Search Inside the Music

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Finding Music – the Old Way

I'm looking for a record for my daughter. For her birthday.
"I Just Called To Say I Love You." Do you have it?

- Genre / Artist
- Playlists
- Ask the guy
  (if you dare)

Finding Music - the New Way

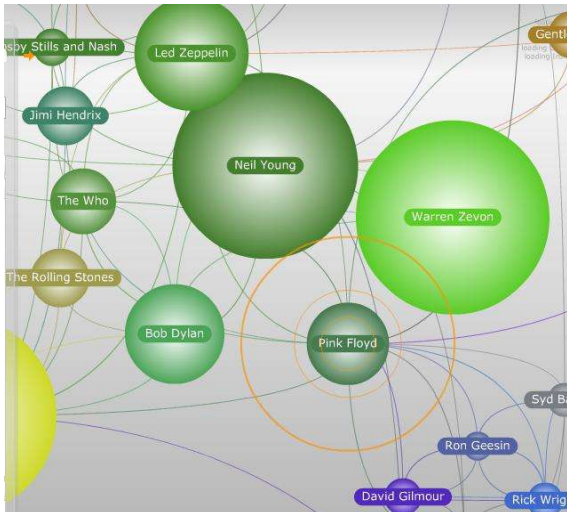
- Music search on line:
  - Album / Artist / Song
  - Playlists / Genre
- It's getting harder:
  - Million song iPod
  - Napster-to-go
  - 100,000 new songs per year
  - Like the web before google

Google

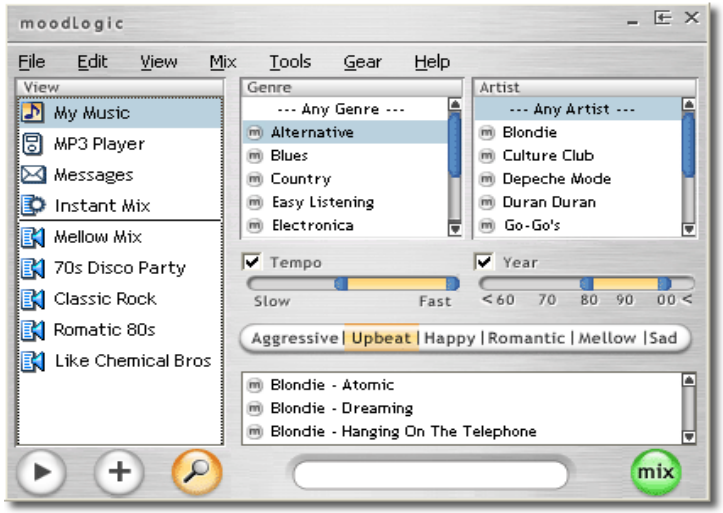
What I Really Want ...

Extend Search

- Use metadata:
  - Playlists
  - User collaboration
  - Reviews
  - Mood / Theme
  - Instrumentation
  - Artist history
  - Lyrics



gracenote

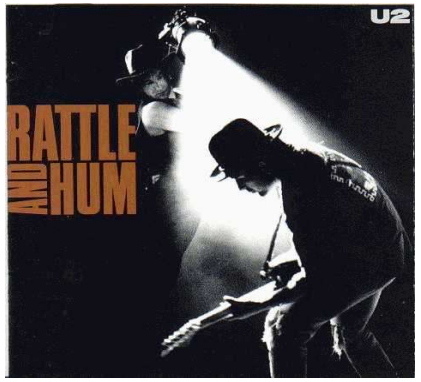


allmusic AMG

AUDIOSCROBBLER
audioscrobbler.com

Problems with Metadata

- Where does the metadata come from?
  - For popular music – hand edited
  - For less popular music, or new music … too bad!
- Always find U2
- Never find



