AudioRadar

A metaphorical visualization for the navigation of large music collections

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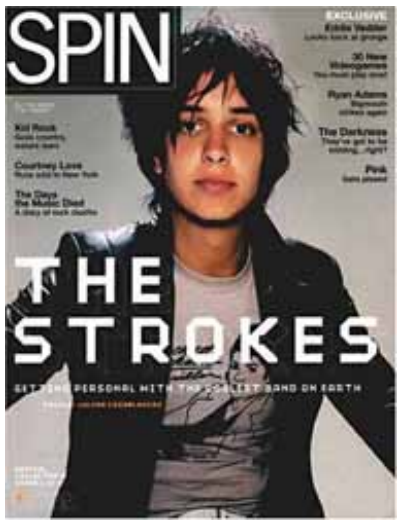
AudioRadar – An Introduction

- AudioRadar is a new interface to
  - Visualize
  - Browse
  - Organize

  Music Collections.
- AudioRadar is based on similarity of songs.
- AudioRadar visualizes similarity by proximity.

Music Similarity



" '*The Blues*' might be Rose's crowning career achievement: It's an epic combination of mid-period Stevie Wonder, early Elton John, and side two of '*In Through the Out Door*' ".

How do we explain music ?

- Music is very complex and difficult to explain.
- Similarity is a very common metric
  - Sounds just like…
  - Is a mixture between…
  - Reminds you of…
- Enables us to get a feeling for the music without actually hearing it.

But – How do we consume digital music?

- Music Collections are increasing in size (1000 to >10.000).
- Current player software relies on metadata for organization.
- Browsing music collections degrades to scrolling endless lists.
- Large collections require better navigation mechanism.

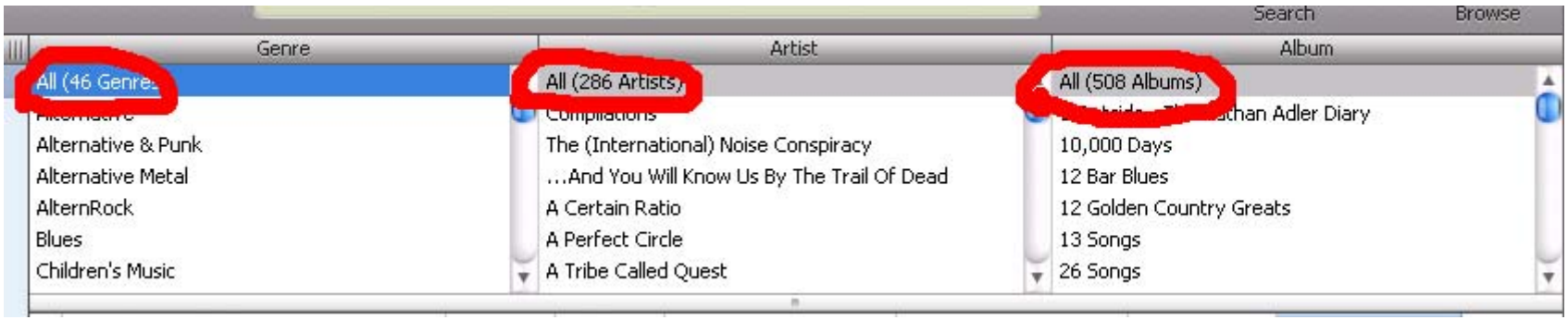
Implications - Statistics

Average collection size	3,542
Largest Collection	50,458
Active songs (80% of plays)	23%
Songs never played	64%

Study: Paul Lamere, Sun Microsystems. Data Courtesy of iPod Registry

Implications on Collection Navigation

- Meta information is *assigned* to music rather then *derived from* it.
- Artist/Title etc. give little information on how a song sounds.
- Classification into genres is troublesome.



