# Sculpture DAXR

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## 1. PROGRAM NOTES

The performance of *Sculpture DAXR* is an offshoot of the *Oscuterium* project, created by the group, RedSpills, a collaborative trio of new musical instrument technologists, artists and performers: Michał Seta (Montreal, Quebec, Canada), Dirk Stromberg (Republic of Singapore), and D. Andrew Stewart (Lethbridge, Alberta, Canada).[1] While *Sculpture DAXR* can be experienced as a live, in-person, multi-media show involving the karlax digital musical instrument (DMI), live coding, video and sound projection, this work is best experienced in its original form: a hybrid performance and experience in which the participants (performer, audience) inhabit both a live venue in real life (IRL) and a 3D virtual reality (VR) meeting point in Mozilla's real-time communications platform, Hubs
(see Figure 1). The innovative nature of this work arises from the production of sound **directly within** the Hubs environment using the Faust (Functional Audio Stream) programming language (i.e., browser-based software synthesis engine). Both sound creation and 3D objects are transformed by real-time data transmitted from a DMI over the internet.

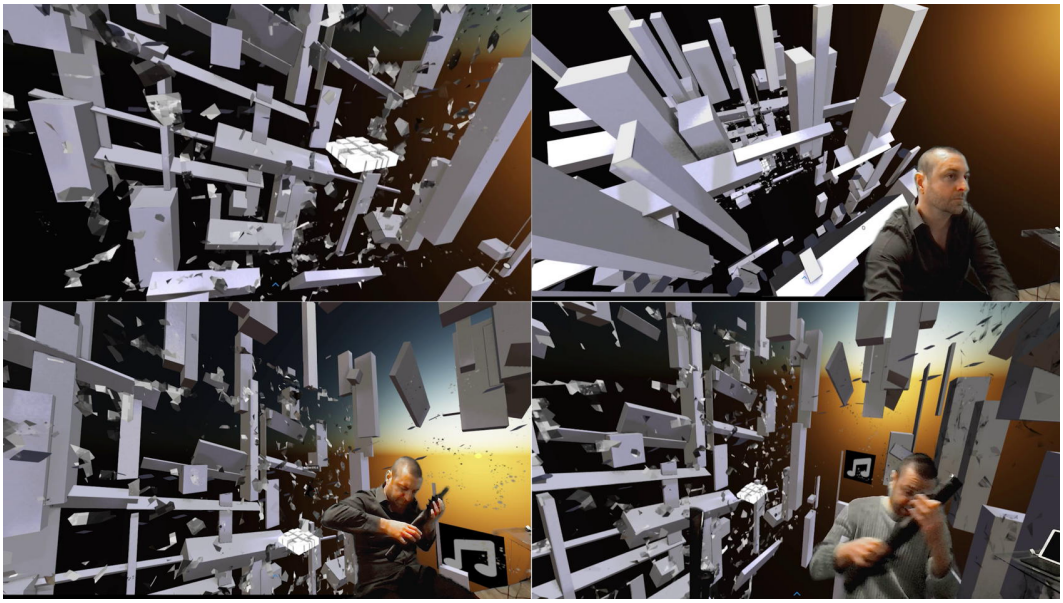

Fig. 1. Four perspectives of the Hubs environment for *Sculpture DAXR*

[1] For more information about RedSpills, visit redspills.gitlab.io



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## 2. PROJECT DESCRIPTION

### 2.1 Overview

One digital musical instrument (DMI) performs *Sculpture DAXR*, transmitting Open Sound Control (OSC) messages to Mozilla's Hubs, a real-time communications platform for virtual reality, augmented reality, desktop, laptop, or mobile. [2] OSC messaging is accomplished using BabyHands – software inspired by Allhands, by Michael Palumbo.[3] BabyHands addresses specific issues of interoperability among customised Hubs clients. The karlax (DMI) and Tidal Cycles (live coding/scripting) are used to control the real-time visual manipulation of 3D objects in Hubs, while at the same time producing sound with browser-based software synthesis engines built using the Faust (Functional Audio Stream) programming language.[4]

### 2.2 Audience

Participants – the audience – may experience the performance by attending a live staged event, with the digital instrumentalist or by logging in to the Hubs environment, where they will encounter the digital instrumentalist in the form of an avatar. Importantly, the Faust synthesis engines integrated into Hubs are instantiated by the web browser of each audience member inside Hubs. As a result, audio quality is significantly advanced and is only dependent on the processing power of each audience member's computer.