Dead Heroes Club

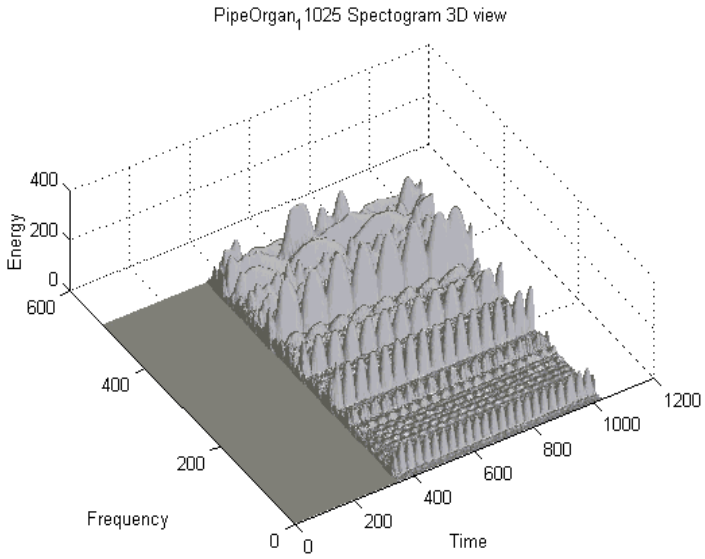
Search Inside the Music

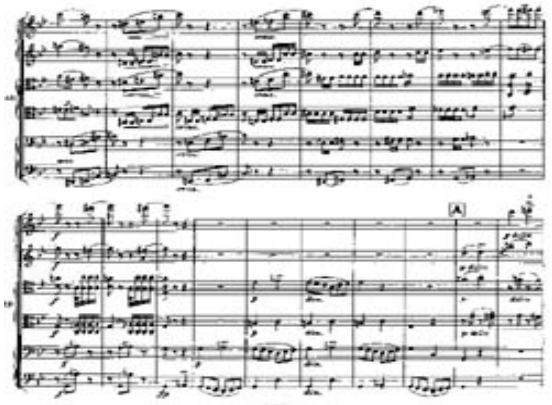
Make it easier to find music, especially new music by:

- Extending music search beyond bibliographic data by using metadata
- Generating metadata directly from content

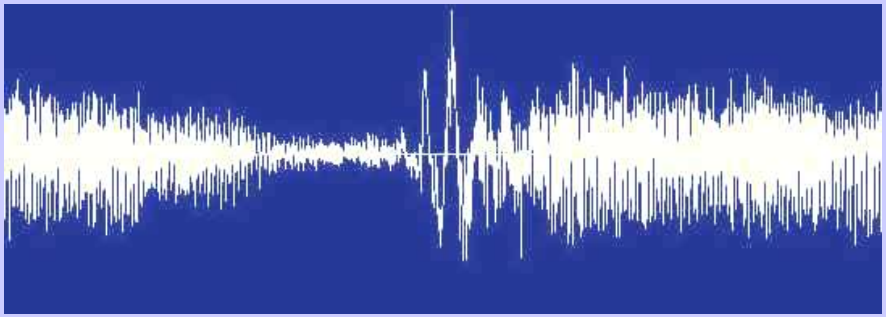
Fixing Metadata Problems

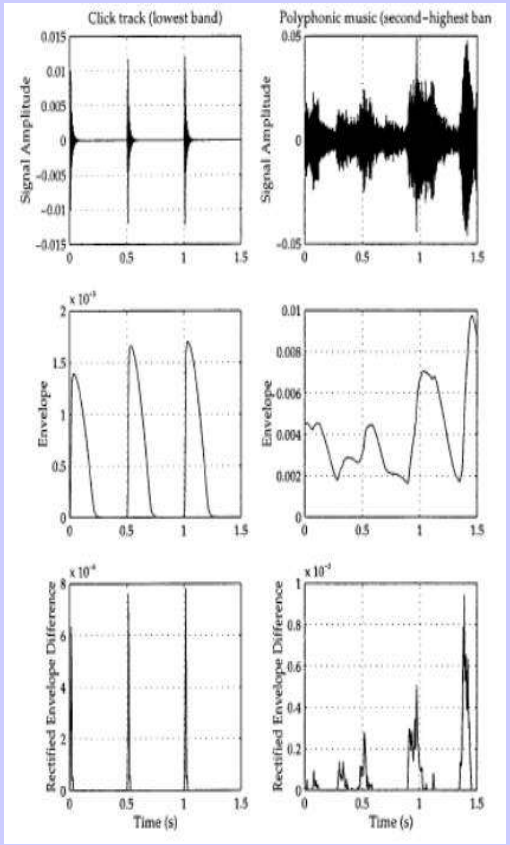
- Generate metadata directly from audio content
  - Eliminates 'popularity' bias
  - Can generate new kinds of data
  - But it's hard!





