



**Interactive Music Science Collaborative Activities**  
 Team Teaching for STEAM Education

**Deliverable 4.3**  
**First Version of 3D design environment for music instruments**

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# Executive Summary

In this deliverable we present the first version of the 3D design environment for musical instruments.

At this stage in the project there will be four virtual instruments: a monochord, a circular membrane, a rectangular membrane and a xylophone. The user can alter virtually some boundary conditions and, by coupling this to a sound engine of Ircam, the user can hear the result of this manipulation.

The mentioned virtual instruments can be accessed by the following URLs:

<https://makers.leopoly.com/create?application=imuscica-V1&instrument=monochord>

<https://makers.leopoly.com/create?application=imuscica-V1&instrument=circle-membrane>

<https://makers.leopoly.com/create?application=imuscica-V1&instrument=square-membrane>

<https://makers.leopoly.com/create?application=imuscica-V1&instrument=xylophone>

Version Log			
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26-09-2017	0.1	Carlos Acosta (LEOPOLY)	Initial content
29-09-2017	0.2	Carlos Acosta (LEOPOLY)	Add suggested modifications by quality assurors
06-10-2017	1.0	Vassilis Katsouros (ATHENA)	Submission to the EU

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## TABLE OF CONTENTS

<b>Executive Summary</b>	<b>1</b>
<b>1. Introduction</b>	<b>5</b>
<b>2. Installation and technical requirements</b>	<b>5</b>
<b>3. Detailed description of core enabling technology</b>	<b>8</b>

## LIST OF ABBREVIATIONS

Abbreviation	Description
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
VR	VIRTUAL REALITY
AR	AUGMENTED REALITY
CPV	COLOR PER VERTEX

# 1. Introduction

Leopoly offers a complete digital asset creation platform and content management solution specializing in easy to use 3D and VR / AR tools, content management and asset libraries in the browser, on mobile devices and in Virtual and Augmented reality (AR/VR) and stand alone applications for many industries including

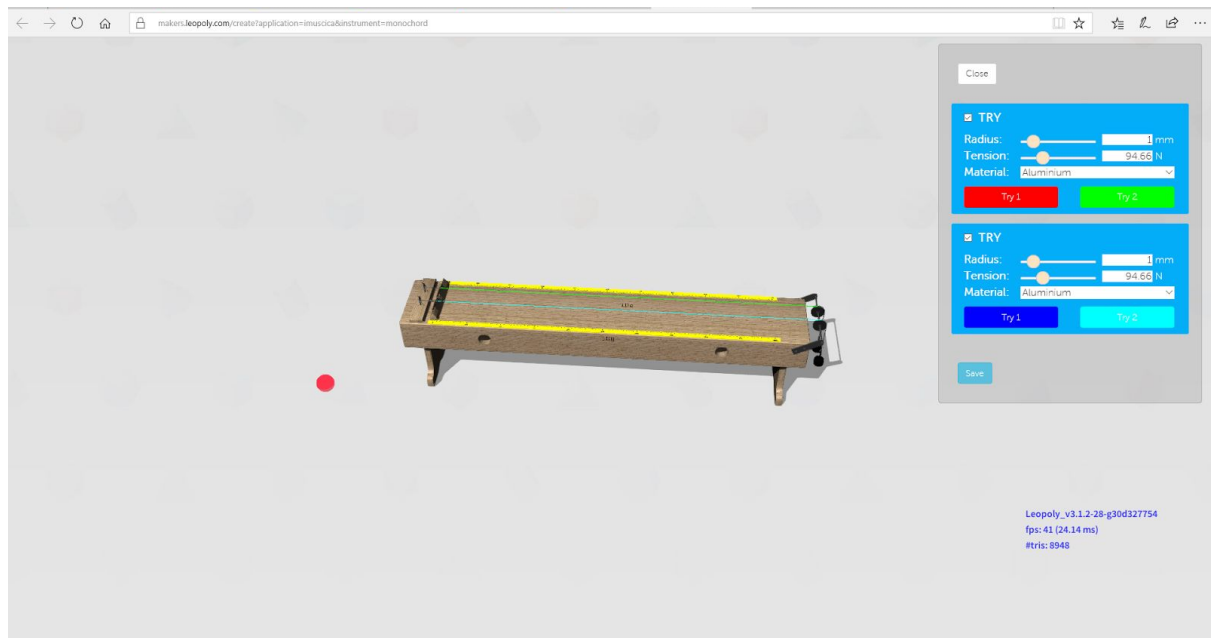
- 3D Printing
- Augmented Reality
- Virtual Reality
- Retail & ecommerce
- Game Development
- Web Development

Our aim is to provide the best solution to create and deploy amazing digital content on any platform easily and effectively. Leopoly tools and features are under continuous development by applying of state-of-the-art technology and improving our engine.

