Interactive Poster: Using CoMIRVA for Visualizing Similarities Between Music Artists

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Abstract

This paper presents our framework for music information retrieval and visualization (CoMIRVA). We focus on the functions for visualizing similarities between music artists or songs and describe some approaches we have already implemented. In particular, we present a novel three-dimensional visualization technique based on a geographic model, the very simple "Circled Bars" visualization which could be used for example for mobile devices, and a graph-based visualization approach for prototypical artists.

CR Categories: H.5.5 [Information Interfaces and Presentation]: Sound and Music Computing—Systems; I.3.m [Computer Graphics]: Miscellaneous—Music Information Visualization

Keywords: music information visualization, music artist similarity

1 Introduction

Music information retrieval (MIR) is concerned with the extraction, analysis, and representation of information that describes various aspects of music. This information can be gained basically from the audio signal or from metadata (e.g. ID3-tags, artists' web pages). One important aspect of MIR is the visualization of the extracted information. In this paper, we present some methods to visualize similarities between music artists, which were implemented in our Java-based framework CoMIRVA (Collection of Music Information Retrieval and Visualization Applications). More detailed information on CoMIRVA can be found on the Internet.[1]

The data for the examples to be shown here was acquired using web-based information retrieval techniques as described in [3, 1]. We used two music collections, one containing 103 artists, the other comprising 224 artists. These could, for example, represent personal music repositories. Applying the methods described in [3, 1], we obtain similarity matrices that reveal how similar each pair of artists is according to the measures used by these methods. To these matrices we apply various visualization techniques, some of which are briefly summarized in the following section.

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[1] *http://www.cp.jku.at/comirva*

2 Visualizing Similarities Between Music Artist

2.1 Three-Dimensional Smoothed Data Histograms (3D-SDH)

Based on the "Smoothed Data Histogram" (SDH) introduced in [2], we elaborated a three-dimensional version of the "Islands of Music" (IoM)[2]. The IoM use a Self-Organizing Map (SOM) to cluster songs or artists on a two-dimensional plane according to their similarity. To visualize these clusters, an SDH that calculates a voting matrix based on the distances between the data items and the map units of the underlying SOM is used. Basically, this voting matrix has high values for areas with many data items, i.e. artists, mapped to them and low values for sparse regions of the SOM. Subsequently, the voting matrix is interpolated and visualized using a colormap which equals that of geographic maps, where oceans represent sparse areas of the SDH and islands cluser artists that produce similar music according to the underlying similariy measure.

To gain deeper insights, Figure 1 shows a standard two-dimensional SDH calculated on the 224-artist-collection. Taking a closer look at the figure reveals various regions. The large island with the mountain on the left side comprises mainly artists that produce Rock-songs in the broadest sense. The second largest island, situated in the lower right, groups mostly artists that engage in the genre Rap, whereas the island in the center of the map contains creators of electronic music. On the sandbank between the Rock and the Rap islands classical artists can be found. The clusters situated along the top border and in the top right corner of the map mainly contain Punk- and Hard Rock-affine artists.

Using the values of the voting matrix as third dimension, we model a spatial representation of the SDH, which we simply call 3D-SDH. An example based on the same SOM as used for Figure 1 can be found in Figure 2. To give the islands a more natural look, the interpolated voting matrix is slightly modified by adding a random component to all of its values, which increases the roughness of the terrain. Furthermore, a simple wave-like animation vivifies the scenery. Since the 3D-SDH should also serve as a user interface, interaction is of great importance. Thus, the user can move through the scenery exclusively utilizing the mouse for navigation. Panning is possible as well as changing the angle and distance to the surface.

2.2 Circled Bars

Since we are also experimenting with user interfaces for small devices like mobile phones or personal digial assistants, the second visualization approach aims at offering a very simple and graphically much less sophisticated method to answer questions like: "Which artists produce similar music to that of my favorite artist X?". To this end, given an artist X, an adjustable number of similar artists (according to the used similarity measure) is arranged in a circle.

[2] *http://www.oefai.at/∼elias/music*

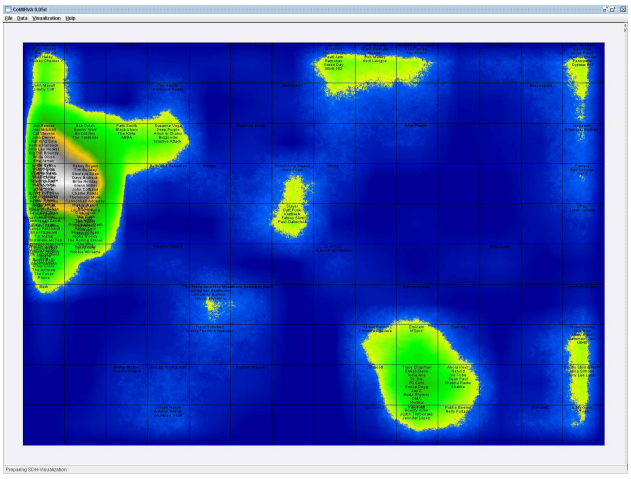

Figure 1: A *Smoothed Data Histogram* visualization of a collection containing 224 music artists.

