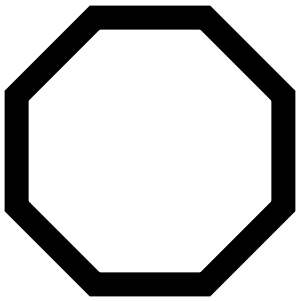
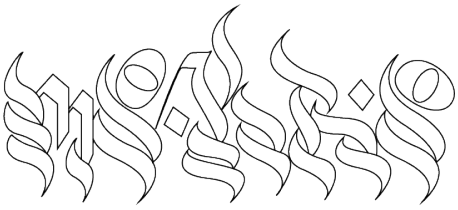
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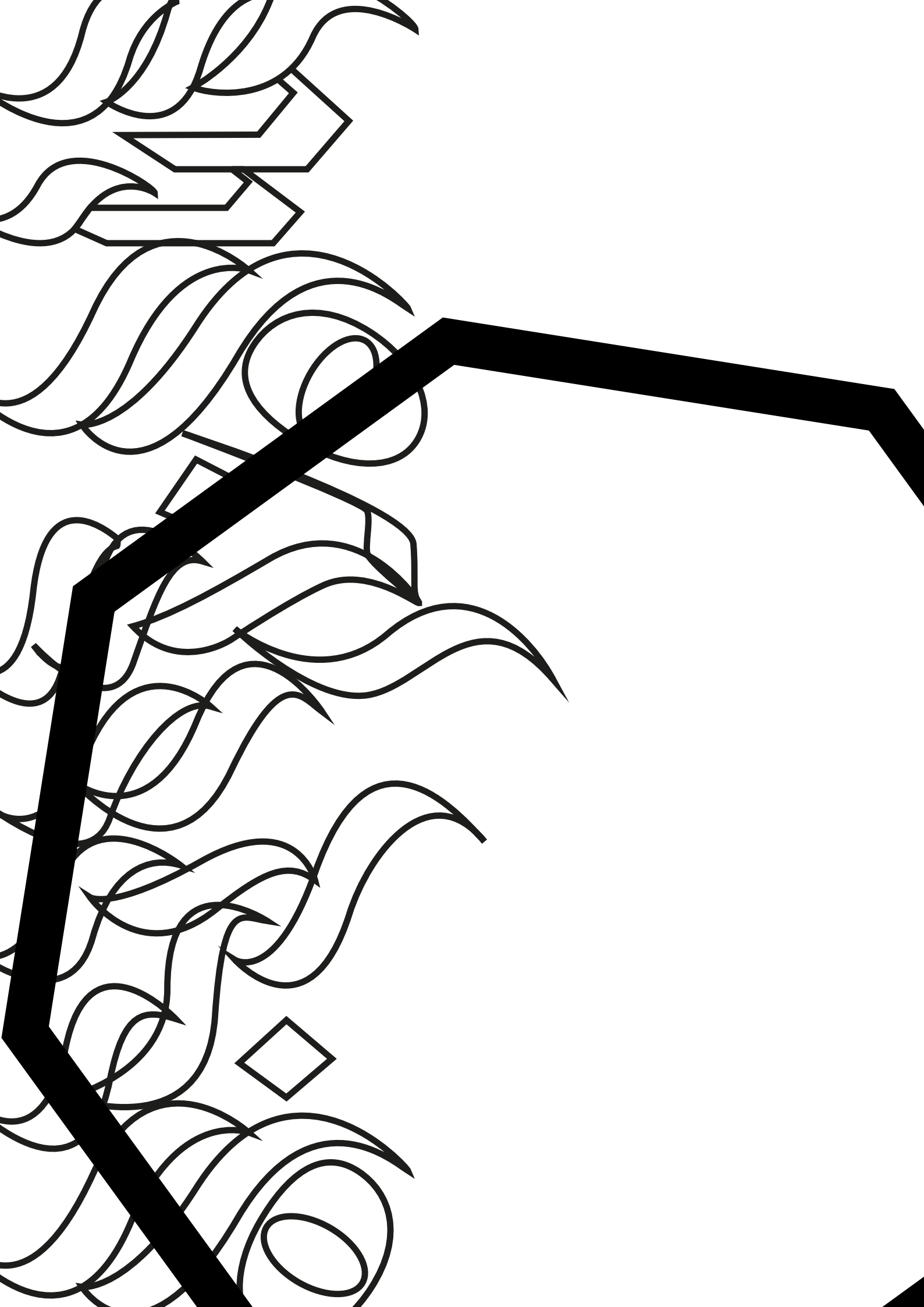




