RABISCO

An artistic creative environment using movement as a form of self-expression

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Abstract

The use of technology in the context of Generative Art has reached far beyond we could imagine. It is possible to verify the direct effects that the digital environments have on artistic expression and aesthetics, enabling new perceptive experiences. Immersion and stimulation are characteristics of the artistic experience, however, with the advent of interactive environments, a new type of involvement has emerged. In interactive computer-based art, the activity takes place through contact between people and artifacts; the user (or audience) and the machine, together, form a relationship capable of producing a unique artistic result at each encounter. This article presents Rabisco, an artistic creation environment that captures the movement of the visitor's right hand and shows its trajectory on a screen, in an analogy with a scribble, or Rabisco in Portuguese. People enjoy playing games and painting in the new virtual space and Rabisco offers both opportunities, surprising and inducing the participant to a continuous reorganization. In addition to an interactive environment for creation,

Rabisco is a possibility of self-expression through the movement with which even a naive interactor is capable of producing a visual composition and engage the audience in the performance. We talk about the hybridization in interactive art and approach the concepts of embodiment and enaction in this context. Designing and implementing technologies are creative processes in themselves, but researchers in the area of interactivity also contribute by developing tools to support creativity as well as providing research platforms for artists.

1. Introduction

The use of technology in the context of Generative Art has reached far beyond we could imagine. It is possible to verify the direct effects that the digital environments have on artistic expression and aesthetics, enabling new perceptive experiences [1, 2, 3]. New media includes technological tools, installation formats, performances, happenings and earth works, among others. Dividers between art genres such as sound, theatre, cinema and the visual arts were torn down. The traditional barrier between viewer and artwork was challenged. [4, 5].

With the advent of computer-based interactivity, a new kind of art experience has come into being. In computer-based interactive artwork, the activity is not only psychological, but also constituted through exchanges that occur materially between a person and an artefact. Today the opportunities for including audience participation have been increased significantly by the widespread availability of digital technology [6, 7]. Recent literature presents specific and elaborate concepts for the term interaction, such as dialogue, transmission, optimal behavior, incorporation and the use of tools [8]. Further, these concepts are associated with different contexts and ways of constructing causal human-machine relationships – emphasizing the need to improve scope and specificity to better clarify the agency and the effects that computers have on the interaction.

In this article, we present Rabisco, an interactive installation that aims to provide, even to a naive visitor, a creative and expressive experience, through another form of interaction based on movement studies. Rabisco allows the visitor to produce multifaceted two-dimensional compositions. It captures the movement of the visitor's right hand and shows its path on the computer screen, in analogy with a scribble (*rabisco* in Portuguese), in different colors and visual effects.

We consider that in this human-machine relationship, the computer acts as a sentient autonomous and adaptive guide, which helps humans to explore creative spaces and discover new patterns [9]. In Rabisco, we created a new possibility of interaction based on studies of movement, developed and used in a previous work, MovieScape [10].

In the next section, we talk about the hybridization process in art. In Sections 3 and 4, we depict Rabisco, its components and conceptual space. In Section 5, we describe the interaction with Rabisco and following we reflect about interactivity, embodiment and enaction. Finally, we present the conclusions.

2. Hybridization in Interactive Art

Kwastek [11] identifies interactive art as an example of the hybridization of the

arts and of their various genres. Hybrid forms in interactive art arise out of the conjunction of elements of theater, music, film, video art, and the visual arts with a variety of digital technologies. The essential characteristic of the hybridization of the arts is that the hybrid form cannot be broken down into its individual components: the whole is more than the sum of its parts.

Since the 1960s, contemporary art has been a prominent setting for such hybrid, intermedia practices, partly because its environment tends to be comparatively permissive. Shortly before, becoming impatient of conventional methods, Jackson Pollock put his canvas on the floor and dripped, poured or threw his paint to form surprising configurations. He probably remembered stories of Chinese painters who had used such unorthodox methods and the practice of American Indians who make pictures in the sand for magic purposes. Pollock has thus been hailed as one of the initiators of a new style known as “action painting” or Abstract Expressionism [12].

Nowadays, motion sensing technologies enable interfaces where a performer moves the body “in the air” without manipulating or contacting a physical object. Such technologies are becoming more and more common in different contexts [13, 14, 15].

In Rabisco, we present the trajectory of the visitor's hand movement on the face of a “conceptual cube”. We can rotate the cube, providing six different possible views of the object. The visitor can choose between three different track formats to display the trajectory on the screen. In addition, each face of the cube has a different orientation; the same gesture performed with another face has a different result. As in a game, this feature is explored and causes surprise, inducing the visitor to change his behaviour when she starts to act on another face of the cube.

