DATT 3700 - Collaborative Project Development

Dan Tapper and Sihwa Park

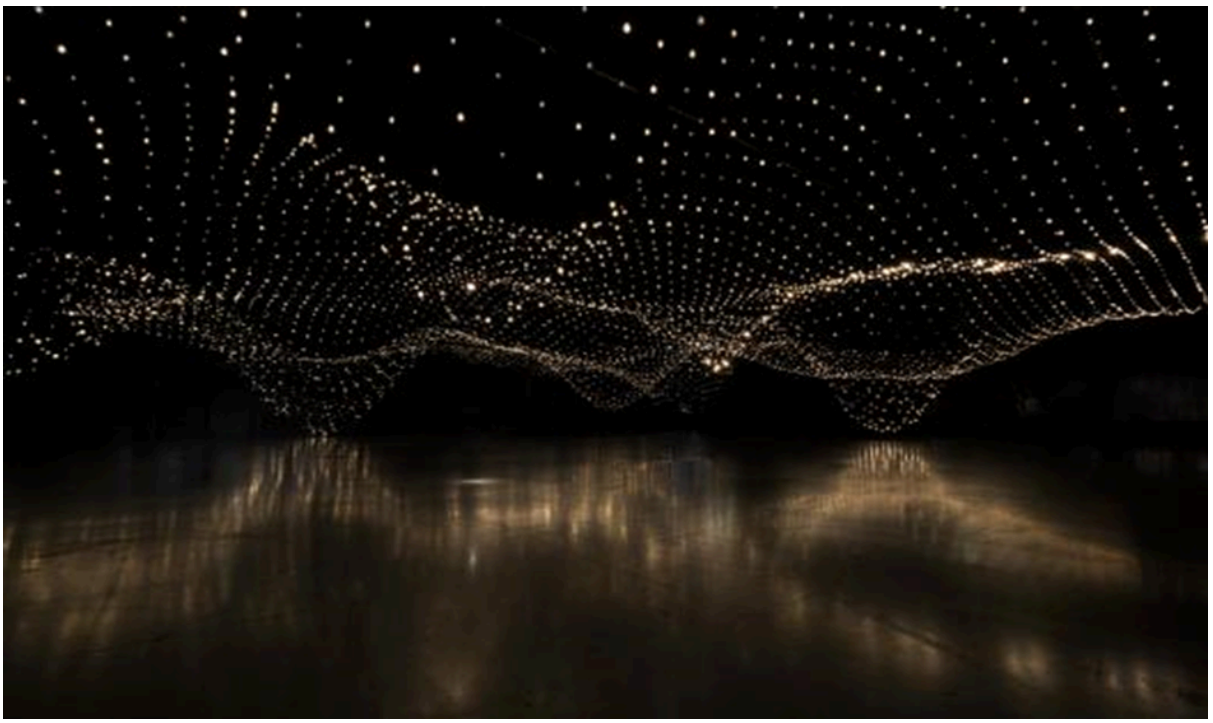
Pixel Pioneers - Master Annotated Bibliography

PHYSICALIZATION

Heinicker, Paul. *Good Night Sms*. 2015.

good night sms is a 3D-printed rectangular, steel necklace that is meant to be a physical representation of the “good night” text messages exchanged between the artist, Paul Heinicker, and his partner over the course of their 2-year long-distance relationship. To create the necklace, Heinicker used meticulous data mining to obtain every “good night” message he sent over two years. The length of each message was calculated and then represented through an applied line graph which served as the basis for the ridges on the vertical sides. Similarly, the flat, horizontal pieces illustrate the time the two of them spent together symbolising the lack of messages during that time. The resulting rectangular pendant was 3D printed in high-grade steel after several iterations to clearly and aesthetically physicalize the data.

The piece emphasizes that communication is essential to any relationship. For the artist and his girlfriend, habitual nightly texts resembled diary entries, allowing them to reflect on their day and express their feelings to each other simultaneously. Sending these text messages enabled them to simulate each other's presence despite not being close physically. The necklace is a symbol of their commitment and connection in spite of the distance that separated them.

