FAKULTÄT FÜR !INFORMATIK

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MeXX
A Virtual World for Experiencing Musical Concepts

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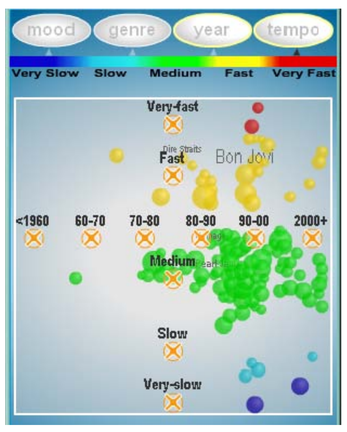
Abstract

Music itself and its richness on features inspire scientists to develop novel software systems that deal with music in a wide variety. This ranges from digital sound analysis and exploration to artificial understanding of music by computers to music visualization systems. This master thesis focuses on modern music visualization systems which go beyond traditional directory structures and provide users with a novel interface in music browsing and experiencing, either in a 2- or 3-dimensional fashion. The aim of this master thesis was the design of a customizable 3D world with spatial sound capabilities and the options to visualize music repositories as well as to explore such repositories in an edutaining way by a game. The system is called MeXX and it is a single-user application developed by Java and its graphics library Java3D.

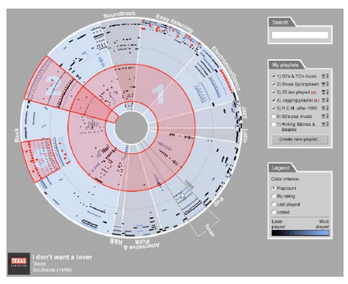
State of The Art

Visualization systems out of the areas Music Information Retrieval, Virtual Environments, Music-Based Games and Music Environment Systems were evaluated in terms of functionalities and utilization.

Artist Map
van Gulik et al., 2004



Disc-Visualization
Torrens et al., 2004

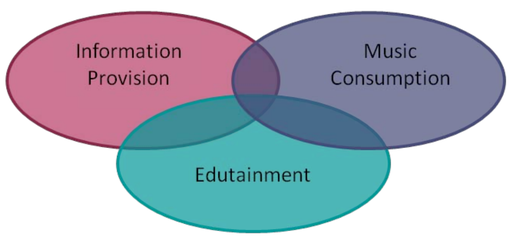


Search Inside The Music
Lamere et al., 2007

nepTune
Knees et al., 2007

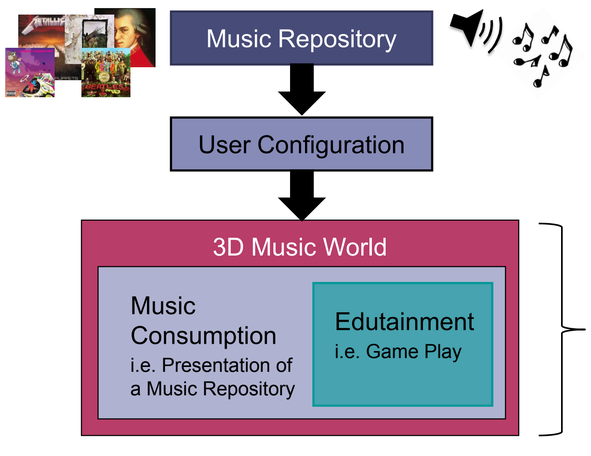
Music Environments for…

- Information Provision – e.g. browsing systems or virtual music stores and museums
- Music Consumption – e.g. sound collages in virtual concerts or music bars and clubs
- Edutainment – e.g. music-based games



Concept of MeXX

- 3D visualization of a music repository for music exploration and consumption (i.e. to obtain a variety of perceptions and insights into music)
- Game setup for music examination (i.e. to train the user's appreciation of musical concepts in an edutaining way)
- 3D world appearance is controllable by the user
- Spatial sound capabilities are provided



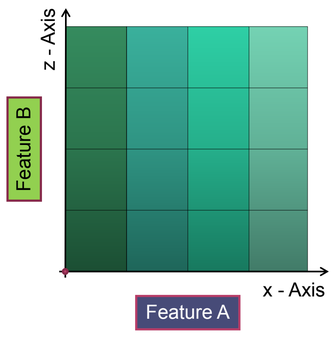
Music Repository

- Contains music pieces, albums and artists
- Music pieces are described by features

