



Interactive Music Science Collaborative Activities
 Team Teaching for STEAM Education

Deliverable 5.12

Final 3D musical instrument interactive design kit

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Dissemination level:	PU
Work package	WP5 – Workbench of iMuSciCA prototypes
Version:	1.0
Keywords:	3D musical instrument, virtual musical instrument design
Description:	This deliverable reports on the final implementation of the 3D musical instrument interactive design kit.



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

This deliverable reports on the final implementation of the 3D musical instrument interactive design kit. The tool has been evolved in terms of architecture, instruments and GUI. It also has several fixes and UX improvements. The environment can be access at:

<http://devtest.leopoly.com/3d-interaction-repository-V6/leopolyDesign.html>

Changes and new features in this version:

- Graphical engine update: whole environment is Unity-based now.
- New GUI conforming to workbench design and UX improvements
- New model descriptor: enables instrument switching with no load time
- New instrument: Tromba marina
- New features implemented:
 - One-click switch to 3D Interaction environment
 - Download STL/OBJ for 3D print
 - Copy-Paste/Save-Load and hibernate
 - Presets available
- Several small fixes and improvements in usability

Note that the updated stable version of the 3D musical instrument interactive design kit can be accessed at <http://platform.imuscica.eu/workbench.html> under the Engineering icon.

Version Log			
Date	Version No.	Author	Change
14.05.2019	0.1	Carlos Acosta	Initial version
22.05.2019	0.2	Carlos Acosta	Submit to reviewers
23.05.2019	0.2	Foteini Simistira	Reviewers feedback
21.06.2019	1.0	Vassilis Katsouros	Submission to EU

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iMuSciCA is an H2020 project funded by the European Union.

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LIST OF ABBREVIATIONS

Abbreviation	Description
3D	3 Dimension(al)
GUI	Graphical User Interface
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 [D5.7 \(Intermediate 3D musical instrument interactive design kit\)](#).

2. Installation and technical requirements

This tool is intended to be included in the iMuSciCA workbench as an iframe using the following URL: <https://leopoly.imuscica.eu/create?application=imuscica-V6&parentHost=https://workbench.imuscica.eu&instrument=monochord>

For full functionality of the tool, latest Chrome browser is recommended. No additional applications or plugins are needed to run this tool.

3. Description of new features

- **Graphical engine update: whole environment is Unity-based now.**

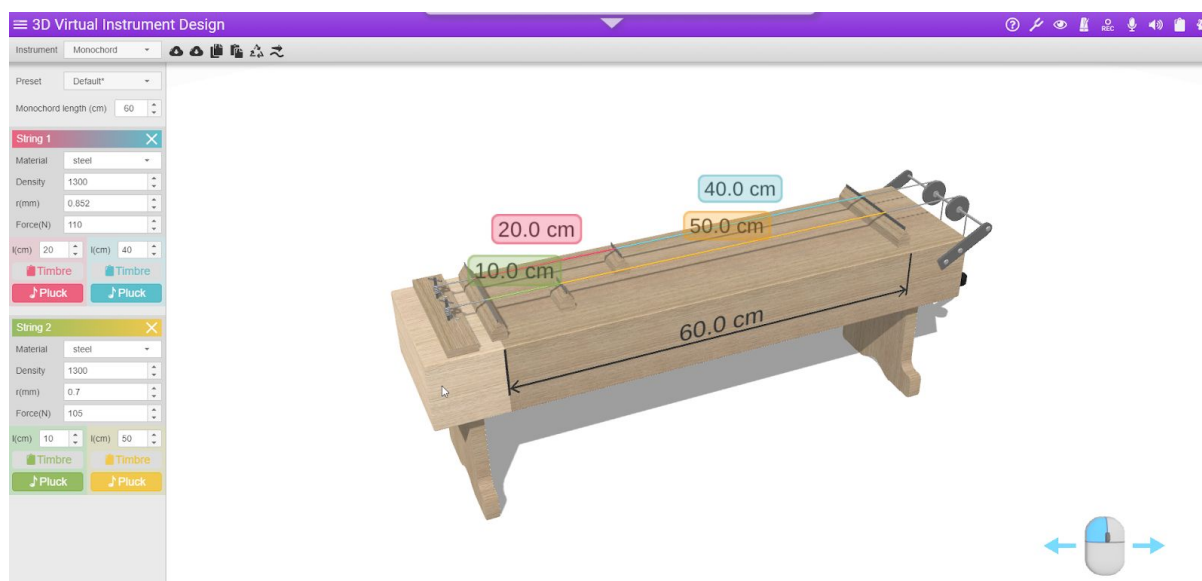


Figure 1-1: New LOOK: Monochord

The Unity engine has several benefits over the Leopoly proprietary graphical engine:

- Unity has a huge developer resource background and they developed a good-looking, fast and easy-to-setup game engine which enables developers like Leopoly to easily build state-of-the-art look-and-feel and interactions. Those saved resources can be focused on 3D modelling development.
- Maintenance and update of the app needs much less resource which has a huge positive impact on stability.

- Complex interactions can be easily implemented and maintained
- Graphical implementation can be done by actual designers by their own and not by developers with designer help. This enables a much improved visual design
- **New GUI conforming to workbench design and UX improvements**

As seen in Figure 1-1 to 1-5 the GUI is much more improved. The focus while implementing the improvement was to conform to workbench and improve UX

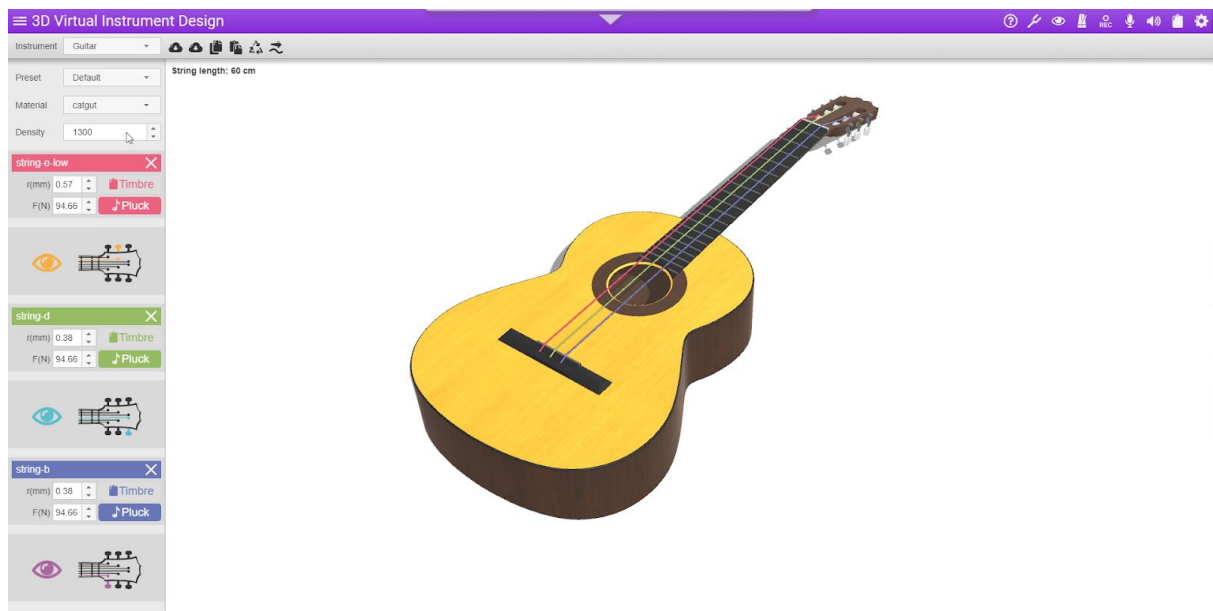


Figure 1-2: New LOOK: Guitar