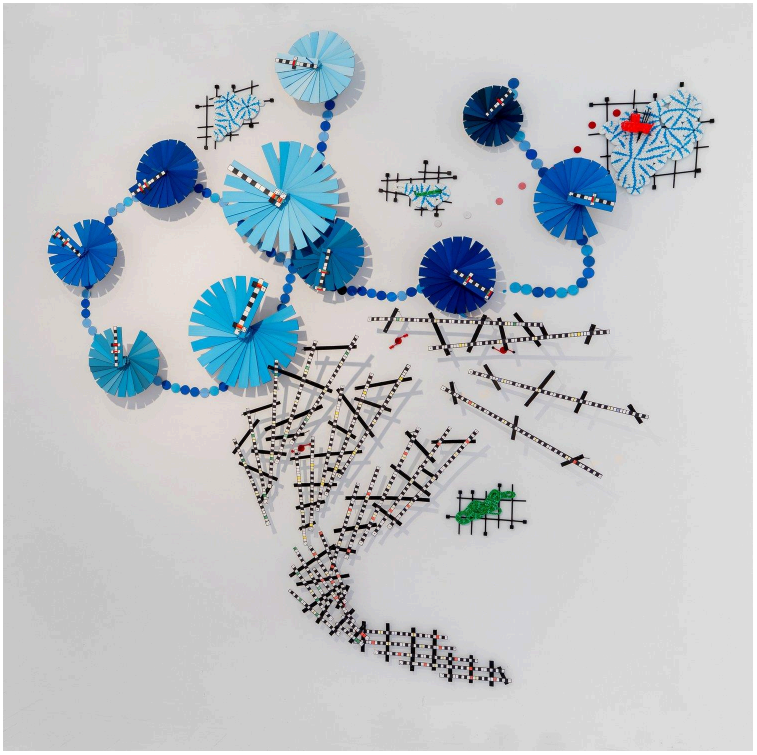


Lorenzo-Hemmer, Rafael. Pulse Topology. 2021.

"*Pulse Topology*" is an interactive installation consisting of 3000 LED light bulbs arranged in the form of a series of peaks and valleys, where light and sound serve as the primary expressions of the work, and the participant plays an essential role. The blinking frequency of each bulb depends on the real-time recognition data of the current visitor. The participant simply walks slowly through the scene; the sensor detects and records the current participant's pulse rate, adding it to the background. When the new pulse replaces the old one

and is reflected in the blinking frequency of the light bulbs, a profound piece of work about death is born.

Human pulse rates are intangible, and "*Pulse Topology*" transforms them into a tangible landscape that can be observed by humans. In addition to this, each person's pulse frequency is unique; each bulb represents a life form that has been or is present—a movement made up of the pulses of the many participants. The connection between individuals becomes tight and organized; each person is part of the "*Pulse Topology*." Creators want participants to resonate effectively with their work, and the pulse is a special medium for that.



Miebach, Nathalie. *She's Coming on Strong*. 2011.

She's Coming on Strong illustrates the fateful journey of Andrea Gail in a captivating manner. The composition features blue windmill shapes symbolising the strong storm, which are connected with a line of smaller blue dots. A smaller storm is shown in the form of a piano score. The right bottom section of the work displays a green patch illustrating the island of Bermuda, while a little red skiff at the top right corner represents Andrea Gail.

Miebach utilizes a unique method, transforming weather data into vibrant installations crafted from paper and wood. Her musical score 3D works function as a musical score, tracking the trajectories of Hurricane Grace and the Halloween Storm, culminating in the "Perfect Storm." The artist's 3D musical scores, derived from 2D interpretations, serve as the foundation for collaborations with composers through the Weather Score project.

Her unique technique involves basket-weaving techniques, merging scientific data with playful sculpture. The artwork serves as a fully functional musical score, inviting musicians to interpret and perform it on diverse instruments such as piano, French horn, and electric guitar. The fusion of scientific rigour with artistic expression allows viewers to engage with the complexities of weather and climate change through a novel lens, blending the boundaries between science and art.

Truniger, Lukas. *A three way Symbiosis*. 2017.

A three way Symbiosis is a multimedia installation that "*explores the beauty and cruelty of the interconnections present in nature.*" This work comprises a plant, a modified fan, and a large LED screen, which are ultimately the three agents of the symbiosis.

The images output onto the screen are generated via the use of a camera being trained onto the plant, and a high-level machine learning algorithm (Generative Adversarial Networks (GANs)) that processes the data collected by the camera. The GANs is written in Python. The camera is connected to the laptop, the GANs processes the image data and through a series of iterations, the algorithm trains itself enough on the data to be able to generate highly realistic novel images of the plant. Simultaneously, the light from the screen enables the continuation of the plant's growth. This is the symbiotic relationship, and the interconnection of beauty in nature that Lukas describes. The plant and the screen benefit from the micro-environment in some way, but how does the fan benefit in this three-way symbiosis? This may be the cruelty Lukas attempts to explore perhaps. Note that this is a work only to be interpreted and not interacted with.

Philips Design Studio. *Bubelle Dress*. 2008.

