TuneIn: A Web-Based Interface for Practicing Choral Parts

Sebastian Rosenzweig[1] **Lukas Dietz**[1] **Johannes Graulich**[2] **Meinard Müller**[1]

[1] International Audio Laboratories Erlangen, Germany
[2] Carus-Verlag GmbH & Co KG

{sebastian.rosenzweig, meinard.mueller}@audiolabs-erlangen.de, jgraulich@carus-verlag.com

ABSTRACT

Choir singers typically practice their choral parts individually in preparation for joint rehearsals. Over the last years, applications have become popular that support individual rehearsals, e.g., with sing-along and score-following functionalities. In this work, we present a web-based interface with real-time intonation feedback for choir rehearsal preparation. The interface combines several open-source tools that have been developed by the MIR community.

1. INTRODUCTION

Choirs aim at blending the voices of different choral parts to create a cohesive whole. To this end, choirs spend a significant amount of rehearsal time on improving timing and intonation. Since joint rehearsal time is limited, singers often need to practice their parts individually (e.g., at home) as preparation for the rehearsals. However, individual rehearsals face several practical limitations due to the lack of fellow singers, interaction, and feedback.

Over the last years, mobile applications ("apps") that support choristers in individual rehearsals have become popular. Two popular commercial examples are *Singerhood* [1] and *carus music* [2]. The general concept of both apps is similar: after selecting a piece, the user can sing along to a choir recording of the selected piece while reading its score on the screen. *Singerhood* includes multitrack choir recordings and allows for adjusting the volumes of different choral parts for playback. *carus music* is based on scores of music editions by the Carus publishing house and includes a score following functionality (music-synchronous highlighting of notes in the score during playback). Furthermore, *carus music* offers a piano playback of the chosen choral part as "coach" for the singer. Both apps are available for Android and iOS devices. A conceptually similar application named "Choir Singers Pilot" is currently under development as part of the European research project TROMPA [3].

Similar to these applications, we have developed a web-based interface to support choir singers during individual rehearsals. Beyond playback and score following functionalities, our interface provides real-time feedback on the singer's intonation. Our interface combines several open-source tools that have been developed by the MIR community. For demonstration purposes, we use recordings and sheet music of choral pieces with piano accompaniment from the Carus music editions. The pieces are arranged for vocal training with children and youth. [4]

2. TECHNICAL REALIZATION

Our web-based interface can be accessed via the following link:

`https://www.audiolabs-erlangen.de/resources/MIR/TuneIn`

The interface is organized in different modules (see Figure 1). In the first module, the user can configure the training session by choosing a piece and a choral part. The second module contains an HTML5 audio player with controls and a progress bar that plays back a mix of all voices. The third module contains a score follower. We use the tool proposed in [1], which displays a digital scan of the sheet music and highlights the currently played back measure. To this end, we annotated measure positions in the audio recordings and the scanned sheet music (in the form of bounding boxes given in pixel positions).

As the main feature, which is often not offered by other rehearsal applications, the fourth module includes a piano roll representation that indicates real-time intonation feedback during the singer's performance. The piano roll shows the notes of the chosen part obtained from a music XML version of the score. The representation is synchronized with the audio recording using beat annotations. When the user sings along to the playback, the interface records the singers' voice and estimates its fundamental frequency (F0) in real-time using CREPE [2] (and the JavaScript library *tensorflow.js* [5]). Furthermore, we determine deviations in cents of the estimated F0-values from

[1] https://singerhood.com

[2] https://www.carus-verlag.com/en/digital-media/carus-music-the-choir-app

[3] https://trompa.netlify.app

[4] https://www.carus-verlag.com/en/focus/singing-with-children-and-young-people/

