Introduction

- themes of the talk
  - specific: creating an encoding language for digital critical editions of lute tablatures
  - generic: digital critical editions from an information system perspective
  - subtext: how can we integrate results from ‘computational’ into ‘mainstream’ musicology
- outline
  - motivation
  - state of the art
  - the critical edition
  - towards some solutions
  - conclusions
- acknowledgements
  - preliminary work at CCARH, Stanford, 2003
  - EPSRC grant GR/T19308/01 (Visiting Fellowship to Goldsmiths, 2005-6)
  - input from Perry Roland, Lou Burnard, James Cummings
Motivation: the ECOLM project

- ECOLM: Electronic Corpus of Lute Music (www.ecolm.org)
- principal goal: to store and make accessible to scholars, players and others, full-text encodings of sources of music for the Western-European lute..., together with graphical images from manuscripts and printed music, such codicological and paleographical detail as is helpful to the potential users, and bibliographical data...
- current situation:
  - works instances are encoded (in TabCode)
  - encodings can be displayed as graphics and played back
- advantages:
  - encodings can be manipulated
  - the musical content can be searched (in principle)

French tablature (Lachrimae Pavan, BL. Add. 31392)

- tablature = playing instruction
  - lines: courses
  - letters: frets
  - overall rhythm, no durations
  - no concept of melodic line
  - no pitch spelling

tablature = automatic transcription, chordal

tablature = manual transcription, contrapuntal
TabCode: 1 to 1 mapping

- ‘tabwords’
- rhythm
  - Q, E, S, etc
- fret
  - a, b, c, d, e, f, etc
- courses
  - 1, 2, 3, 4, 5, 6
- barline, comment, etc.
- full description on ECOLM website
- same encoding system can be used for Italian tablature (1 to 1 mapping)

Issues in ECOLM

- tablature is a specialist notation: some sort of translation needed for non-specialists
  - partly solved by MIDI playback
  - translation to CMN consists of
    - 1 to 1 (n to 1): mapping to target symbols
    - 1 to n: inference of missing features (pitch spelling, voice leading)
  - textcritical information cannot be encoded yet
    - provisions are needed to be able to record
      - editorial decisions and interventions
      - different versions of a work
  - in a generic form, such problems occur in many other repertoires
Static approach: virtual scores

- digital facsimiles
  - many projects, mostly library-oriented
  - virtual restoration: DIAMM
- online editions
  - online access to editions (image-oriented)
    - grassroots: Choral Public Domain Library
    - reproducing existing editions: Variations project (Indiana)
    - planned for Mozart, C.P.E. Bach
  - databases of encoded notation
    - purposes: (dis)play and/or analysis
    - (too) many encoding systems
    - grassroots: MIDI collections
    - derived from scholarly editions: MuseData (CCARH), Humdrum

Towards a dynamic approach

- Dynamic approaches
  - (dis)play in different formats
    - ECOLM: code, tablature, MIDI
  - transcription
    - Corpus Mensurabilis Musice Electronicum
    - encode mensural notation, display CMN, in different ways
  - source comparison
    - Thomas Hall: experiments with stemmatics (1975)
    - Byrd Edition (preliminary work: comparing electronic facsimiles)
    - Online Chopin Variorum Edition: facsimiles of variants, linked
- Examples represent different steps in the editorial process
- Is it possible to take the entire process into account?
**Critical edition: the process**

- aim of critical edition: to establish a well-reasoned text of a musical work
  - traditionally, one that comes as closely as possible to the composer’s finished text (Lachmann)
- important steps in the process:
  - recension: comparison of sources, to reconstruct the archetypal source(s)
  - examination, emendation: inspection and correction of the archetype
  - translation: creating a modern representation of the reconstructed text. In music, this may involve scoring, transcription to CMN, musica ficta etc.

**Limitations**

- recension
  - developed for reconstruction of lost originals (genealogical approach)
  - less suitable for situations where authorial sources survive (genetic approach)
  - stemmatics not widely used in music
- emendation, translation
  - how to record grounds for decisions
  - only one, preferred view is easily available
- general
  - work concept: substitution of one editorial text for a multitude of sources
  - presumes that they are indeed instances of the same conceptual entity, the work
  - paradox: critical edition is scholar’s understanding of a work, itself expressed as a text
  - is the work the most important category?
    - performance is at least as important as text
    - flexible status of many ‘works’: adapted for new performance circumstances, etc.
    - reception history: works influenced others through specific instances (cantus firmus, parody, variation, intabulation)
- medium is the ultimate limitation: paper, static, graphics, 2 dimensions
Computing science approach

- modelling the editorial process
- digital critical edition as an information system
  - database of source information
  - functionality for processing this information
- caution
  - modelling is a reductive process: separates meaningful from non-meaningful, and enforces logic of the model on reality
  - experience: source information is very hard to reduce to a stable model
    - experience of DARMS, SMDL and similar encoding systems
    - Text Encoding Initiative method and experience
    - suitable encoding system must be expressive and extensible, and reason from the texts of the sources
      - in principle, this is what TabCode does

Modelling CMN: sample encoding systems

- DARMS
  - ‘the most mature and complete digital representation of musical notation’ (Selfridge-Field, 1998)
  - print-oriented, but also used for computer analysis of music
  - encodes only musically relevant aspects of notation
  - layout is automatically derived
- SMDL
  - encodes ‘logical domain’ of music information: the musical content itself
  - assumes this content is obvious
  - other domains can be linked to SMDL: visual (score), gestural (performance), analytical
Sample encoding systems (2)

- MusicXML
  - interchange between music printing programs: specifies notation
  - hierarchical model of score
  - e.g. bar is a container for notes - shifting a barline is hard
  - support for text critical features insofar as they are visible on the printed page

```
<measure number="1">
  <attributes>
    <time>
      <beats>4</beats>
      <beat-type>4</beat-type>
    </time>
    <clef>
      <sign>G</sign>
      <line>2</line>
    </clef>
  </attributes>
  <note>
    <pitch>
      <step>C</step>
      <octave>4</octave>
    </pitch>
    <duration>4</duration>
    <type>whole</type>
  </note>
</measure>
```

Limitations of existing encoding systems

- examples:
  - DARMS
  - Standard Music Description Language (SMDL)
  - MusicXML
- generally, these encoding systems reason from the finished product
  - assume score (or even the musical work) is an undisputed entity
  - support publication (and analysis, interchange), not preparation
- suitable encoding system must be expressive and extensible, and reason from the texts of the sources
  - in principle, this is what TabCode does
What gain might a digital critical edition offer?