Audio Content Analysis

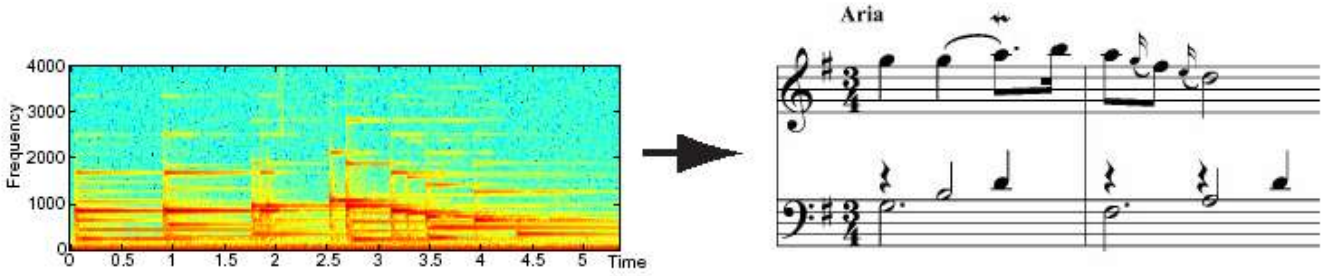




- Pitch / Harmony / Key
- Timbre / Instrumentation
- Tempo / Rhythm / Energy

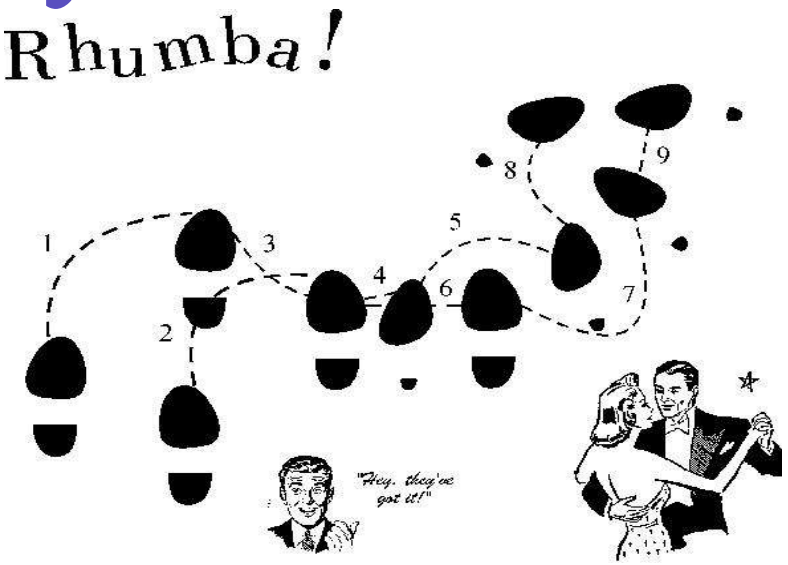
Feature Extraction – Pitch Tracking

- Uses:
  - Composer tools / Transcription
  - Genre / Mood / Similarity
  - Score tracking / Query-By-Humming (QBH)
- Issues:
  - Monophonic – fairly easy / Polyphonic – Extremely Difficult
  - Current focus: Piano / Two known instruments