3. The Components of Rabisco

Rabisco has three main componentes: 1) a physical motion capture sensor; 2) a programming environment / language for visual effects; 3) a projection screen, depicted in Figure 1.

For the first component, we used the Microsoft Kinect V2 sensor [16] which uses the combination of two images (color and infrared) to track the body of the visitor. With this device it is possible to represent the visitor's body by a set of 25 points, or together, as they are called. In addition, we were able to capture the state of the visitor's hand, open, semi-open, closed or not tracked.

For the visual effects we used Processing3 [17] a graphical programming environment based on the Java programming language. Processing3 supplies the library ProcessingKinectV2Skeletons Tools [18] that integrates the sensor into the software through an API. This library also has a movement smoothing algorithm for all joints. In order to improve the accuracy and response time of the sensor, it updates the physical model generated by Kinect over time. With each new measurement of the sensor, the algorithm predicts the current estimated position, calculates a confidence factor based on Kinect information, and then defines how much the new estimated position will consider of this new measurement the next iteration.

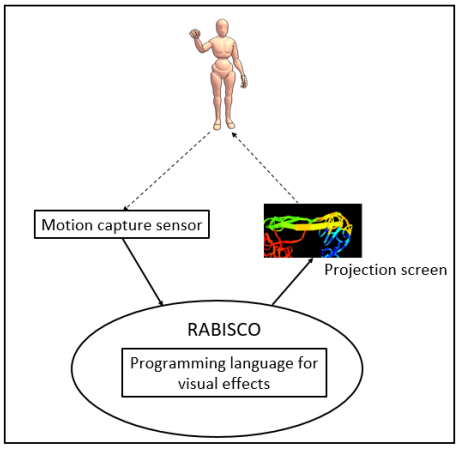


Figure1. The three main components of Rabisco: the sensor, the graphical programming environment and the projection screen. Above, a person interacting with the system.

For the third and last component, we used a 52-inch screen, which can be replaced by a computer screen, a projector or an immersive environment, such as the ImCognita laboratory. The ImCognita Lab provides physical space and audiovisual resources to experiment with visualization, sonification and interact with generative processes via computer support, such as soundscapes, interactive video, animation and 3D graphics.

4. Rabisco: the Conceptual Space

Conceptually, in Rabisco the visitor will be drawing on the face of a cube every moment, as depicted in Figure 2.

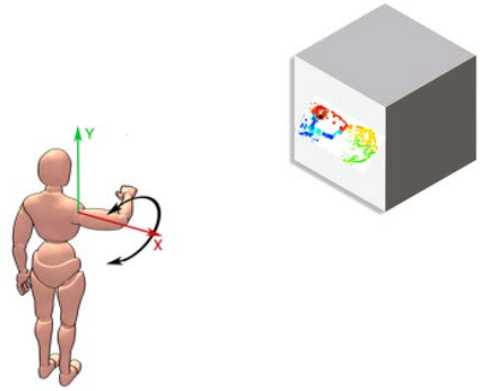


Figure2. The conceptual space of Rabisco: the visitor draws on the face of a cube.

However, on each face of the cube, the coordinate system changes, causing a surprise reaction and inducing the participant to adaptive behaviour. Thus, the same movement produces different results on each face. Figure 3 shows the coordinate system and its behaviour on each one of the six faces of the cube.

The trajectory evaluated by Kinect has three dimensions, but the representation of the movement has only two dimensions. Thus, it is possible to choose which coordinates to use on each face, in order to produce a unique system for each of them. In addition, in order to enrich the artistic proposal, each face has a unique color system.

4.1 Navigating the cube faces

Through a gesture called "arc" the interactor can navigate the faces of the cube. Specific recognition functions identify the associated movement and recognize the gesture. Each rotation of the arm around the coordinate system, associated with the right shoulder as shown in Figure 4, represents a rotation of the cube.

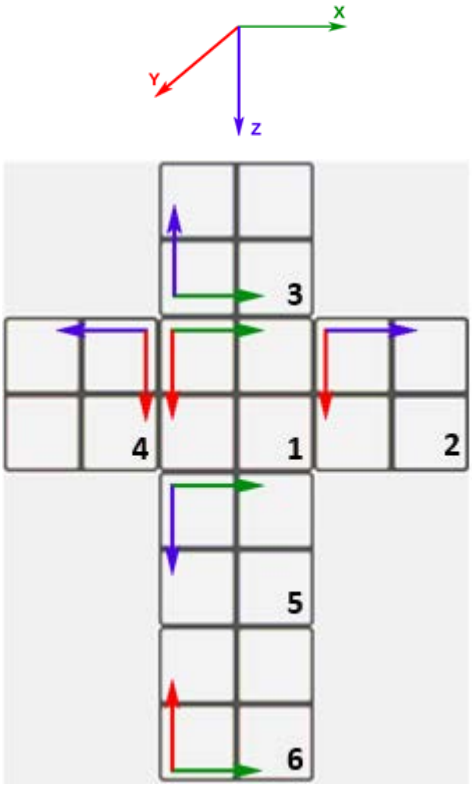


Figure 3. In green, red and blue the coordinate system and how it operates on each face of the cube.

