

Sound Clay: An Immersive Art Form by Sculpting Clay and Sound

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Abstract. This paper attempts to show the fourth generation of the immersive art forms - Immersive Art - Interactive art platforms that artists and designers serve audience to make their own art through this art platform. The user not only participated in media art, but also they can make their own art. This paper will focus on demonstration all of the above. Therefore we introduce the art form 'Sound Clay' on the border of Immersive Art. An audience can deform clay and refine transforming sound simultaneously in the immersive environment. Thus, this study provides an exciting opportunity to advance our knowledge of user experience design in the media art. Our second goal is to develop a range of techniques that support intuitive 3D modeling interactions based on free-form sculpting operations like those used when working with modeling clay.

Keywords: Virtual clay, three-dimensional modeling, augmented reality, head-mounted display, hand tracking systems, interactive art, sound generating systems

1 Introduction

1.1 The Next Generation of Interactive Media Art

The advances in science and technology have been always reflected in art. From a few years ago, arts shifted gradually from traditional forms towards new media types. The current development in digital media arts involves a significant amount of new carriers in not only new materials, but also in perusing technology, resulting in new dynamic and interactive forms [1, 2].

Looking into the development of public arts, especially the introduction of interactivity, based on the work of Edmonds, Turner and Candy [3], Wang, Hu and Rauterberg defined three generations of art and generative technology according to the carrying material, technology and interactivity [2]: 1) Static forms: there is no interaction between the art artifact and the viewer, and the artifact does not respond to its context and environment. 2) Dynamic forms: the art artifact has its internal mechanism to change its forms, depending on time or limited to reacting to the changes in its environment such as temperature, sound or light. The viewer is

however a passive observer and has no influence on the behavior of the artifact. 3) Interactive forms: the viewer has an active role in influencing the dynamic form of the art object. The input from the viewer can be gesture, motion, sound as well as other human activity that can be captured by the artifact's sensorial layer. When interactivity is introduced, the "dialog" between the viewer and the perceived dynamic form of the artifact can always vary depending on the difficult-to-predict behavior of the human viewer.

This paper attempts to show the fourth generation of the immersive art forms - Immersive Art - interactive art platforms that artists and designers serve audience to make their own art in the immersive environment. The user not only participated in media art, but also they can make their own art. Through this platforms, they can concentrate this art more deeply and more time in the immersive environment [4]. Then artists and audience can communicate each other to refine unique art forms.

In this paper will give an account of the art form 'Sound Clay' on the border of Immersive Art. An audience can deform clay and refine transforming sound simultaneously in the immersive environment. Thus, this study provides an exciting opportunity to advance our knowledge of user experience design in the media art.

To conform above definition of Immersive Art, Sound Clay uses many devices to make immersive environment. In this virtual environment, an audience can deform clay easily, and can listen to altered sound each of clay. This system will be an electronic musical instrument, then through get together all of the processes, they can make own music.

1.2 Intuitive 3D Modeling for Laymen

3D Graphic artists, industrial designers, researchers and those of many other disciplines perform creating and capturing 3D models using 3D modeling applications, such as Autodesk's 3dsMax or Maya. But current 3D modeling applications perform surface modeling using a range of input devices including keyboard, mouse and tablets. Manipulation techniques are based around mathematical operations to alter surface shape and require extensive training to master. It takes time to get used to seeing a 3 dimensional model in a 2 dimensional monitor. Also, it is difficult to fabricate a 3 dimensional model using 2 dimensional input devices such as a mouse, or a tablet [5].

Our second goal is to develop a range of techniques that support intuitive 3D modeling interactions based on free-form sculpting operations like those used when working with modeling clay. By using the clay sculpting metaphor for the interaction technique design, we endeavored to leverage people's pre-existing understanding of physical clay modeling properties [6].

2 Sound Clay System

Three devices are used to implement this tool. Imagine pushing the keyboard and mouse aside, and reaching into a truly 3 dimensional modeling environment with both

your hands through Leap Motion. And using the Vuforia from Qualcomm for augmented reality, it enables one to see that model on the marker from many angles through webcam on the Head Mounted Display (HMD). Finally, wearing Oculus Rift. One of next generation HMDs, It offers environment that engrosses you in the model by making you think you're seeing it in real life.