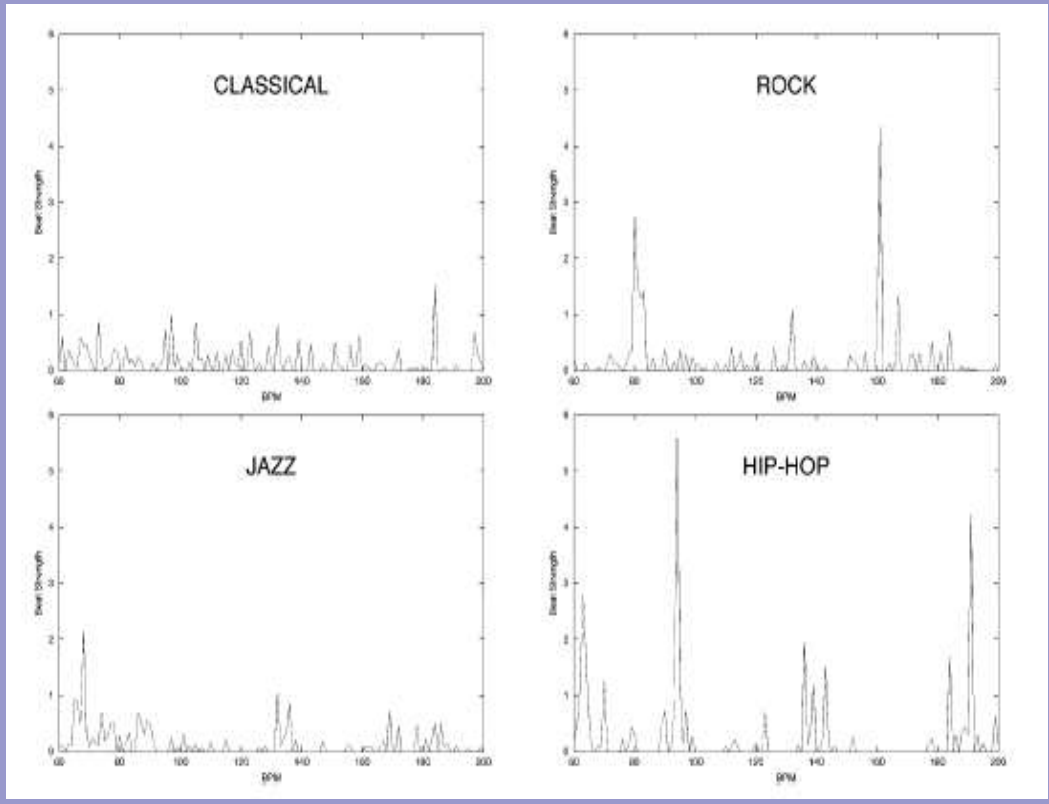
Feature Extraction – Rhythm

- Uses:
  - Classification:
    - Mood / Genre
    - Similarity
  - Segmentation / Alignment
  - Playlist generation / Auto DJ
- Issues:
  - Tempo variations / Beat Complexity
  - Hierarchical structure
  - Wide range (marching band vs. string quartet)



Music Classification

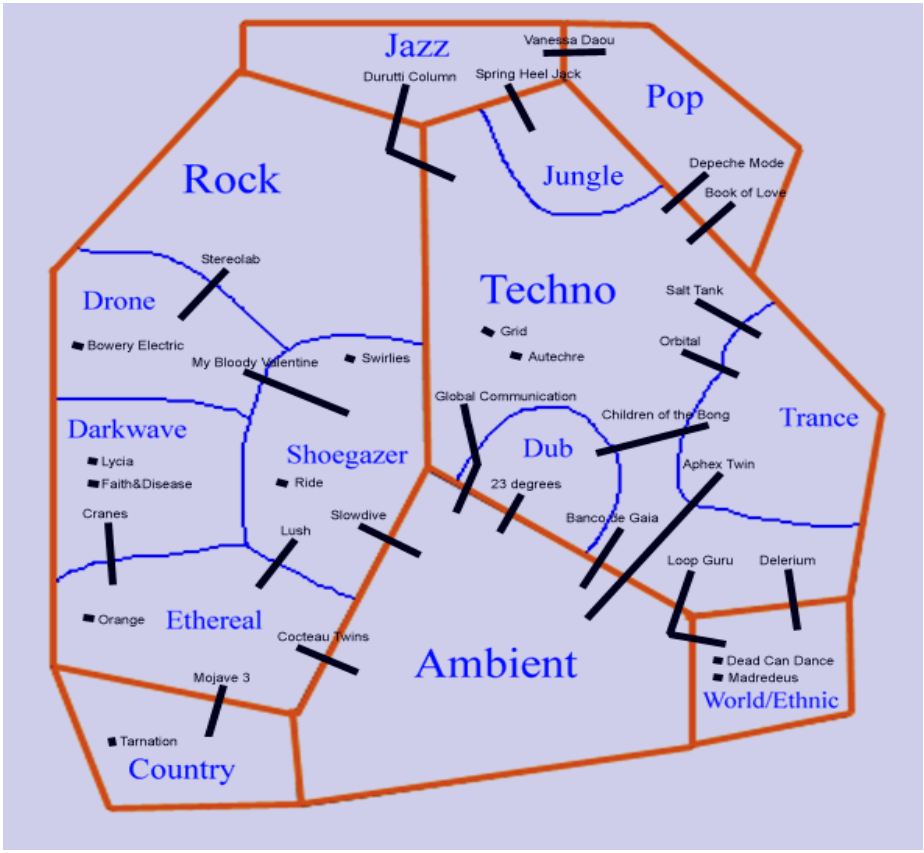
- Genre
- Similarity
- Segmentation
- Fingerprinting



From Manipulation, Analysis and Retrieval Systems for Audio Signals by George Tzanetakis

Classification - Genre

- Uses:
  Music search / recommendation
- Issues:
  - Often available as metadata
  - Difficulty with cross-genre music
  - Artists can span genre
  - AMG: 35 Genres
    >150 rock subgenera
  - Amazon: >1300 Genres



Classification - Similarity

- Uses:
  - Playlists /Recommenders
- Issues
  - Lack of 'ground truth'
  - Best feature set?
  - Best classifier?

