The *Ancestral Symbol* installation: how unpredictable interactions are musically organized to create a sound of a Paleolithic cave sign

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**Abstract**
This text explains how the visitors’ unpredictable movements are transformed into a consistent narrative musical form by using electronic devices with no central software to control them in the interactive installation *Ancestral Symbol*, created by Edson Zampronha. The installation uses a paleolithic cave sign as the basis for the connection of sounds and images through the visitors’ movements in the installation room, thus connecting art, archaeology and interactivity. This text explains the technology involved, the sounds and visual materials used, how the visual elements work as loudspeakers, and the strategic spatial distribution of all the elements to organize the installation.

In 2019, I created the visual-sound installation *Ancestral Symbol* for the “Archaeological Site – 12 Artists, 12 Visions” exhibition held at the *Experimental Archaeology Centre* (CAREX) in Burgos, Spain. CAREX is next to the internationally recognized archaeological site of Atapuerca, and this exhibition aimed to build bridges between art and archaeology [1]. The core element I used in order to connect archaeology and art was a graphic sign found in paleolithic cave paintings usually called the claviform [2,3], showed in Fig. 1. This sign appears in various ways in paleolithic caves, and I took its shape as a starting point to create the *Ancestral Symbol* installation. However, I simplified and stylized it, interpreting it as a straight line with a deviation (also in Fig. 1).

![Fig. 1. The claviform: as depicted by its author (left), in its stylized form (middle), and as read in the time axis (right) © Edson Zampronha](http://direct.mit.edu/leon/article-pdf/doi/10.1162/leon_a_02050/1927579/leon_a_02050.pdf by guest on 22 November 2021)

The installation room includes three paintings, twenty-two dried gourds, four wood sticks, and four electronic devices working independently. Fig. 2 shows the installation floor map. Fig. 3 is an illustration of the elements included in it (notice that just three walls are represented – the fourth wall is empty), and Fig. 4 shows the three paintings included in it © Edson Zampronha
Fig. 2. Floor map of the Ancestral Symbol installation as exhibited at CAREX, Spain, 2019. (© Edson Zampronha)

Fig. 3. Illustration showing the elements included in the Ancestral Symbol installation as exhibited at CAREX, Spain, 2019. (© Edson Zampronha)
Fig. 4. The three paintings used in the installation Ancestral Symbol. (© Edson Zampronha)

The three paintings represent a process by which a singular mark is abstracted to become a symbol. Painting A has one gourd attached to the canvas. The gourd on the canvas is a metaphor for a mark on the ground that calls your attention, but you do not know what it means. Painting B has twenty-one gourds attached to it. Metaphorically speaking, you compare similar marks and recognize they all share a common shape that can be abstracted to give rise to a symbol. Painting C has no gourds, and it depicts graphically the abstracted shape shared by all marks, i.e., the stylized claviform.

Starting from different points of view, most archaeologists agree that the graphic signs found in paleolithic caves are symbols, although there are only hypotheses about their meanings [4 – 6]. For this reason, I freely interpreted the claviform as a graphic representation of a sound so that the material aspects of the claviform relate to the visual aspects of the installation, and its hypothetical meaning relates to the sounds. Therefore, almost all the sounds in this installation share the same stylized claviform shape, which is why the meaning is the stylized claviform shape expressed in the sounds (the connection between the stylized claviform shape and the sounds is iconic), as I will explain in detail later. In this way, the claviform shape is read as if it were a kind of score. Moreover, the sequence of sounds is designed to be listened to as a narrative piece of music in which its opening is followed by a tension (a deviation) and a resolution (a release), reproducing the stylized claviform sign in the time axis (Fig. 1). This narrative form may give visitors the impression that this piece of music “tells them something”, which is a convenient metaphor to explain the connection between sounds and the hypothetical meaning of the claviform. Besides, considering that its meaning is a hypothesis that depends on
the way an observer interprets it, the use of interactivity to change the sounds is fully justified in the context of this installation, as it only changes the sounds, not the images, since the meanings of the sounds change according to the visitors’ point of view, whereas the images are fixed both in the installation and in the paleolithic caves.

The interactivity

Interactivity is a key concept found in a wide variety of new multimedia artworks. A sound installation, for instance, might be responsive to the visitors’ actions in such a way that their actions influence what they listen to. However, if the sounds and their narrative musical organization relate to the meaning of the stylized claviform shape and this meaning depends on the visitors’ unpredictable actions, the challenge is to put both things together, i.e., to obtain a musically organized result from the visitors’ unpredictable actions.

