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Vocalmetrics: Music Visualization and Rating Techniques

Abstract *Vocalmetrics* is a web application that provides scientific techniques for an interactive exploration and manipulation of multidimensional data. It was developed for the visualization and classification of musical data as a pivotal aim of music education and analysis. It introduces two visualization techniques: *Prototype Visualization*, as a very intuitive and playful way of exploring and classifying multidimensional musical data. *Egg Cell technique*, as a direct manipulative interaction technique for rating features of musical data, particularly suitable for subjective assessments.

6.1 Introduction

This chapter is based on the work of Schönfeld (2013), Schönfeld, Berndt, Hähnel, Pfleiderer & Groh (2014).

Music is ubiquitous and versatile and so is the perception of it. The classification of music helps to communicate about it, e.g. about its style, its time of creation and also about detailed musical features like structure, sound and expression. Therefore, the ability to classify music pieces and artists is a pivotal aim of music education. Ratings and classifications form an important basis for discussing and learning about musical characteristics, e.g. in classrooms or university seminars.

Vocalmetrics is a software tool that supports the communication about music. It has initially been developed as a visualization tool for musical data, in particular for analysed audio samples, which are an outcome of the research project *Voice*

and singing in popular music in the U.S.A (1900-1960)¹ at the Franz Liszt School of Music, Weimar. These samples were rated according to nine dimensions of vocal expression in order to show relationships between song excerpts, singers, and their ratings. Since then the software has experienced further development, and the current version *Vocalmetrics 1.1*² offers the following functionalities:

- Geometric visualizations of multidimensional data (scatter plot, star plot)
- Similarity analysis between data records (*Prototype Visualization*)
- Supportive tool for rating data records (*Egg Cell Interaction Technique*)
- Multiple users and projects
- Data import/ export functionalities (from and to CSV-files)
- Web-based application

Section 2 looks at related work on visualizations of music in general, at similarity in general and at music similarity in particular.

The project's objectives are described in Section 3. As a first step, the data analysis and its consequences for the design concept of *Vocalmetrics* are outlined. Then, the software functionalities are described in detail starting with the general user interface and administration tools. The main part focuses on actual data visualizations and facilities to rate audio excerpts with the help of the *Prototype Visualization* and so-called *Egg Cell Interaction Technique*.

Finally, section 4 sheds light on spaces for improvements and points out implications of *Vocalmetrics* for musicological research and possible applications in music education.

Section 5 summarizes the chapter.

6.2 Related Work

The discipline of information visualization attempts to transform complex data into meaningful information by focussing on the human visual perception system. The data will be analysed and visualized by appropriate imaging techniques. Thus, the data can be viewed from different perspectives and new insights may be gained.

¹<http://www.hfm-weimar.de/popvoices/vocalmetrics/main.htm>, last accessed: June 2015

²<http://schoenfelds.org/vocalmetrics>, last accessed: June 2015.

This is a reading sample!

prototypes. It performs an interpolation of the features of all objects within the cell envelope, by their distance to the core. However, a green pure prototype inside the cell envelope dominates the rating of its particular dimension and causes the value of all other data objects to be ignored. Thus, it defines an absolute value for its respective feature solely. The influence on the rated data record can be observed immediately with the help of the smaller pink circle, which is the data record that is currently rated.

The concept has further improvements and interaction patterns. So far, it supports the rating of musical data with the following advantages:

- The whole data set is present. Each data record can be used for comparative listening and can be referenced to actively affect the rating. Change of a rating immediately changes the visual state of the rated data record.
- The use of prototype semantics allows for a weighted inheritance of feature values. This facilitates the rating, because similar audio samples can be adopted and complex feature combinations are applied much quicker than by rating each feature individually. Moreover, prototype semantics automatically provides reference pieces for comparative listening.
- Direct input of numeric values is possible, but largely avoided. For questions like „What is a maximum vibrato?“ or „When is it medium?“, absolute values are inappropriate. Instead, the focus lies on a more relational rating which complies better with the object of analysis, music.
- The slider-like dragging of objects closer to the core reflects an intuitive direct relation of proximity and similarity.

6.4 Discussion

Vocalmetrics has not been officially evaluated yet. Experiences among musicologists show, that common tasks in musical research projects can be optimized when using *Vocalmetrics*, especially the presentation and exploration of research data as well as the process of data creation or gathering respectively. *Vocalmetrics* combines both tasks in one application.

The *Scatter Plot View* enriches a well-known visualization technique with useful functionality, which is gladly accepted by the user. The *Prototype Visualization*

This is a reading sample!

of musical structure, sound, and performance as well as relating to meta data. On the one hand, *Vocalmetrics* can help to classify, explore, and compare large repertoires of music and music of differing provenience. On the other hand, it offers a quick and intuitive approach for visualizing features of and relations between music excerpts and, hence, to communicate about music in various settings. Listeners reflect on these features and relations during the rating process which might also exert an educational gain.

The chapter describes *Vocalmetrics* as a software tool for data visualization and manipulation. It introduces the *Prototype Visualization* as an intuitive and playful way of exploring complex data sets and analysing similarities and differences between data records. Furthermore, it offers tools for the process of rating subjective data attributes such as musical features that are assessed by music experts. Therefore, the *Egg Cell Interaction Technique* is introduced as a tool for indirect rating, i.e. to set the values of data features by referring to and adopting from other data records instead of specifying a feature value directly by numerical input.

Section 6.1 gives a quick introduction of a musical research project called *Voice and Singing*, which was the occasion to develop the software. Section 6.2 looks at related work in the field of music similarity visualizations. The project objectives and software requirements are described in Section 6.3, followed by the data analysis and its consequences for the design concept of *Vocalmetrics*. Then, the software functionalities and visualizations are described in detail. Section 6.4 mentions experienced problems and possible improvements of the *Vocalmetrics* software as well as its benefits for musical research and education.

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