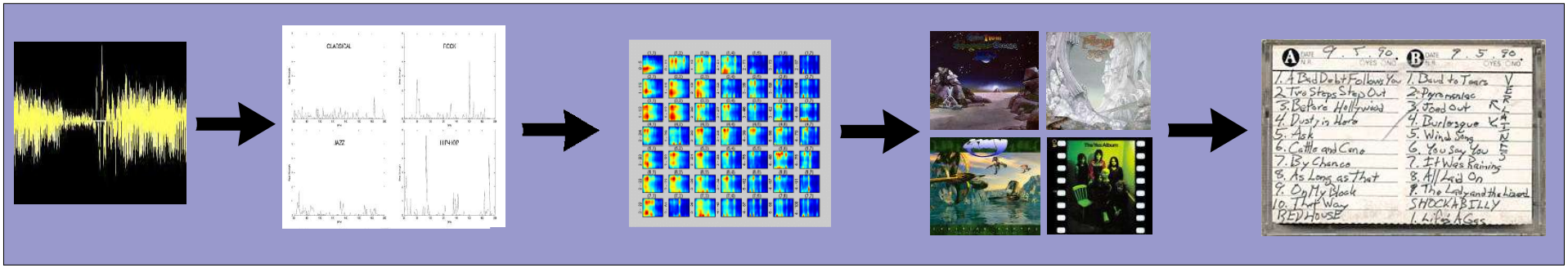
Segmentation

- Breaking Audio into smaller pieces
- Uses:
  - Audio indexing (find the horn solo)
  - Thumbnailing (extract the chorus)
  - Fingerprinting (separate songs and identify them)

Fingerprinting

- Identifying a song based on content
- Uses:
  - Copyright enforcement
  - “What's this song?”
  - Attaching Metadata
- Must be insensitive to
  - Encoding / sample rate
  - Starting / ending point

What are We Doing Now?



- Song Similarity -> playlist generation
- Research Questions:
  - What acoustic features / metadata to use?
  - What classifiers to use?
  - What's a good user interface?
  - How can a system be evaluated?

Music Manager

MusicMan

Browse | Details | Search | Similar

The Wanton Song

Physical Graffiti

Led Zeppelin

Genres:

Classic Rock, Hard Rock,

Worklist | Playlist | Junklist

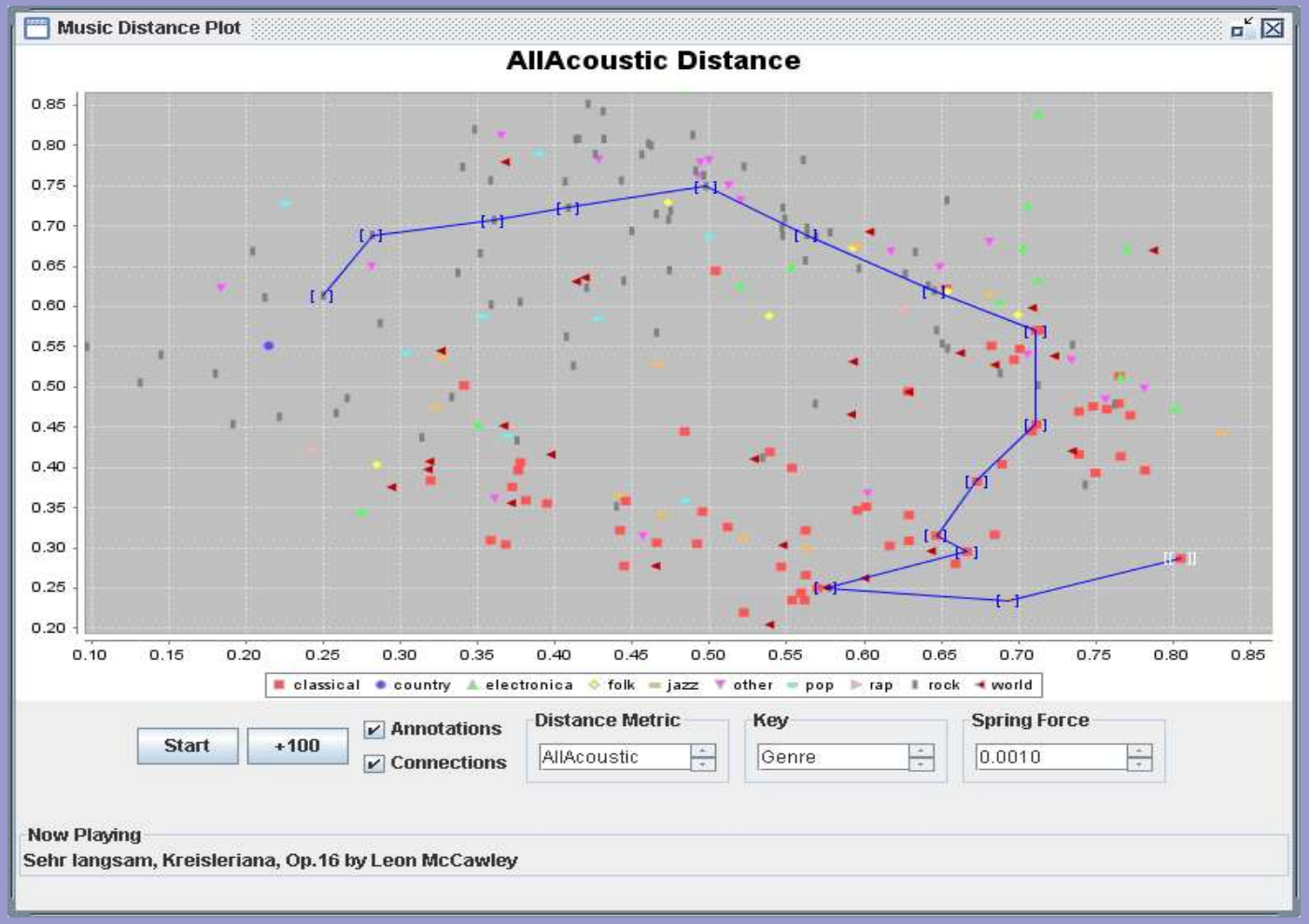
#	Track	Album	Artist	Year
1	Freedom	Rage Against the Machine (Mil...	Rage Against the Machine	2003
2	The Wanton Song	Physical Graffiti	Led Zeppelin	1995
3	Uh-Oh, Love Comes To Town	The Best of Talking Heads	Talking Heads	2004
4	Another Day	The Best of Rent	Rent - Original Broadway Cast	1999
5	Winner Take All	Over 60 Minute With...	Red Rider	1987
6	Something's Gotta Give	The Best of the Song Books	Ella Fitzgerald	1993
7	Gumboots	Graceland	Paul Simon	1990
8	Teach Me Tonight	How Long Has This Been Going...	Sarah Vaughan	1991
9	Record Body Count	Melville	The Rheostatics	1991
10	Branle Simple	Le Tresor d'Orphee by Antoine...	James Edwards	2004
11	Impromptu in B-flat major, op...	Schubert - Works for Solo Forte...	Seth Carlin	2005
12	Papillones, Op. 2	CD1-Schumann Piano Music	Leon McCawley	2003
13	Fantasie in F minor - largoo	Schubert - Music for fortepiano...	Seth and Maryse Carlin	2000
14	David Bryan / Beethoven's Moo...	Steinway To Heaven	Various	1996
15	Stardust	Songs Of Hoagy Carmichael	The Beegie Adair Trio	1995
16	Chansons sans paroles (1989),...	Dry Fig Trees	Gerard Satamian	1996
17	Steve Porcaro / Ravel's Pavane...	Steinway To Heaven	Various	1996
18	Widmung	CD2 Schumann Piano Music	Leon McCawley	2003

