Melodic Search: Strategies and Formats

CS 275B/Music 254

On melody

- What is a theme?
- What is an incipit?
- Are all themes incipits?
- Can you tell the key from a melody?
- Can you tell whether something you hear begins at the beginning?
- Is melody one-dimensional?
- How can we isolate a melody algorithmically?

On melody

- What is a theme? Significant content that identifies a piece
- What is an incipit? Opening phrase
- Are all themes incipits? No
- Can you tell the key from a melody? Sometimes
- Can you tell whether something you hear begins at the beginning? ??
- Is melody one-dimensional?
- How can we isolate a melody algorithmically?

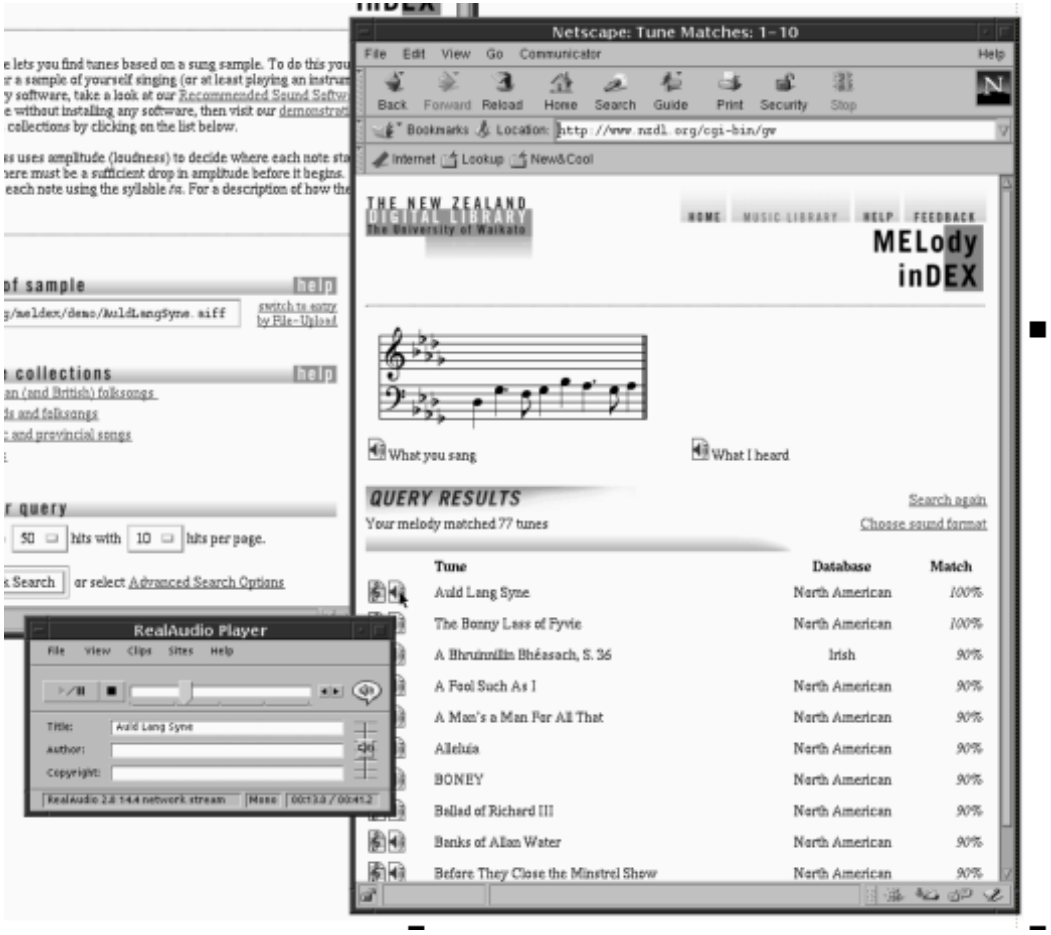
Imported search strategies

Imported search strategies

- Probability ranking
- Sorting, clustering, categorization
- String matching, edit distance
- N-grams
- Dynamic programming
- Pattern detection

Probability ranking

"Query-by-humming": work of Lloyd Smith et al, *c*. 1995.