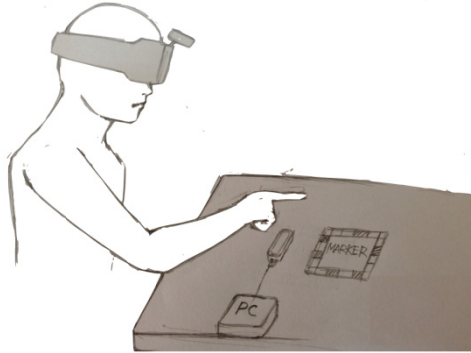


Fig. 1. System overview

Table 1. System specifications

<i>Name</i>	<i>Type</i>	<i>Version</i>	<i>Usage</i>
Apple iMac	Hardware		Personal computer
Microsoft LifeCam Studio	Hardware		Tracking marker
Leap Motion	Hardware		Tracking hands
Oculus Rift	Hardware	For developer	Head Mounted Display
Unity Engine	Software	4.0	Game Engine
Qualcomm Vuforia SDK	SDK	2.5.8	Augmented reality

3 Hand Gestures for Deforming Clay

It provides four gestures, classified by how to deal with a model with both hands. It's the same sort of idea as making a doll out of clay. First, trim the general appearance by molding it with your palms. Second, knead it with your hands. Last of all, take out specific portion by hold and take it up with your thumb and index finger. An audience more easily and instinctively fabricates the model by doing these four gestures.

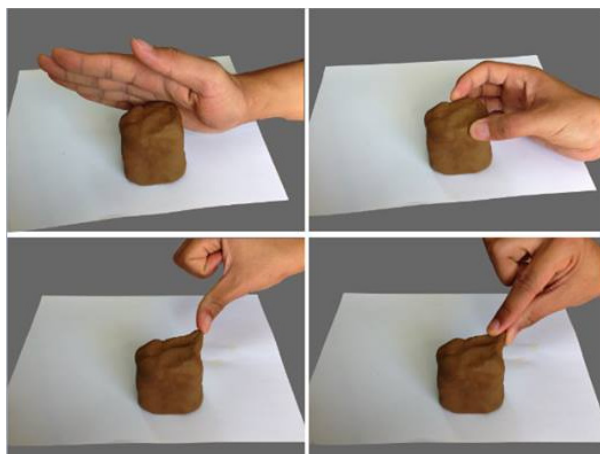


Fig. 2. Four hand gestures for deforming virtual clay

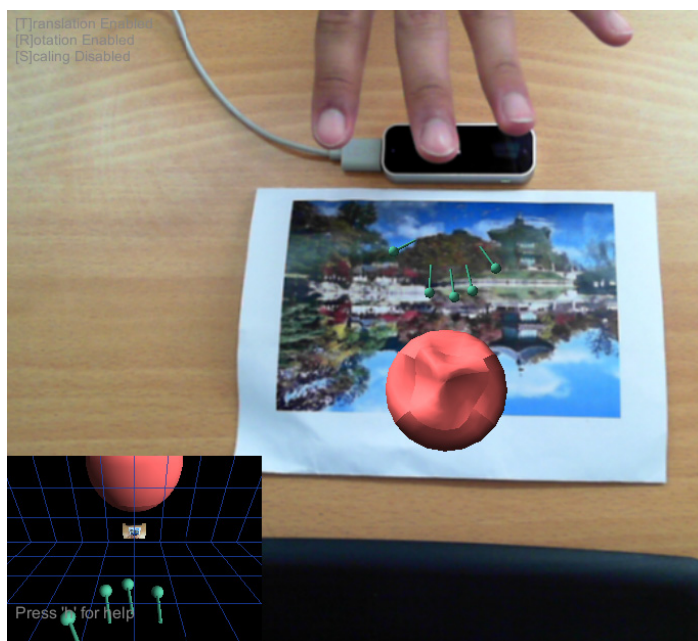


Fig. 3. Prototype view

4 Conclusion

In Immersive media art a Sound Clay is now reaching beyond Interactive media art. In this art space, deforming virtual clay using real hands becomes simultaneously-generated sound. I have argued that in order to make physical and sound interactions in fully immersive augmented environment.

The Sound Clay project also showed the possibility to provide fully immersive augmented environment for deforming clay and sound using HMD, hand tracking device, and AR marker.

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