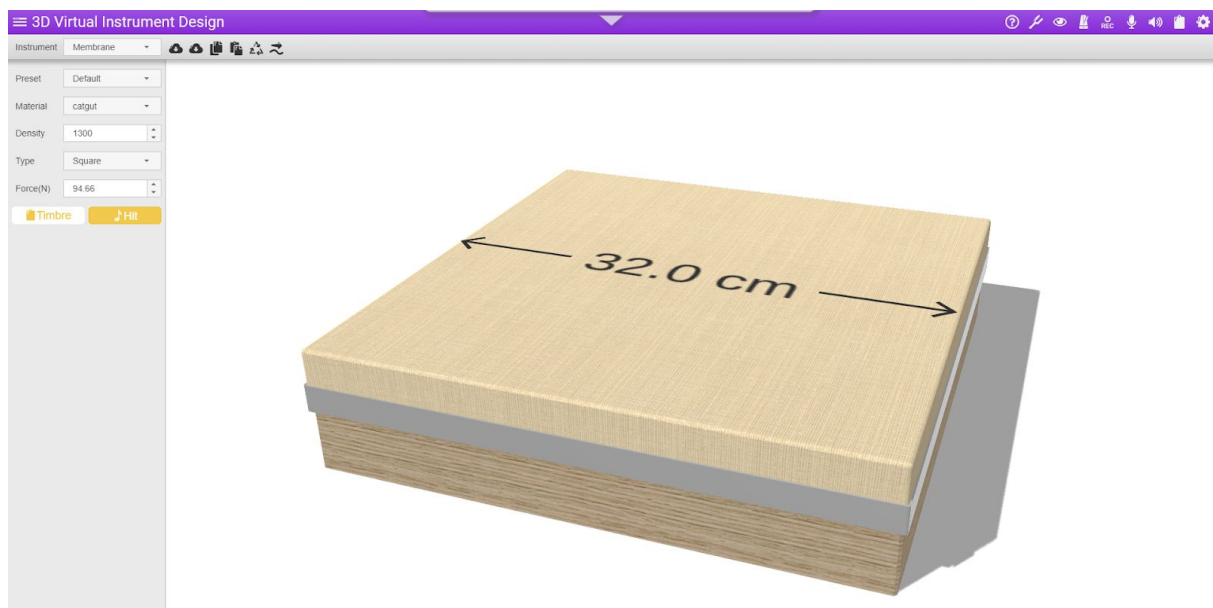


Figure 1-3: New LOOK: Membrane



Figure 1-4: New LOOK: Xylophone

- **New model descriptor: enables instrument switching with no load time**

Earlier model descriptor included the whole mesh of the instrument. The load time was quite long while the system needed to load the actual mesh and textures all the time. Thanks to the switch to the new 3D modeling format GLTF it is now possible to only load references and deformation matrix which drastically reduces data amount so loading time. Compared to the old method which took 3-10 seconds to load an instrument, now it is less than half a second.

- **New instrument: Tromba marina**

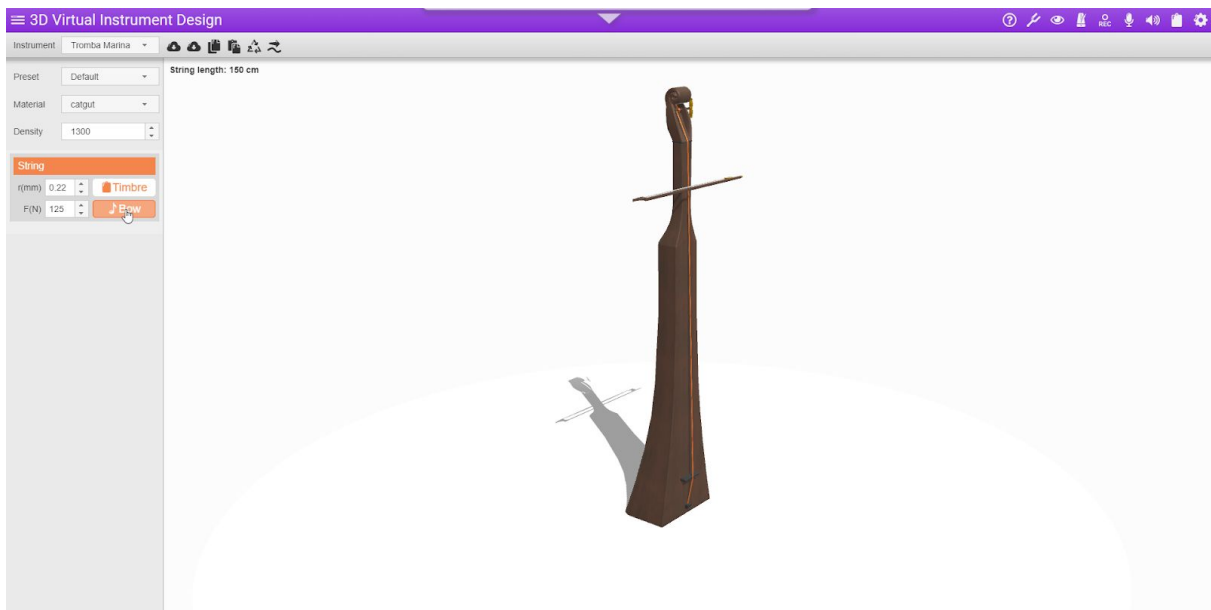


Figure 1-5: New instrument: Tromba Marina

The new instrument is based on the guitar but has a special interaction when playing on it: “Bow”. The instrument geometry is static but the string parameters can be customized.