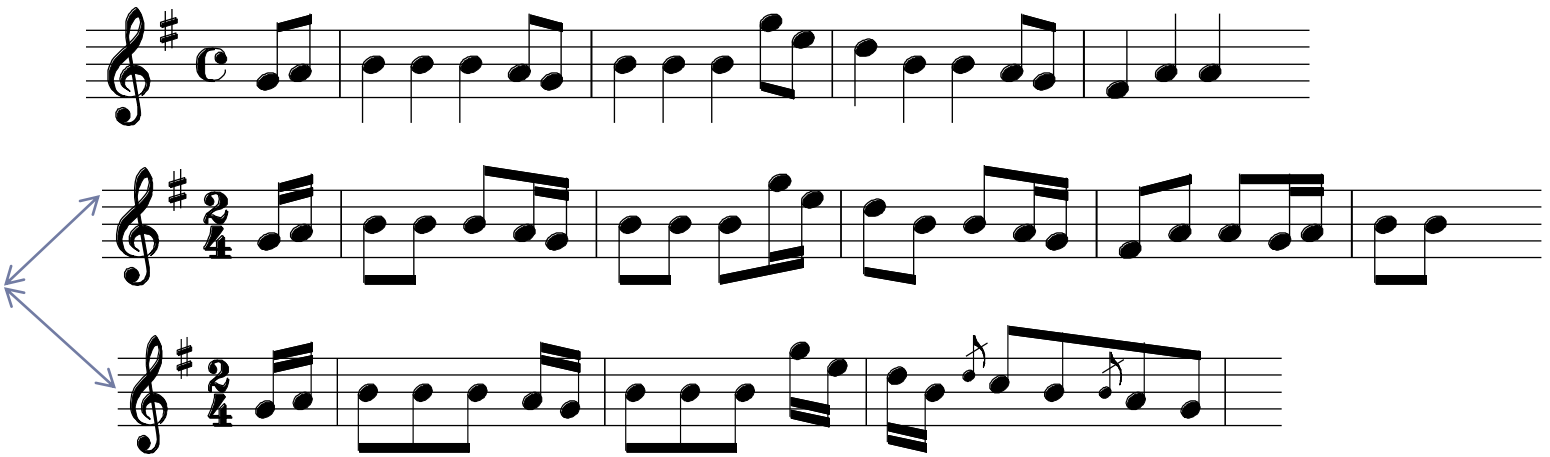


Example: MELDEX

Melodic sorting (incipits)

[Ranking??]

Examples from RISM



John Howard, "Strategies for sorting melodic incipits," CM 11 (1998).