Audio Controls

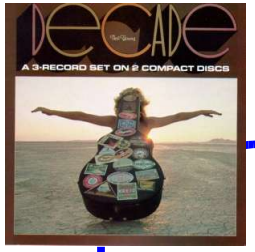
Pause | Play | Prev | Next

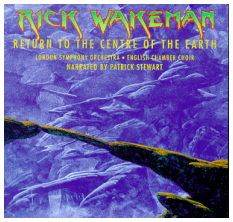
Total Tracks: 21

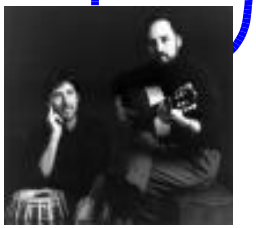
Musical Journey

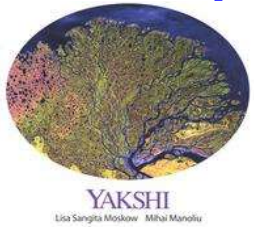


A Musical Journey







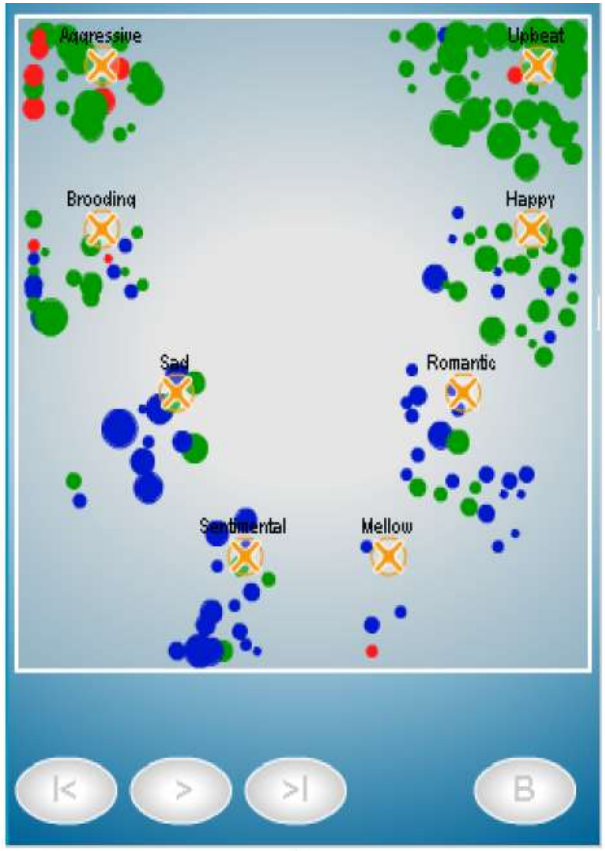


Worklist	Playlist	Junklist

#	Track	Album	Artist	Year
1	Freedom	Rage Against the Machine (Mil...	Rage Against the Machine	2003
2	The Lemon Song	Led Zeppelin II (Limited Editio...	Led Zeppelin	2003
3	This Kiss	100% Hits Volume 27	Various	1999
4	Never is a Long, Long Time (T...	Return To The Centre Of The ...	Rick Wakeman	1999
5	Billy Joel Movin Out Anthony...	The Rs500 Super Audio Cd Sa...	Various	
6	Under the Carlaw Bridge	Shakespeare My Butt	The Lowest of the Low	1997
7	Walk On	Decade	Neil Young	1997
8	Fame Is	Woodface	Crowded House	1991
9	Mosaicos do Soledad	Flamenco Passion	Curandero	1998
10	Suite no. 2 in D Minor: BWV 1...	J.S. Bach: The 6 Cello Suites C...	Phoebe Carrai	2003
11	Suite no. 2 in D Minor: BWV 1...	J.S. Bach: The 6 Cello Suites C...	Phoebe Carrai	2003
12	Fantasie in F minor – largoo	Schubert – Music for fortepia...	Seth and Maryse Carlin	2000
13	Yakshi	Yakshi	Lisa Moscow and Mihai Manoliu	2003
14	08–mussorgsky bilder einer ...	Mussorgsky Bilder Einer Ausste	Vladimir Askenazy	
15	Stardust	Songs Of Hoagy Carmichael	The Beegie Adair Trio	1995
16	Sonata in G minor, op. 5, no. ...	Beethoven Piano and Cello Wo...	Tanya Tomkins and Eric Zivian	2003
17	Widmung	CD2 Schumann Piano Music	Leon McCawley	2003