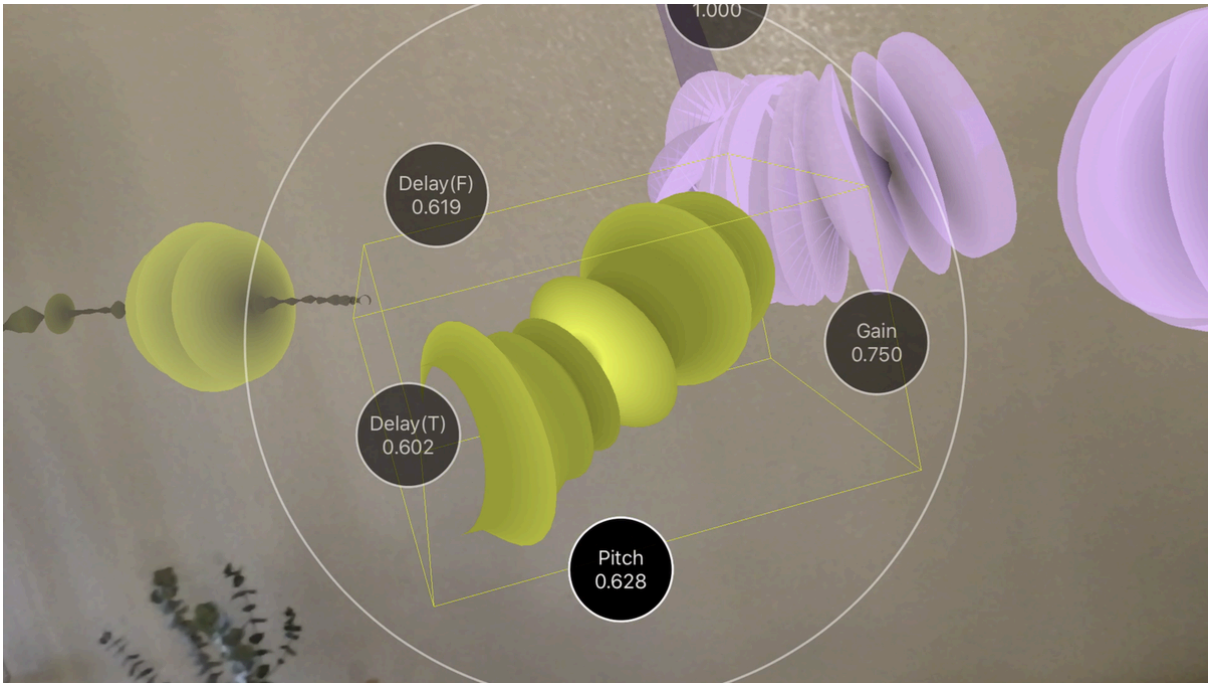
Bubelle Dress consists of two layers, and it shows beautiful clothes through the combination of LED lights and sensors. Its inner layer has a biosensor, which can display a person's emotions, on the outer layer, it shows color projection. The emotional state of customers is closely related to the color of skirts. Philips' design probe project aims at understanding the lifestyle after 2020, which studies the future integration of sensitive materials in the field of emotional induction.

Bubelle Dress is Philips' transformation from intelligence to sensitivity. The audience needs to wear *Bubelle Dress*, and the audience can change the color of the dress through emotional changes, which will form a high degree of intimacy between the wearer and *Bubelle Dress*. Besides, the bystanders who watch the exhibition will also have an impact on the wearer. The inner layer detects the wearer's mood through a biometric sensor. This sensor

has many functions, such as identifying living people according to the attributes of fingerprints, facial images, irises and voice recognition. After the inner layer obtains the emotional state, it projects the color onto the second outer fabric layer.

Philips is promoting emotional dress to a future level, and this combination of fashion and technology will have an impact on more and more fields.

REPRESENTING DATA IN A 3D ENVIRONMENT



Park, Sihwa. *ARLooper*. 2019.

ARLooper is an innovative augmented reality (AR) mobile interface that revolutionises collaborative sound creation and performance. Its appearance on mobile screens is an engaging blend of 3D waveforms and AR spaces. The interface allows users to record, edit, and perform sound collectively, leveraging the mobility and collaborative potential of modern mobile devices.

Technology that is used in ARLooper is its integration of visual-inertial odometry, a tracking technique within iOS ARKit, mapping the real world and seamlessly synchronising

it with AR spaces. This enables multiple users to share and synchronise world map data, connecting them in the same AR environment. Users record sounds through their device's microphone, visualising them as 3D waveforms that can be manipulated with various audio filters, allowing for various colour, location, and sound adjustments.

