

Computer Music Instrumentation

Grim Planetarium, 7 September 2011

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Acoustic Versus Electronic

Analog versus Digital

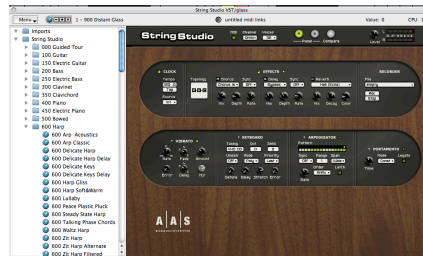
- Analog versus digital is easy to describe.
 - A continuous, time-varying voltage transduced by a microphone or pickup is analogous to time-varying sound pressure level or magnitude of vibration.
 - A discrete, time-varying sequence of numbers mapped from a time-varying voltage by an analog-to-digital converter describes a time-varying sound pressure level.
- Acoustic versus electronic is a little harder.
 - Tonight we are working with electro-acoustic music.

It's All Real

- Real versus Virtual is hard.
- The Virtual World is also Real 😊
- The Real World is not Analog or Digital.
 - It's not an analog of anything.
 - It's not a discrete description of anything.
 - It encompasses analogies, descriptions, and more.
- Make these machines extension of yourself.
Own these machines!

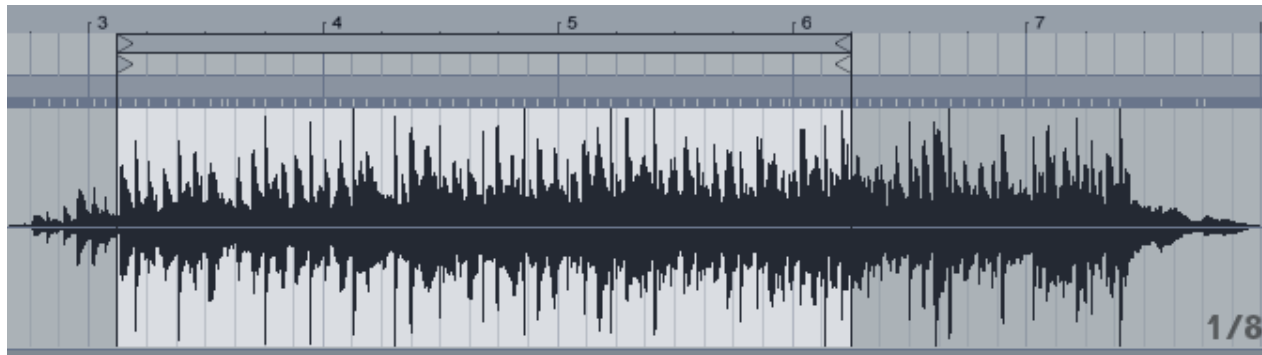
Musicians synthesize sound.

- Electro-acoustic musicians sculpt sound.
- *Synthesis* is a means for creating a sound from the ground up.
 - Analog synthesis uses oscillators that generate signals, combined with circuits that shape them.
 - Digital synthesis uses algorithms that generate and modify descriptions of physical signals.



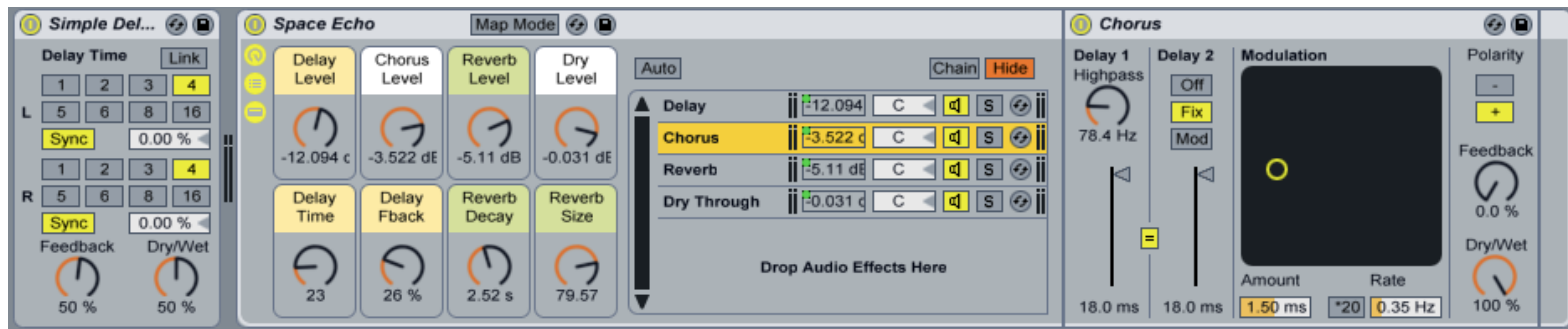
Musicians sample sound.