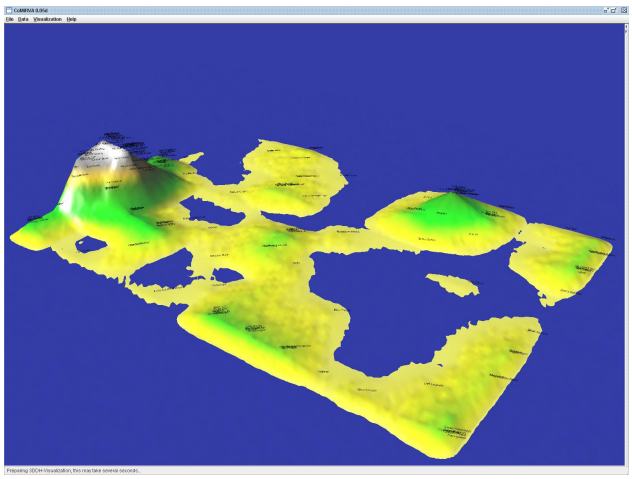

Figure 2: A *3D-SDH* visualization of the 224-artist-collection.

The artists are ordered by their similarity to artist X. The similarity values are visualized by filled arcs that vary in length and color corresponding to the applied colormap. Figure 3 shows a sample visualization with artists similar to the well-known Hard Rock band *"AC/DC"*.

2.3 Continuous Similarity Ring (CSR)

The last visualization technique we present here uses a graph-based model to illustrate prototypical artists for certain genres. Given a set of artists and information on which artist belongs to which genre, we determine a prototype for each genre and arrange these prototypes in a circle, cf. Figure 4. Additionally, for each prototypical artist, its most similar neighbors are shown. To preserve the distances given by the similarity matrix, the neighbors are positioned using a cost-minimizing heuristic. The artists' vertices are connected by edges whose thickness and color vary according to their similarity values and the colormap applied.

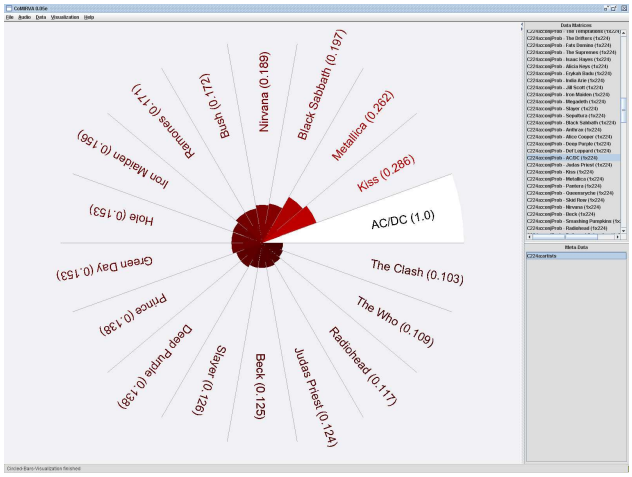

Figure 3: A *Circled Bars* visualization, e.g. for mobile devices. Given the seed artist *"AC/DC"*, an adjustable number of artists with maximum similarity to the seed artist is presented. The values in parenthesis correspond to the probability that the respective artist can be found on a web page that is known to contain the seed artist.

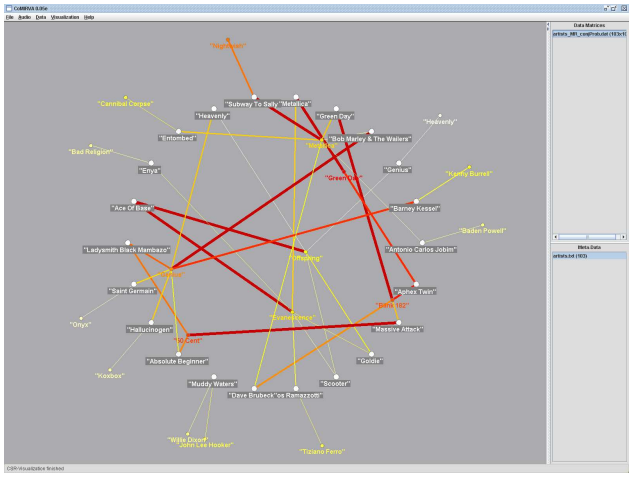

Figure 4: An example of a *Continuous Similarity Ring* for visualizing prototypical artists and their relations to other artists. The collection of 103 artists from 22 genres was used in this example.

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