Thus, a positive rotation of the arm around the Y axis will produce a rotation of the cube to the right, while a positive rotation about the X axis will produce a rotation of the cube upwards. As a result, a negative rotation about the Y axis will produce a rotation of the cube to the left and a negative rotation about the X axis will produce a rotation of the cube downwards. With that, we were able to create a sign language for navigation through the faces of the cube.

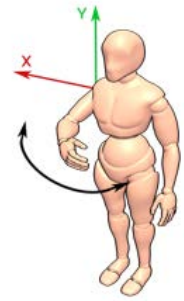


Figure 4: Representation of the arc movement chosen as a form of control.

Another programmed action was to save the composition created on the current face in a .jpg file, and then delete that face. This action happens when the visitor raises both arms above his head.

4.2 The Representation of the Paths

It is also possible for the visitor to alternate between three types of lines, combining them to produce different compositions: a normal straight line, a line where each point of the trajectory creates a sphere, and a line where each point of the trajectory creates a square.

Designing and implementing technologies are creative processes per se, but interactivity researchers also contribute to art and design by devising creativity–support tools [19] as well as by providing design research platforms for artists [20].

5. Interacting with Rabisco

Interactive art involves interaction between art objects, the audience and the viewer. Interactive artists are also

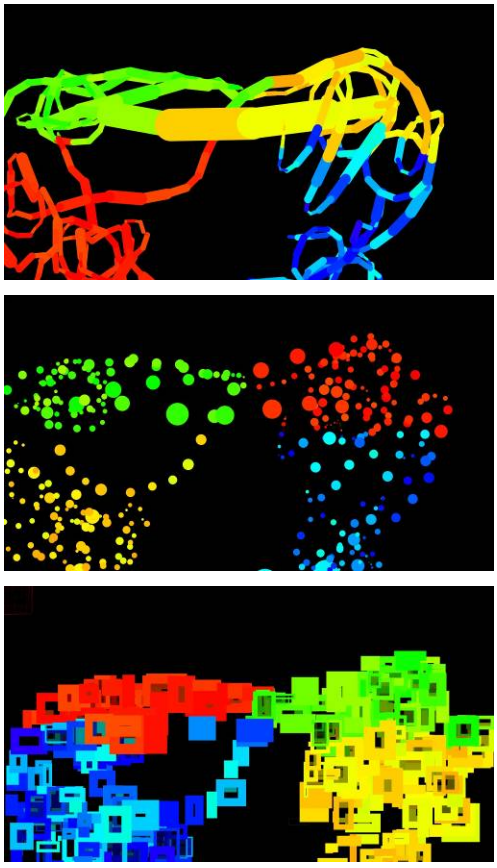


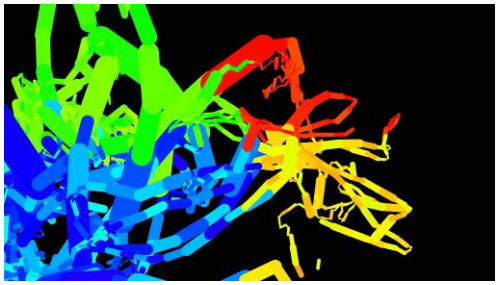
Figure 5: The three possible path representations in Scribble: lines, spheres and squares.

Like a painter starting a work, in Rabisco the participant initially faces an empty canvas. Once the process has started, when the viewer closes his right hand, the movement results in a visual effect on the screen, stimulating the continuation of the visual production. We noticed that some became enthusiastic about the production, as well as the audience that watched. When exploring a new face of the cube, a hand movement performed on the previous face has a different effect, which causes a surprise reaction and induces a new examination, with interested in the relationships that exist, or can be developed, between the physical world and virtual ones or between physical movement and symbolic representation. Some use movement in a space as an integral part of their interactive works, so that performance and visual art are brought together.adaptation, inciting to investigate the other faces of the cube.

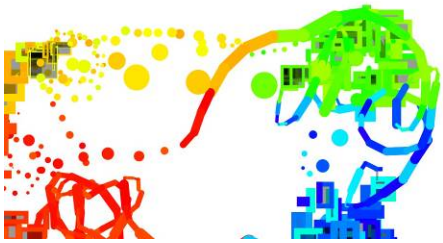
The production of the participant can become performative, resulting in an interesting spectacle for the audience. Observed aspects were the excitement of the interactor with his visual creation, as well as the audience with the visual result and the observed performance, instigating others to experiment Rabisco. The visual composition can be considered the record of an activity, which can be saved and later retrieved for contemplation, on a computer screen or in a printed material, becoming a memory.