Similarity Based Browsing of Music Collections

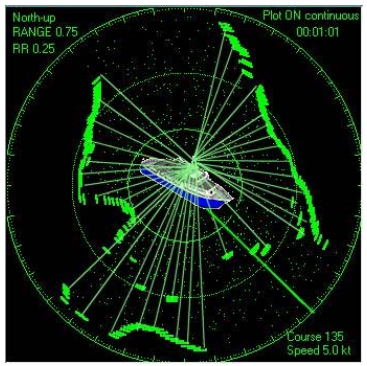
AudioRadar – Our Approach

- We don't rely on metadata.
- We especially don't rely on genres.
- We don't rely on lists and textual information.

AudioRadar – Our Approach

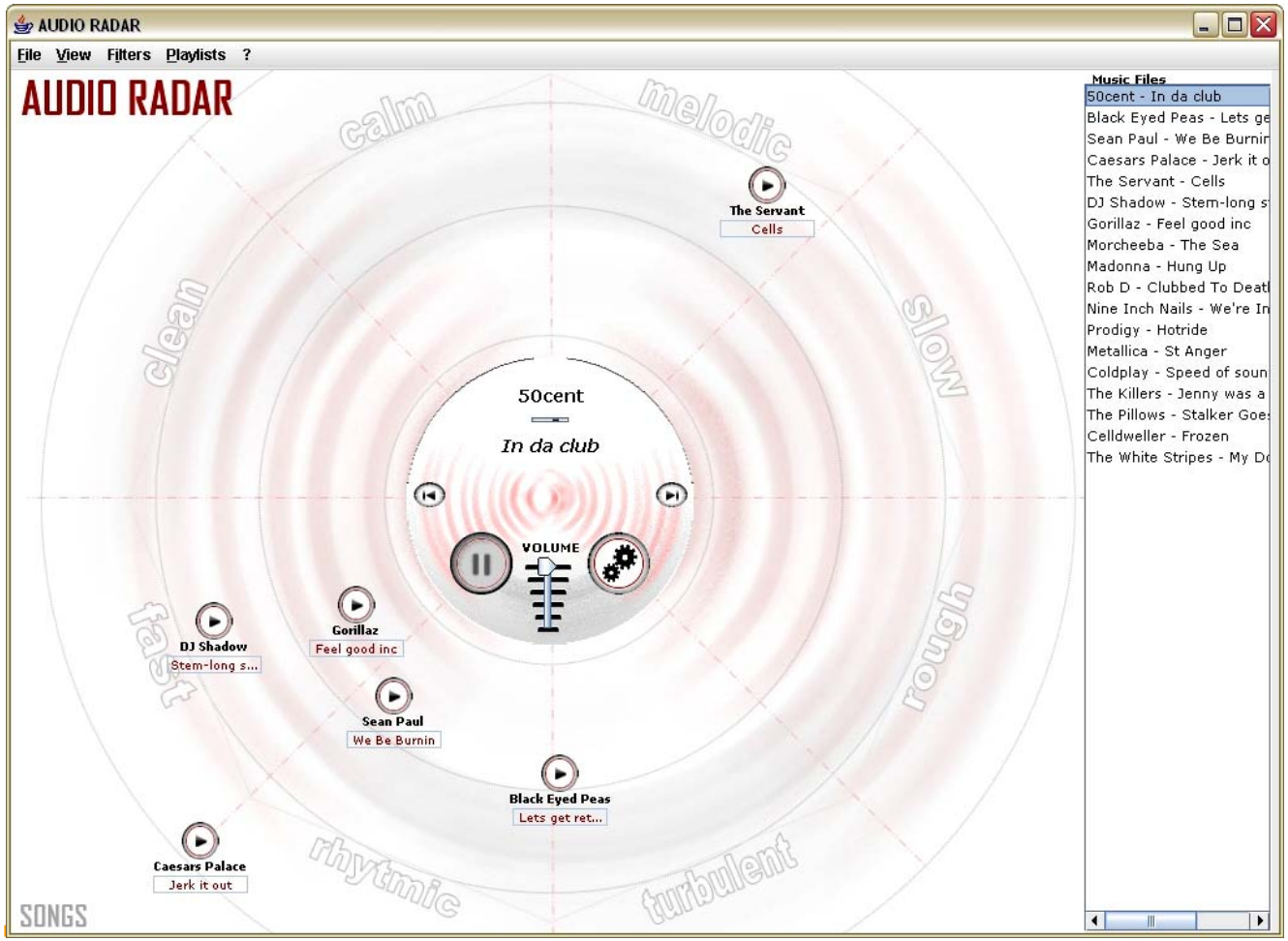
- We derive a set of meaningful descriptive features from the audio stream.
- We visualize music collections based on similarity/proximity.