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2025237422

Course of Sound and Image
Project Final 2025.26
Nuno Monteiro

POLITÉCNICO DE LEIRIA
ESCOLA SUPERIOR DE EDUCAÇÃO E CIÊNCIAS SOCIAIS



Final Project Report

theme: Sound as a generative, spatial and relational force

SYNOPSIS

Gyroscope is an interactive spatial sound installation built around eight speakers arranged in an octagon, conceived as a living sonic organism that perceives and responds to the people who enter its space. Left alone, it breathes a deep, rotating vibration that cycles slowly through the speakers like the perpetual motion of a wind turbine.
When someone enters, the system notices: it reacts to their position, their stillness, their speed and their number, reshaping its sound in real time. Built with Ableton Live for spatial sound synthesis and TouchDesigner with an overhead camera for presence tracking, Gyroscope is an attempt to build a tangible interface with sound a bridge between the listener and a force that is normally felt but never touched.

1. Introduction

This report documents the conception, research, production and outcome of Gyroscope, an interactive spatial sound installation realised as my final university project. The text follows the work from its first intentions through its technical construction to its public presentation, and closes with an analysis of what the project achieved and where it is headed. The introduction sets out the premises of the brief and my own intentions, traces the references and lived experiences that shaped the concept, and describes how I prepared the work. The second chapter details the production: the materials, the technical chain that makes the installation respond, the sound design, and the physical setup. The third presents the result and the public's response. The final chapter reflects on what worked, what I would change, and what Gyroscope represents within my path as an artist.

1.1 Premises

The final project was framed as the realisation of a finished work, within the scope of the Sound and Image course, capable of expressing the technical, theoretical and practical competences acquired during the studies while allowing the student to develop and deepen languages and themes close to them. The brief left a wide creative freedom, with no fixed theme imposed. The project began as research into sound, guided by an idea I had set down in my first pitch: sound as a force, able to generate space, emotions, message and relations. The goal I gave myself was to create a sound, matched with installation and performance, capable of leaving a perceptual, political and relational mark, even after its conclusion.

1.2 Statement of Intentions

Gyroscope was born from my exploration of sound and from my first personal, participatory approach to working with it. I found myself in a context that was stimulating and actively inviting for me to go beyond my usual boundaries. The project comes, then, from the search for how far I can push myself and what I am able to do when I work outside my comfort zone. The starting point was the idea of building a place with a purpose that sets sound as an alternative instrument to make something different a kind of reconceiving of sound itself, turning it into a tool for something other than what it usually is.

I wanted to create a true and tangible interface with sound: the bridge that connects us to it. When I imagine the public entering the space, I think of the possibility of finding themselves before a new interaction with something common to everyone, almost a simulation of what I went through myself in rediscovering techniques I already knew. I wanted the audience to come into contact with sound in a tangible way, and for the audience itself to become part of the work. The event happens when the visitor enters the installation, which on its own, by itself, remains alive and active.

This is why I consider the installation alive. Even without an audience it exists and emits sound much more neutral and low, like breaths waiting for someone's presence to wake up. The neutral state of the installation helps to invite and make the octagon of speakers more captivating, as most like a challenge. I like to consider it alive because there is a factor of unpredictability and chance that does not fully allow me to predict what the emitted sound will do or how: even when left alone, every so often the installation reacts on itself, starting sounds without any concrete input from a spectator.

My initial ambition was to genuinely experiment with sound and with software and techniques I had never used before, pushing myself to learn things I had been interested in for a long time but had never had the chance to put into practice. As the work progressed, the concept developed in direct connection with the skills I was learning, which kept opening new possibilities to create things I had not foreseen. In that sense, the ambition and the project grew together.

1.3 Research and References

The first sources of inspiration were live events where sound became an event in itself: Aphex Twin at the Barbican Hall, London (10.10.2012), and Massive Attack's live performances with their use of live visuals and TouchDesigner. I was looking for a sound that could be an event at the same time. From there my research deepened into different uses of sound. Janet Cardiff's The Forty Part Motet was the strongest reference and the artist who most guided me, mentally, in thinking about the dimension and the interface that the public can have with sound itself. Ryoji Ikeda was also an influence, for his interactive installations built on the relationship between technology and the public.