- A sampler is a counterpart to a synthesizer that stores and manipulates audio samples of acoustic instruments or other sounds.
- A digital recording tool can record and manipulate samples, e.g., via delays, echoes, looping, time stretching & pitch shifting.



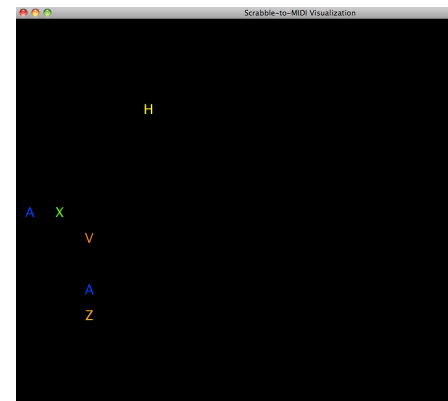
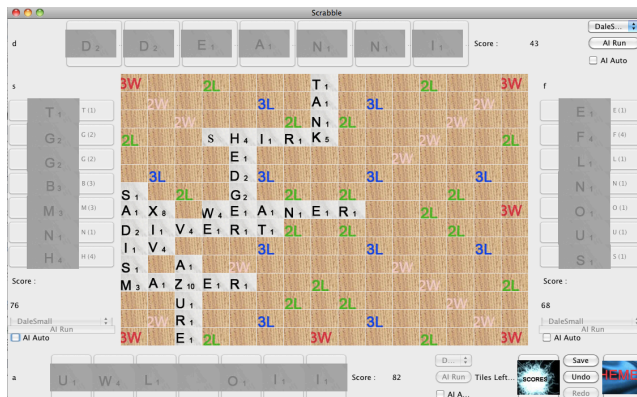
Musicians process sound.

- Effects (FX) are signal processors.
- There are digital signal processors especially designed for manipulating audio in real time.
- Filters, delays, chorus, reverb, flanging, phasing, mixing, compressing, spatialization.

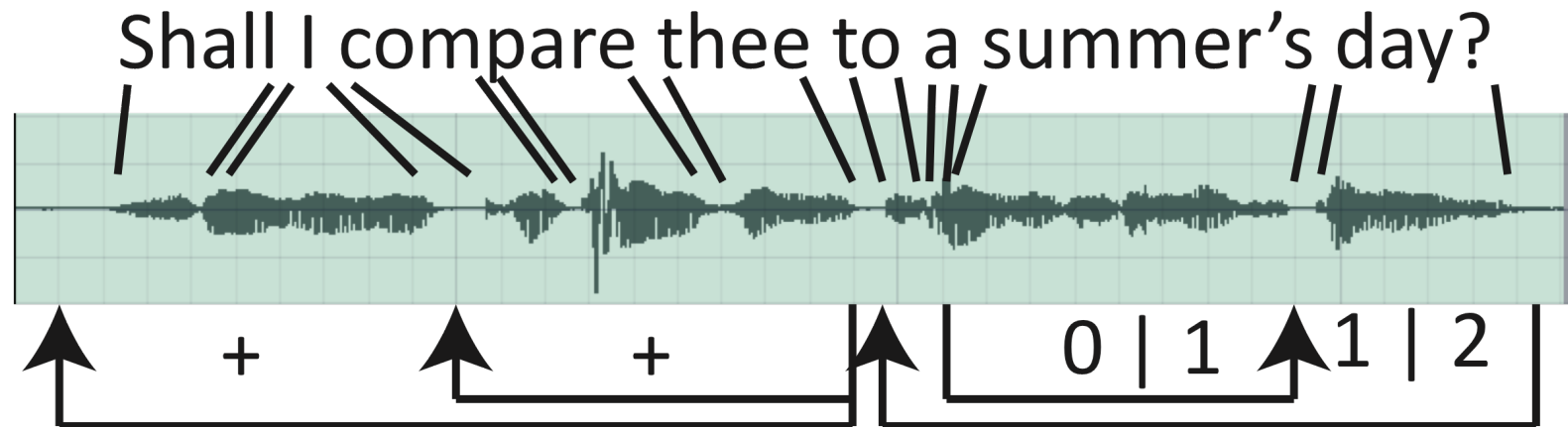


Composition

- Creating new sounds can be a form of composition.
- Generating synthesized or sampled sounds into novel performances – algorithmic composition or improvisation – is another.