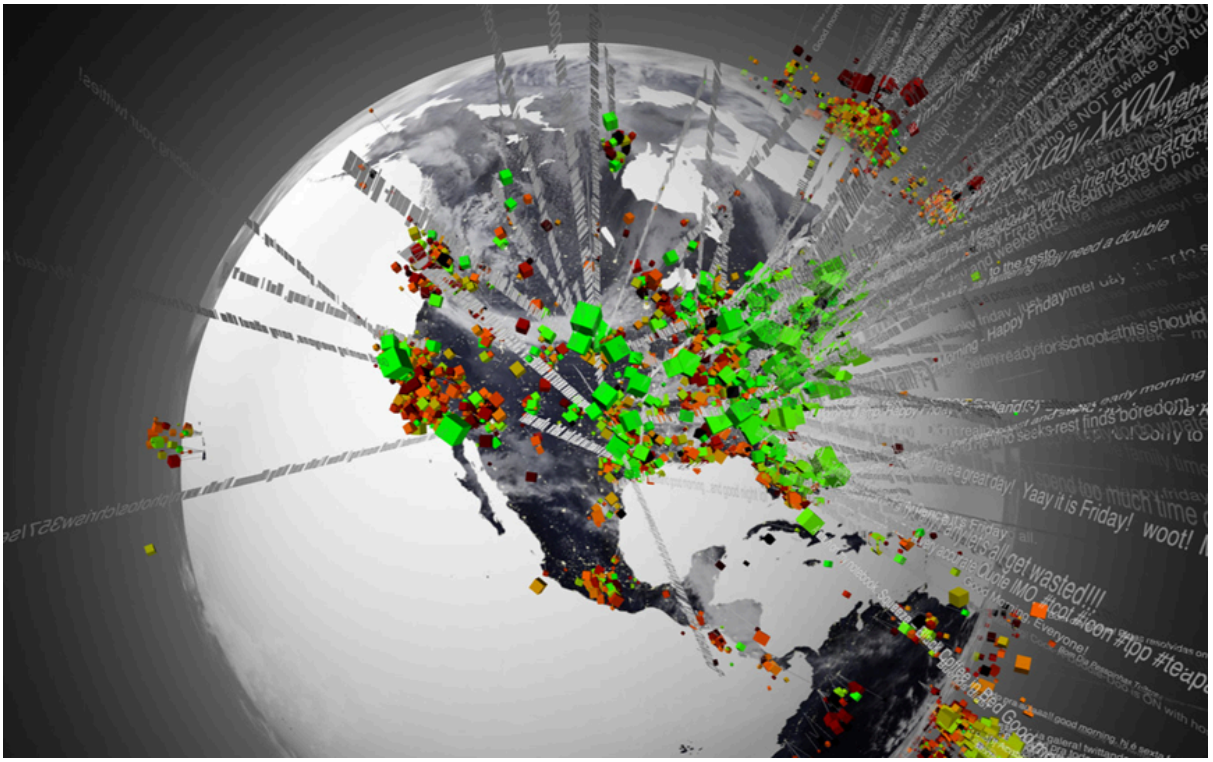
ARLooper is a collaborative musical expression in augmented reality. As users share the same AR space, they witness each other's 3D waveforms and activities, fostering a unique and interactive collaborative AR performance. This work explores the versatility of mobile devices, utilising sensors and network connectivity to redefine the landscape of musical creation and experience. The dynamic interface and collaborative potential of ARLooper lets users explore new frontiers in mobile music production.

Quévillon, François. Dérive. 2011.

Dérive is a 3D interactive, audio-visual, art installation that portrays the changes to natural and urban locations according to live environmental data. Using photogrammetry and geomatic data, natural and urban locations are recreated as point cloud models, whose movements resemble a dynamic particle model. The visuals of these clouds are influenced by the meteorological and astronomic data collected from the Internet as a way to simulate them. For instance, the colour of the points illustrates the temperature while the brightness of the

lines during the nighttime depicts the lunar phase. Furthermore, the virtual camera moves as the viewer moves, adding another layer of interaction. Additionally, data from remote environmental sensors combined with atmospheric pressure are ‘sonified’, creating an immersive environment.

The French word ‘dérive’ translates to ‘drift’ in English, which usually happens due to wind – a hint that the piece is related to nature. Created with LiDAR and 3D scanning tools, François Quévillon uses this art piece to communicate the evolution of various geographic locations due to environmental effects. The artist intertwines physical and digital spaces in order to question the audience’s perception of mixed reality while encouraging them to notice the changes in nature and their characterization of the world around them.



Thorp, Jer. Good Morning. 2009.

As a data visualization project, 'Good Morning' is more interesting and closer to people's daily lives than other works. It collects 11,000 tweets within 24 days and presents

them on a 3D data map. The content of these tweets was uniformly 'good morning,' but the language used was not limited to English.

The tweets are displayed on the map in squares with different colour codes. The picture shows a distant second in the number of green squares, which were sent early in the morning local time. Orange tweets were sent around 9:00 a.m., red tweets were sent later in the morning near noon, and black tweets were sent at other times of the day with the phrase 'Good Morning.'

This offers a disruptive and innovative opportunity to create a visualization tool for 'Good Morning,' making it a new type of social network and creating a new type of communication platform based on the habits of people around the world who greet in the morning. Secondly, it is also a social media data visualization tool that analyzes real-time social media, providing users with a greater desire to explore. Finally, adjusting received information according to the time may be a new communication technology in the future.