## 2. Installation and technical requirements

Leopoly web-based engine can be set up in unlimited way and most of the options can be found on <https://makers.leopoly.com>. One of the 3D editor engine's advantages is that it can (and preferred to) be tailored for the given object so user can only manipulate the object as designer allows. This will be the case for iMuSciCA instruments, where tools of Leopoly will be chosen and set up for the given virtual instrument object. In the following URLs we present sample virtual musical instruments in the 3D editor engine. For each one there has been added a control panel that allows the user to define basic parameters of the virtual music instrument that modify its sounding behaviour.

<https://makers.leopoly.com/create?application=imuscica-V1&instrument=monochord>



<https://makers.leopoly.com/create?application=imuscica-V1&instrument=circle-membrane>



<https://makers.leopoly.com/create?application=imuscica-V1&instrument=square-membrane>



<https://makers.leopoly.com/create?application=imuscica-V1&instrument=xylophone>



Leopoly engine is supported by most recent versions of Edge, Chrome and Firefox browsers. No additional apps or plugins are needed to run the editor.



## 3. Detailed description of core enabling technology

A short video of Leopoly's numerous tools and supported platforms can be found here:

<https://www.youtube.com/watch?v=OSe6Rc0Pa3U>

### Technology

Leopoly's proprietary 3D Engine is built up from the ground in C++ and WebGL allowing us to offer clients high quality, custom turn-key products that are lightweight and deployed faster for any platform. Our engine and modular development processes are key to enabling our team to remain agile and provide superior products for every client.

All of our 3D and VR tools are available everywhere you are.

- Modular C++ Engine utilizing WebGL and very soon WebVR technology to bring our 3D and VR engine to the Web.
- Cross-Platform Availability
  - Web Browsers (Firefox, Chrome, Edge...)
  - Mobile devices (Android, iOS)
  - AR/MR/VR Platforms (HTC Vive, Oculus, HoloLens, Meta...)
- Browser based 3D and VR applications and asset creation.
- VR 3D modeling applications and asset management

### Features

We make it easy for you to create, customize, assemble, share, import, and export 3D files and digital objects within seconds. Leopoly offers a wide range of 3D design tools and products from our premier ShapeLab applications for 3D modeling in the browser and in VR to 3D product configurators and multi-user collaboration using our 3D sculpting and parametric design tools. We also offer a huge online gallery where users can save, store, share their creations. Check out some of our products and services below.

#### Platform Features

- 3D/VR/AR sculpting and painting
- 3D engraving (images, text and patterns)
- Microsite creation and deployment
- Manage assets and users through a simple web interface
- Create 3D editors and configurators easily and no programming required
- Add multi-user collaboration tools to any project

- Developer API for customizing everything, including the tools, user interface and much more
- Create embeddable 3D and soon WebVR content
- Import/Export all major 3D and vector files. Texture maps and CPV supported
  - .STL, .OBJ, .WRL, .FBX, .PLY
  - .AI, .SVG
- Import 3D Scan Data
- Repair 3D meshes and scan data automatically

#### Shape Lab Products

- ShapeLab VR - VR 3D modeling tools available on Steam / Oculus Store / Vive port
- 3D editing tools available in any browser and on mobile devices
- ShapeLab LT - 3D editing on Mobile VR platform compatible including GearVR and Google Daydream

#### 3D Sculpting and Painting

- **Pull/Push** the surface directly with different intensity
- **Erase** the surface you do not need or like
- **Smooth** the surface to decrease polygons and simplify your creation
- **Flatten** the 3D object to create perfectly flat surfaces
- **Edge** the grooves or any part of your object
- **Sculpt** the object as if it was plasticine
- **Shift** parts of the mesh to move features and details around as needed
- **Mirror mode** enables you to sculpt on both side of the object symmetrically
- Modify Paint color, hue, saturation & brightness and Color picking tools

#### Parametric Design

- Create primitive objects like square, cylinder and spheres, and define segments and radius
- Specify unit of measure
- Define objects segments
- Modify the vertical resolution and the sides of the object
- Twist objects to deform them into fun and useful shapes
- Squeeze objects to modify specific regions
- Wave/Ripple the object on X, Y, Z axis
- Scale on any axis or uniformly