

Music and Text: Integrating Scholarly Literature into Music Datasets

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Contexts, Crises, Futures, 8 September 2009

Outline

- 1 Purcell Plus
- 2 Musical Materials
- 3 Future Work
- 4 Back Matter

e-Science in the Arts and Humanities

- e-Science in the Arts and Humanities Initiative
- Seven projects
- Assess the impact of e-Science

e-Science Methodology for Musicologists

- *Purcell Plus* focusing on musicology
- Intelligent Sound and Music Systems (ISMS) research group at Goldsmiths
- Tim Crawford principal investigator
- Funded from 2007–2012
- Technical phase ended 31 August 2009

Music and Technology

- Technology for practice-led research
- Audacity, ProTools, Max/MSP, PureData, Supercollider
- Sibelius, Finale
- Mature and well understood

Musicology and Technology

- Music theory and analysis, historical musicology
- Ethnomusicology
- Sonic Visualiser, MelodicMatch, HUMDRUM
- Outside the main discipline

Musicology as Criticism

- Joseph Kerman (1985), musicology as criticism
- Criticism of the work
- Cultural context of musical practice
- No room for technology

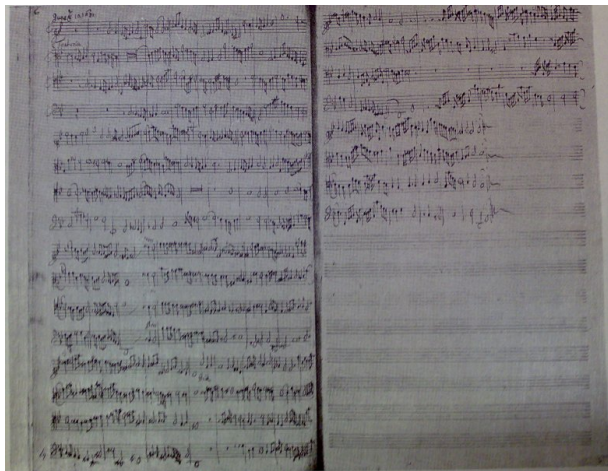
Technology for Musicology

- Musical source materials: scores, historical documents, recordings
- Manipulated syntactically

Hence *Purcell Plus*

- e-Science methodology for musicology
- Database of Henry Purcell's *Fantazias* and *In Nomines*
- Audio and score data
- Textual commentaries
- The *three domains* of source material
- Analysis of music scholarship

Fantazia Example



Fantazia No. 4 a 4 in G minor Z.735; from GB-Lbl Add. MS 30930

Music as Data

- Music and computation
- Storage and processing
- Syntactical

Music as Data: Audio

- 44100 (typically) samples per second
- WAV, MP3
- Extract features
- Event onsets, pitches, timbre, and loudness

Music as Data: Symbolic

- Like musical notations
- Events with pitch and onset time
- MIDI, MusicXML, MEI, IEEE P1599

Nightingale, MusicXML, MEI

- Michael Good, Recordare LLC
- `<note>`, `<rest>`, `<chord>`, `<measure>`, `<staff>`,
`<voice>`, `<part>`
- Don Byrd's *Nightingale*
- Perry Roland (Virginia) Music Encoding Initiative
- TEI influenced
- Extensive metadata (like `<teiHeader>`)
- Text critical elements (`<app>`, `<rdg>`)

Music as Data: Representation Agnosticism

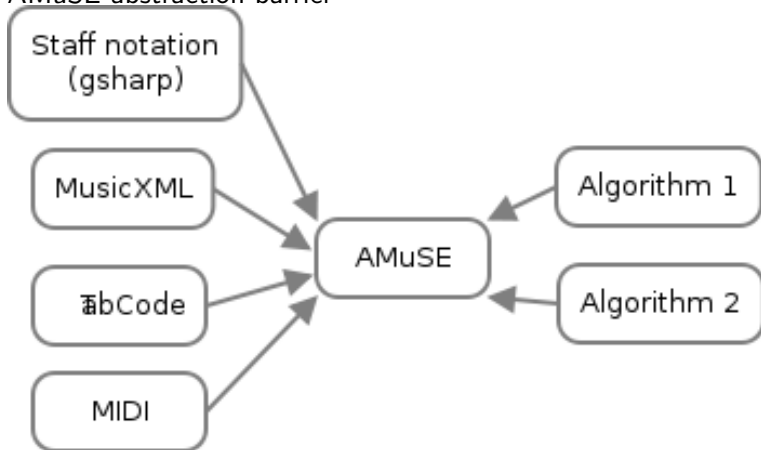
- Wiggins (2009) avoid dependence on encoding method (e.g. MusicXML, MIDI, WAV)
- Abstract representation