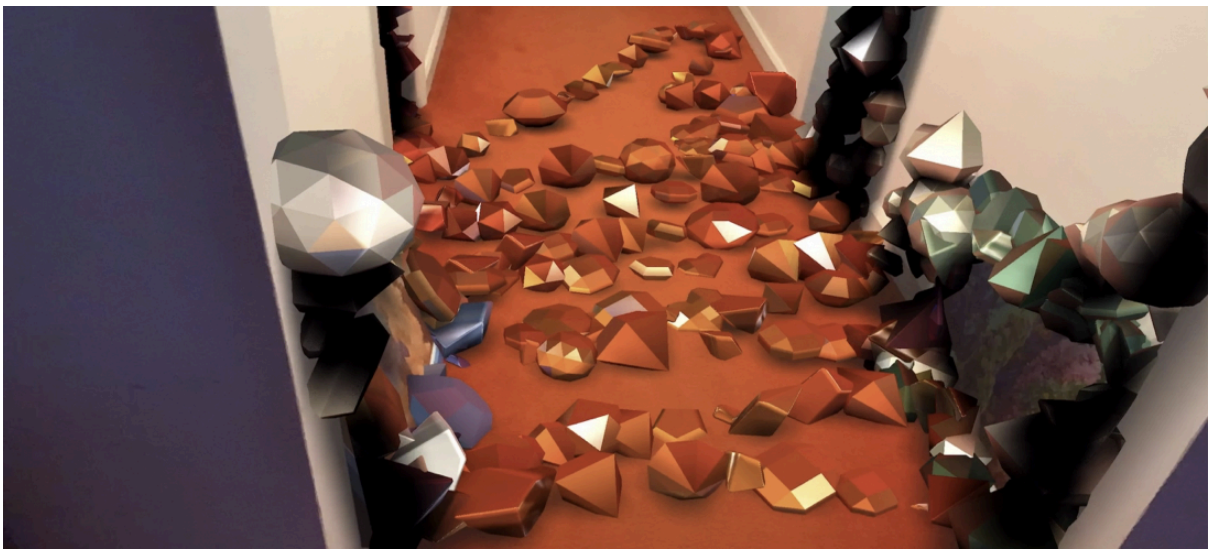
Zhang, Weidi. *Repository*. 2019.

Repository is an immersive audio-visual interactive VR experience in which artist Weidi Zhang raises concern about the presence of our digital footprint. She attempts to evoke in us – amongst the vast, endless sea of data – are we truly in control of our data? And do we have the right to be forgotten?

As audience members put on the VR headset, they are immersed into a world of data in motion as if they are a minute component *of* that world. The virtual space consists of conversations collected from Twitter posts in 2019, arbitrary numbers, characters, symbols, sounds, and objects floating in the space. Think of the virtual reality experience as if you are a deep-sea diver floating through the data stored in a server farm but also through a paper shredder (that shreds data), swimming through both new and old, deconstructed data.

As our lives are increasingly lived and documented online, we create a presence of digitized human memories that become – as the name suggests – a *repository* of memories, affecting how individuals are remembered and how data is recorded.

The experience was centered around the matter of the data authorship and data oblivion. The fact is, whatever we create, delete, or think is forgotten, still exists, and is not entirely owned by us.



Universal Everything. *Hyperspace AR*. 2022.