In *Ancestral Symbol*, the solution for this challenge does not use a central software to filter the visitors’ actions and organize the sounds musically. Instead, it uses four electronic devices that work independently, with no central control, and it works efficiently because the temporal musical organization is distributed onto a spatial organization, which is put to work properly by visitors’ movements. As a result, the complexity of the electronic devices could be reduced to a minimum.

The electronic devices are very small to be as inconspicuous as possible. Each one includes just a motion sensor, a small programmable circuit board (the Arduino Pro Mini), a mini player that plays sounds from an SD memory card (the DFPlayer Mini), a volume control, and connectors (Fig. 5).

![Fig. 5. The electronic device, the vibration speaker and dried gourd used in the installation *Ancestral Symbol*, as exhibited at CAREX, Spain, 2019. © Edson Zampronha, 2019)](image-url)
Each electronic device has a different set of five sounds, and the Arduino Pro Mini circuit runs the Pure Data software to randomly select which of the five sounds is played each time. However, the five sounds inside each device are similar. In fact, it is as if each device had one single sound which is played in five different variations so that you always listen to the same musical idea in different ways, avoiding mechanical repetitions and keeping the visitors’ interest in the installation.

Once a sound is selected, its audio signal is sent to a small vibration speaker (see Fig. 5). Vibration speakers do not make any sound. Instead, they transform sound waves into vibrations, and when they are in contact with reverberating surfaces like the dried gourds and the canvases used in this installation, they vibrate accordingly, amplifying the sounds that can now be listened to. However, as canvases do not amplify sounds very well, I glued patches of foam board behind them to get a louder sound. So, there are no traditional speakers in this installation at all. All sounds come from both the gourds and the canvases, and are modified by their natural resonance frequencies. Concerning the gourds, which have been used as resonators since ancient times, they give the sounds a specific quality that is likely to be similar to the ones our ancestors could have listened to thousands of years ago.

The sounds

All sounds are non-realistic artistic transformations of recorded sounds, such as sounds from nature. However, for this text, it is relevant to identify a few characteristics that connect them with each painting. Fig. 6 displays the sound waves of three sounds from paintings A, B and C. In painting A, the idea of a mark on the ground that calls your attention is represented by an irregular and noisy sound (the ground) that attracts your attention and creates expectations because it has a sudden attack (it starts with the deviation). The gourd sounds, but the canvas does not, reinforcing the idea of a singular mark on the ground. Its sound wave is unstable, with sudden ups and downs, as well as a noisy and complex timbre. Conversely, the sound from painting B is expressive and contrasting, creating the idea of a deviation that requires a resolution in this context. It is less unstable than in painting A. This one does not sound like an attack, it is noisy at the beginning, but with a sense of pitch at the end, but it is not exactly claviform-shaped. Besides, the sound comes from a gourd at the center of the painting that causes a few others in contact with it to vibrate, which suggests multiplicity. In painting C, the sound wave resembles the stylized claviform closely. The sound is smooth, clean, and with a clear pitch. As this painting has no gourds, the whole canvas amplifies the sound, intensifying the idea of generality and abstraction. Finally, painting B also includes a set of sounds coming from its canvas. These are background sounds that contextualize all the others, which I will comment on later.
The musical organization and its spatial distribution

The four electronic devices are responsible for detecting the visitors’ movements and launching the sounds. They are attached to the walls at average waist height or below. They are barely visible, therefore, most of the interactions are involuntary. Besides, every sound is preceded by 1.5 to 14 seconds of silence, which eliminates the impression of a mechanical response like when you press a button and immediately get the same sound again and again. As a result, visitors have the impression the installation is responding to them, although they do not know exactly how it happens.

Because of the placement of the paintings in the room (Fig. 3), the result is similar to a quadraphonic sound system: one sound source comes from the left (painting A), another one from the right (painting C), and two from the front (the sound of the gourds and the background sound, both from painting B). However, the placement of the paintings produces an asymmetric surround sound: painting C is not across from painting A, giving the sensation that its sounds come slightly from the back, and painting B is displaced to the left.

One of the key points for the construction of a musical organization is that the sounds from each painting fulfill a different musical function. The sounds from painting A function as an opening. They are like attacks calling your attention and triggering an expectation. The sounds from painting B’s gourds are contrasting and expressive, and they are like a deviation from the other sounds, creating tension that calls for resolution. The sounds from painting C serve the function of resolution (release). They are calm and clean, resolving all tensions from painting B as well as expectations from painting A. Concerning the background sounds that come from the canvas of
painting B rather than from the gourds, their function is to create different sound contexts. They last longer (about two minutes) and are not preceded by silence, which is why they follow each other without noticeable gaps. In this way, not only do they contextualize all the other sounds but also create a continuity that links all of them. Every time they change, they create variation by introducing a different context with a new quality and mood.

