

Professor Guerino Mazzola

Fall 2010. MUS 3950: *Introduction to Music Information Technology*

Course Description

Introduction to Music Information Technology is a first introduction to some basic concepts, theories, and hard- and software technologies regarding music. We first discuss the nature of sound and its most famous synthesis methods: Fourier, Frequency Modulation, Wavelets, and Physical Modeling. We then discuss the digital encoding and decoding of sound and related file formats with their compression, and in more detail MP3. After this sound-oriented discourse, we look at symbolic encoding, mainly MIDI and associated soft- and hardware. We then have a more systematic look at a number of audio and MIDI software, including Audacity, GarageBand, Live, Logic, Sibelius, and Max. However, this is not a course on one of these software, we shall just try to work with them in order to see how they implement audio and MIDI encoding of sound. We terminate the course by a short discussion of the technology of global music.

Media and Collaboration

Powerpoint slides, audio and MIDI software, whiteboard discussions (important!). Collaboration with students essential.

Prerequisites

Instructor's consent, but most importantly the willingness to understand how sound and symbolic music data are encoded and implemented in various software environments.

Goals and Objectives

The three principal objectives: (1) to understand how sound and notes are structured, (2) how these structures are encoded in analog and digital concept frameworks, and (3) how these concept frameworks are implemented in various commercial software environments.

The goal of this course is to work together towards a new book on music technology, a book much as the free jazz and performance theory books written following the free jazz and performance theory classes in Spring 08 and Fall 09. The publication of such a book by Springer is guaranteed from my position as the chief editor of the book series *Computational Music Science* at Springer.

Grading

I grade on a scale 0-10 with 0.1 steps: 9.5-10 = A, 9-9.4 = A-, 8.5-8.9 = B+, 7.6-8.4 = B, 7-7.5 = B-, 6.5-6.9 = C; 6-6.4 = C-, 5-5.9 = D, 0-4.9 = F.

We have three presentations, each given by a group of two students.

1st in-class presentation due October 06/08/11, length = 20 minutes.

2nd in-class presentation due November 03/05/08, length = 20 minutes.

3rd in-class presentation due November 22 to December 10, length = 40 minutes.

Final grade: Class participation 30%, first presentation 20%, second presentation 20%; third presentation 30%; no final exam.

Plagiarism will not be tolerated and will lead to failure.

Contact

My office hours are by appointment (room 164).

Email = mazzola@umn.edu

Web = <http://www.encyclospace.org>

Schedule of Classes

I Introduction and ontology

I.1 (W Sep 08)	Introduction	Introduction and overview
I.2 (Fr Sep 10)	Introduction	The oninotology of music
—		
I.3 (M Sep 13)	Introduction	Discussion of oniontology by examples

II Acoustic Reality

II.1 (W Sep 15)	Acoustic Reality	Sound
II.2 (Fr Sep 17)	Acoustic Reality	The communicative dimension of sound
—		
II.3 (M Sep 20)	Acoustic Reality	Fourier
II.4 (W Sep 22)	Acoustic Reality	FM, Wavlelets, Physical Modeling
II.5 (Fr Sep 24)	Acoustic Reality	Examples via Audacity SW
—		
II.6 (M Sep 27)	Acoustic Reality	Examples: Simple waves
II.7 (W Sep 29)	Acoustic Reality	Examples: Noise, envelopes
II.8 (Fr Oct 01)	Acoustic Reality	Examples: Own recordings
—		
II.9 (M Oct 04)	Acoustic Reality	Examples: Spectra, Tuning, FM
II.10 (W Oct 06)	Acoustic Reality	Assigned presentations 1
II.11 (Fr Oct 08)	Acoustic Reality	Assigned presentations 1
—		
II.12 (M Oct 11)	Acoustic Reality	Assigned presentations 1

III Electromagnetic encoding of Music: Audio HW and SW

III.1 (W Oct 13)	Audio HW and SW	General picture of analog/digital sound encoding
III.2 (Fr Oct 15)	Audio HW and SW	LP and tape technologies, some history
—		
III.3 (M Oct 18)	Audio HW and SW	The digital approach, sampling
III.4 (W Oct 20)	Audio HW and SW	Finite Fourier analysis
III.5 (Fr Oct 22)	Audio HW and SW	FFT
—		
III.6 (M Oct 25)	Audio HW and SW	MP3, MP4, AIFF
III.7 (W Oct 27)	Audio HW and SW	Examples of compression
III.8 (Fr Oct 29)	Audio HW and SW	Filters, EQ, Reverb
—		
III.9 (M Nov 01)	Audio HW and SW	Time and pitch stretching
III.10 (W Nov 03)	Audio HW and SW	Assigned presentations 2
III.11 (Fr Nov 05)	Audio HW and SW	Assigned presentations 2
—		
III.12 (M Nov 08)	Audio HW and SW	Assigned presentations 2

IV Symbolic Formats: Notes, MIDI, Denotators

IV.1 (W Nov 10)	Symbolic Formats	Western notation and performance
IV.2 (Fr Nov 12)	Symbolic Formats	MIDI: what it is about, short history

—		
IV.3 (M Nov 15)	Symbolic Formats	MIDI networks: MIDI devices, ports, and cables
IV.4 (W Nov 17)	Symbolic Formats	MIDI messages: hierarchy and anatomy
IV.5 (Fr Nov 19)	Symbolic Formats	Time in MIDI, MIDI Standard files
—		
IV.6 (M Nov 22)	Symbolic Formats	Short introduction to Denotators and Rubato
 <i>V SW Environments for MIDI and Audio</i>		
V.1 (W Nov 24)	Symbolic Formats	GarageBand: Assigned presentation 3
Thanksgiving		
—		
V.2 (M Nov 29)	SW Environments	Abelton Live: Assigned presentation 3
V.3 (W Dec 01)	SW Environments	Logic Express
V.4 (Fr Dec 03)	SW Environments	Logic Express: Assigned presentation 3
—		
V.5 (M Dec 06)	SW Environments	Sibelius: Assigned presentation 3
V.6 (W Dec 08)	SW Environments	Max
V.7 (Fr Dec 10)	SW Environments	Max: Assigned presentation 3
 <i>VI Global Music</i>		
—		
VI.1 (M Dec 13)	Global Music	Concluding observations and discussion

Selected Original References

Audacity software: <http://audacity.sourceforge.net>

Dan Hosken: Introduction to Music Technology. Routledge, New York and London 2010

Curtis Roads: The Computer Music Tutorial. MIT Press Cambridge Mass. and London 1998

Guerino Mazzola: The Topos of Music. Birkhaeuser, Basel 2002

Guerino Mazzola et al: Elemente der Musikinformatik. Birkhaeuser, Basel 2006

Guerino Mazzola et al: <http://www.rubato.org>