

SERIOUS GAMES FOR MUSIC LEARNING WITH REAL-TIME AUDIO INTERACTION

Mario Molina Isaac Ariza Ana M. Barbancho
Lorenzo J. Tardón Isabel Barbancho

ATIC Research Group, Dpto. Ingeniería de Comunicaciones, E.T.S.I. Telecomunicación,
Universidad de Málaga, E-29071, Málaga, Spain.

mmolina@ic.uma.es, iariza@ic.uma.es, abp@ic.uma.es, lorenzo@ic.uma.es, ibp@ic.uma.es

ABSTRACT

In this LBD, four Apps for learning music in a fun and interactive way are presented. These gamified musical Apps are based on real-time audio interaction algorithms developed by ATIC Research Group at Universidad de Málaga on the basis of musical and technical expertise.

1. INTRODUCTION

At ATIC Research Group at Universidad de Málaga [1], we have developed serious games aimed at helping and encouraging children and adults to learn music by playing. The serious game concept describes games that have an additional purpose like obtaining specific learning outcomes: psychological or physical skills by education, advertising, training or simulation [2]. These games are developed making use of new learning techniques and applying new technologies to teaching, taking advantage, in our case, of the professional musical knowledge of some member in the group.

Four Apps are presented: Recorder Teacher, SolFaMe, SolFaFly and SolFaDrop. These games use versions, modifications or adaptations of audio transcription algorithms developed through the years [3], [4], [5], with a simple and appealing user interface oriented to build the different serious games to learn musical notes, their sound and their spelling. These Apps have several playing modes and different levels of difficulty. These applications are now available to download on Google Play [6], [7], [8], [9].

2. APPS FOR MUSIC LEARNING WHILE PLAYING

In this section, four serious game music Apps in which our music processing algorithms are used are presented.

2.1 Recorder Teacher

Recorder Teacher is an interactive music game that makes it possible to learn to play the recorder in a enjoyable way.

In Figure 1, some screenshots of the application are shown. This App is designed for students in Primary and Secondary School, where the recorder is used as a basic tool in teaching music. It has several modes of operation:

- Let's Play: this mode allows to select a series of exercises to practice, such as scales or popular songs. The exercises consist of playing the current note correctly, while the placement of the fingers on the recorder appears on the right side of the screen. The application detects the performance of each note in real time and after finishing the exercise, a grade is given assessing the performance (Figure. 1(a)).
- Editor: this mode allows to create your own scores, which, later, can be used to practice in Let's Play mode. These scores can also be saved and shared with friends (Figure. 1(b)).
- Tune up: this mode allows to tune the recorder by playing a note.



(a) Let's Play mode

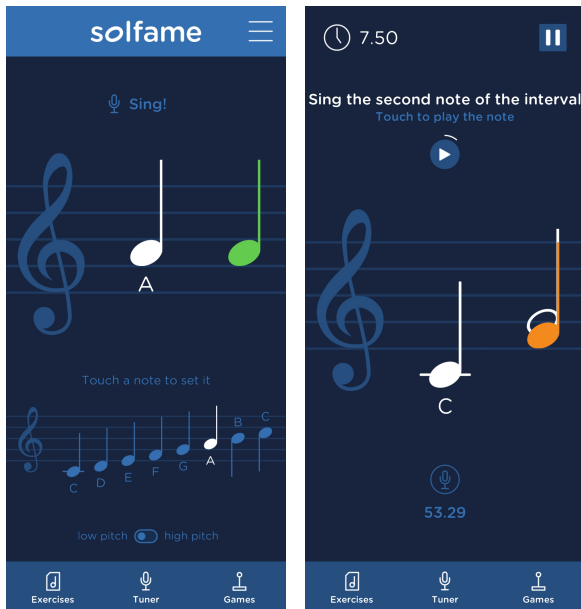


(b) Editor mode.

© Mario Molina, Isaac Ariza, Ana M. Barbancho, Lorenzo J. Tardón and Isabel Barbancho. Licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). **Attribution:** Mario Molina, Isaac Ariza, Ana M. Barbancho, Lorenzo J. Tardón and Isabel Barbancho, "Serious games for music learning with real-time audio interaction", in *Extended Abstracts for the Late-Breaking Demo Session of the 22nd Int. Society for Music Information Retrieval Conf.*, Online, 2021.

Figure 1. Recorder Teacher screenshots. Available on Google Play [6]: <https://play.google.com/store/apps/details?id=com.paramo.fluteteacher>

This application has been developed in collaboration with Paramo Games.



(a) Tuner (b) Sing interval exercise.

