

Next Generation Music Search

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What is Music Search?

- You've heard a song and you want to find out what it's called. All you have is a **tune** playing in your head.
- Something is on the radio or at the night club and you like it. What is it?
- You're bored with your current personal collection and want some more music:
 - in a similar **style** to artist X
 - that you **like**
- You are a DJ, documentary maker, or just someone who likes to establish a mood through music. How to find music that matches a particular **mood** you're trying to convey?

A Real Example

“My wife and I love this piece of fast paced music what was used during a segment for the men's gymnastics as they were showing highlights. It is also used with Movie trailers. We think is from an Opera, (part of a funeral procession we think) and it is very fast paced, high criscendo, with multiple voices singing (Mike will now attempt to hum in a Newsgroup)

DA DA DA DA....DA DA DA DA...DA DA...DA..DA..DA...DA DA. We have been looking for this music like FOREVER, and it seems that everyone has heard the music, but know one knows the title.”

MIRT Aims

- To develop technologies that enable us to answer a range of queries about music, such as:
 - where does this melody fragment come from?
 - who wrote the piece that sounds like this?
 - how similar is this composition to existing ones?
 - what pieces sound similar to this one in style?
 - find me a piece that has the following mood⁴
What pieces will I like?

Ancient History of Music IR

Offline Music IR:

- Barlow and Morganstern “A Dictionary of Musical Themes” 1948 - represented by a sequence of note names, with the theme transposed into the key of C, for example: EEFGGFED
- Parsons “The directory of tunes and musical themes” 1975 - contour strings (*RUURDDD)