Edit distance: text

1. Item-by-item comparison
2. Penalties for
   - substitutions
   - insertions
   - deletions

Bag

Bat

Cat

Catch

Target=bag

Matches=bag, Bag, BAG
Non-matches [different order]=gab, abg, bga

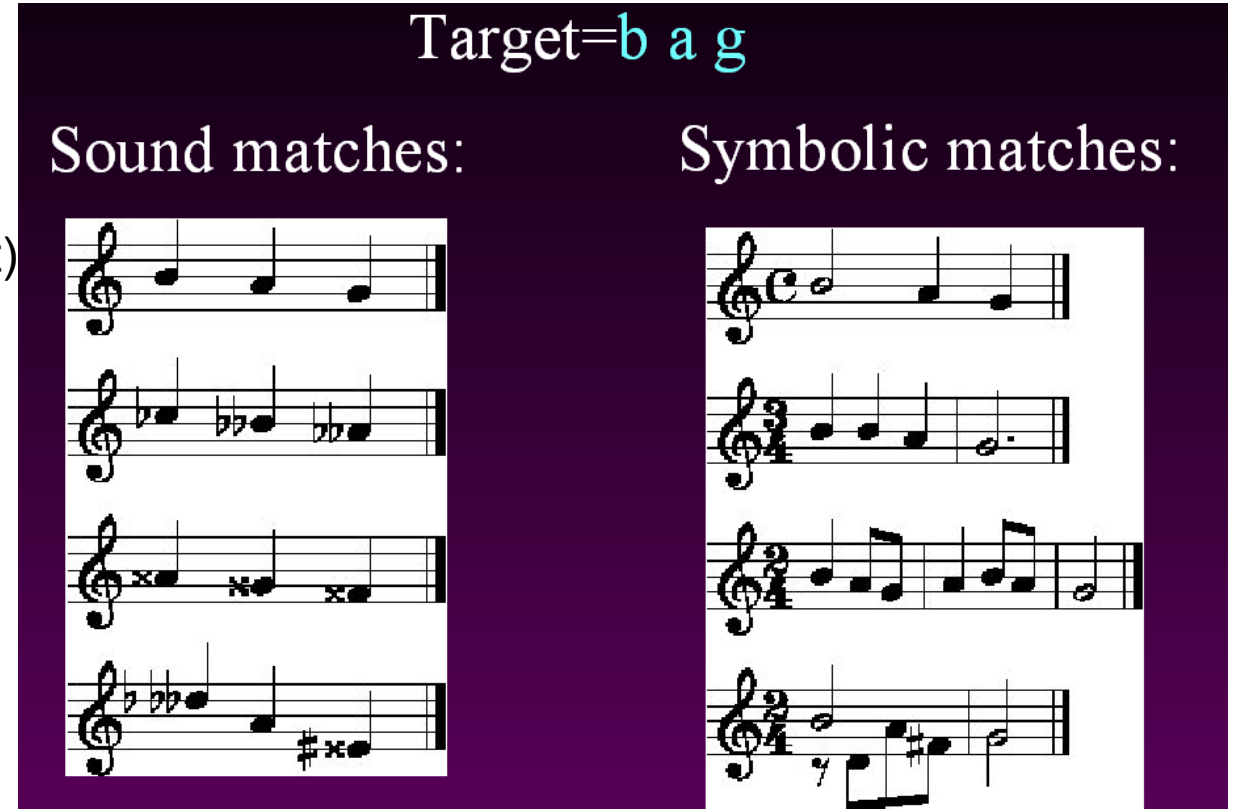
Direction of comparison=L→R
Match=L→R
Non-matches [different direction]=R→L; T→B; B→T; ZZ

Literal content required for match=bag
Matches=baggage, cabbage
Non-matches [different literal content]=beagle, bang, bad and good

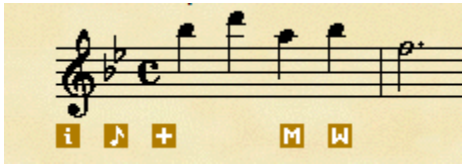
Edit distance (music)

Ambiguities

-iteration (accent invariant)
-polyphonic involvement
-decoration (accent invariant)



