VIZMUC - VIZUALIZATION OF MUSIC CORPORA

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ABSTRACT

To meet the challenge of analyzing and visualizing large music corpora, we have developed a web platform that simplifies the path from raw data processing to data visualization, search and comparison. Our platform can process both symbolic (MusicXML) and audio data, allowing users to easily access and compare different corpora. It provides a web-based interface for intuitive browsing and filtering as well as comparison of selected features of music pieces. It simplifies the exploration and comparison of growing digital music collections and speeds up the analysis process for users with different levels of knowledge.

1. INTRODUCTION

Modern Music Information Retrieval (MIR) techniques can generate large amounts of music descriptors, but visualizing and comparing these descriptors across large corpora remains a challenge. While complex MIR algorithms can provide valuable insights into musical works, interpreting the results usually requires specialized knowledge, which limits their usability for a broad audience.

To solve these problems, we have developed a music processing pipeline and a web platform that simplifies the analysis of music corpora from raw data processing to data visualization and search. The first step was to identify the features that can be easily standardized and extracted from sheet music in MusicXML format and from raw audio data. To enable search capabilities, a popular search engine was used to perform tasks such as pattern matching and aggregation. Finally, a web-based user interface was designed and created to make the information easily searchable and accessible to the general public. Through the interface, users can visually compare all extracted features and download the raw analysis data for further use.

2. RELATED WORK

The field of music visualization has evolved in recent years, with different systems contributing to different aspects of learning and analysis of music. Early examples include Brass [1], which helped performers improve their understanding of music by visualizing the relationships between the parts of compositions, and Songle [2], which enables the visualization of structural segments, hierarchical beat structures, melodic lines and chords. Similarly, VisualMelody [3] aimed to support the learning of four-part compositions. It was shown that visualization reduces melodic errors and accelerates the learning process.

Li [4] investigated melodic visualizations at macro and micro levels, while VisualHarmony [5] used visualization to support harmonic analysis. Phon-Amnuaisuk [6] demonstrated the use of open source tools such as Music21, Word2vec, Python and visualization techniques to facilitate the analysis of music data.

In contrast to these earlier efforts, which focused on the analysis of individual pieces of music, the newer CorpusVis [7] system provides an interactive workspace for the visualization of large music corpora that uses metadata and computational techniques to provide deeper insights.

3. THE MUSIC CORPORA EXPLORER

3.1 Features and implementation

Our platform is designed for processing and analyzing music corpora and supports both MusicXML and audio formats. Various open source tools for music information retrieval are used to analyze the corpora. The processing pipeline is shown in Figure 2.

The MusicXML files are processed using the widely used music21 library [8] to extract metadata such as title, authorship, tonality, meter, tempo, melodic range (ambitus) and number of bars for each piece in the corpus. In addition, the tool calculates melodic contours based on the encoded music data and displays them graphically. These metrics enable a comparative analysis of pieces of music with the help of an integrated comparison function.

The raw audio data is first pre-processed with Spleeter [9] to extract the lead voice from the accompaniment. The lead voice is processed with the Torchaudio library [10,11] so that the extracted metadata includes title, song duration, tempo, key and the pitch contour (in Hz), which can be
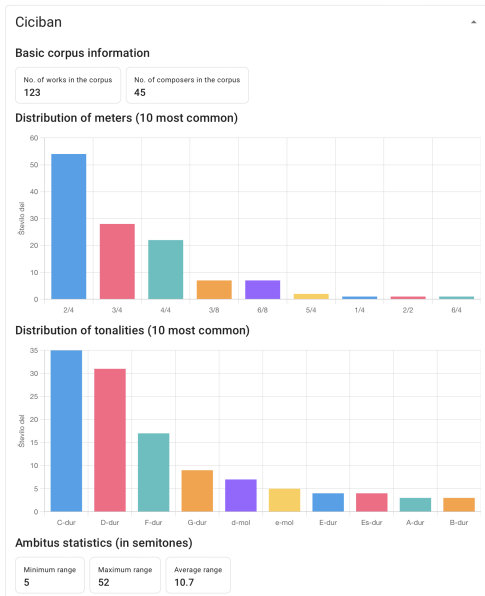
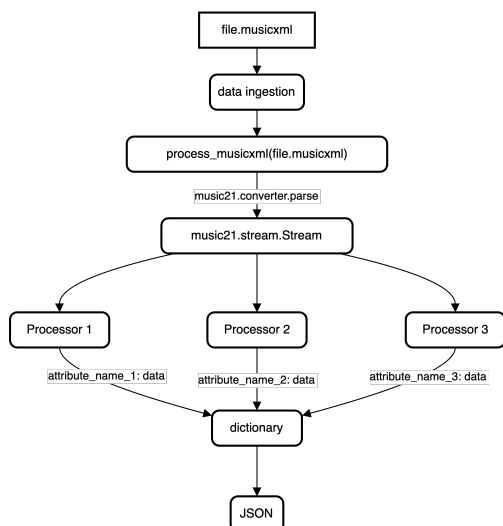**Figure 1**. Corpus overview

Figure 2. The processing pipeline

visualized in a time-pitch diagram. The user can choose to analyze the vocal melody or the accompaniment and can also view the RMS loudness levels. Additional options allow the user to visualize the detected beats, chord estimates or averaged pitch values instead of the detailed frequency data. While audio-based analyses can also be compared, cross-format comparison between audio and sheet music is not yet supported due to differences in contour calculation methods.

The platform's user interface is implemented as a web application using the Remix full-stack web framework. The homepage provides an overview of each corpus, including statistical summaries of meter, tonality and average ambitus in the case of musicXML corpora (see Figure 1) and average tempo in the case of audio files. The platform also offers advanced search and filtering features that allow users to query metadata and apply filters based

Figure 3. Representation of audio recording

on tonality, meter, tempo and note range in selected corpora. Users can also search for rhythmic and melodic patterns through specific queries. Currently, the tool is only available in Slovenian, as it was developed as part of a government-funded project; however, translation into other languages is expected to be completed in the near future.

3.2 Example of use

We demonstrate the application of our tool using corpora selected for the project *Music for the young people since 1945 and Jeunesses Musicales in Slovenia*.[1] The MusicXML corpus consists of 123 children's songs taken from the Slovenian children's magazine Ciciban, while the audio collection includes more than 1,200 recordings from six different corpora covering Slovenian children's songs, popular music and folk songs. Figure 3 illustrates the melodic contour of an audio recording calculated as an average of detected pitch values and chord estimates.

4. CONCLUSION

With the development of our tool, we have taken up the challenge of making complex MIR techniques accessible and usable for a wider audience. By integrating MusicXML and audio data analysis into a single, user-friendly platform, it simplifies the process of visualizing and comparing large music corpora. The tool's web interface enables intuitive browsing, searching and filtering of musical metadata, making it useful for musicologists and general users. Although cross-format comparisons between audio and sheet music are not yet possible, the platform provides a solid foundation for future enhancements. Ultimately, this tool is a significant step forward in making music analysis more accessible, as it helps users gain insights from large datasets without the need for advanced technical knowledge. The source code is available at https://github.com/filiptrplan/korpusi.

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[1] https://korpusi.musiclab.si

5. ACKNOWLEDGMENTS

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