



Interactive Music Science Collaborative Activities
 Team Teaching for STEAM Education

Deliverable 5.8
Intermediate music activities based on mathematical equations and geometric curves

Date:	23/04/2018
Author(s):	Álvaro García (WIRIS) and Daniel Martín-Albo (WIRIS)
Contributor(s):	-
Quality Assuror(s):	Laurent Varin (CABRI), Erica Andreotti (UCLL)
Dissemination level:	PU
Work package	WP5 – Workbench of iMuSciCA prototypes
Version:	1.0
Keywords:	music activities based on math equations
Description:	This deliverable reports on the initial implementation of the music activities based on mathematical equations and geometric curves.



H2020-ICT-22-2016 Technologies for Learning and Skills
iMuSciCA (Interactive Music Science Collaborative Activities)
 Project No. 731861
 Project Runtime: January 2017 – June 2019
 Copyright © iMuSciCA Consortium 2017-2019

Executive Summary

This deliverable reports on the intermediate implementation of the music activities based on mathematical equations and geometric curves. Users can hand-draw strokes that are converted into the most suitable mathematical equation. Moreover, users are able to sonify (play) those functions, as the tool assigns a particular frequency (or intensity) to each point of each function depending on its y-value. The demonstrator is accessible here:

<https://wiris.imuscica.eu/sonification/release/v2/tool.html>

Changes and new features in this version:

- The tool now works over secure HTTPS connection.
- Equations can now be sonified in three different modes:
 - **Frequency mode:** The y-value correlates to a particular frequency.
 - **Intensity mode:** The y-value correlates to a particular intensity with a fixed frequency of 440 Hz.
 - **Notes mode:** The y-value correlates to a particular note.
- Now the range of frequency/intensity/notes played by the tool can be chosen by moving a side toolbar (slider) that displays this range.
- The tool implements support for copy & pasting features from the workbench clipboard with data compression.
- Updated settings screen with slider settings and instrument selector.

Note that the development of the activity environments continues, and the updated stable version of the activities based on Mathematical Equations and Geometric Curves can be accessed at <http://platform.imuscica.eu/workbench.html> under the left icon of the Math and Science section.

Version Log			
Date	Version No.	Author	Change
26-03-2018	0.1	Daniel Martín-Albo (WIRIS)	Initial content
26-03-2018	0.5	Álvaro García (WIRIS)	Updated content
26-03-2018	0.6	Daniel Martín-Albo (WIRIS)	Reviewed content
28-03-2018	0.6	Daniel Martín-Albo (WIRIS)	Address reviewers comments
23-04-2018	1.0	Vassilis Katsouros (ATHENA)	Finalized and submit to EU

Disclaimer

This document contains description of the iMuSciCA project findings, work and products. Certain parts of it might be under partner Intellectual Property Right (IPR) rules so, prior to using its content please contact the consortium head for approval.

In case you believe that this document harms in any way IPR held by you as a person or as a representative of an entity, please do notify us immediately.

The authors of this document have taken any available measure in order for its content to be accurate, consistent and lawful. However, neither the project consortium as a whole nor the individual partners that implicitly or explicitly participated in the creation and publication of this document hold any sort of responsibility that might occur as a result of using its content.

This publication has been produced with the assistance of the European Union. The content of this publication is the sole responsibility of iMuSciCA consortium and can in no way be taken to reflect the views of the European Union.

iMuSciCA is an H2020 project funded by the European Union.

TABLE OF CONTENTS

Executive Summary	1
1. Introduction	5
2. Installation and technical requirements	5
3. Description of new features and user manual	6

LIST OF ABBREVIATIONS

Abbreviation	Description
URL	UNIFORM RESOURCE LOCATOR
ATHENA	ATHENA RESEARCH AND INNOVATION CENTER IN INFORMATION COMMUNICATION & KNOWLEDGE TECHNOLOGIES
UCLL	UC LIMBURG
EA	ELLINOGERMANIKI AGOGI SCHOLI PANAGEA SAVVA AE
IRCAM	INSTITUT DE RECHERCHE ET DE COORDINATION ACOUSTIQUE MUSIQUE
LEOPOLY	3D FOR ALL SZAMITASTECHNIKAI FEJLESZTO KFT
CABRI	Cabrilog SAS
WIRIS	MATHS FOR MORE SL
UNIFRI	UNIVERSITE DE FRIBOURG
GUI	GRAPHIC USER INTERFACE
HTTPS	HYPertext TRAnSFER PROTOCOl SECURE

1. Introduction

In this deliverable we will describe the updates performed in the tool since [D5.2-Initial Music Activities Based on Mathematical Equations and Geometric Curves](#).