### 2.3 Control surface

For this project, the performer generates output data with a unique original control surface, or Digital Musical Instrument (DMI). A DMI comprises a control surface (i.e., gestural controller, input device) and a sound generation unit, both of which are independent modules and are linked *via* liaison strategies between the output signals of the control surface and the input parameters of the sound unit [2]. In *Sculpture DAXR*, the performer uses the karlax, which has a significant presence in the NIME community. The karlax resembles a clarinet or soprano saxophone in size and geometry, although its control structures do no involve blowing air through the instrument. Instead, the karlax wirelessly transmits data to a sound engine (e.g., computer software instrument) by manipulating 10 keys (with continuous range output), 8 velocity-sensitive pistons, 17 buttons and a combination mini-joystick and LCD character display, operated with the thumb of the left hand. The interior of the karlax contains both a 3-axis gyroscope and 3-axis accelerometer. In addition, the upper and lower half of the karlax can be

[2] https://hubs.mozilla.com/docs/welcome.html
[3] https://github.com/michaelpalumbo/allhands
[4] http://www.dafact.com (karlax), https://tidalcycles.org (Tidal Cyles), https://faust.grame.fr (Faust)

twisted in opposite directions; that is to say, the upper and lower half can be rotated in opposite directions because the joint between the two halves of the instrument acts as a type of rotary potentiometer with a maximum rotation angle of 65°. Furthermore, at each angle boundary (i.e., 0° and 65°), the karlax offers an additional 12.5° of resistive twist space, providing a resistive force for the performer, who may have a sensation similar to bending or pulling a spring – albeit the movement is still a twisting/turning motion [1].

### 2.4 Structural transformation in the artistic system

A technology is interactive to the degree that it reflects the consequences of our actions or decisions back to us. It follows that an interactive technology is a medium through which we communicate with ourselves – a mirror. The medium not only reflects back, but also refracts what it is given; what is returned is ourselves, transformed and processed [3]. The NIME community has produced control surfaces, and DMIs, that create a rich range of sonic material, reflecting the consequences of the performer's actions through intelligent mapping strategies. In this project, the performer's decisions are mirrored, additionally, through structural transformations of 3D objects in Hubs. Consequently, an action-reaction potentiality occurs not only in a dynamic change in the structure of the artwork but also in the spectator's cognition. In this way, *Sculpture DAXR* promotes an interactive system that not only refers to a mental level between the spectator [audience, performer] and the artwork, but also on a level of structural transformation in the artistic system [4].

### 2.5 Frugal Music Innovation

The performer (D. Andrew Stewart) of Sculpture DAXR, along with the team who developed the Oscuterium project (see Program Notes, above) are inherently cross-disciplinary scholar-artists, combining music composition and performance with the visual media arts and computer science. These artists also have an interest in open source hardware and software and, thus, their projects belong to a community of like-minded people. Furthermore, the Hubs-centric artworks are accessible to anyone with a standard web browser, including mobile platforms; the artworks are invitations to explore free on-line virtual meeting points that can be navigated with merely a computer keyboard and mouse.

## 3. PERFORMANCE NOTES

Participants – the audience – may experience the performance in one of two scenarios: (1) attending a live staged event with the digital instrumentalist on karlax or, (2) by logging in to Mozilla's Hubs environment, where they will encounter the digital instrumentalist, and sound, in the form of an avatar. In the first scenario, the performance venue should be suitable for critical listening and include a high-speed internet connection (ethernet is preferred) and 2 to 6 high-quality loudspeakers. Additional specifications are listed, below. In the second

scenario using Mozilla's Hubs, participants use their own personal listening devices (headphone or loudspeaker) – a console game controller (e.g., PlayStation 4 DualShock Controller) is also useful for navigating the Hubs environment.

#### 3.1 Stage space

- A performance area of 3 by 3 meters

#### 3.2 Set-up, sound check and rehearsal

*Sculpture DAXR* should take approximately 20 minutes to set up, if all equipment is immediately available. After set-up, a 60-minute rehearsal in the venue would be appreciated, if possible.

#### 3.3 Networking

Robust and stable high-speed internet connection is required. Please note that one of the features of the performance is exploring the remote transfer of data. Participants – the audience – could potentially participate be connecting from different parts of the world.

#### 3.4 Computing and web browser

One computer for projecting both the visuals and audio produced in Hubs is required. All live audio synthesis occurs in a web browser. Google Chrome and Mozilla's Firefox are the browsers of first choice. The computer remains separate from the performer's rig and a NIME facilitator is fully in charge of this computer. The facilitator logs in to the Hubs environment and projects/relays their experience to the live audience; project the experience to the in-person audience.

#### 3.5 Audio

- 2 to 6 high-quality loudspeakers
- 1 to 2 subwoofer
- 2 stage monitors
- Audio cables (1/4-inch male to mixing console)

#### 3.6 Video

- Digital projector and large screen for projecting Hubs environment

#### 3.7 Green screen (option)

A green screen could permit the artist to produce a third scenario for participants, who are not part of the in-person audience. Setting up a screen behind the artist, along with adequate lighting that permits proper chroma keying, would allow for a seamless visual overlay of the artist into the Hubs environment, which could be transmitted to participants *via* Twitch, for example.

### 3.8 Electrical

- Power bars and cord

### 3.9 Furniture

- 1 chair
- 1 low and small table

### 3.10 Components provided by the artist

- Digital musical instrument (karlax)
- Computing power for instrument
- Audio interface with 1/4 inch audio outputs

## 4. MEDIA LINK(S)

- Video: vimeo.com/791525997

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## ETHICAL STANDARDS

The submitted work does not involve research with people or animals..

## REFERENCES

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