Music as Data: Representation Agnosticism II

- CHARM, the *Common Hierarchical Abstract Representation of Music*
- AMuSE framework (*Advanced Musical Score Encoding*)
- Used in Intelligent Sound and Music Systems lab

AMuSE

AMuSE abstraction barrier



AMuSE

- Common Lisp
- *generic functions*,
- *methods* implement generic functions
- AMuSE API as generic functions

AMuSE Generic Functions

Examples of some of AMuSE's generic functions:

```
(defgeneric pitch (object &key kind))
```

```
(defgeneric chromatic-pitch (pitch))
```

```
(defgeneric diatonic-pitch (pitch))
```

```
(defgeneric diatonic-pitch-octave (pitch))
```

```
(defgeneric duration (period))
```

```
(defgeneric timepoint (moment))
```

```
(defgeneric time+ (object1 object2))
```

```
(defgeneric time- (object1 object2))
```

```
(defgeneric pitch+ (object1 object2))
```

```
(defgeneric pitch- (object1 object2))
```

Musical Data: Text

- treatises (evidence of cultural practice)
- critical commentaries (justification for editorial decisions)
- analyses (evidence of practice, information for future analysts)
- programme notes (historical significance)
- sleeve notes (performance practice)
- Orthogonal with music

TEI for Music

- Encoded as XML using the TEI (via OCR)
- `<musicRef>`
- `@cFrom` and `@cTo` attributes
- e.g. `<musicRef cFrom='Z737:45:4'
cTo='Z737:64:4'>double counterpoint in the
closing bars</musicRef>`

Referring to Digital Musical Materials

- Performances, scores, and commentaries
- Metadata for musical works, literary works, performances, recordings, manuscripts, published scores, etc.
- Relationships between these objects
- Parts of objects

Referring to Digital Musical Materials: Abstractions

- **points**: (e.g. note in a score, word in a text, page in a document)
- **spans**
- **ranges** (e.g. between 0:30 and 1:15 of a recording)
- **sets** (e.g. folios 1r, 3r, 10v, and 14v of a manuscript)
- **links**

Referring to Digital Musical Materials: Links

- Between exactly two points/spans/objects
- Link semantics
- Chains of inference
- A text refers to part of a recording, which is of a performance, which features a performer, who is a member of an ensemble, ...
- Interpretation
- **provenance** (e.g. analyst, editor, algorithm)
- **trust**

Parts of (Digital) Objects

- **discretizable** (e.g. text, music notation, manuscripts)
- Reference by **set-spans** (a collection of points)
- **continuous** (e.g. audio, image)
- Reference by **range-spans** (range between two points)

Referring to Digital Musical Materials: Audio

- *Continuous*
- Range references
- Time indexes
- MPEG-7?

Referring to Digital Musical Materials: Score

- *Discretizable*
- Note, bar (measure), system, phrase, movement
- bar number, beat number (e.g. 41₂)
- MusicXML, XPath

MusicXML, XPath examples

```
<score-part id="P4">  
  <part-name>Part 4</part-name>  
</score-part>  
</part-list>  
<part id="P1">  
  <measure number="1">  
    <attributes>  
      <divisions>32</divisions>  
      <key>  
        <fifths>-2</fifths>  
      </key>  
      <time>  
        <beats>4</beats>  
        <beat-type>2</beat-type>  
      </time>  
      <clef number="1">  
        <sign>G</sign>  
        <line>2</line>  
      </clef>  
    </attributes>  
    <direction placement="above">  
      <direction-type>  
        <words>FANTAZIA 4</words>  
      </direction-type>  
    </staff>1</staff>  
  </direction>  
  <note id="n1">  
    <rest/>  
    <duration>128</duration>  
    <voice>1</voice>  
    <type>whole</type>  
    <staff>1</staff>  
  </note>  
  <barline location="right">  
    <bar-style>regular</bar-style>
```

//part [@id=' 'P2' ']/measure [@number='1']

Referring to Digital Musical Materials: Text

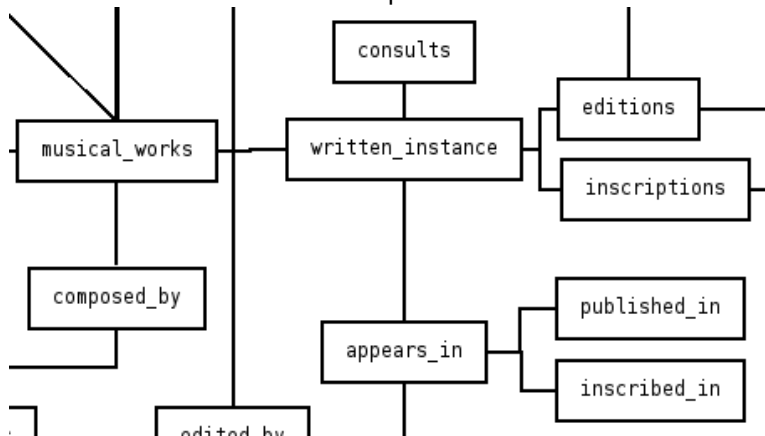
- *Discretizable*
- Unique string; five words, or at least 25 non-whitespace characters
- XPath