N-grams

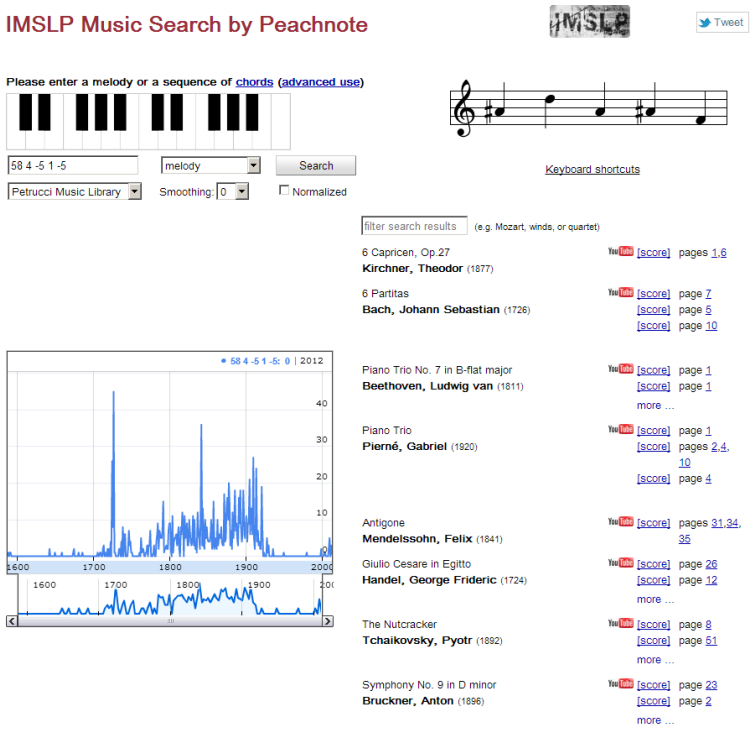


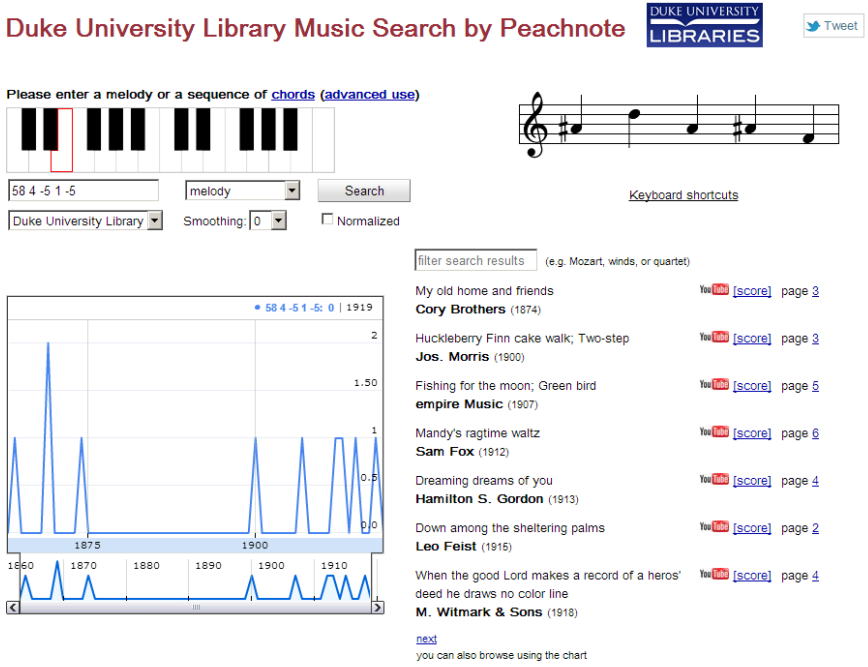
Beethoven: Archduke Trio

Method

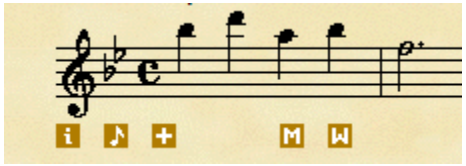
Pick a string length

Seek all its permutations





N-grams



IMSLP Music Search by Peachnote

Please enter a melody or a sequence of chords (advanced use)

58 4 -5 1 -5 | melody | Search

Petrucci Music Library | Smoothing: 0 | Normalized

Keyboard shortcuts

filter search results (e.g. Mozart, winds, or quartet)

6 Capricen, Op.27
Kirchner, Theodor (1877) [score] pages 1,6

6 Partitas
Bach, Johann Sebastian (1726) [score] page 7 [score] page 5 [score] page 10

Piano Trio No. 7 in B-flat major
Beethoven, Ludwig van (1811) [score] page 1 [score] page 1 more …

Piano Trio
Pierné, Gabriel (1920) [score] page 1 [score] pages 2,4, 10 [score] page 4

Antigone
Mendelssohn, Felix (1841) [score] pages 31,34, 35

Giulio Cesare in Egitto
Handel, George Frideric (1724) [score] page 26 [score] page 12 more …

The Nutcracker
Tchaikovsky, Pyotr (1892) [score] page 8 [score] page 51 more …

Symphony No. 9 in D minor
Bruckner, Anton (1896) [score] page 23 [score] page 2 more …

Duke University Library Music Search by Peachnote

Please enter a melody or a sequence of chords (advanced use)

58 4 -5 1 -5 | melody | Search

Duke University Library | Smoothing: 0 | Normalized

Keyboard shortcuts

filter search results (e.g. Mozart, winds, or quartet)

