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Music 109/209N & MAT 276N
SPECIAL TOPICS IN ELECTRONIC MUSIC

MODULAR SYNTHESIS

Spring 2017

Friday 4-6 PM, Music Room 2215 (Studio Xenakis)
Instructor: Professor Curtis Roads
Media Arts and Technology + Department of Music
University of California, Santa Barbara
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Teaching Assistant: Muhammad Hafiz Wan Rosli, hafiz@create.ucsb.edu

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1   7 April Friday
Lectures:
        Introductions and overview
        Grading criteria
        Curtis Roads's background in modular synthesis
        History of analog synthesis
        Introduction to modular synthesis concepts: *Arp 2500 manual* 2-19
        Shopping for modular: Moog and Buchla web sites, Big City Music, Control for Eurorack
        Quick introduction to the Pittsburgh Modular Foundation 2 Synthesizer

Music: Moog (East Coast) versus Buchla (West Coast)
Switched-on Bach (1968) Wendy Carlos on the Moog III modular synthesizer
Silver apples of the moon (1967) Morton Subotnick on the Buchla 100 synthesizer

Readings: *Pittsburgh Modular Foundation 2 Synthesizer Manual and Patch Guide*

***Assignment 1: Realize a 3-minute study using the Pittsburgh Modular Foundation 2
Synthesizer and modules from the CREATE Teaching System. Present your mixed file in class.
For extra credit, provide documentation of your patches (e.g., photos, diagrams, videos). Note
that the lighting in Studio Varèse makes it difficult to get good pictures without a flash. Due week
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***Assignment 2
Read Pages 2-19 of *ARP 2500 Owner's Manual.* (This is a basic intro to audio and control
signals.)

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2   14 April
Lectures:
        Overview of synthesis techniques via the Braids module
        Review of Pittsburgh Modular synthesizer
        Theory of modular synthesis: analog and digital, modules and patching, voltage control
                Hetrick text

Reading: Braids illustrated manual

Music: The analog sound
Forbidden Planet (1956) by Louis and Bebe Barron
Touch (1968) by Morton Subotnick
Patchworks by Emma Lou Diemer (1980)

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3   21 April

Lectures:
Introduction to the CREATE Teaching Synthesizer
Building sequences: Braids, Brains, Pressure Points, Dixie, and Quad Clock Distributor
Overview of modulation, AM, RM, FM, SSBM (or frequency shifting)
Presentation of *Modulude* (2017) by Curtis Roads
Sound example: *Turenas* by John Chowning

Lecture: Rhythm in electronic music from Chapter 6 of *Composing Electronic Music* by Roads.
Introduction
Liberation of time from meter
Rhythm and the electronic medium

We start to cover sequencing by showing Pressure Points and Brains. We sequence a simple melody for the Braids, and show how to manipulate the sequence with various other clock signals. The clock will start as a simple square wave from the Dixie. After that, we will slowly introduce complexity by using the Quad Clock Distributor (but saving more complexity for next week). We will create our first feedback loop by having a row of Pressure Points modulate the speed of its clock source. We will also show how to use Pressure Points as an in-modular keyboard or as preset-voltage storage. Points of emphasis: The reuse of modules for different purposes (Pressure Points as a sequencer or keyboard; Braids for numerous synthesis methods), and the usage of different modules for similar purposes (An oscillator/LFO vs. a dedicated clock). Time in the modular domain. Voltage-controlled clocking. Basic feedback.

Overview of Gates and Clocks: Quad Clock Distributor, Shades (Attenuator/Mixer), Peaks, Optomix
This week will continue our study of clocking techniques. Our first patch will be the same as last week, with the QCD clocking Brains. However, we will start to plug the QCD into itself, creating broken clock patterns and polyrhythms. The chaos will be controlled by attenuating these signals with Shades. The next patch will be using Peaks as a drum synthesizer, turning our gates into rhythmic sounds. We will then build a similar patch by using Optomix and an oscillator for our percussive tones.

Points of emphasis: Non-grid sequencing. Self-feedback. Rhythm. Chaotic systems and feedback.