2. Installation and technical requirements

This tool is intended to be included in the iMuSciCA workbench as an iframe using the following code:

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
  "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html>
  <head>...</head>
  <body>
    <iframe src="https://wiris.imuscica.eu/sonification/release/v2/tool.html"
frameborder="0"></iframe>
  </body>
</html>
```

The tool adapts itself to the size of the container iframe, although a minimum iframe size of 650x400 is required.

3. Description of new features and user manual

The demonstrator of the new version of the tool is accessible here:

<https://wiris.imuscica.eu/sonification/release/v2/tool.html>

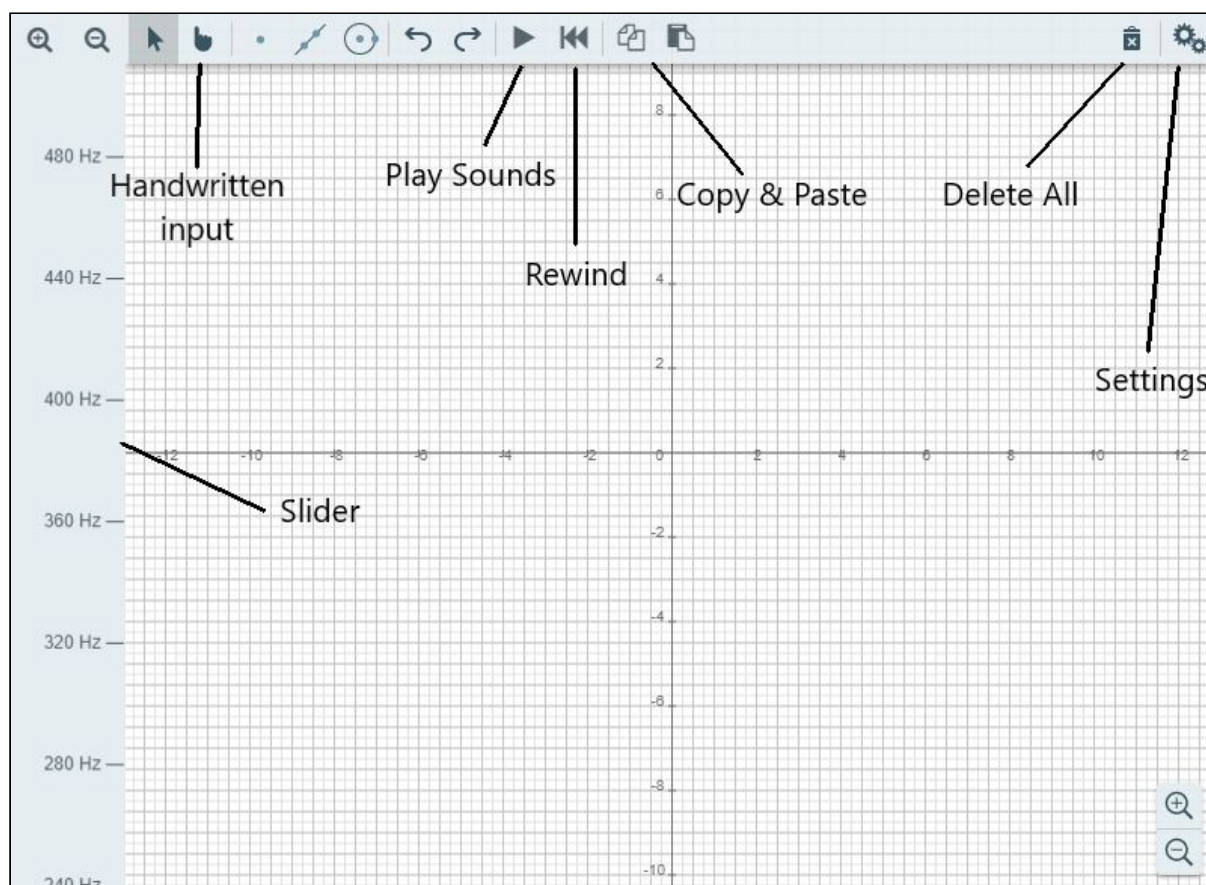


Figure 3-1: Sonification tool interface

Changes in this version:

- The tool now works over HTTPS, a secure protocol which uses certificates to validate server identity to avoid impersonation.
- The tool can now produce sound using specific instrument timbres, by using their Fourier transform parameters to play sounds.
- The workbench clipboard has been integrated through the Import/Export functionality. This allows the user to:
 - copy the whole geometrical scene, or a specific function to the clipboard for later storage;