Implementing Points/spans/links

- Points: (e.g. `musical_work_points`, `literary_work_points`)
- Spans: (e.g. `musical_work_span`)
- begin and end
- One table for each semantic link
- (e.g. `text_ref_work`, `text_ref_performance`, `resource_of_recording`, etc.)

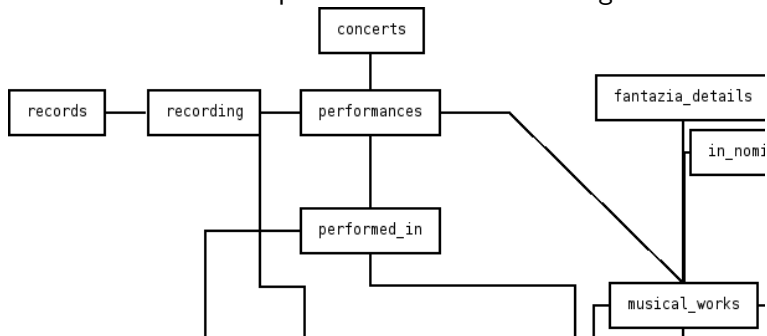
The *Purcell Plus* database

Includes metadata on manuscripts and editions



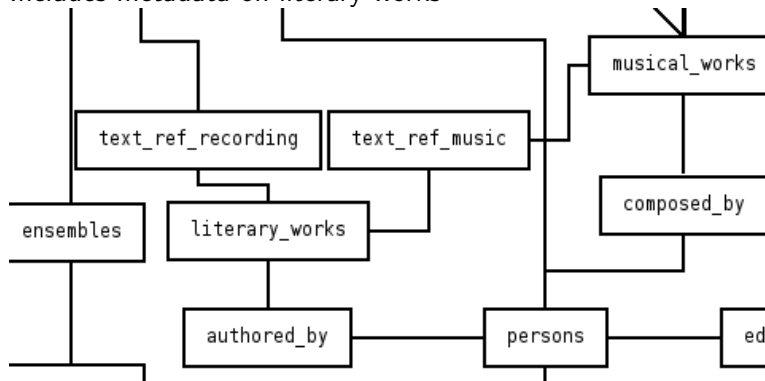
The *Purcell Plus* database

Includes metadata on performances and recordings



The *Purcell Plus* database

Includes metadata on literary works



Visualising: Real-time

Purcell Plus Pages (under development) - Iceweasel

File Edit View History Bookmarks Tools Help

file:///home/richard/research/phd/purcell-plus/experiments/sync/index.html?WorkId=... Google

PURCELL PLUS

[Four-part Fantazia No 1, Z735](#) [Four-part Fantazia No 2, Z736](#) [Four-part Fantazia No 3, Z737](#)

London Baroque (2001)
Phantasm (1996)
Not in db (Pre-1900)
Rose Consort of Viols (1996-11-22)
Not in db

PURCELL PLUS
www.purcell-plus.org

Goldsmiths
UNIVERSITY OF LONDON
Arts & Humanities Research Council

Demonstration page: navigating sound, score and text

Switch between available recordings using the links on the left
Current time: 00:11

Back a little Pause Stop and Rewind Forward a little

Commentary:

Done

Towards a Framework for Musical Materials

- Display orthogonally three domains of musical material
- Music Information Retrieval (MIR)
- Virtual Research Environment
- User comments, collaboration

Computational Discovery

- Schema for musical references
- Linking references to digital musical documents
- Computational discovery techniques

Computational Discovery II

- Natural language processing
- Music information retrieval

Acknowledgements

The Purcell Plus project is funded under the **AHRC-EPSRC-JISC** Arts and Humanities e-Science Initiative, award number 128607 **David Lewis** developed the Web performance/score/commentary alignment application, making use of **Roger Dannenberg's** ScoreAlign algorithm. David also commented on the database schema.

Don Byrd developed the *Nightingale* music notation software used for preparing editions of the *Fantazias*

`http://www.purcellplus.org/`

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`<http://www.richard-lewis.me.uk/>`

References I

Wiggins, G. A. (2009). Computer representation of music in the research environment. In T. Crawford and L. Gibson (Eds.), *Modern Methods for Musicology: Prospects, Proposals, and Realities*, pp. 7–22. Farnham: Ashgate.