Figure 6 presents some visual compositions created with Rabisco. Those with a black background were created in an immersive environment, the ImCognita Lab at NICS/Unicamp. The others were created at Cyberphysics Lab at CTI Renato Archer.

Research shows that creative works can be obtained by exploring, combining, or transforming existing ideas in the conceptual domain [21]. But the mere imagination of an original concept does not fulfill the definition of creativity; rather, it must be materialized or represented as a product (drawing, composition, sculpture, etc.). Therefore, in creativity the process of manifestation is critical.



(a)



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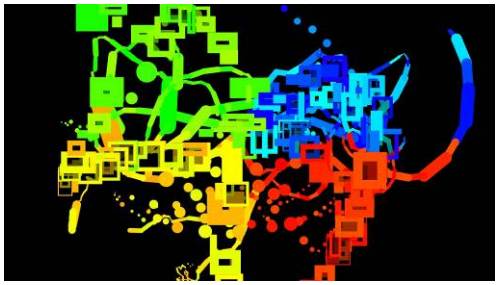

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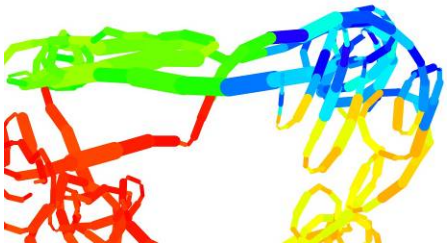

(d)

Figure 6. Compositions created with Rabisco

People often use the arts to express their emotions and internal states, and art is often designed to provoke empathetic responses and other emotions in audiences. When technology considers a person as an affective system, not merely as an information processor, it should consider how to deal with their expressing, regulating, estimating, understanding, and influencing emotions and affect. Artists can expertly manipulate or influence people's emotional states, Also, artists can utilize their own emotional states and audience's emotional states to complete their own artworks with the help of technology [20].

6. Interactivity, embodiment, enaction

Penny [22] argued that the strategy of contemporary art should be shifted from a representational model to a performative model. Therefore, the application of embodied interaction to interactive art offers a new paradigm of aesthetic practice involving behaviour design. Theories of embodiment present new topics that artists and researchers can consider in their interaction design. Klemmer et al. [23] pose that: (1) Users can learn through doing. They think by gesture and movement and identify implicit constraints and problems easily. (2) Users can act through an artifact, rather than act on it. They perceive the artifact as an extension of their body, rather than as an independent object. This explains the rise in importance of emotions and affect in interaction design [20] (3) Users can easily perceive the status and response of other users, as suggested by distributed cognition theory [24]. (4) Embodiment provides an opportunity to integrate physical and

digital worlds, which was previously unavailable.

By embodiment, we refer to the multimodal, experiential, motor and pragmatic component of Embodied Cognition [25]. In Rabisco installation embodiment allows for a continuous behavioural adaptation acting on the codetermination between participant and environment, where we include the audience.

Although the Embodied Cognition paradigm emcompasses several models and theories, the central concept is that most cognitive processes take place through the body's control systems, especially through the interaction between higher cognitive functions and the sensorimotor system [26]. According to the enactive approach of Varela [27], an autonomous system (agent) has continuous interactions with its environment so that this process influences the configuration of the sensorimotor system. Enactivism, in turn, attributes a crucial role to perception as a particular type of exploratory activity mediated further by the knowledge of sensorimotor contingencies [28]. Thereby, adaptations occur both from the agent and from the environment [10].

In addition, when audience members participate in an art process or piece, they often feel like they are in a different time and place, invocating the sense of “presence”. Sometimes, interactive art implies having virtual presence.

Conclusion

Just as audience involvement and experience are crucial to the success of contemporary interactive art, engagement and user experience are fundamental to the area of interactivity, while art focuses on aesthetics and emotions. From the point of view of art, the area of interactivity can provide new experiences of presence for the public and new possibilities for artists to carry out more research and experimentation. From the point of view of interactivity, art can create new representations and interactions based on incorporation and help to design interactive and emotionally intelligent systems.

From a compositional point of view, Rabisco provides a gestural interface, three types of strokes and a four-color scheme, but the variation of the coordinate system on the different faces of the cube surprises and induces the participant to a continuous reorganization. We consider increasing the possibilities of visual composition or the sonification of gestures, which can modify the performance of the participant.

People enjoy playing games and painting in the new virtual space and Rabisco offers both opportunities. In addition to an interactive environment for creation, Rabisco is a possibility of self-expression through the movement with which even a naive interactor is capable of producing a visual composition and engage the audience in the performance.

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