Figure 2. SolFaMe screenshots. Available on Google Play [7]: <https://play.google.com/store/apps/details?id=com.abonfireofsouls.SolFaMe>

2.2 SolFaMe

SolFaMe is designed to learn notions of musical language in a friendly, orderly and interactive way, using the sound of the voice. It is oriented to the general public and, specifically, to those are interested in learning the sound of notes and their spelling (see Figure 2), though other options and concepts are taught.

This application is able to detect the sung notes in real time, indicating the note sung at each moment. You can choose between three main options:

- Tuner: You can preview the notes and select the note you want to train by singing (Figure 2(a)).
- Exercises: in this option you can choose different exercises to learn musical notes, train your ear, sing the notes, practice note intervals, sharps, flats, etc.
- Games: this choice drives to other Apps in our music learning environment: SolFaFly and SolFaDrop, which are described next.

This application and the games SolFaFly and SolFaDrop have been developed in collaboration with A Bonfire of Souls [10].

2.3 SolFaFly

SolFaFly is another interactive music application to learn to tune your voice while playing. In Figure 3, some screenshots of the application are shown. The player must sing the right note to control a drone up and down through a series of obstacles getting points every time one of them is overcome. It has different difficulty levels with diverse numbers of notes and works for both low and high voices. It also includes classical and ABC musical notation.

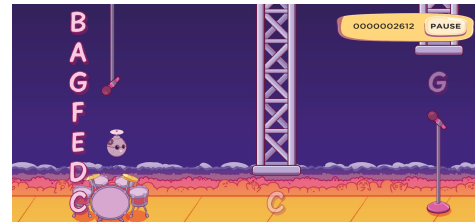


Figure 3. SolFaFly screenshot. Available on Google Play [8]: <https://play.google.com/store/apps/details?id=com.abonfireofsouls.SolFaDrop>



Figure 4. SolFaDrop screenshots. Available on Google Play [9]: <https://play.google.com/store/apps/details?id=com.abonfireofsouls.SolFaFly>

2.4 SolFaDrop

SolFaDrop is an interactive music game application where you can also learn to tune your voice. The player must sing the correct note, the one falling down the screen, to move the robot left or right and get points. Silence symbols also drop and must be avoided in order not to lose points. In Figure 4, actual game screenshots are shown.

3. CONCLUSIONS

The applications Recorder Teacher, SolFaMe, SolFaDrop and SolFaFly can be used to learn and improve musical skills while playing, in an enjoyable way. They can all be used by general public, both adults and children. All of them have an easy-to-understand an appealing graphical interface as well as very good performance regarding real-time audio interaction thanks to the algorithms developed by ATIC Research Group.

4. ACKNOWLEDGEMENTS

This work has been funded by "Proyecto singular de actuaciones de transferencia del conocimiento Campus Excelencia Internacional Andalucía TECH. Ecosistema innovador con inteligencia artificial para Andalucía 2025" (UMA-CEIATECH-26) and Junta de Andalucía under Project AT17-5883-UMA (PAIDI 2020). The work has been done at Universidad de Málaga, Campus de Excelencia Internacional Andalucía Tech.

5. REFERENCES

- [1] ATIC Research Group. <https://www.uma.es/atic>.
- [2] Clarac C. Abt. Serious games. The Viking Press, 1970.
- [3] E. Molina, A. M. Barbancho, L. J. Tardón, and I. Barbancho. Evaluation framework for automatic singing transcription. In International Society for Music Information Retrieval (ISMIR), pages 27–31, 2014.
- [4] E. Molina, L. J. Tardón, A. M. Barbancho, and I. Barbancho. SIPTH: Singing transcription based on hysteresis defined on the pitch-time curve. *IEEE Transactions on Audio, Speech, and Language Processing*, 23:252–263, 2015.
- [5] C. Roig, L. J. Tardón, I. Barbancho, and A. M. Barbancho. Automatic melody composition based on a probabilistic model of music style and harmonic rules. *Knowledge Based Systems*, 71:419–434, 2014.
- [6] Recorder Teacher: <https://play.google.com/store/apps/details?id=com.paramo.fluteteacher>.
- [7] Solfame: <https://play.google.com/store/apps/details?id=com.abonfireofsouls.SolFaMe>.
- [8] Solfafly: <https://play.google.com/store/apps/details?id=com.abonfireofsouls.SolFaFly>.
- [9] Solfadrop: <https://play.google.com/store/apps/details?id=com.abonfireofsouls.SolFaDrop>.
- [10] A Bonfire of Souls Studio: <https://abonfireofsouls.com/>.