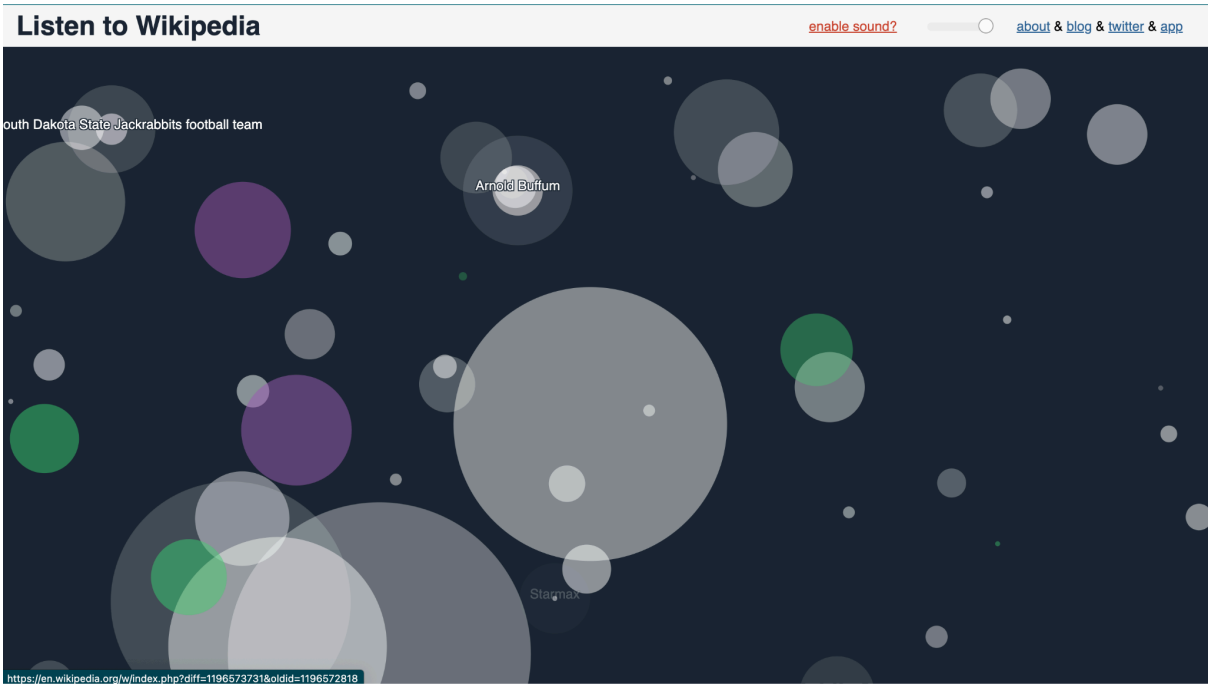
Hyperspace AR is an augmented reality experience, and *Hyperspace AR* enables the audience to enter a multi-dimensional virtual space through advanced technology. It is like a transparent dome, creating an immersive atmosphere for the audience. The core of *Hyperspace AR* is that it uses AR technology to create a surreal visual effect. *Hyperspace AR* projects dynamic light, shadow and particle effects around the audience through advanced tracking and projection mapping technology, which will give the audience the ultimate illusion.

Audience participation is an important part of *Hyperspace AR*. The audience can create an AR sculpture exhibition in a specific place in their own space, scan it in the space, and draw on the screen to create a 3D AR sculpture. *Hyperspace AR* combines real-time projection mapping, motion tracking and high-definition rendering to provide a realistic virtual environment for the audience. *Hyperspace AR* also uses AI technology, which can process the input of the audience and make real-time adjustments. However, it should be noted that *Hyperspace AR* will only be used on iPhone 12 Pro and iPad Pro 2019 and later.

Generally speaking, *Hyperspace AR* takes exploration and perception as its theme. *Hyperspace AR* encourages viewers to transcend reality and experience and think about the

unknown universe. *Hyperspace AR* makes the audience feel the infinite possibility and beauty of the universe from a unique perspective.

DATA VISUALIZATION/SONIFICATION & AUDIOVISUAL ART



Hatnote. *Listen to Wikipedia*. 2014.

Listen to Wikipedia is an open-source data art piece that illustrates various types of edits happening in real time on Wikipedia. Upon enabling sound in the browser or app, the audience hears a collection of tones that signify the type of activity occurring on Wikipedia. Specifically, bells represent the addition of information while string plucks represent the deletion. Furthermore, a string melody plays when a new user joins Wikipedia, and the audience is prompted to welcome them with a simple click.

Beyond the sonification of this data, Hatnote (a duo comprised of Stephen LaPorte and Mahmoud Hashemi) visually represents each edit as a circle. The size illustrates the magnitude and the colour indicates the type of user making the edit – purple depicting automated bots, green depicting unregistered users, and grey depicting registered users. The

audience also has a choice to toggle the visibility of the graphics or even choose to display data from the different languages that Wikipedia supports.

Hatnote coded this piece using their Wikimon API with Javascript libraries D3 and HowlerJS, in addition to audio processing software SoX. The creators highlight the vast number of crucial contributions made to Wikipedia, emphasizing the idea that every edit plays a part in the symphony of information.

Refik Anadol. *Machine Memoirs: Space*. 2021.

