CHAPTER 5
The Transformation of Sound by Computer

> "Composers have experimented a lot with unusual time-domain restructuring of sound. By chopping up waveforms into very small segments and radically reordering them, some noisy and unusual effects can be created. As in collage visual art, the ironic and interesting juxtaposition of very familiar materials can be used to create new works that are perhaps greater than the sum of their constituent parts."
>
> – Burk et al., *Music and Computers*

Terms and Concepts

5.1 Introduction to the Transformation of Sound by Computer
Transformation techniques
- Crossfade
- Cut & paste
- Deconstruct
- Filter
- Mutate
- Overlap
- Retrograde

Time-domain restructuring
Rabelais' Argeïphontes Lyre
Probabilistic decisions
Sampling as quotation
Drum machines
Digital audio workstations (DAW)
Breakout box
FireWire

5.2 Reberb
Direct sound
Dry/wet mix
Physical space simulation
Imaginary soundscapes
Reverberant chamber
Resonance characteristics
First reflection
Early reflections
Reverb tail
Room model
- Room size
- Surface qualities
- Absorption coefficient
- Brightness

Signal
- Delay
- Gain change
- Phase inversion
- Feedback
- Feedforward convolution

Smoothed function
Blended reverb
Taps
Multitaps
Comb filter
Impulse
Impulse response (analysis)
Impuse response libraries
Music function
Filter function
Pointwise product
Flanges

5.3 Localization/Spatialization
Filter-based localization
Binaural localization
Interaural time delay (ITD)
Speed of sound (345 m./sec.)
Head transfer functions
Head-related transfer functions (HRTFs)

5.4 Introduction to Spectral Manipulation
Phase vocoder
Analysis/resynthesis
Filtering
- Time domain
- Spectral domain

Time stretching
Pitch shifting
Chipmunk efect
Varispeed
Windowing
- Overlapping

5.5 More on Convolution
Cross synthesis

5.6 Morphing
Amplitude crossfade
Source/target
Sonic morph
Morphing
- Interpolation
- Replacement
- Feature

Spectral centroid
Spectral metric

5.7 Graphical Manipulation of Sound
Lecain's Spectrogram
Xenakis' UPIC
IRCAM's AudioSculpt
Erbe's QT-coder
Penrose's Hyperupic
Repetto's Squiggy

Reference

Burk, Phil, Larry Polansky, Douglas Repetto, Mary Roberts and Dan Rockmore. 2011. *Music and Computers: A Theoretical and Historical Approach*, Archival Version. Available online at: <http://music.columbia.edu/cmc/MusicAndComputers/>.