My old home and friends
Cory Brothers (1874) [score] page 3

Huckleberry Finn cake walk; Two-step
Jos. Morris (1900) [score] page 3

Fishing for the moon; Green bird
empire Music (1907) [score] page 5

Mandy's ragtime waltz
Sam Fox (1912) [score] page 6

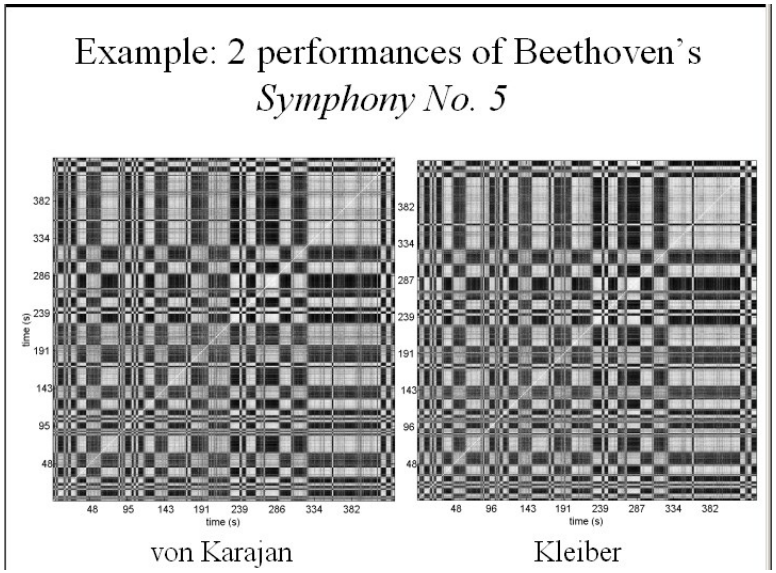
Dreaming dreams of you
Hamilton S. Gordon (1913) [score] page 4

Down among the sheltering palms
Leo Feist (1915) [score] page 2

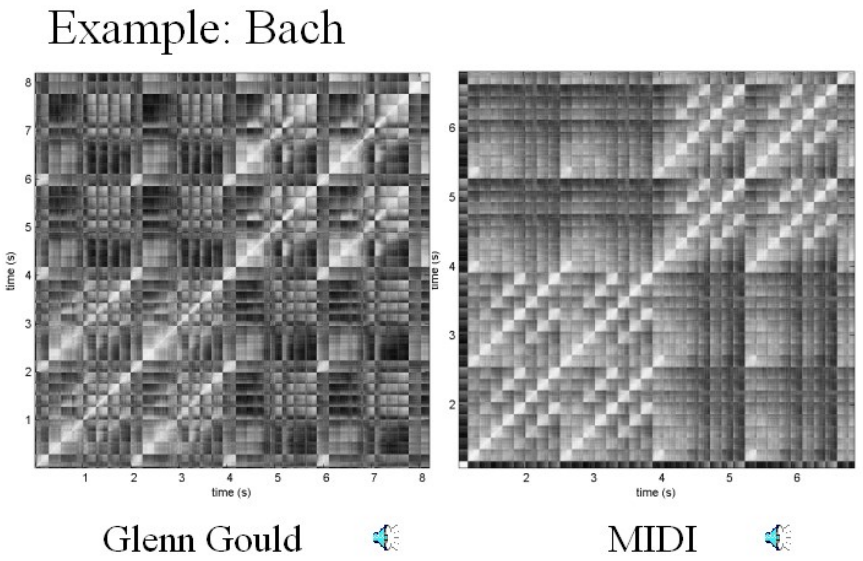
When the good Lord makes a record of a heros' deed he draws no color line
M. Witmark & Sons (1918) [score] page 4