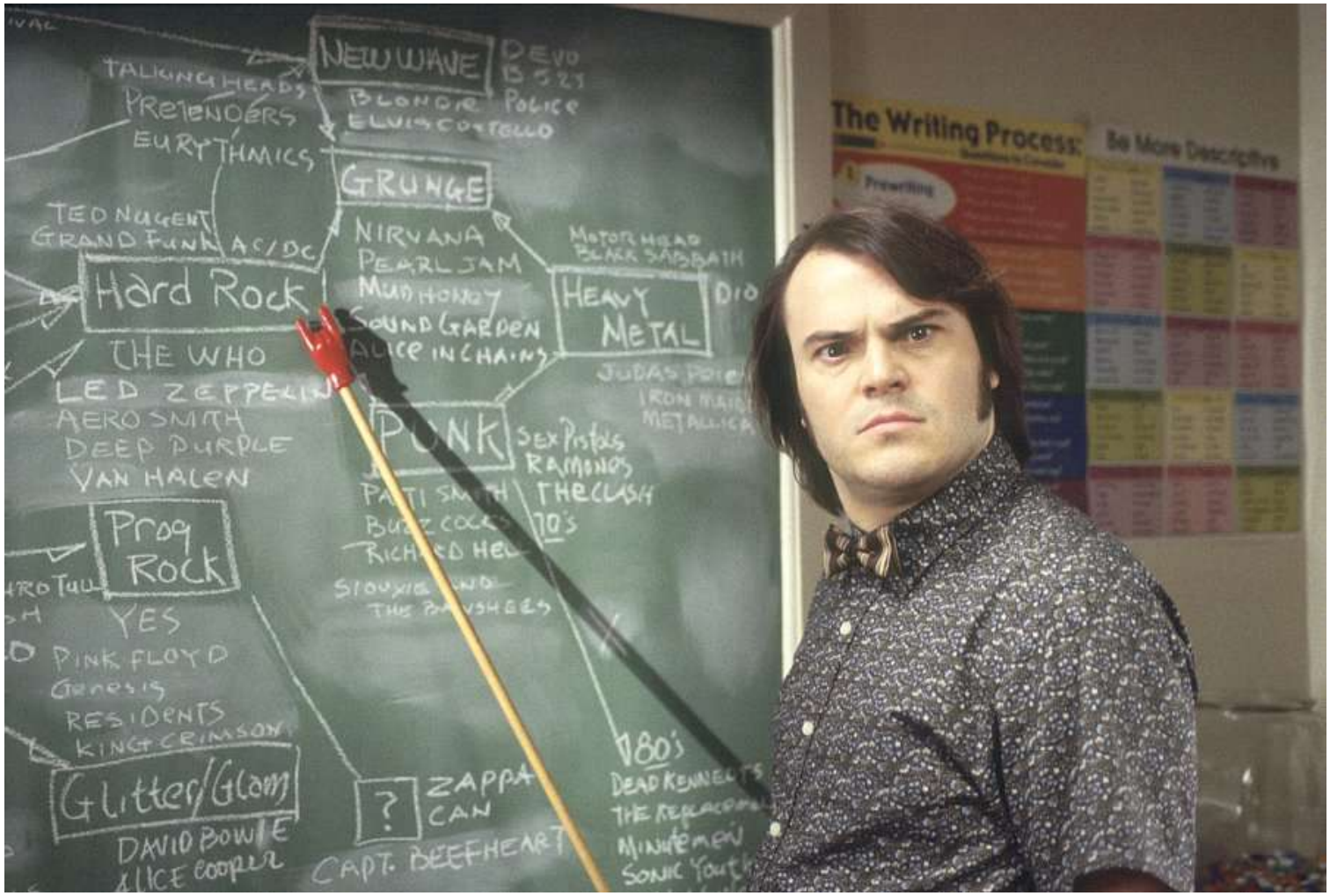
What's Next?

- Explore better features for similarity
- Combine with meta-data (lyrics, reviews, user collaboration data)
- Explore new user interfaces
- Continue with IMIRSEL



Mapping Music in the Palm of Your Hand
van Gulik, Vignoli, van der Wetering

Questions ?


NEW WAVE
DEVO
TALKING HEADS
PRETENDERS
EURYTHMICS
BLONDIE
POLICE
ELVIS COSTELLO
GRUNGE
TED NUGENT
GRAND FUNK
AC/DC
NIRVANA
PEARL JAM
MUDHONEY
SOUND GARDEN
ALICE IN CHAINS
MOTORHEAD
BLACK SABBATH
Hard Rock
HEAVY METAL
DIO
THE WHO
LED ZEPPELIN
AEROSMITH
DEEP PURPLE
VAN HALEN
PUNK
SEX PISTOLS
RAMONES
THE CLASH
70's
Prog Rock
YES
PINK FLOYD
GENESIS
RESIDENTS
KING CRIMSON
Glitter/Glam
DAVID BOWIE
ALICE COOPER
?
ZAPPA
CAN
CAPT. BEEFHEART
80's
MINUTEMEN
SONIC YOUTH
The Writing Process:
Be More Descriptive

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