An Historical Overview

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Overview of the Overview

- In the Beginning: early transcription systems

  - Piszczalski, Moorer

- Note Detection

  - Piszczalski, Foster, Chafe, Katayose, Maher, Kashino

- Other Detection

  - Lerdhal, Chafe, Mont Reynaud, Desian

- Missing References

- Conclusions

  - What wasn't published

Moorer 77

- Restrictions
    - Only harmonic instruments
    - No vibrato
    - No overlaps between fundamentals and harmonics

Moorer 77

- Method

  - Periodicity detector to separate harmonics

  - Look for fundamental frequencies

    - assign by goodness of fit

  - Get duration by getting minimum durational value as an input from the user.

Piszczalski 77

- Restrictions
  - Monophonic recorder or symphonic flute

- Method
  - Convert to frequency domain
  - Frequency of strongest partial + average weighting of spectral neighbors
  - Abrupt change in pitch or change in amplitude implies a note off.

Piszczalski 81

- Restriction

  – Monophonic input

- Method

  – Change to frequency domain

  – 'abrupt' change in pitch or amplitude implies note off

  – Ignore 'impossible' notes by thresholding duration

Foster 82

- Restrictions

  - No harmonic based polyphony

- Method

  - Transform into frequency and process backwards

  - Determine pitch

  - Use autoregressive measure of goodness of fit. Drop in goodness of fit implies an attack.

Foster 82

- Notes on polyphony
    - Recognize by differing attack times
    - Identify by 'frequency locked' vibrato patterns
    - Can not handle harmony.

Chafe 85

- Restrictions

  – None listed

- Method

  – Blackboard style approach

  – Separate signal into pieces by BoundedQ frequency transform

  – Multiple passes

Chafe 85

- Blackboard Modules

  - Signal Transformation

  - Event Detection

  - Note Modeling

  - Metrical grid formation

Katayose 89

- Restrictions

  - Precomputed spectra for all instruments used

- Method

  - "pick up every note whose harmonic is associated with the tone under investigation"

  - Set threshold for deciding whether tone is fundamental or not

  - Extract fundamental using threshold

  - Repeat for notes in order of loudness

Maher 90

- Restrictions
  - 2 monophonic voices
  - Instruments must be harmonic
  - Max(voice b) < Min(voice a)
  - Noise free

Maher 90

- Method

  - Choose 2 fundamentals that maximize coverage of harmonics present

  - Full search 3 times per second

  - Up to semitone difference checked between full searches

Kashino 93

- Restrictions

  - None listed

- Method

  - cluster partials using vertical theory of timbrel perception

  - Cluster these partials into sound sources

Kashino 93

- Methods for clustering
    - Harmonic mistuning
    - Onset asynchrony
    - Timbre memory
    - Old + new

Lerdahl and Jackendoff 83

- No experiment conducted

- Foundation for most symbolic based computer processing of music

- Collections of rules for segmentation and meter detection.

Chafe 82

- Monophonic transcription

- Method

  - Uses Foster's algorithm to get notes'

  - Marks agogic accents based on Lerdahl and Jackendoff's duration grouping rule and accent grouping rule.

  - Uses accents to weight tonality measurements to estimate key

  - Similar process for analyzing meter

Mont Reynaud

- Metrical Pattern Matching

  – Formed from Interval Onset Intervals (IOI)

- Methods

  – All patterns are time invariant

  – Exact pattern matching

  – Unconstrained elaboration

  – Grammar driven elaboration

Desian 89

- Quantization of music

- Connectionist approach

- Method

  - Sequentially iterates over IOI's, slowly transforming them into simple integer ratios of each other.

Conclusions

- Prior to Lerdhal and Jackendoff, no processing of symbolic data – only audio

- Polyphonic transcription problem has been around for quite a while

- Beat detection and meter detection has historically been an afterthought