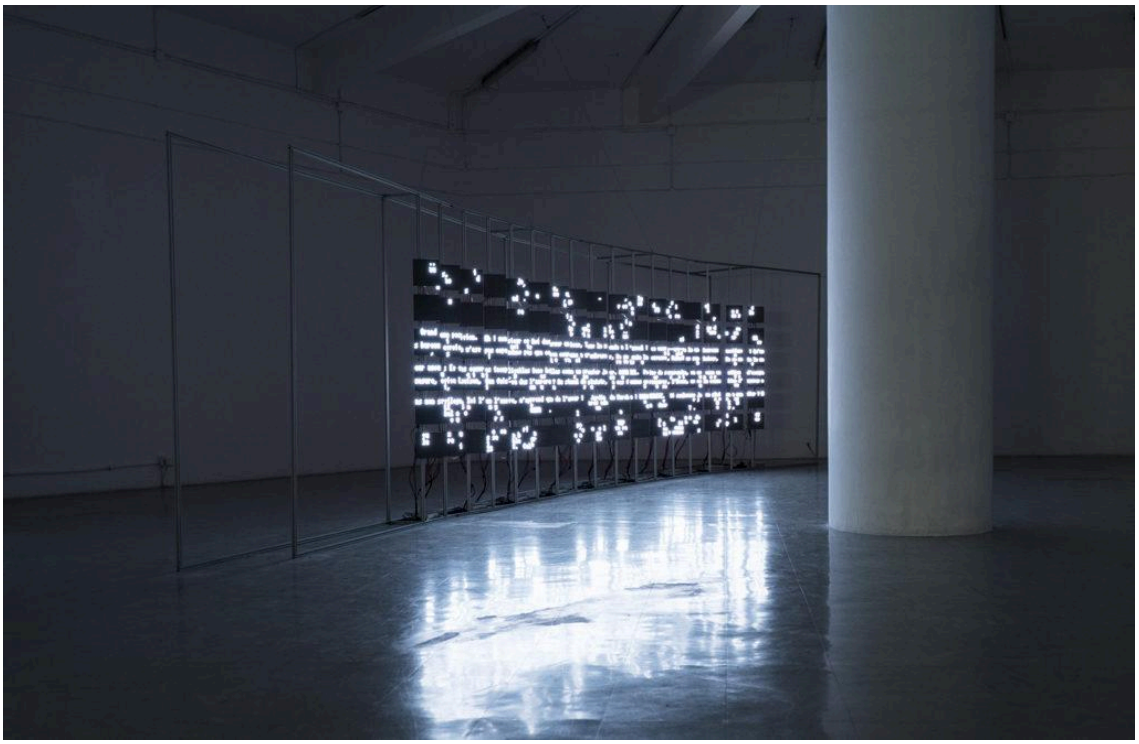
Machine Memoirs: Space is an exhibition in collaboration with NASA JPL that investigates the relationships between data, memory, knowledge, and history in cosmic dimensions.

The name “Machine Memoirs” had initially come from a revelation by the director and artist himself, Refik Anadol, in which telescopes could be seen as visual travel journalists of spaces that explore where man cannot travel. Essentially, the works of the exhibition are memoirs of space, written by the world’s most comprehensive telescopes –

the ISS, Hubble, and MRO telescopes, that is.

The visual experiences of the work are produced by training a publicly available dataset of photographs taken by NASA and training them onto generative AI machine learning algorithms (GANs). The dataset of photographs are of space and celestial bodies taken by satellites and spacecrafts. The outcome is an artificially imagined universe, producing endless abstract aesthetic possibilities, or more profoundly, a telescope's dreams. The audio experience from the exhibition has also been designed using the same data.

The memoir is made up of three components: *Data Tunnel*, *AI Sculpture*, and *Machine Hallucinations*. Each of these have different narratives and use different technologies to express their narrative, but all are elements that ultimately compose the story. The audience is invited to view and reflect upon the exhibition.