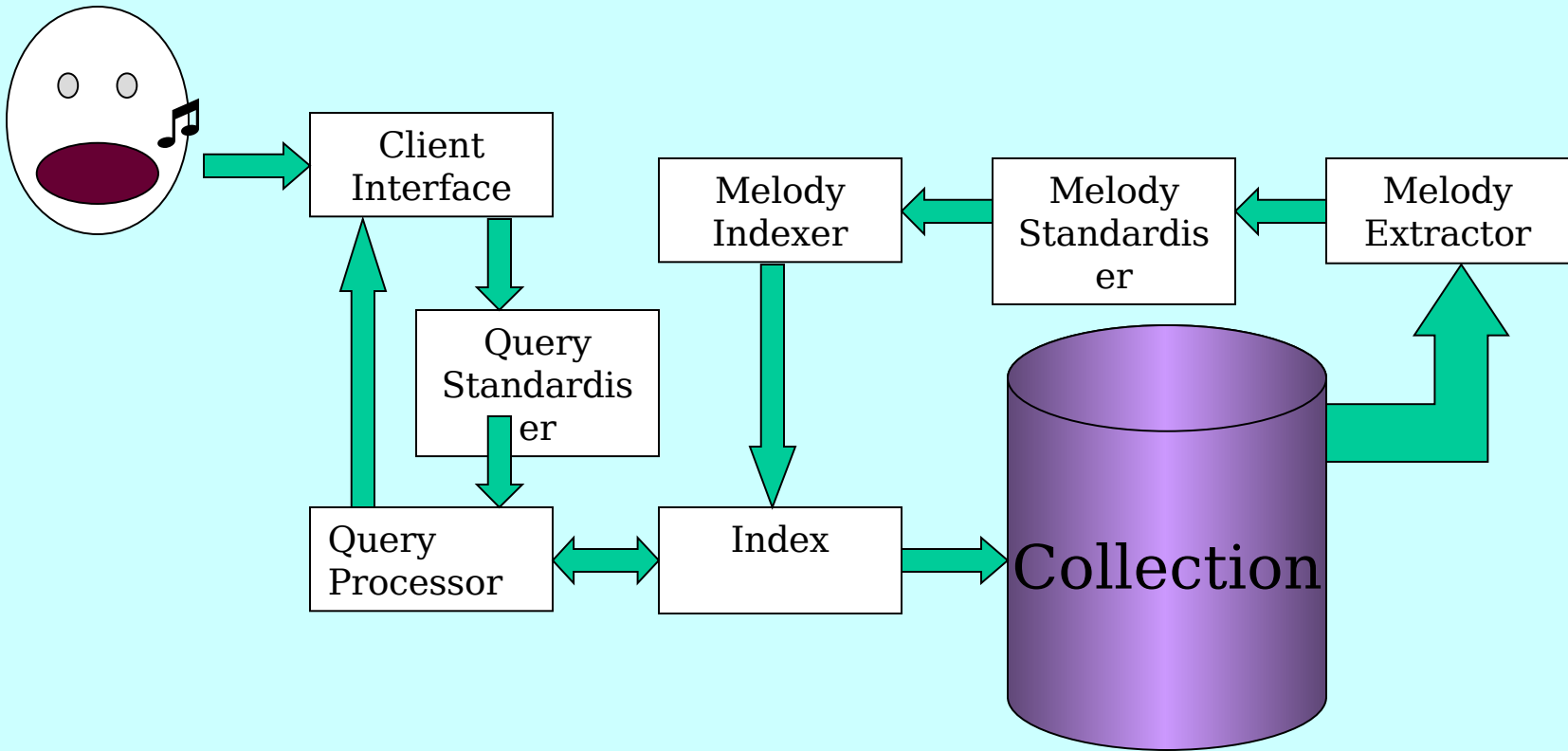
Ancient History of Music IR

- Early computerised music retrieval:
 - French Chanson catalogue featured a melody index using intervals and direction (Hudson 1970)
 - MIR programming language for music information retrieval (Kassler 1970)

First Query by Humming System

- Singing and exact match – 1988
- DP-based inexact matching of sung queries – 1993
- Paper that often gets cited as first - 1995

Query by Humming



The Current Challenge

- Most music is not available as MIDI or sheet-music.
- Some music doesn't even contain identifiable notes.
- Audio recordings are the main format.
- Current abilities to extract musical information from audio are limited.

Note-based Matching of Audio

- Requires automatic music transcription:
 - Note detection in audio is only reliable for restricted sets of music, such as monophonic or mono-timbral
- Requires matching poorly prepared queries against a poorly transcribed audio collection
- Some success achieved with matching:
 - a polyphonic symbolic query against collections of ~2000 pieces of poorly transcribed audio classical music
 - monophonic symbolic query against ~800 operatic arias

Answering Queries on Preference

- “I like piece X, what else would I like?”
- Types of data that can be used:
 - ratings of pieces of music by lots of users
 - implicit ratings from website use
 - personal data
 - audio data from piece X

What determines preference?

- Personality
- Cultural background
- Age
- Occupation
- Socio-economic background
- Gender
- Musical education
- General attitude to music
- Familiarity with the music

Personality and Preference

	Stable	Unstable
Introvert	cognitive styles of baroque and classical	mystical impressionist romantic
Extrovert	solid predictable music	romantic emotional music

Answering Queries on Style

- What can we do currently?
 - use manually classified recordings, then locate pieces based on the hierarchical classification
 - locate pieces of a similar style using extracted audio features – but this only groups pieces into about 4-6 genres well, and people disagree on the genres quite a lot

What determines style?

- All-music guide had 531 classifications, Amazon 719, and mp3.com 430.
- On-line classifications of music are based on:
 - genealogy (pop, disco)
 - history (eg. baroque, classical, romantic)
 - geography (eg. Latin, Turkish)
 - instruments used (eg. electronic, choral)
 - sub-genres (rock, hard rock)

The Mood Juke Box

(with Ian Kaminskyj at

- Find pieces/make a play list of a specific mood
- Make a play list that moves from one mood to another
- Make a play-list that avoids a specific mood
- Recommend music given a user's tastes, incorporating mood information
- Soundtrack selection assistant

