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Dynamical Systems

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***Dynamical Systems* is an audiovisual installation consisting of two artworks. Both artworks explore the concept of feedback and iteration. They allow the viewers to deliver input data with their bodies and gestures and create alterations in the presented artworks' behavior. These alterations may lead to momentary chaotic behavior. Without any input, the artworks regulate into a balanced state. Each artwork inheres a physical structure and projected imagery. Additionally, the installation includes interactive sound design, which evolves by monitoring the changes in the presented artworks. Initially, the artworks are designed for on-site presentation, interacting with the viewers standing in front of them. In this submission, we propose an iterated version of the installation, which fulfills online communication requirements. We present our artworks as a video stream. A video conference accompanies our system. Our system analyzes the webcam feed of the participants present in the video conference, providing remote interaction.**

Fig. 1. Documentation of the installation exhibited at MŰTŐ gallery during the Budapest ArtWeek 2020.

Fig. 2. Dávid Maruscsák's artwork. The horizontal white threads are stretched between the side of the frame, creating the projection screen.

Description

The installation's concept relies on the popular term called the butterfly effect, denoted by Edward Lorenz. The term describes a concept of such systems whose initial condition highly affects their long-term evolution. Dynamical systems are open to outside influences. Positive feedback present in these systems amplifies their internal system over time, leading to chaotic behavior. This sensitivity to subtle changes suggests the idea of holism, where each action has the potential to influence the dynamics of the whole world.

In the proposed installation, the central concept recurses into two individual artworks. Both of them rely on the principles of chaos, especially on positive feedback loops and on fractals' aesthetics. Their author determines their initial condition, but they remain open for user input.

Fig. 1. Documentation of the installation exhibited at MŰTŐ gallery during the Budapest ArtWeek 2020.

Initially, the interaction between the user and the artwork would occur on-site at the exhibition space. We would track the position and the viewers' motion in the specified areas in front of each installation. Both artworks would accept multiple inputs. Each user's position in the space would affect a randomly assigned parameter, making each artwork oscillate between chaotic and orderly behavior.

For example, the artworks might amplify their internal behavior when a user is present. Meanwhile, another user might start to interact with the installation, which can result in several conditions. For example, it may amplify the artwork's internal working even more, resulting in chaotic behavior, or even out the artworks' behavior, causing them to return to an orderly behavior.

Máté Bredán's interaction system builds on the attributes and possibilities of online communication. It aims to emphasize the main idea of our installation system. We present the artworks online as a video stream. The participants can join a video conference and provide input data through their webcams. The interaction system tracks the participants' heads and hands. Using a combination of an OpenCV face tracker with a pre-trained Deep Neural Network and blob tracking, it determines their position inside the camera's frame. This setup aims to model the term of the butterfly effect truly. Hence anyone who joins the video conference can alter the artworks from any point in the world.

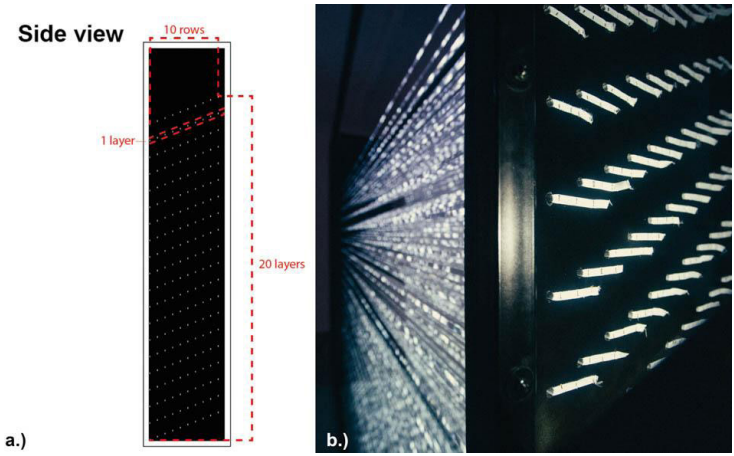

Fig. 3. a.) The layout of the horizontally stretched white threads. One layer consists of ten rows. The installation consists of twenty layers. b.) Documentation of the finished structure.