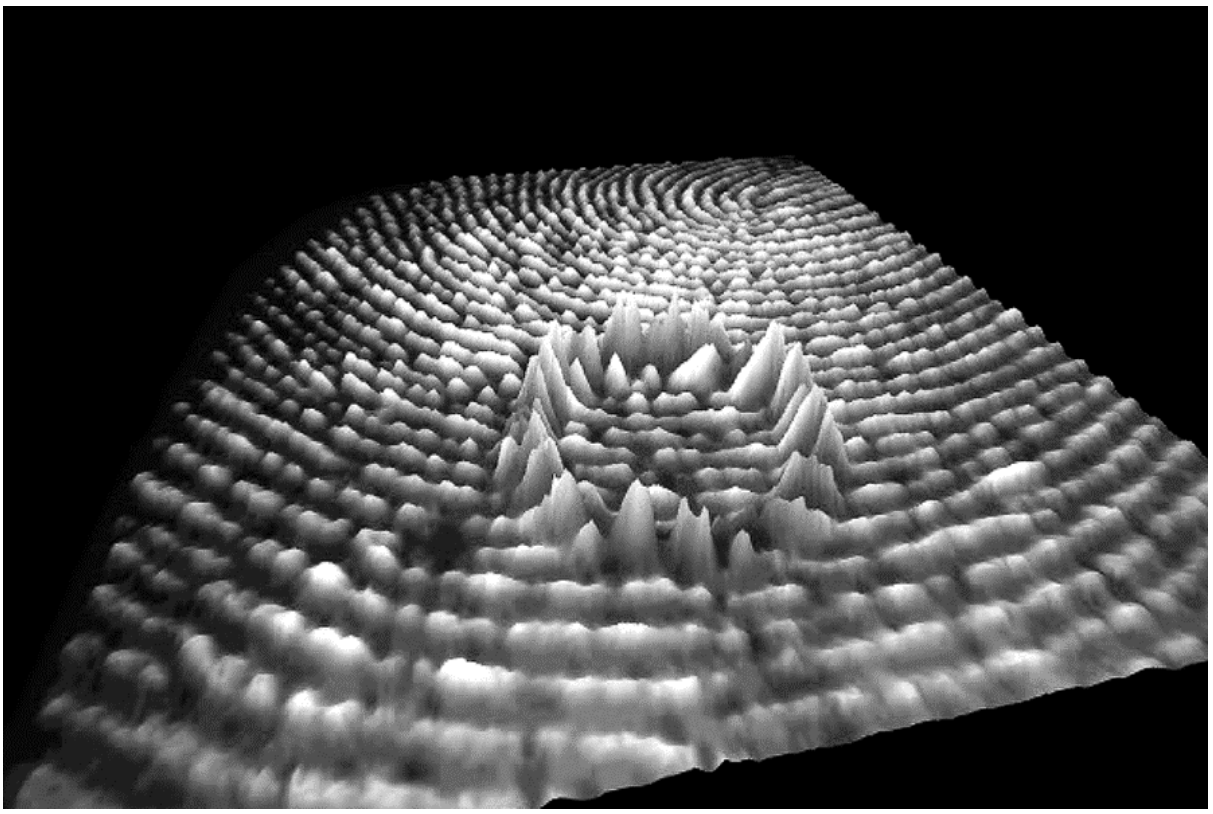


Truninger, Luka. Déjà Entendu | An Opera Automaton. 2015.

Déjà Entendu | An Opera Automaton reflects the combination of traditional language with modern digital poetry techniques. The installation examines the Faust myth using the machine learning algorithms omnipresent in our daily lives. The work is made up of 102 LED screens and speakers, the installation forms an emergent audiovisual sculpture. The repetitive arrangement of screens, projecting black backgrounds with white text with a simple animation is shown.

The following artwork is built with custom PCBs, electronics, a CAN network, machine learning (snake algorithm) and others. The algorithm that is used in the work constantly reproduces phrases and melodies from operas displaying the Faust myth, challenging the limits of language and reconstructing them into fragmented movements of light and sound. Viewers engage with the work as they navigate through an immersive space where language loses its conventional meaning, transforming into a pure rhythmic and melodic structure.

Déjà Entendu | An Opera Automaton is an installation that explores the boundaries of perception. It is a generative installation that transcends traditional boundaries of perception, immersing the viewer in a digital opera experience based on the Faust myth. Truninger's work is an exploration where language, with its abstract and reconstructible qualities, is the main focus in the interplay of light and sound.



Yoon Chung, Han. *Digiti Sonus*. 2012.

Digiti Sonus is an interactive fingerprint sound installation that enables viewers to explore the unveiling of sensory identity. It accomplishes this by transforming the distinctive pattern of each person's fingerprint into a personalized and unique sound effect."

As we all know, fingerprints are different for every living being, and compared to other body line data, fingerprints are the only ones that are clearly identifiable and can be recorded in a database for various purposes. As one of the most important biotechnologies, fingerprints are widely used for identification due to their clarity and uniqueness.

The author of *Digiti Sonus* mentions that she believes fingerprints can represent the original identity and voice of each person, which is innate and cannot be modified. Only the simple spiral pattern is the truth of human birth, genetics, and growth. Therefore, in addition to identity determination, fingerprints are an important factor in exploring the inner, unconscious, and pure voice of the human body. This gives the initial source of inspiration

for her work.

Participants can generate spiral fingerprint patterns by touching their fingers to sensors, each of which emits a unique sound pattern.

Park, Sihwa. *BeHAVE*. 2018

BeHAVE is an artistic design work, which can combine audio and visual effects and visualize behavioural data.

The appearance of *BeHAVE* is a dynamic heat map, which includes human movement trajectory, social interaction and other behavioural data. The colour of this heat map means different intensities and modes of data, and audio and visual effects will provide a synchronous audio-visual experience. The purpose of *BeHAVE* is to present the patterns and meanings behind behavioural data to the audience. In order to obtain behavioural data, *BeHAVE* will use various data collection and analysis technologies and combine modern programming and visualization tools to convert data into heat maps and audio.

The way for the audience to participate in this work is to observe the heat map and listen to the audio. By observing the changes of colours, patterns, rhythm and tone of audio, they can deeply understand the patterns and meanings of behavioural data. Technically,

BeHAVE creates a heat map by data visualization library and generates audio by audio processing library.

The theme of *BeHAVE* is the expression and understanding of behavioural data. Through innovative audio-visual methods, *BeHAVE* shows the patterns and meanings hidden behind behavioural data and gives the audience a deeper understanding of human behaviour.

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