Another key point for the construction of a musical organization is the already mentioned strategic location each painting occupies in the room. Both the strategic location of the paintings and the different musical functions of their sounds work together so that the visitors’ movements generate a narrative musical organization whatever direction visitors move in. As soon as they walk into the installation (see Fig. 2), the electronic devices connected to painting A (the blue arrow on its right) and painting B (the blue arrow on its right) are both triggered. A background sound from painting B sounds before an opening sound from painting A because all the sounds from painting A are preceded by silence. Note that painting C is hardly visible from this position. So, if visitors move further into the room, the electronic device to the left of painting B is triggered, and an expressive and contrasting sound is heard, creating a tension that requires a resolution. Visitors now can see two other sticks to the right of painting B. By turning left to face them (the sticks are visual links between the paintings), the third painting becomes more visible and the electronic device connected to it plays sounds that resolve the musical tension. If visitors leave the installation at this point, they will go while a complete musical sentence is being concluded. Even if visitors trigger painting A while going out, they will hear nothing or very little, because of the silences at the beginning of the sounds. However, if visitors begin to wander around aimlessly instead of leaving the installation, the sounds will start to overlap in a specific order creating a polyphonic (imitative) texture. For instance (see Fig. 7), first, visitors will listen to an opening sound coming from painting A and then to a tension sound coming from painting B. However, visitors may decide to go back to painting A and another opening sound is heard. Now, if visitors decide to move to painting C, another tension sound from painting B will sound first and only then a resolution sound from painting C will be heard. Obviously, this polyphony could be extended and resolved many times, creating complex textures that could include repetitions (painting A could sound twice, for instance). However, suppose a visitor walks into the room and goes directly to painting C. In this case, a background sound from painting B and an opening sound from painting A will have already started, and painting C will function as a release. Finally, all sounds except the background sounds include silence at the beginning, which were calculated to avoid excessive overlapping, but in the end, painting C will resolve all musical tensions.

![Polyphonic Imitation](image)

**Fig. 7.** A possible sequence of sounds coming from paintings A, B and C creating an imitative polyphonic texture. (© Edson Zampronha)
Clearly, visitors are an essential part of *Ancestral Symbol*, as much as in many present-day interactive installations [7,8]. Besides, it is important to mention that an interactive installation is not an incomplete work just because it is interactive [9]. Indeed, in *Ancestral Symbol*, all the interactivity rules were created in advance, so it is not an incomplete work despite the visitors’ relevance. As Pinto [10] explains, in an interactive installation all interactions take place *after* the work was created so that each interaction is like an actualization. As a result, at least in certain interactive installations, it is possible to say that artists compose interactions [11]. That is the case in *Ancestral Symbol*: visitors actualize the previously composed interactions, and that is why I understand that visitors act more like performers playing a musical score (because of the actualization each visitor generates) than like a composer creating it.

Besides interactivity, immersion is another key concept present in contemporary art [12], particularly because it offers a different experience when compared with the renaissance concept of a painting as an open window where viewers are external observers that look through it [13]. In an immersive installation, visitors become participants instead of observers, and the *Ancestral Symbol* installation produces both a visual and a sound immersion into the work. Also, the feeling that the installation somehow responds to visitors’ movements through interactivity intensifies the experience of immersion, resulting in an intensified feeling of participation.

**Conclusions**

In the *Ancestral Symbol* installation, the visitors’ unpredictable movements are transformed into a narrative musical organization as a result of the strategic placement of the three paintings in the room in connection with the three specific musical functions fulfilled by the sounds from each painting (opening, tension and a resolution). In this way, time (music) and space (paintings in the room) are deeply interwoven, and the key piece that connects them is the visitors’ movements detected by the four electronic devices.

Besides, the use of a stylized paleolithic claviform as a basis to connect sound and images works as a deep connection between all the media involved. If its image is the graphic support, the sound is its meaning (it is the claviform shape expressed in sounds, i.e., it is the graphic sign expressed in another dimension). In this way, the installation as a whole work is also a metaphor of the experience of walking into a rough and not easily accessible paleolithic cave thousands of years ago, as if it were an immersion in ourselves or in our ancestral past by means of interactions with unknown symbols that insist on telling us that “reality is perceived as consisting of more than that which everyday vision brings to light.” [14].

**References and Notes**

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**Bibliographical information**

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