Discrete Features		Numerical Features	
Genre	Mood	Tempo	Year

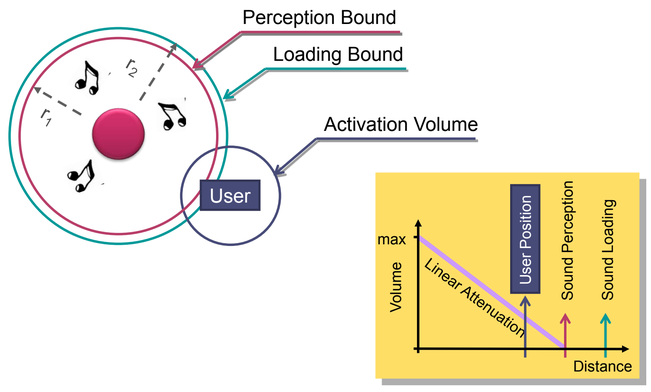
Feature Mapping

- Two features are mapped to the axes of the 3D world
- Feature sections are evenly partitioned
- Music pieces are mapped using their feature values



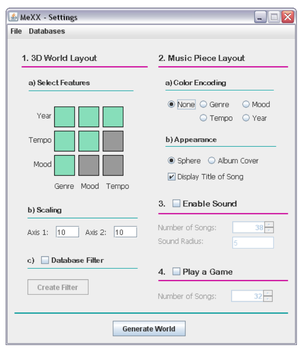
Sound Rendering

- PointSound attached to music pieces for play back
- Within perception bounds audio files are played
- Loading bounds control the sound loadings
- JOALMixer is responsible for 3D sound rendering



Implementation

- Feature combination specifies base of 3D world
- Sphere- or album layout for music pieces
- Color encoding of features
- 3D sound rendering
- Optional database filter



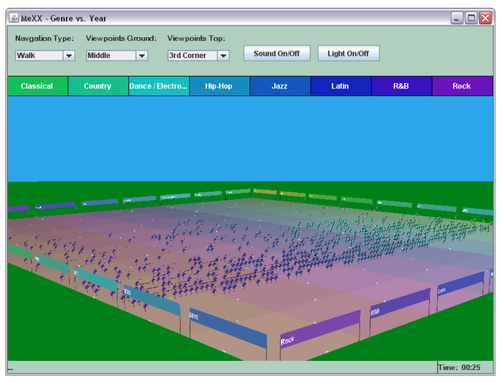
Game Setup

- Official goal is to collect scores by inserting music pieces to their correct positions in the 3D world
- Unofficial goal is to train the user's sense for music
- User is forced to attentively listen to the songs to identify their feature values
- A non-obvious learning process as a natural benefit

Application Scenarios

Scenario 1, Large Dataset

A music repository containing 951 music pieces of 545 artists and 691 albums is visualized in terms of **Genre** and **Year**. The sphere layout was used and **Genre** as color feature.



Scenario 2, Large Dataset (Filter)

Only music pieces having the genres **Jazz**, **Latin** and **R&B** published between **1990** and **2010** are visualized in the world. The album layout was used and **Year** as color feature.

Scenario 3, Pink Floyd

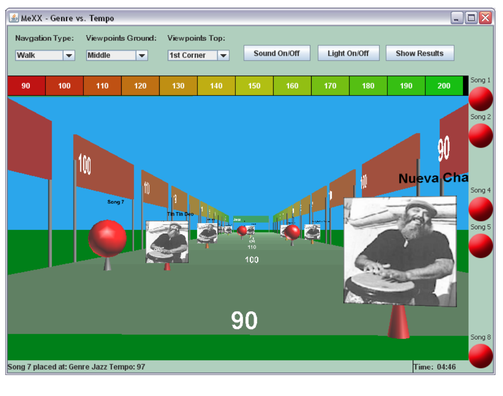
22 music pieces of the famous British band **Pink Floyd** are arranged in the 3D world by their **Genre** and **Tempo** as a homage to the band. The album layout was used for the music pieces and **Year** is color encoded. Additionally the night simulation of the 3D world was switched on as a variation.

Scenario 4, Music History (Filter and Game)

38 music pieces ranging from 1700 to 2010 are mapped in the 3D world in terms of filtered **Mood** and **Tempo**. Ten music pieces were chosen in the game setup to be inserted in the world.

Scenario 5, Poncho Sanchez (Game)

22 song of the American jazz musician **Poncho Sanchez** are visualized in terms of their only genre **Jazz** and **Tempo**. Eight songs were chosen to be challenged on their **Tempo**.



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