- **New features implemented:**

- One-click switch to 3D Interaction environment

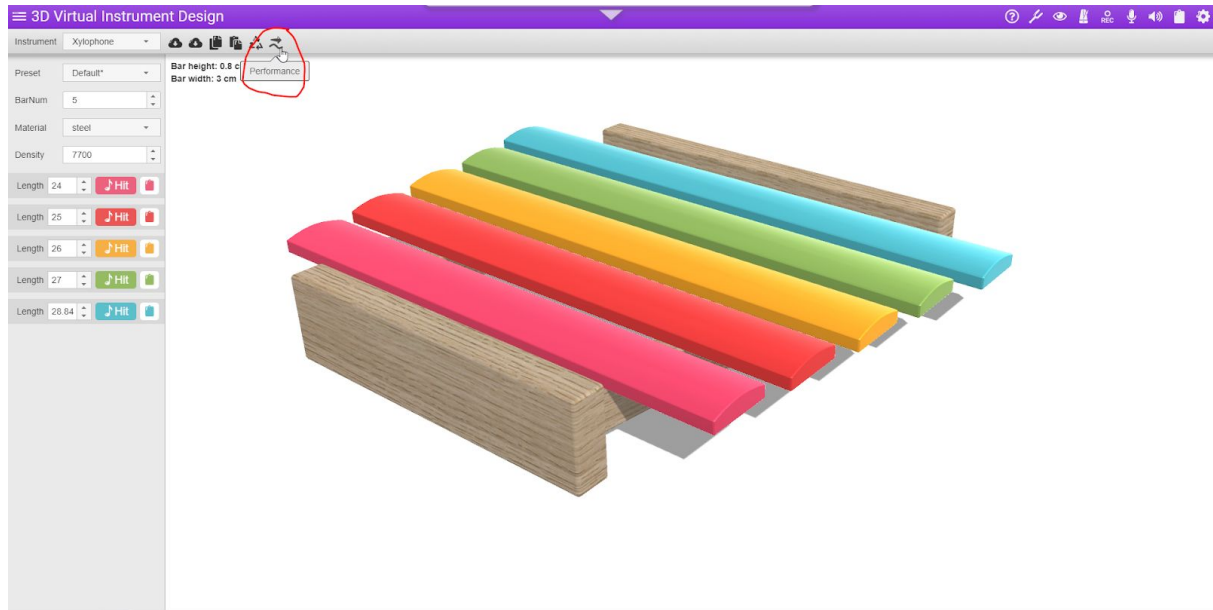


Figure 1-6: One click switch

With this new feature it is possible to copy instrument -> switch environment to 3D performance -> paste instrument by a single click. This also works backwards from the 3D Performance Environment