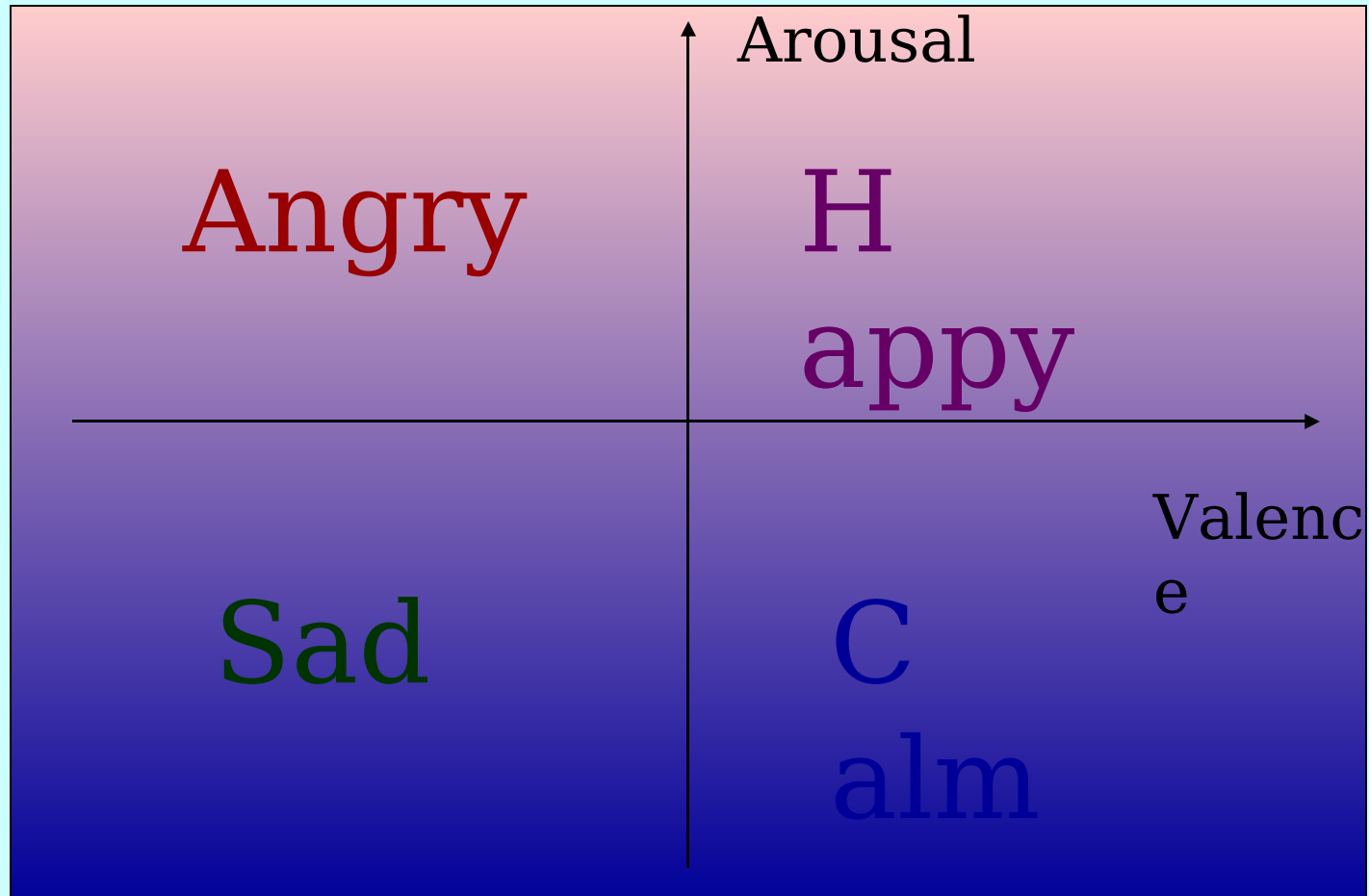
Answering Queries on Mood

- What determines mood?
 - Tempo (speed),
 - Tonality (major or minor keys),
 - Distinctiveness of rhythm,
 - Pitch (high or low)
 - Dynamic (loud or soft)
 - Timbre
- Example: solemn music is slow, with a definite rhythm, and low pitch

Mood Categories by Label

<p>Bright Cheerful Happy Joyous</p>	<p>Calm Delicate Graceful Quiet Relaxed Serene Soothing Tender Tranquil</p>	<p>Dreamy Sentimental</p>	<p>Heavy Majestic Sacred Serious Spiritual Vigorous</p>	<p>Agitated Angry Restless Tense</p>
<p>Humorous Light Lyrical Merry Playful</p>		<p>Dark Depressing Gloomy Melancholy Mournful Sad Solemn</p>	<p>Tragic Yearning</p>	<p>Dramatic Exciting Exhilarated Passionate Sensational Soaring Triumphant</p>

2D Mood



Other Audio Work in Progress

- Query by instrument timbre.
Current work includes:
 - automatic musical instrument timbre classification
 - learning more about human abilities to associate instrument timbres



MIRT is part of SEG

- RMIT Search Engine Group currently working on:
 - retrieval problems in Persian, Arabic and Chinese
 - multimedia retrieval (video, audio, images)
 - bioinformatics, genomic search and data mining
 - distributed text retrieval
 - retrieval models
 - query refinement
 - document summarisation
 - document management, XML-based retrieval
 - compression, string matching
 - user's interactions with search engines
 - computer-assisted language learning: readability, concordancer indexing