AudioRadar – The Metaphor



- We use a radar as visual metaphor.
- The currently playing song is the centroid.
- Similar songs are grouped around the centroid in the near vicinity.
- The more similar a song, the closer it is placed to the center.

AudioRadar – The Metaphor

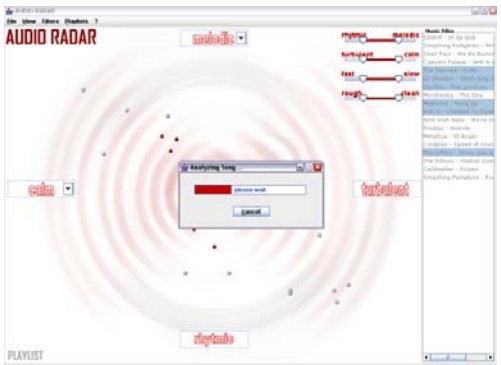


Interface Understandability

- For users to understand the radar interface two things are most important:
  - The measured similarity must be as close as possible to the subjectively perceived similarity.
  - The songs must be placed
    - Correctly
    - Meaningful

Automatic Audio Analysis
and
Placement Strategies

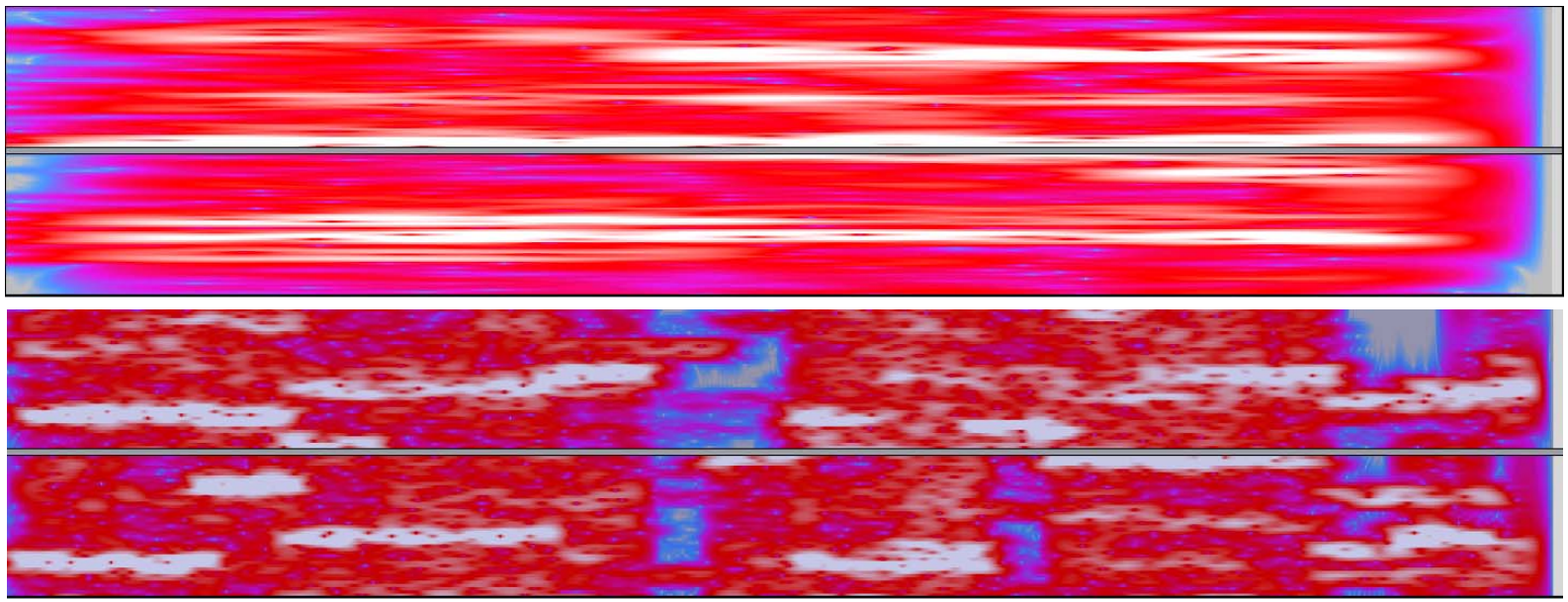
Automatic Audio Analysis



- We extract a set of descriptive features from the audio stream.
  - Tempo
  - Tonality
  - Harmony