Dávid Maruscsák's artwork consists of a custom-built projection screen. It is a 3-dimensional object. It consists of a steel frame (3, 3 x 2,6 x 0,5m). White threads stretched horizontally between the left and right sides of the frame serve as the projection screen. The installation consists of twenty layers of these threads. Each layer is a set of ten threads expanding from the front of the frame to the back. The layout of these threads resembles the layered aesthetic of fractals. This projection surface aims to structure the projected image and to divide the flat image in space. The projected image is a generative animation. The generative animation relies on a positive feedback loop system. This system has ten iterations. Each of them has a unique appearance predetermined by its author. These iterations are changing randomly over time. Initially, the artwork would monitor the position and the gestures of the users standing in front of it. The users can alter the look of each iteration and also generate a motion with their gestures. The online version of the system monitors the viewers present in the video conference and their motion.

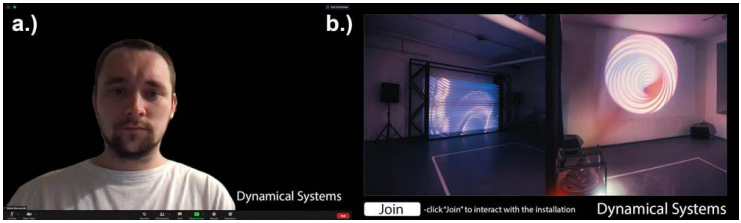

Fig. 4. a.) Example of the user's zoom appearance with a background provided by us. b.) Example of the website, while streaming the installation. The button with the "Join" script leads to the video conference, where the users can interact with the installation.

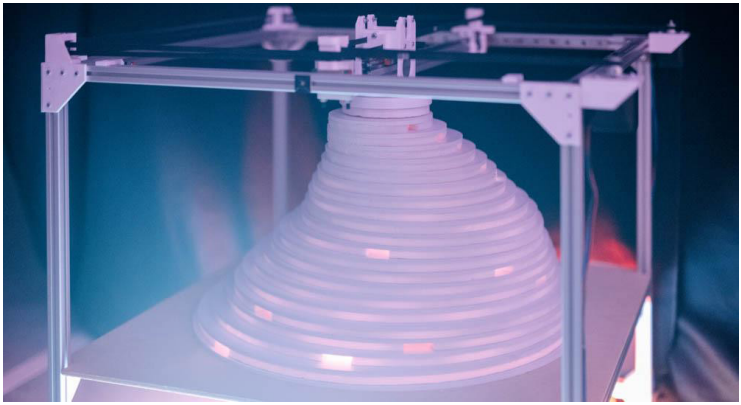

Fig. 5. Boldizsár Mátyás's artwork. Twenty rings form the kinetic sculpture. The adjacent parts are attached. The bottom ring is static, and electrical motors control the top ring's position.

Boldizsár Mátyás's artwork is a geometrical shape, which depicts similar forms on many levels inspired by the fractals' aesthetics. It is a kinetic sculpture built from twenty rings. These rings are building on each other, and with every step, their radius gets smaller. Each ring connects with its adjacent parts. The bottom ring is static, and electrical motors control the top ring's position. As the top ring moves, it attracts the rings below. The motion creates various phases and poses to the kinetic sculpture. LED lights are lighting up the inner area of the sculpture. A camera monitors the sculpture's inner area, and its image gets projected onto the wall behind the sculpture. The projection depicts an inward shrinking spiral. The viewers can control the position of the top ring and how the lights behave. In the initial scenario, the viewer's position in the designated area in front of the sculpture would affect the parameters mentioned above. The sculpture would analyze the viewers' layout and correspond to an averaged value in a multi-user scenario. This dialogue between the users and the artwork would alter both the sculpture's outer and inner look. We redesigned this artwork's interaction method, which generates the motion from the participants' video feed.

The sound reacts to the two artworks. It is creating a feedback loop between the users and the installation. The sound design is calm, ambient music, which can turn into a cacophony when the artworks show chaotic behavior. The online streaming features the sound design along with the video.

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