Composition with Samples



(aux-verb (noun | pronoun)(verb(noun | pronoun))+)+(prep art adj₀₋₁ noun)₁₋₂

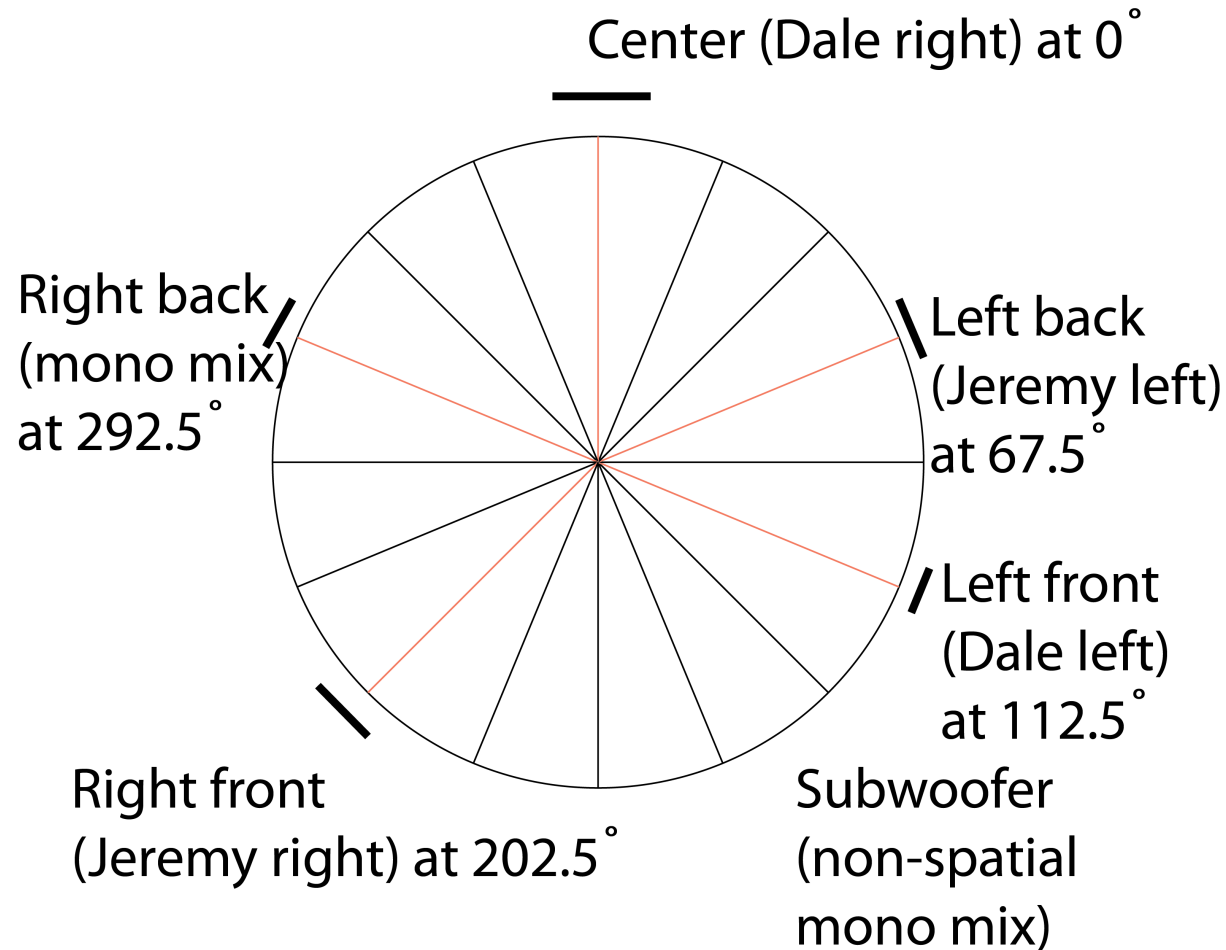
A regular expression supports sequencing,
alternatives (|), repetition (* + i-j), and grouping.

A finite automaton is a machine that recognizes
a sentence that conforms to a regular expression.

Granulation and microsounds

- Take rhythm – repetitive sonic patterns occurring over many milliseconds or seconds.
- Smash it together until you have pitch – repetitive sonic patterns (waveforms) occurring more closely together.
- Smash them even further and you have timbre – the sonic signature of an instrument on which you play pitch and rhythm.

Spatialization in Grim 100



Other Digital Media

- There are related considerations in other digital media.
- Just as digital audio is sampled for precision in measurement of amplitude and frequency in which measurements are taken, a digital image in resolution of pixels per inch and number of bits of information per pixel.
- We are looking at the cross product of a multidimensional matrix of descriptions.

Shameless Plug

- Read <http://www.electro-music.com>.
- Listen to <http://radio.electro-music.com>.
- Consider attending <http://event.electro-music.com>.
- Students interested in pursuing this line of inquiry should talk with me.
- <http://faculty.kutztown.edu/parson/music>

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