  - Rhythm patterns

Dimensions

- We calculate a four dimensional vector space
  - Fast vs. Slow
  - Melodic vs. Rhythmic
  - Clean vs. Rough
  - Calm vs. Turbulent



Placement Strategies

- Different strategies are possible to calculate proximity and placement on the radar
- Choosing the right strategy is crucial for the understanding of the songs' relationships.

Dimensionality Problem

- General problem of displaying a high dimensional space on a 2D screen.
- In our case 4D space <-> 2D display.
- Desired: No expressivity loss of the visualization.

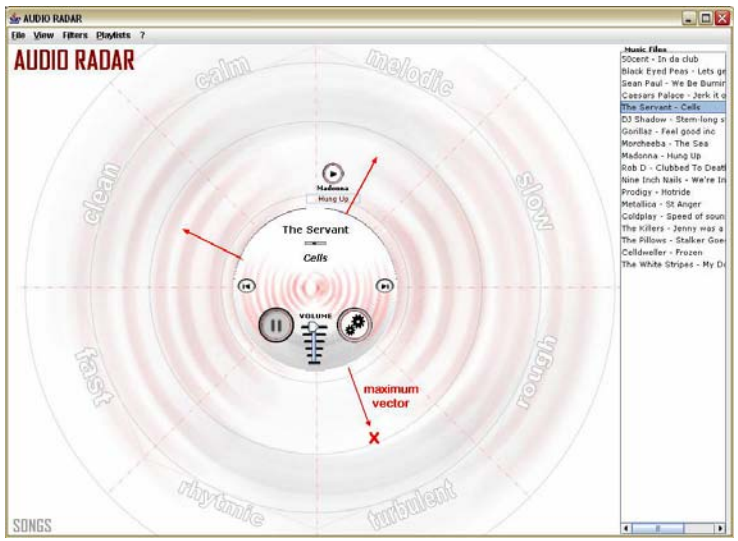
Naïve Approach

- Easiest but correct method is to omit 2 dimensions.
- Position of items on the 2D plane can be calculated directly from their values in the original space.

  → leads to information loss.

