

SONGS2SEE: LEARN TO PLAY BY PLAYING

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ABSTRACT

Songs2See is a music game developed based on pitch detection, sound separation, music transcription, interface development and audio analysis technologies. While keeping the entertainment and excitement of normal video games, *Songs2See* provides the users with a practice tool that makes the process of learning to play a musical instrument, a more enjoyable and engaging one. The two key features of this application are: 1. The use of real musical instruments instead of game controllers, 2. The possibility to create your own musical exercise content for the game. *Songs2See* is composed of two main applications: the *Music Game* used at practice time and the *Music Editor* used to create content for the game out of normal audio tracks.

During the **demo** session, the main features and options of both applications will be explained. We will show how the game works with different musical instruments, the practice modes supported, the learning aids included, i.e., fingerings, score view, piano roll view, and the analysis features available in the *Music Editor*.

1. SYSTEM OVERVIEW

As previously stated, *Songs2See* [1] is composed of two main applications which will be briefly described in the next two sections.

1.1 Music Game

The main features of the game are ¹:

- **Real-time Performance Feedback:** users can play their instruments directly to the computer microphone. A

¹ Demo version available at:
http://www.idmt.fraunhofer.de/eng/research_topics/s2s_en/Songs2See_web.html

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real time pitch detection algorithm [2] is used to evaluate users' performance. The melody played by the user is displayed on the screen for reference and a rating system gives points to the user when the correct pitch is played.

- **Instrument Selection:** the user can select among saxophone, piano, guitar, trumpet and flute. The most common fingering positions for the expected melody progression are automatically extracted and displayed in a real-time animation that guides the user's performance.
- **Score View:** the melody is displayed in common music notation and the progress on the score, as the game is running, is displayed on the screen.
- **Piano Roll View:** for the users that are not familiar with music notation, a piano roll view, popular in music rhythm games and karaoke applications, is also displayed.
- **Practice Modes:** any content loaded into the game can be practiced at normal speed, half speed and in a step by step mode where the progress of the game is halted until the user plays the correct note.

1.2 Music Editor

To create content for the game, users have the possibility to load any mp3 or wav file of their choice. The possibilities in terms of style, genre, and artist are thus, endless. The audio file is analyzed as follows:

- **Main Melody Extraction:** by means of a state of the art pitch detection algorithm [3], the most predominant melody in the track is extracted and displayed on screen. As detection errors can be expected, the user has the possibility to correct note durations and pitch, to include or delete notes that are missing and to refine the extraction to perfectly fit the recording.
- **Tempo and Key Analysis:** the analysis extracts the 5 most probable keys which the user can listen as chords played on top of the audio tracks and then refine as

needed. Tempo and beat grid extraction are also performed. The user can edit each beat independently, change or modify the time measure of the track or of specific measures. A tapping option is also included where the user can tap the beats in especially complex sections of the audio track.

- Solo and Accompaniment Track Creation ² : by means of sound separation techniques [4], [5], independent accompaniment and solo tracks are extracted from the original audio. Accompaniment tracks can be used as play-alongs, while solo tracks can be used for performance analysis purposes.

After the analysis has been performed, results can be exported as s2s files, i.e., the proprietary used in the *Music Game*, the accompaniment and solo tracks can be exported as mp3 or wav files, plus the solo track can be exported as MIDI or MusicXML.

2. CONCLUSIONS

Songs2See, with its two constituent applications, i.e., the *Music Game* and the *Music Editor*, offers a solid and flexible alternative for music gaming and practice. Supported by music technology, *Songs2See* brings music, entertainment and education closer together.

3. ACKNOWLEDGMENTS

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4. REFERENCES

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² Demo video available at:
<http://vimeo.com/27615655>