topic of musical signal processing and sonic design utilizing software synthesis techniques within real-time contexts. This book blends a pedagogical approach with a fundamental research orientation.

Thompson’s most recent recordings include Orbital Lullaby (created in collaboration with School of Art and Design colleague Craig Dongsok) which focuses on the integration of fragmentary text and found sounds within a soundscape/ecological framework. A current project is the follow-up to this work which is made entirely of source recordings from the local environment building upon the collaboration with Oise Dire (France) during their residency in the School of Music and School of Art and Design in 2003 as part of the Pulse Field International Exhibition of Sound Art. Two other discs from 2011, Folio Volume One and Folio Volume Two, include works composed using interactive performance systems currently under development in Max and PD. Several new recordings are scheduled for release in 2012. Slovenian clarinetist, Tadej Knetig, will record Thompson’s Canto (de Las Sombras) for his own next solo CD release.

5. FUTURE PLANS

The music technology program is currently drafting a proposal for a Ph.D. in computer music and investigating potential partnerships with other departments from the GSU community. The multidisciplinary doctoral curriculum will focus on both musical and technical aspects related to computer music including developing competency in programming languages, HCI, digital signal processing, musicianship, analysis, EAM repertoire, and composition.

In December 2012, the current 2CINEM research lab will be expanded to a 7,000 square foot interdisciplinary space for collaboration and research which will include a professional multi-channel EAM studio, a computer lab, and video lab facilities. The music technology program and 2CINEM are also planning to actively explore project engagement opportunities that are multidisciplinary and interdisciplinarity in nature. The Citygram project is such an example where future iterations will focus on other non-ocular energy measurements to visualize, map, sonify, and gain insights about our environment through invisible energies. Other plans include extending, updating, and releasing FMS and EASY Toolbox 1.0, which will be freely available for download in the near future.

6. CONCLUSION

The music technology program at GSU is currently experiencing a period of substantial growth. Many factors, including hard work by faculty and staff have contributed to this positive momentum including the establishment of the Computer-Aided Recording (CARA) in 1996, building professional studios and performance spaces, and recruiting new students and faculty in 2011. With the establishment of 2CINEM, the School of Music and Music technology programs are further expanding their collaborative efforts and investment in digital arts and new media within a collaborative and interdisciplinary framework.

7. REFERENCES


CENTER FOR COMPUTER MUSIC AT THE COLLEGE-CONSERVATORY OF MUSIC, UNIVERSITY OF CINCINNATI

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ABSTRACT

Recent research, music and activities at CCM (the College-Conservatory of Music) Center for Computer Music, or (ccm)², the computer music studios at the University of Cincinnati will be discussed, and presented in a multimedia format including excerpts of recent works. A new semester-based set of courses in computer music will replace the old quarter-based curriculum in the fall of 2012. In research, collaborative projects in wireless sensor networks for music between the studio and the School of Engineering has resulted in a number of projects and performances using infra-red, accelerometer and other sensor networks. Also, applications have been developed for mobile devices and for interactive performances. A new student laptop ensemble, CICLOP, and participation on concerts by performance faculty, guest composers, and students enhance the Sonic Explorations series. Faculty and students are active in performing new works with inventive technologies at CCM and elsewhere.

1. INTRODUCTION

The most significant recent developments at the studio have been curriculum modifications, an increased interaction between the computer music studio and other departments of CCM, an even more lively level of performance activity by faculty and students, including the new laptop ensemble, and exploration of new areas of experimentation including sensor research, special hardware configurations and mobile device applications. The facilities have been described previously [1], [2]. Mara Helmuth has been the studio director since 1995, and the graduate assistants are Joel Matthys, Paul Schuette and Sangbong Nam.

2. CURRICULUM

The change-over to semesters, and recent developments in the field required re-thinking the courses available in computer music. Because semesters afford more time to dig into topics, the new courses are designed to be more independent modules. Currently the courses are primarily taken by composition students, but occasionally students in performance, electronic media, jazz studies, art, and engineering participate, which facilitates collaboration. Courses currently include Introduction to Electronic Music, Electronic Music Techniques, Computer Music Composition, Interactive Music, Live Electronic Music, Timbre Studies, Laptop Performance, Computer Music Projects, Music Programming Projects, Listening Strategies and Practices, Sound, Music and Science. These courses should both give conservatory students opportunities to master the latest techniques in composition and performance, as well as provide opportunities for collaboration, exchange of ideas and perspectives, and experimentation in related areas for students in CCM and other colleges. The new courses have a greater emphasis on interactive music than in the past.

3. RESEARCH

3.1. Wireless Sensor Networks

The extension of the wireless sensor network and music projects was aided by Mara Helmuth’s sabbatical in