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4   28 April

Lectures:

Rhythm in electronic music from Chapter 6 of Composing Electronic Music
Algorithmic rhythm generation
Modulating control voltages:
Quantimattor quantizer, 4ms Quad Clock Distributor, O'Tool oscilloscope. WMD Toolbox

This focuses on various ways of handling CV. We will begin with simple attenuation of voltages. Our next step will be to use the Quantimator to turn a dissonant sequence towards consonance. We will use many of the WMD Toolbox's functions to create more advanced CV, including Sample + Hold for sequences, a switch for routing multiple messages, a comparator for deriving gates, and an analog OR for finding the greatest voltage between two signals. Finally, we will build our own sequencer from scratch by combining a clock generator with a mixer. Throughout this lecture, all signals will be explicitly shown on the oscilloscope.

Points of emphasis: Combining control voltages. Obtaining complexity from simple signals, and deriving simplicity from complex signals.

Listening:
Ionisation (1931) by Edgard Varese. Intricate rhythms.
Quatermass by Tod Dockstader (tape echo feedback)
Confield by Autechre
Subotnick Buchla bongos (to go along with the Optomix)
Electronic Studies Number 1, 2, and 3 (1961-1965) by Mario Davidovsky

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5	5 May

Presentation of mid-term projects

Lectures:
Granular synthesis overview
The Klangumwandler
Modular processing: Clouds, Ears external input

During this lecture, the modular will be presented as a processor instead of a generator. We will use external inputs. Delay, reverb, granulation, and spectral processing will be demonstrated with Clouds. The effects will be sequenced and modulated in various ways. Points of emphasis: Processing signals. Granulation.

Listening:
Point Line Cloud by Curtis Roads

***FINAL PROJECT assignment: Realize a 4-minute piece in either of two ways:
a. Make a patch and videotape yourself playing it
b. Record a piece in ProTools or another audio mixing program.
For extra credit, bring documentation (photos, videos, patch diagrams).
Due in last class.

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6	12 May

Lectures:
Analog computation and digital logic
Analog Computing (2013) book by B. Ullmann

Video: Bright Sparks –1:00, 3:33-13:10 ADSR.

MakeNoise Maths and its various functions. We use its many features to build various patches, such as rectification, voltage mirroring, slew limiting, bouncing balls, quadrature envelopes, complex envelopes, oscillators, analog OR, and more. This should be thought of less as a Maths

class and more of a CV manipulation class.

Readings: Maths illustrated manual

Recommended Listening:
Richard Devine, *Creature* (MakeNoise Shared System Series)
Video: *I dream of wires*
Music: *Sidewinder* (1970) by Mort Subotnick with Liquid Light show by Tony Martin

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7   19 May

Lectures:
        Special Guest: Professor Yon Visell on modular synthesis.
        Generative Sequencing and Digital Logic: Intellijel Plog logic device, Peaks (Probability
and
        tap tempo modes)

During this class, we will start to combine knowledge to build an advanced generative patch. Plog
will be used to apply Boolean logic to binary and ternary gates. We will look at some of Peaks'
alternate modes, which introduce probability processing and trigger delays for gates.

Listening:
        Krell Music (from Forbidden Planet) by Louis and Bebe Barron (1956).
        Richard Devine's Vimeo videos.

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8   26 May

Lectures:
        Analysis of *Then* (2015) by Curtis Roads, a piece produced by analog technology
        Review of modular topics

Demo:
        Software modulars
        Berna 1950s electronic music studio emulation
        Moog 15
        Reaktor
        EuroReakt
        AAS Tassman
        Arturia Modular V
        Madrona Labs Aalto/Kaivo
        u-he Bazille
        Xils Lab XILS4 (EMS VCS 3 emulator)
        Softube Modular

        Demo: u-he Satin Tape emulator plugin

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9   2 June
Lectures:
        Guest lecture demo: Xopher Davidson (San Francisco) on modular synthesis
Video:
        I dream of Wires

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5-9 June Dead Week – No Class
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10   16 June

FINAL PRESENTATIONS
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REFERENCES

Holmes, T. 2012. *Electronic and Experimental Music.* 4th edition. London: Routledge.

LINKS

http://en.wikipedia.org/wiki/Alessandro_Cortini
http://www.analognotes.com/
http://www.muffwiggler.com/forum/
http://www.electro-music.com/
http://www.sonicstate.com
http://www.synthtopia.com
https://www.modulargrid.net/
https://www.bigcitymusic.com/