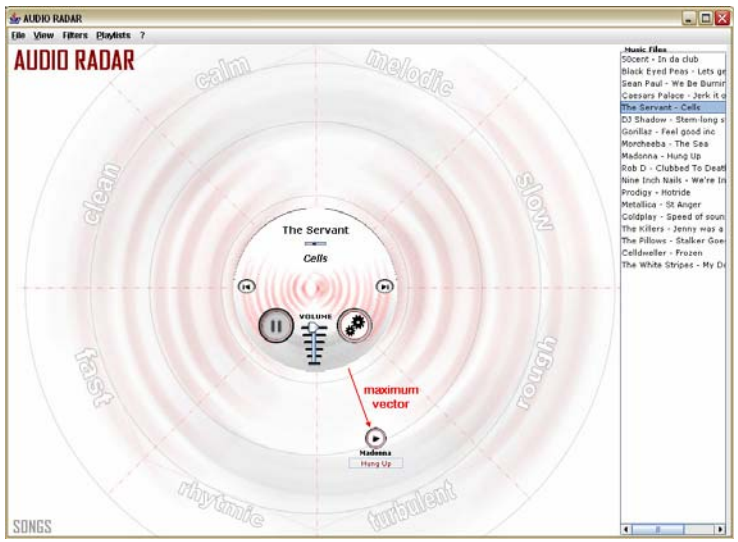
Placement Strategies I

- Another approach is to find a projection from 4D to 2D
- Projection onto 2D Cartesian coordinate system.



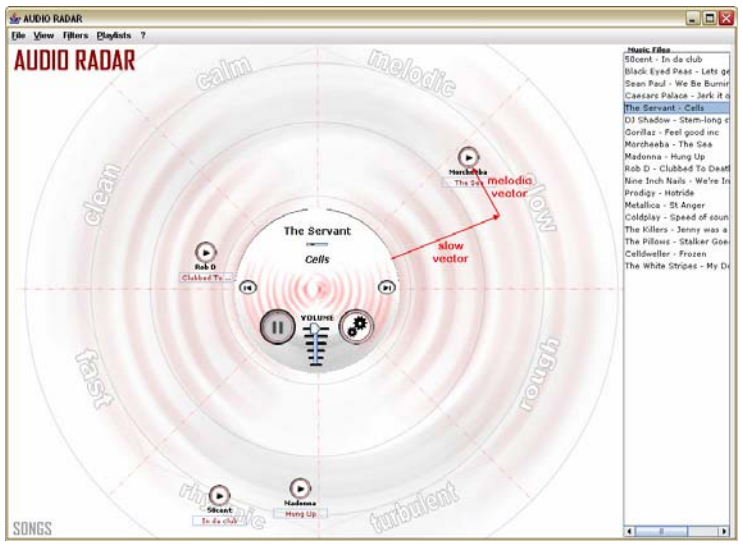
Placement Strategies II

- Maximum value placement
  - Meets subjective similarity measurement better.
  - Leads to visual clutter.



Placement Strategies III

- Sector is chosen on maximum value
  - To avoid visual clutter we compute an offset using the second highest value.
  - This placement matches subjective similarity perception even if inexact.

