Research trends in automatic music performance

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ICMC05: Panel **Software Tools for Expressive Music Performance**

Expressiveness in music performance

- *Expressiveness* refers to:
  - the means used by the performer to *convey* the composer's message
  - the performer's contribution to *enrich* the musical message.

- *Modeling* expressiveness in music performances
  - commonalities vs. specificities
  - computational models
    - for understanding
    - for music production

Expressive deviations

- *Deviations* from the musical notation
  - measurable from audio or MIDI
  - but: deviations are only the external surface

- *Reference* for computing deviations:
  - score
  - the norm as given by a higher level structural unit

  - mean performance
  - neutral performance

Strategies for developing models

- *Analysis-by-measurement* models
  - analysis of deviations measured in human performances
  - description by means of a mathematical model, relating score to expressive values
- *Mathematical* models
  - based on geometric theory
  - based on physical (motion) analogy
- *Analysis by synthesis* models
  - Model formalizes intuition, knowledge of expert musician
  - Performance generation by model simulation
  - Evaluation by experts and then refinements

Strategies for developing models (cont.)

- *Machine learning* and data mining algorithms:
  - Search for and discover dependencies on very large data sets
  - Describe discoveries in intelligible terms
  - No preliminary hypothesis: bottom up approach

- *Case-based reasoning*:
  - uses the knowledge implicit in examples of human performances.
  - search for similar cases
  - interactive revision of new solutions and memorization
    - learn by experience

Comparing performances

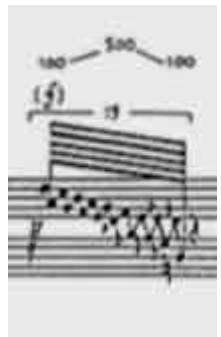
- Human comparison according to:
  - an ideal performance
  - an actual reference performance
- Numerical comparison
  - absolute or relative values
  - distances: absolute, Euclidean, maximum, . . .

- How timing and loudness values should be combined?
  - e.g. emphasis: lengthening, dynamic accent, timbre
- Need of intermediate expressive parameters: e.g. emphasis

- How are subjective and objective comparisons related?

Models for performance production

- Models for music performance production:
  - classic music
    - focus on pitched sounds
    - melodic and harmonic organization
    - linguistic paradigm
  - contemporary music
    - focus on sound, timbre
    - acoustics, psychoacoustic
    - performance as timbre control



- From structural models to sound control models
  - sound synthesis
  - live electronics

Future research trends

- Art and research exchanges:
  - from classical music performance studies to performance models of new music creation.
  - from the practical knowledge of new music creators to new performance models.
- When automatic performance is acceptable?
- Models for expressiveness extraction and processing
- Toward model-listener interaction (conductor paradigm)?
- Toward common models for performing arts?