Optical Tablature Recognition for ECOLM III

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September 2012

Overview

1. Background and history
   - the state of the art before ECOLM III

2. How does Optical Tablature Recognition (OTR) work?
   - an introduction for the uninitiated

3. New developments for ECOLM III
   - enhancements due to the needs of ECOLM

4. Where is the OTR software?
   - it is cross platform and free!

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Background and history

Music recognition (OMR) ≠ tablature recognition (OTR)

- OMR research since the 1980s
- focuses on common music notation

Work on lute tablature notation started around 2004

- prelimary experiments at Goldsmiths during ECOLM II
- complete system developed at Niederrhein University

OTR-System is an addon ("toolkit") for the *Gamera Framework*

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Background and history

Gamera Framework

- OpenSource software library for building recognition systems
- 2000-2004 developed at the JHU (USA)
- meanwhile maintained by myself

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Gamera Framework

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- in worldwide use for all kinds of document types: text, music, neumes, multiple choice tests …

Background and history

OTR status before ECOLM III

In 2011, the OTR toolkit for Gamera generated *abc* code
and could deal with

French tab   *Italian tab*   *German tab*

Sounds good!

Background and history

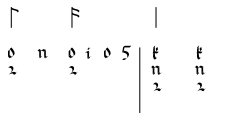## OTR status before ECOLM III

In 2011, the OTR toolkit for Gamera generated *abc* code
and could deal with

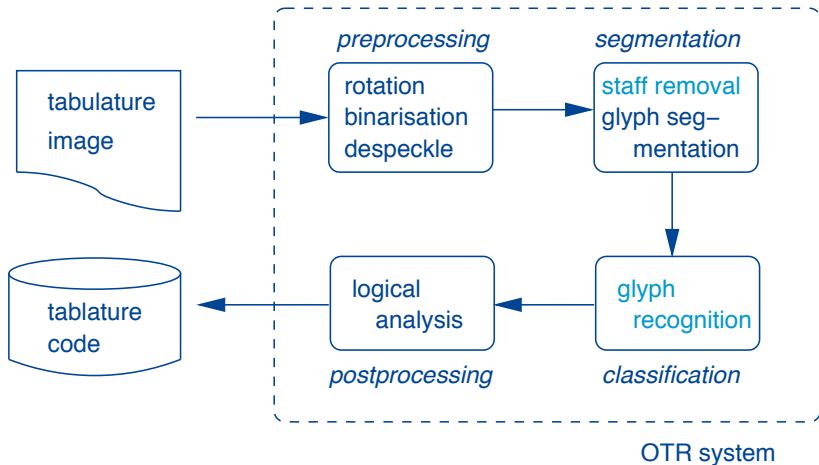*French tab*   *Italian tab*   *German tab*

Sounds good! Actually only few sources from *Early Music Online*
were fully supported. Missing features included:

- beamed flags in French tab
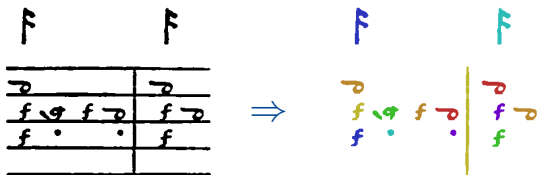- special symbols (hash, star)
- ledger lines and diapasons

How does OTR work?
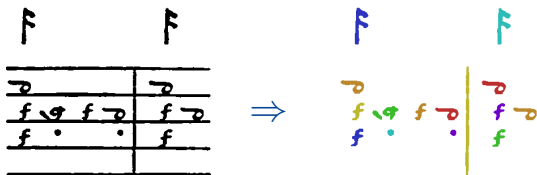
How does OTR work?