Two songs in particular gave a strong inspirational and artistic guide to the development of the work:

Radiohead's - Videotape and

Boards of Canada's - Gyroscope, the latter also gave the installation its name.

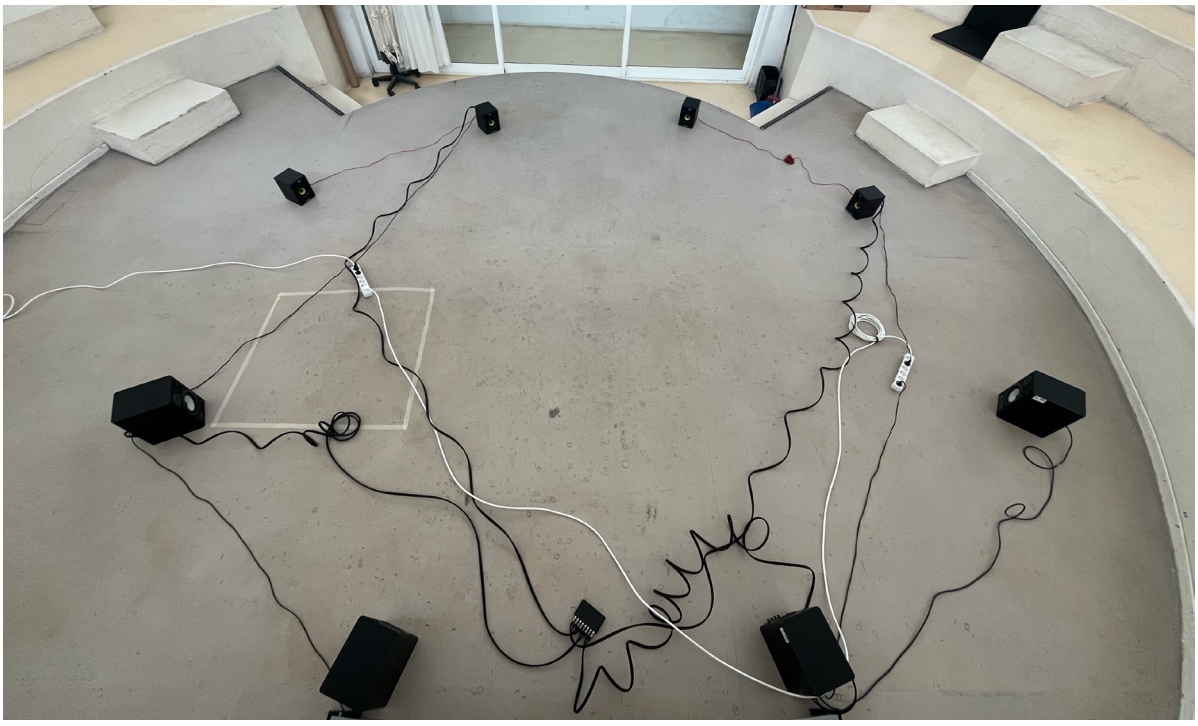
Beyond art, I want to give proper space to the direct influence of reality that led me, mentally, to live the sonic octagon I built. The experience that most marked the project was spending time in Chãos, near Rio Maior, in Portugal, the country where I am currently based during my Erasmus programme. It is a special place where I dedicated personal time to think and to make small retreats devoted to my research into sound.

There, the sound of nature is constantly polluted by the wind turbines, whose continuous and perpetual rotation hypnotised me and gave me a kind of answer. The very sound of the work derives from the attempt to recreate the deep perpetual motion of those turbines. The area is in fact a place where the installation of wind turbines altered the landscape and introduced a constant noise into it. My bicycle in Bolzano produced a sound very similar to the Boards of Canada track, the same rotating rhythm I kept finding as a hypnotic pattern in my personal life. All of this, joined to a deep research into sound, brought me to the personal need to build Gyroscope — an installation I almost see as a means to give life to sound and to its living interaction with me and the public.