[5] https://www.tensorflow.org/js

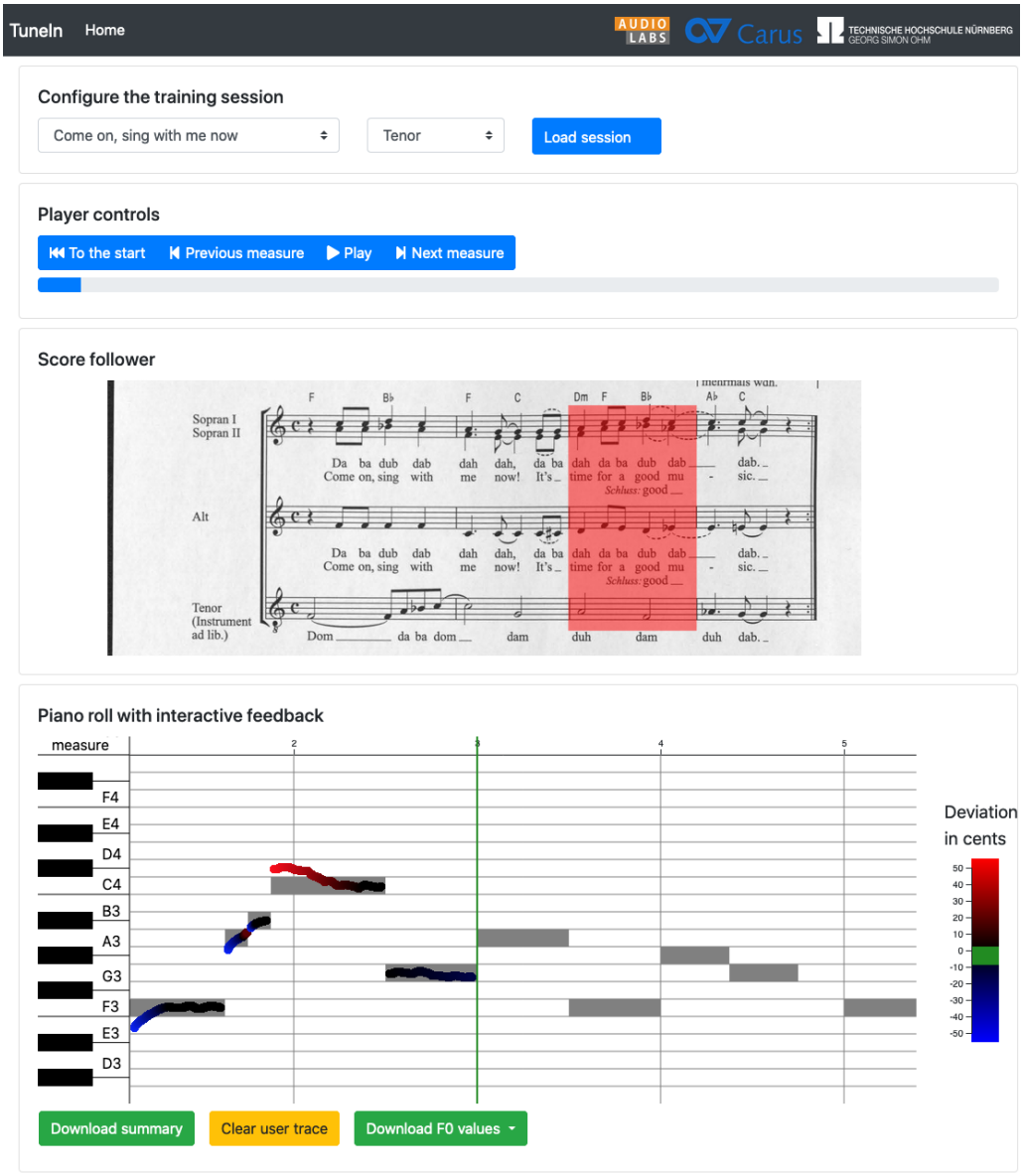

Figure 1. Web-based interface for practicing choral parts on the example of the piece "Come on, sing with me now" composed by Werner Rizzi, which is part of the Carus songbook *SingSangSong III*.

the MIDI center frequency. Since the piano accompaniment prevents the choir from drifting in intonation in the chosen recordings, the computed deviations can serve as an indicator for the intonation quality of the singer's performance. The singer's F0-trajectory and the color-coded deviations are visualized superimposed with the piano roll representation (red: positive deviation, blue: negative deviation). The singer can download the performance as an image or the estimated F0-trajectory as a CSV file for later analysis.

3. CONCLUSIONS

Seen individually, the utilized tools are not novel. However, their combination to a web-based, platform-independent interface with intonation feedback can be beneficial for choir singers during individual rehearsals. The modular structure of the interface and the usage of open source tools simplifies expanding functionality and repertoire in future work. Furthermore, our interface can serve as a starting point for exploring different (multitrack) audio players and score following techniques as well as a platform for interactive evaluation of F0-estimation algorithms.

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5. REFERENCES

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