Computer Music Researcgh at UCSB: An Annotated Bibliography

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ABSTRACT

This is a short annotated bibliography that shows various works at UCSB's MAT program. The focus of this is paper is on computer music, however, its applications in MAT's feature research project– the Allosphere– are mentioned.

General Terms

Computer Music, Additive Synthesis, Data Visualization, Psychoacoustics

Keywords

Computer Music

1. INTRODUCTION

At the UCSB Media Arts and Technology program, efforts between a multitude of architects, professors, graduate students have aggregated into an innovative new medium of visualizing complex multi-dimensional data. The program features a 3-story cube housing an aluminum sphere lined with 26 3D projectors, sound-absorption material, and an array of speakers designed to produce an immersive environment for scientists. A team of computer music researchers generates the audio for the sphere–providing auditory constructs that visualize data from neural networks to electron spins. This use of musical representations is the focus of this annotated bibliography.

Section 2 explains the background for the MAT program and how its contributions have aided researchers and scientists alike.

Section 3 touches on Gamma and the computer music research at UCSB.

In section 4, we describe the methods in which computer music are implemented in the allosphere.

2. BACKGROUND

Creating a fluid process for understanding multi-dimensional data/simulations is a difficult task. The Media Arts and Technology program at UCSB focuses on lending artistics practices in constructing visualizations of scientic data. These often depict comlex concepts such as quantum mechanics, MRI data, etc. using openGL algorithms to create visual representations. Similarly, Gamma–a powerful computer synthesis library– is used to create auditory representations using purely mathematically-generated waveforms.

SIGCSE '14 Someplace TBD

3. COMPUTER MUSIC

Roberts, Charlie, and Wright M. "The Web Browser As Synthesizer And Interface."[3]

The usage of two new javascript libraries called Gibberish.js and Interface.js allow the web browser to act as a synthesizer. Usage of websockets allows for efficient communication over standard AJAX procedures in javascript. These new libraries promote an improvement to Google's Web Audio API– more sample–accurate timing as well as feedback networks. These two allow far improved latency in browser-based music synthesis. Today, both of these libraries are open source and drastically add to the Web Audio API.

Roberts, C., Forbes, A. and HÃűllerer, T. "Enabling Multimodal Mobile Interfaces for Interactive Musical Performance."[2]

A new mobile app called Control allows musical performances from a mobile interface. The application uses JSON to create complex structures capable of multimodal signals. MIDI signals can be sent wirelessly from a mobile device such as an Iphone aggregated from a variety of sensory inputs such as touch and accelerometer.

4. ALLOSPHERE

Wakefield, Graham and Höllerer, Tobias and Kuchera-Morin, JoAnn and Roberts, Charles and Wright, Matthew. "Spatial Interaction in a Multiuser Immersive Instrument"[4]

Using the allosphere, users can immerse themselves in spatially-visualized multidimensional data. 26 projectors and an array of speakers are used to create these auditory and visual projections. Research in computer music at UCSB has contributed to innovative new ways of creating these auditory representations.

Kuchera-Morin, JoAnn C. "Using the Creative Process to Map N Dimensions: Quantum Information at Your Fingertips"[1]

N-dimensional data can be mapped and understood in the way a musician leads an ensemble. Using the allosphere, commanding complex quantum information is as intuitive as an artist paints a canvas.

5. ADDITIONAL COMPUTER MUSIC RESEARCH

Wright, Matthew James. The Shape of an Instant: Measuring and Modeling Perceptual Attack Time with Probability Density Functions (if a Tree Falls in the Forest, when Did 57 People Hear It Make a Sound?)[5]

Probability density functions can be used to determine the likelihood that a listener will hear a sound's Perceptual Attack Time("PAT") at the same time. The functions can be used to show how different sounds' PAT can be actually estimated using shortest path algorithms.

6. REFERENCES

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