Staff line removal

- with lines: all symbols connected
- without lines: easy segmentation as connected components

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Staff line removal

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Algorithm is based on a recent study:

📕 Dalitz, Droettboom, Pranzas, Fujinaga: *A comparative study of staff removal algorithms.* IEEE TPAMI 30, pp. 753-766 (2008)
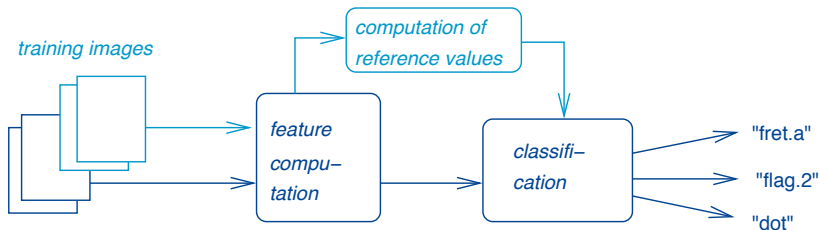
How does OTR work?

Glyph recognition

Problem:

- many different fonts and glyph shapes

Solution:

- use a statsitical classifier and
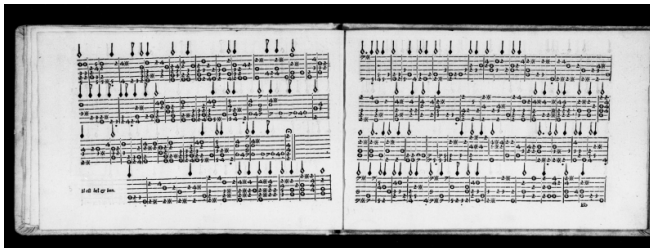 let the user train the glyphs

New developments for ECOLM III

Page segmentation

Characteristics of the EMO images required

- page splitting
- "region of interest" extraction
- individual skew correction on each side

Newly written software does this *all automatically*

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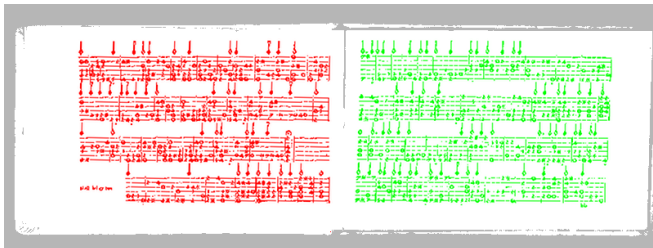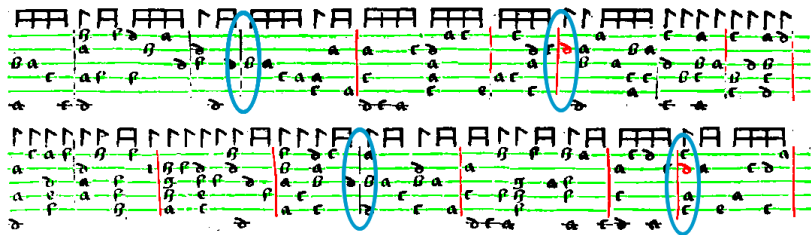- individual skew correction on each side

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New developments for ECOLM III

Extensions of the OTR system

Additional Features:

- TabCode output with glyph location information
- beamed flag and ledger line support in French tab

Phalese 1546

- decorations star and hash; position is trainable

Bianchini 1546

Barberiis 1549

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New developments for ECOLM III

Barline recognition rewritten

Barline recognition problematic when
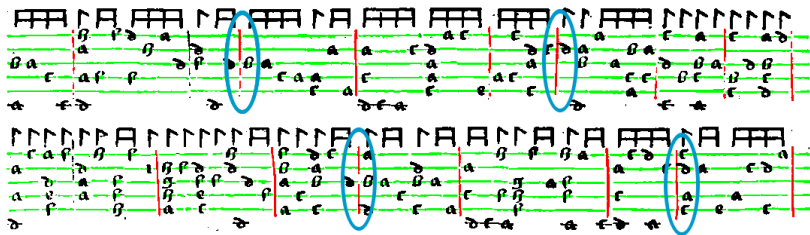
- barlines were broken
- bar lines touched symbols

New algorithm works *much better*

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Where is the OTR software?

OpenSource Software for MacOS X, Linux, and Windows; freely available (GNU GPL) from

`http://gamera.informatik.hsnr.de/`

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Additional references

📕 Dalitz, Karsten: *Using the Gamera framework for building a lute tablature recognition system.*
ISMIR 05, pp. 478-481 (2005)

📕 Dalitz, Pranzas: *German lute tablature recognition.*
ICDAR 09, pp. 371-375 (2009)