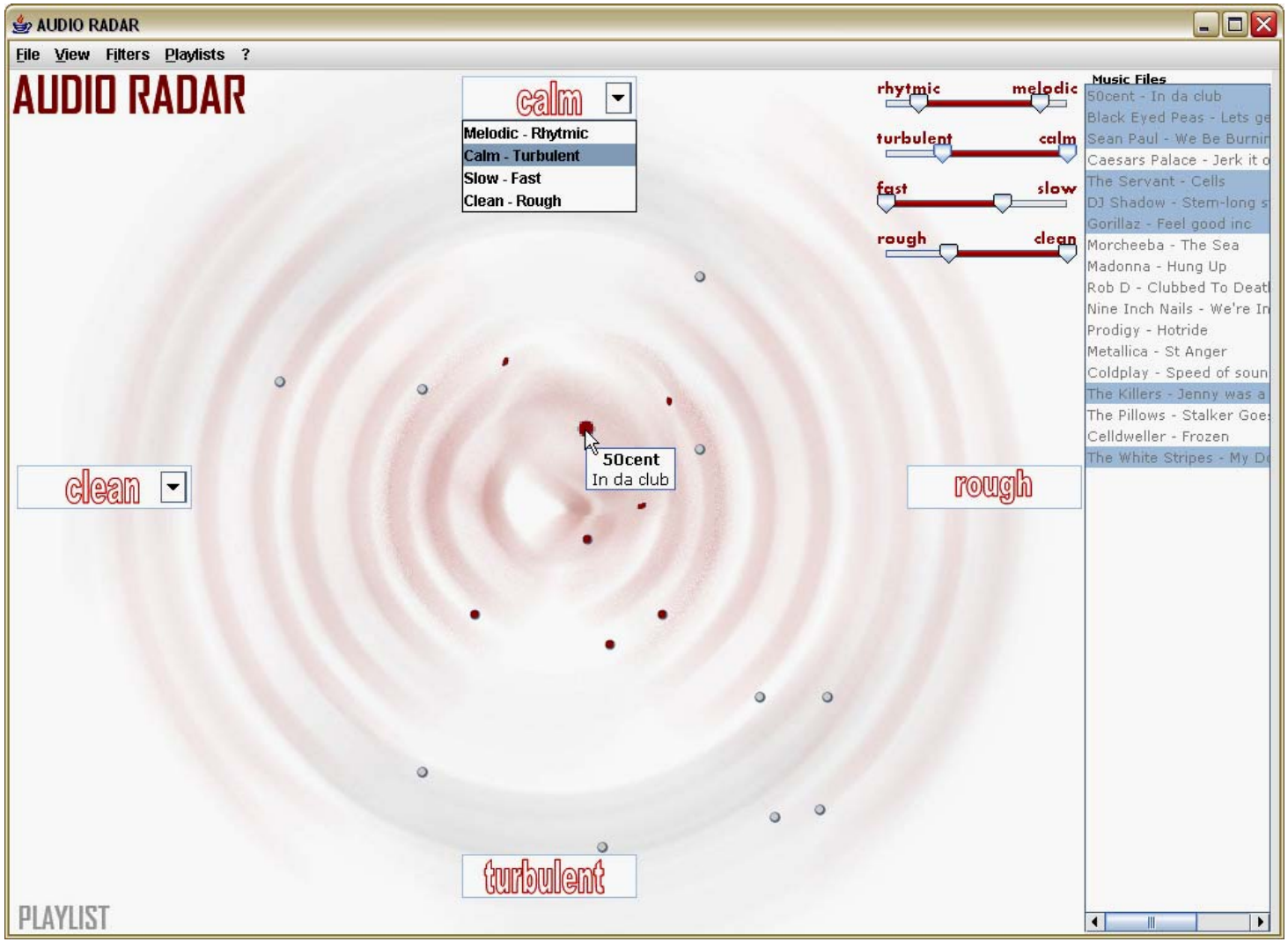


Mood Based Playlist Generation

Playlist Generation

- Standard playlists are containers for a set of artists/genres/decade.
- We want to listen to music that fits our mood.
- We might not know how a song/artist/genre actually sounds.

Mood based playlist generation



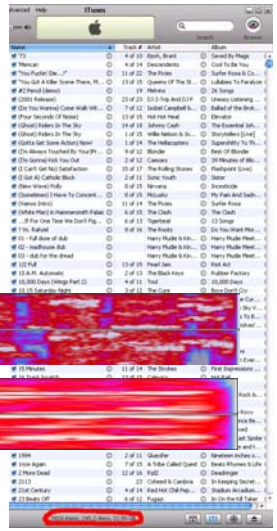
Conclusion
and
Future Work

Conclusion

- Similarity in music is a very human concept.
- We created the first functional player fully relying on this concept.
- We found and applied a coherent visual metaphor to display music similarity.
- We extended the concept into mood based playlist generation.

Issues and Future Work

- Feature extraction algorithms are very basic and produce faulty results.
- The dimensions clean vs. rough and turbulent vs. calm are problematic.
- Playlist generation could be improved e.g. drawing border around regions of interest.
- We want to explore fuzzy search methods for music retrieval.



Any Questions?

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Thank You!