The Application of Cochlear Audio Analysis Techniques to Percussion in Electroacoustic Music

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Introduction

- Objective
- Background
 - Electroacoustic Music
 - Auditory Image Model (A. I. M.)
- Percussivity Profile
 - Definition
 - Algorithms
- Results
- Conclusion and Future Work

Objective

The Greater Goal

provide detailed, informative images corresponding to pieces of electroacoustic music (lack a standard visual representation)

My Goal

create algorithms which use models of human hearing to extract audio properties from recorded electroacoustic music

Today's Goal

create a percussivity profile from "sound bites"

Background

Electroacoustic Music

- definition involves electronic technology for the compositional manipulation of sound
- not restricted by physics
- the blurry lines of perception
- no Western musical score

Background

- A. I. M. The Auditory Image Model
 - time-domain model of auditory processing
 - attempts to simulate "auditory images" humans hear
 - developed at the University of Cambridge in the Center for the Neurological Basis for Hearing (C. N. B. H.) by Dr. Roy Patterson, et. al.











Percussivity	Profile
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Definition

measure of the presence of a percussive event at all points in a piece of music

- any type of percussive event
- ignore for now the phenomenon of too much percussion

Algorithms

Cross-Correlation Method

- Cross-Correlation within channel
- Sum of In-Channel Percussivity Profile



Algorithms

Cross-Correlation Method



Algorithms

Noise Likeness Method

- Convolve Frequency Components by Gaussian Impulse
- Use Correlation Coefficient of the "Model Vector" with the Frequency Vector



Algorithms

Percussiveness Method

- Half-wave Rectify and Low Pass Filter the Sound
- Correlate With a 200 msec Descending Ramp

Other Suggestions

- Spectral Dissonance
- Spectral Flatness

Biggest Problem

• Cannot Use NAP as Spectral Components

In-bin correlation 0:07 of "Le Vertige Inconnu" with impulse



Results In-bin correlation 0:07 of "Le Vertige Inconnu" with ramp ×10

Cross Correlation Method of "Le Vertige Inconnu" by spectrogram



In-channel correlation 0:07 of "Le Vertige Inconnu" with impulse



In-channel correlation 0:07 of "Le Vertige Inconnu" with ramp







Cross Correlation Method of "Le Vertige Inconnu" by spectrogram



In-channel correlation 0:07 of "Le Vertige Inconnu" with frequency dependent hit



Cross Correlation Method of "Le Vertige Inconnu" by A. I. M. with frequency dependent hit





Conclusion and Future Work

Conclusion

- from a larger scope, currently working on **percussivity profile**
- shown the first draft unmastered tool

Future Work

- frequency dependent hit with scaling for sample length
- human experiment comparison
- use temporal profile of the S. A. I. for noise-likeness
- self-similarity according to percussivity profile