- Download STL/OBJ for 3D print

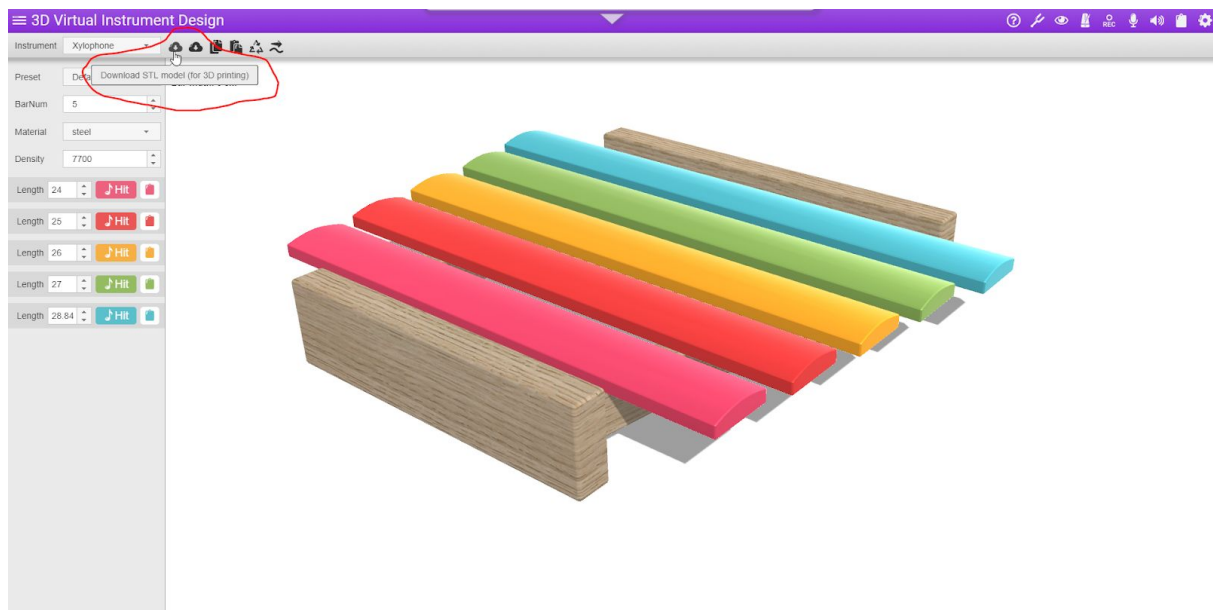


Figure 1-7: Download STL/OBJ

The instrument design is possible to be downloaded as STL or OBJ files. These files can be used in several 3D modelling applications including 3D printer preprocessors.

○ **Copy-Paste/Save-Load and hibernate**

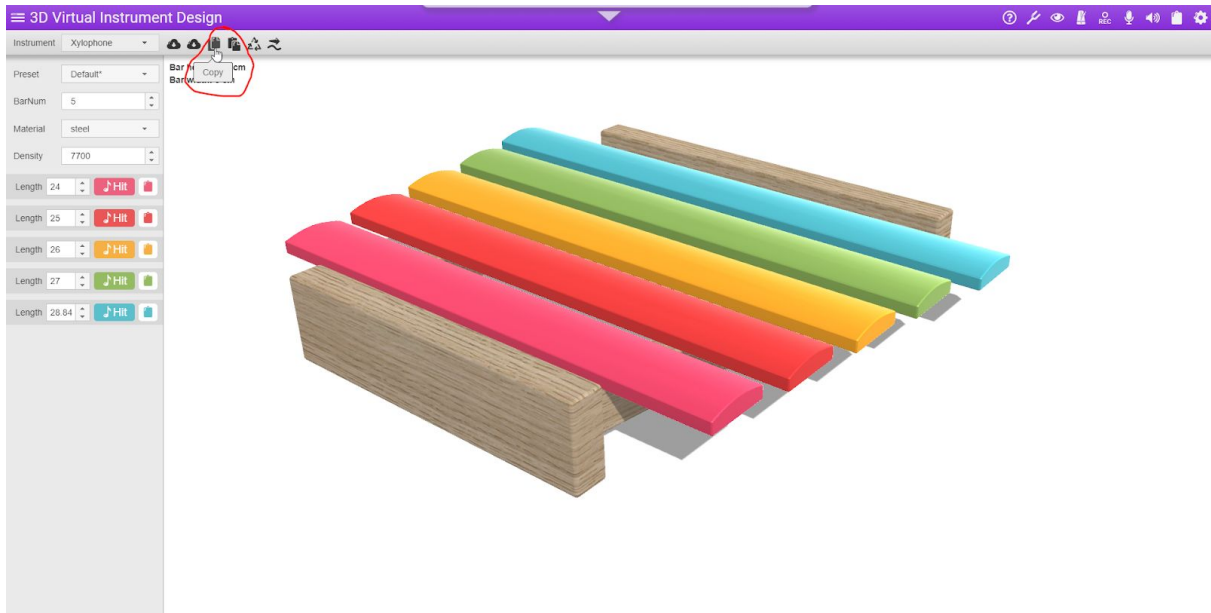


Figure 1-8: Copy-paste

3D Virtual Design environment can now handle Clipboard of the workbench. Only instrument type item is supported. This can be used to transfer instruments to 3D Performance Environment. The same data structure is used to save data to the permanent storage of the workbench and it is also used for the lately implemented hibernate function which enables to resume the environment state after user switches between workbench tools.

○ **Presets available**



The environment now supports read-only presets.