next
you can also browse using the chart

Dynamic programming



Examples: Jonathan Foote



Performance-based

self-similarity matrices

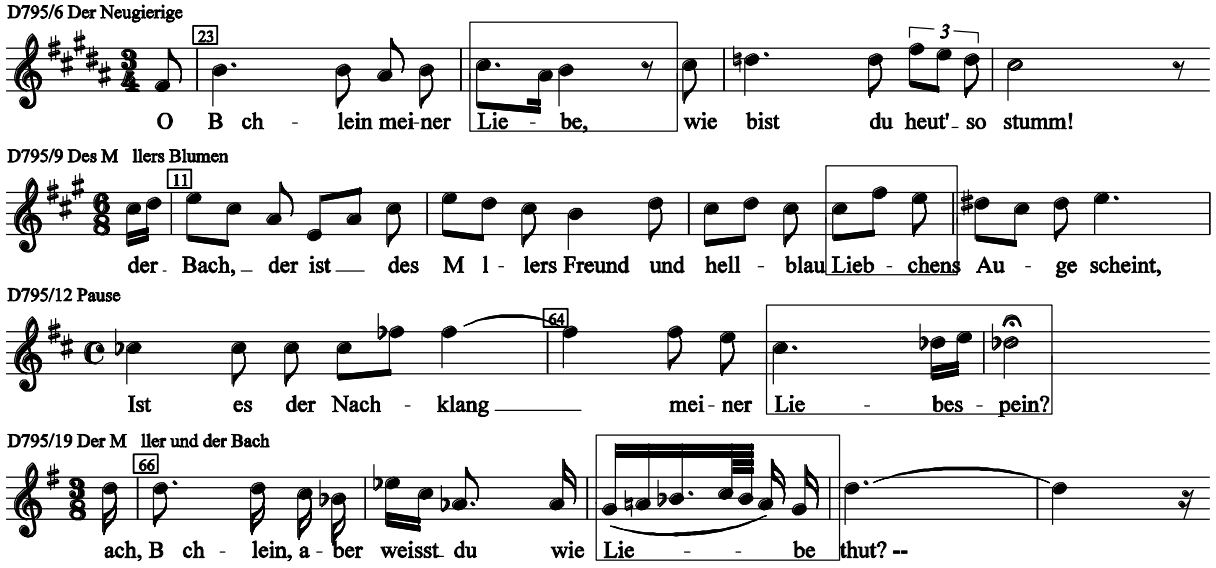
Rhythmic similarity

Pattern detection

Pattern detection

Settings of the word "Liebe"

Nettheim: MuSearch (SCORE)

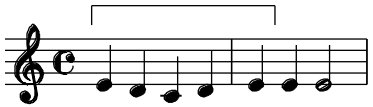


Pattern realms

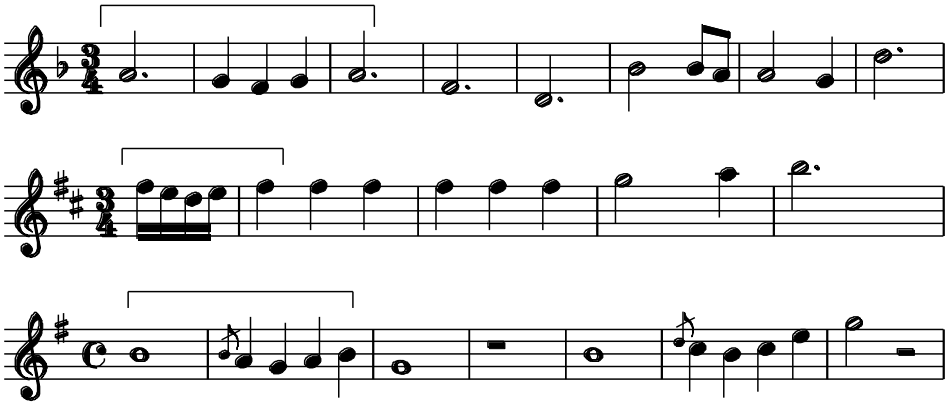
- Lyrics
- Pitch
- Duration
- Phrase structure

Vulnerabilities

Query



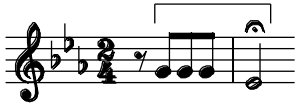
Target (scale degree): 32123



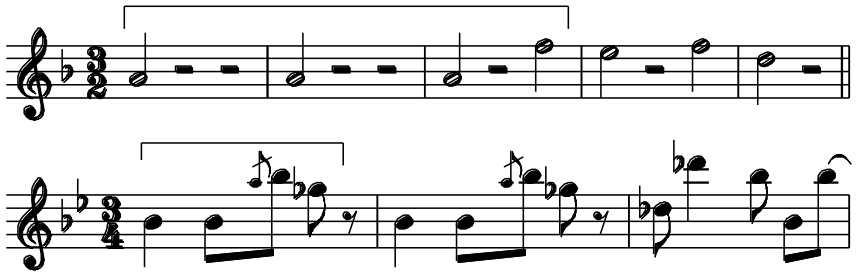
Pitch (scale-degree) matching without **rhythmic, metric invariance**

Vulnerabilities

Query



Target: 3331



Pattern-matching without:

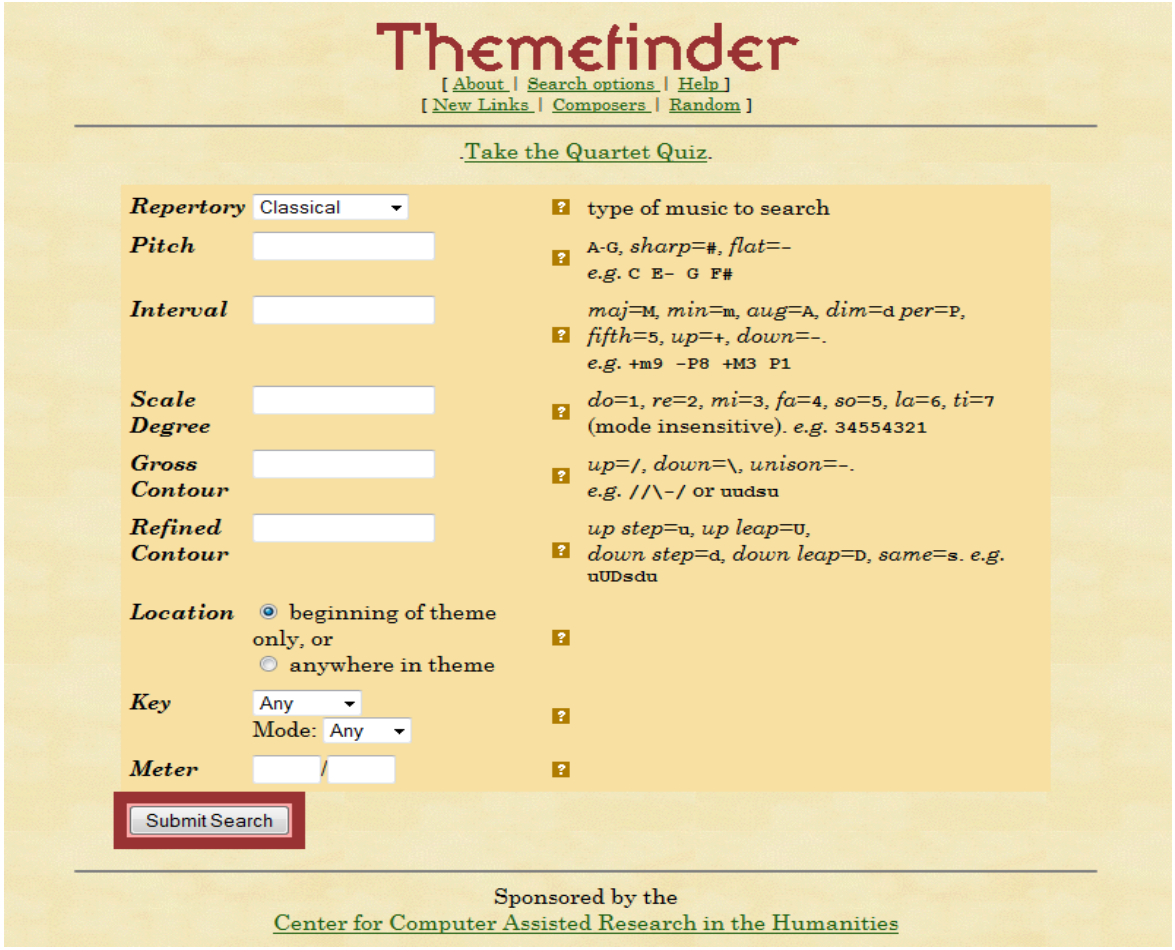
- **R**ests
- **R**egister considerations
- **R**epeated notes

Themefinder

A search application for melodic data

2016 Eleanor Selfridge-Field

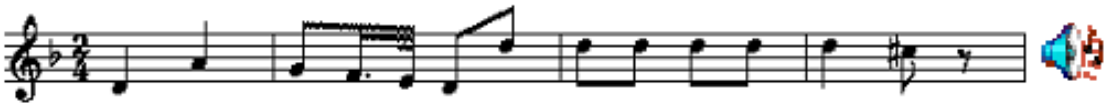
Themefinder



Classical = themes
Folk = incipits
Renaissance = incipits

Search examples

…in decreasing order of precision



pitch: D A G F E D D D D D D D C#

interval: +P5 -M2 -M2 -m2 -M2 +P8 P1 P1 P1 P1 P1 -m2

scale degree: 1 5 4 3 2 1 1 1 1 1 1 1 7

gross contour: / \ \ \ \ / - - - - - \

refined contour: U d d d d U s s s s s s d

http://www.themefinder.org

Thought for the day

- "The dictionary describes melody as a series of notes strung together in a meaningful sequence."

Source: U.S. Patent application *20060254411* (Nov. 16, 2006)