- in principle, many things that cannot be done with printed paper
- integration of score and critical apparatus
  - verification, control at lowest level
- easy access to versions of a work
  - see [Mode 8 demo](#) (skip if necessary)
- multiple presentation modes
  - different presentation styles and notation systems
  - level of editorial addition
  - generation of audio
  - hyperlinking

More advantages

- access to the information content of the sources
  - computer-supported analysis
  - information retrieval
- editing as an ongoing process
  - collaborative editing of the source database
  - defining new views of the database
- economical considerations
  - cheap, easy production
  - cut out publisher
  - can use digital libraries infrastructure
- ideally, a digital critical edition
  - offers a better way of dealing with text-work paradox
  - moves from individual, static to collective, evolving understanding
### System overview

![Diagram of system overview]

### Requirements

- **principle**
  - requirements and functionality are fundamental; techniques are secondary
  - common ICT error: present technique, use it to solve any problem

- **rest of this talk: partial proof of concept**
  - some specific requirements for source encoding
    - provisions for recording editorial interventions in lute tablatures
    - by means of some document analysis
    - example encodings will be skipped
Example 1 (S.L. Weiss, London Ms.)

- autograph correction of another scribe’s error
- an uncorrected error
- what to encode? authorial and editorial correction
- functionality: view source as it was before and after correction; generate apparatus

Example 2 (Cambridge UL, Ms Dd 2.11)

- partly illegible (water damage)
- 2 version of same piece:
  - ABC
  - AA BB CC
- sections out of order, with intervening materials
- what to encode?
  - uncertain/ supplied information
  - alternative versions
- functionality
  - view editorial decisions
  - view different versions
  - show in document order?
Example 3 (V. Galilei, Fronimo)

- red characters for ornamented version of same piece (1568)
- colour has disappeared in 1584 edition
- what to encode?
  - colour: its information content
  - differences with 1584 edition
- functionality
  - show each version separately
  - show compound result, in colour
  - show differences with 1584 edition

Example 4 (Capirola Ms, 1517)

- decorations
- fingering
- colour used for rhythm signs
- what to encode?
  - fingering
  - colour--possibly; does it represent additional information?
  - decorations--context; digital facsimile
- functionality
  - view facsimile
  - digital edition with colours?
What to encode-categories

- information content of the tablature ‘text’
- problems in the source text: errors, missing or illegible information;
- variant readings: scribal corrections, improvements, or explications; versions of the work
- changes to conform to modern usage:
  - mapping: adaptation to modern notational conventions
  - inference: derivation of implicit content. Here: pitch spelling, note duration, voice leading
  - realisation of abbreviations
  - different changes needed for different tasks

Creating an encoding system: TabXML

- principles
  - start from TabCode
  - integrate results of document analysis
  - modularity: keep TabCode and textcritical markup conceptually separate
    - enables reuse for other notations
- Solution: TabXML
  - TabCode + XML markup
- TEI (Text Encoding Initiative) contribution
  - XML vocabulary for encoding of textual sources
  - contains modules for textcritical editions and many other purposes
  - experiments show that few adaptations are needed (AHC paper, september 2005)
  - obvious advantage: interoperability with texts encoded in TEI markup, e.g Thesaurus musicarum italicarum (www.euromusicology.org)
- testcase: encode V. Galilei’s Fronimo
Example (Fronimo)

(bars 2-4)

```xml
<app><rdg type="simple">E</rdg><rdg type="variation">S</rdg></app>
f3f4d5
<add type="variation">c5</add>
<add type="variation">Q</add>e3d5
Ec3d5d6
Sc5
a5
Qc5 /
a3d5c6
E
Ec2d5c6
Qe3c5c6
f3f4d5 /
c3a5d6
e3a4c6
<app><rdg type="simple">H</rdg></app>
<rdg>e2 a3 c3</rdg>
```

Explanation

- NB: ‘transliteration’ to French tablature
  - rendering software displays as Italian
- XML construction 1
  - new duration symbol added to tabword
- XML construction 2
  - alternative readings, each marked up as `<rdg>`, together wrapped in an `<app>` element
- Note that the information content of the colours is encoded, not the colour itself
  - again, rendering software can take care of this
Processing TabXML

TabXML source

preprocessing (XSLT)

TabXML simple

TabXML variation

rendition

French tablature

playback

Italian tablature

CMN transcription

Conclusion

- Digital critical edition
  - information system
  - database of sources
  - multiple views, no fixed presentation
- Advantages
  - economical
  - deals better with text-work problem
  - collective, dynamic understanding
  - accessibility
  - retrieval
- Application: TabXML
  - preliminary experiments
  - perspective for other notations
- Almost no debate (yet)
  - why???
  - very different in literary computing
Points for discussion

- concept of digital critical edition
  - database of source information + functionality
  - other approaches?
- suitability
  - for different repertoires
  - for different notations
  - what would we gain/lose
- important requirements
- how to convince mainstream musicology?