 - paste from the clipboard various objects: functions from the Handwritten Math Recognizer tool, geometrical primitives from itself, or Fourier transforms of instrument timbres from other tools.

- The GUI has been updated. The 'Open Math Editor' button has been removed, in favor of sharing through the new Import/Export functionality. In its place, two new Copy/Paste buttons (these buttons will only appear if the tool is executed within the iMuSciCA Workbench) have been added to copy elements from the Sonification tool into the Workbench Clipboard and vice-versa.
- The left-side toolbar called Slider allows the user to slide and choose the frequency or intensity range the sounds will be generated in when they press the ► button. Frequencies range from 220 Hz to 7000 Hz. Intensities can now range from 0% to 100%, with a fixed frequency of 440 Hz when using the intensity mode.
- The Settings screen has been updated (see Figure 3-2), allowing the user to choose the Sonification mode, either by frequency, by intensity or by notes; the instrument timbre that will be used to play sounds; the interval that will be used by the slider; and the numeric label step for the slider.

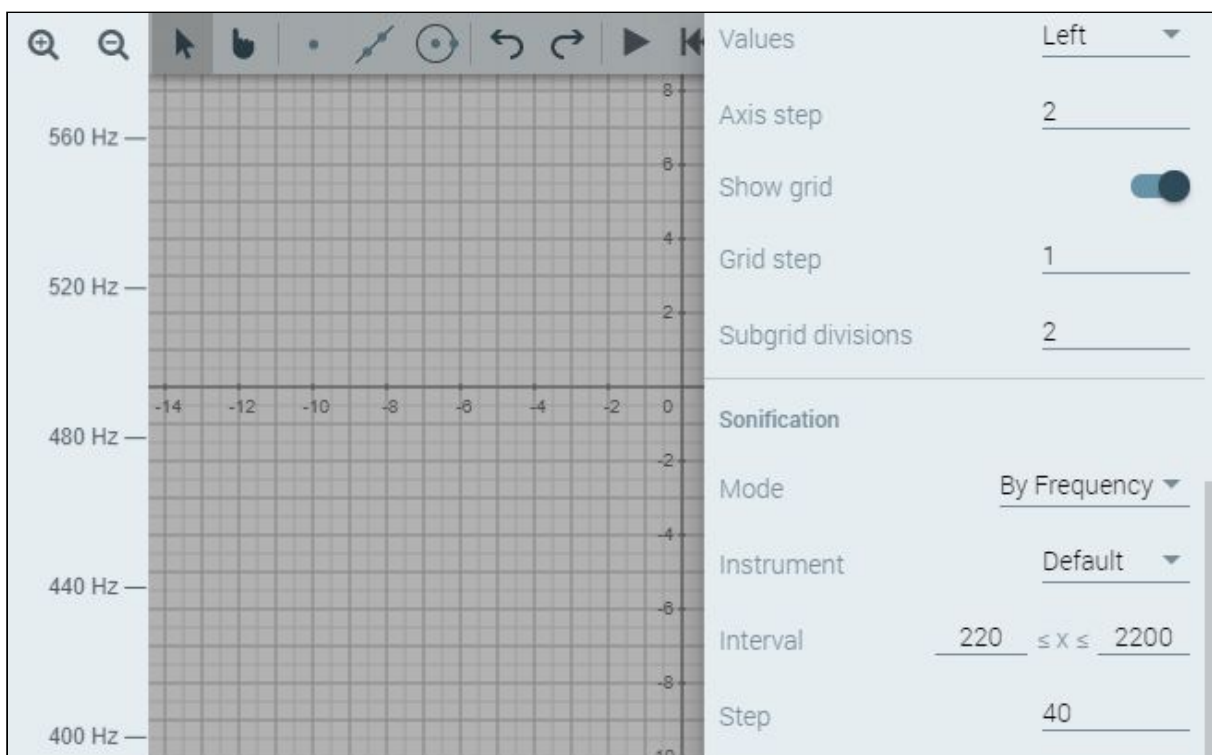


Figure 3-2: Sonification tool Settings screen