Introduction to Audio Content Analysis

Module 16: Music Performance Analysis

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corresponding textbook section

Section 16

- **lecture content**
  - musical communication
  - music performance
  - music performance analysis

- **learning objectives**
  - give examples for score-inherent and performance-inherent musical characteristics
  - describe typical challenges in music performance analysis

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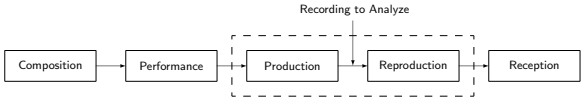
music performance
introduction

- music exists only with performance
- performance realizes acoustic rendition of musical ideas
- each rendition is unique
- score information is interpreted, modified, added to, or dismissed
- adds “expressivity”



music performance
parameters

category	score representation/idea	performance
tempo/timing	explicitly defined rhythmic content	tempo, micro-timing
dynamics	basic dynamics instructions	accents,...
pitch	explicitely defined pitches	vibrato, intonation,...
timbre	implicit definitions (instruments, ..)	playing techniques

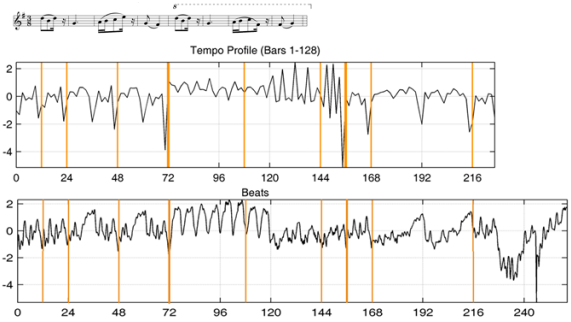
music performance analysis
goals

by analyzing the music performance, we learn about

- the **performance**:
  - general performance characteristics
  - notable stylistic differences (over time, between artists, ...)
- the **performer**:
  - mapping of intent and projected emotion to measurable parameters
- the **listener**:
  - what is perceived as (appropriate level of) expressiveness
  - how can different performance parameters impact the listener
  - how is aesthetic perception shaped by performance parameters

performance analysis
insights 1/3

- close relation between **tempo/dynamics and structure**:
  - ritardandi at phrase boundaries
  - tempo changes at structural boundaries
  - repetitions very similar
- performance sounds unnatural without these general trends
- no clear relation to timbre

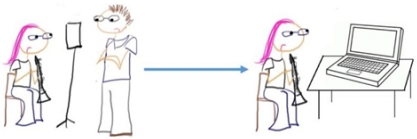


performance analysis
insights 2/3

- perceptual relevance of "expressive" performance characteristics:
  - dynamics highest impact on ratings of emotional expression
  - expressive timing best predicts ratings of musical tension
  - sharpened intonation at phrase climax contributes to perceived excitement
- measured $\neq$ perceived
  - e.g., measurable difference between "normative" and "expressive" performance does not necessarily lead to perception of expressivity
  - e.g., no correlation between measured and perceived vibrato onsets

performance analysis
insights 3/3

- Humans rate performances regularly (schools, auditions, competitions) but specific criteria are often badly defined
- use cases
  - music education
  - computer-assisted practice
  - pre-screening of candidates for music programs
  - provide insights into **technical and aesthetical descriptors** of human judgments
- most models still lack generalizability and reliability beyond simple note matching



music performance analysis
challenges

- **observations**
  - style dependent, lacking research beyond western classical music
  - data is manually annotated in most cases
  - most research
    - focused on piano and voice
    - descriptive and explorative

1. datasets small, not general
   - automatic tools not reliable enough?
   - generality: instrument specific, performers, listeners
2. unknown mapping of performance parameters to perception
   - isolation of parameter meaning tricky
   - hard to define expressivity, hard to control variables

summary
lecture content

- **performance**
  - all music needs to be performed
  - while the general performance characteristics are clear, their analysis is less clear

- **performance analysis**
  1. describes and formalizes commonalities and differences of performances

- **challenges**
  1. tricky to disentangle variables
  2. unclear impact on listeners
  3. hard to find reliable ground truth data