1.4 Preparation

For the realisation I started from a strong motivation to experiment with sound and with different programs and techniques I had not used in the past, pushing myself to learn things I had been interested in for some time. The starting point was experimentation with two programs I had long wanted to explore Ableton Live and TouchDesigner, which I committed myself to learning. Over time, the idea of the project developed in direct connection with the skills I was acquiring, increasingly giving me the means to create new things. The preparation was therefore not a single fixed plan made in advance, but a continuous back-and-forth between learning the tools and shaping the concept: as the technical possibilities became clearer, so did the work.



2. Production

2.1 List of Materials Used

The equipment was at an intermediate level, assembled with what the university made available. It is divided here by area.

Audio:

• 8 active speakers, arranged in an octagon
• Gigaport eX — 8-channel USB audio interface
• 8 XLR / TRS audio cables
• Speaker stands

Computing and tracking:

• Computer running Ableton Live 11 Suite (audio engine)
• Computer running TouchDesigner (tracking and routing)
• Overhead camera (mounted above the centre of the installation)
• overhead mounting for the camera
• Smartphone providing the local network (hotspot) between the two computers

Software:

• Ableton Live 11 Suite — spatial sound synthesis and distribution across the 8 channels
• TouchDesigner — camera input, presence and movement tracking, parameter routing
• AbletonOSC — bridge translating tracking data into Ableton parameters over the network

2.2 Technical Process

The system is built as a chain that turns the presence of a body in space into sound. An overhead camera observes the circular room from above. Its image is read in TouchDesigner, which tracks the presence, position, movement and speed of the people inside the space. These values are sent, over a local network, to Ableton Live, where they continuously reshape how the sound is generated — its frequency, its volume, its spatial rotation and other parameters. The sound is then distributed across the eight speakers through the Gigaport eX interface, so that it can rotate around the octagon. The sound itself is organised in layers. At its foundation is a deep, low drone — the breath of the system, always present, built from very low notes chosen to give a profound, almost spiritual sense and to be felt not only in the ears but in the body. Above it sit further layers that emerge with interaction: a warmer tonal layer that grows as someone is present, a textural layer that appears with movement, and an impulse that surfaces as an event when the movement becomes intense. I looked for a sound that was deep, rhythmic and perpetual, just like the wind turbines that inspired it.

The interaction follows three states. When no one is present, the installation rests in its neutral state: only the deep drone and slow, autonomous breaths, with the system occasionally reacting on itself. When someone enters, the sound is gently disturbed out of its neutral state — it becomes higher and more agitated, as if a living animal were being stirred. The audience acts on several aspects of the sound at once: position, the number of people, their displacement and their speed all alter, in specific and different ways, how the sound is generated. The closer and the faster the movement, the more the organism awakens.
I realised the project entirely on my own. In practice I did everything by myself; in the conceptualisation I drew on several people I know, especially in the art world, to develop and give shape to the whole. The hardest moment was at the beginning — finding what I wanted to do. The great freedom and the absence of a clear theme, together with many thoughts tied to my private life, meant I spent a long time concentrating on a concept while making very little. The moment I started actually making, I understood better and better how to do the whole thing. The second hardest moment was the end: finding the right balance in TouchDesigner to achieve the effect I wanted, where a handful of parameters could completely change the experience.

2.3 Setup Scheme

The installation occupies a circular room. The eight speakers are placed around the perimeter to form a regular octagon, numbered clockwise from SPK1. The camera is mounted overhead, at the centre, looking straight down, so that a person's position in the image corresponds to their real position in the room. The two computers sit near the centre: one running Ableton Live connected to the Gigaport eX and, from it, the eight speakers; the other running TouchDesigner and receiving the camera feed.

The two machines communicate over a local network provided by a phone hotspot. A schematic diagram of the speaker layout, camera position and signal flow is included in the annexes.

3. Results

The exhibition went very well. The public reacted very positively, turning the space into a genuine personal exploration of the body. The diversity of the ways people interacted was extremely interesting: there were those who played, those who ran, those who danced, those who lay down and meditated. Some people were disturbed by the sound, while others treated it as something sacred. It is impossible to unify into a single reaction all the variety of responses I received. In any case, seeing Gyroscope react to all of this was magnificent, I was able to hear, from the installation, sounds and synchronicities with people that I would never have imagined.
I had no particular expectation about how people would react. I only hoped that someone would come to see what I had made, and from that point of view it was a success: many people saw the installation and even came back to try it again.
Fundamentally, I can be satisfied that, at the moment of the exhibition, I managed to make the whole thing work. Gyroscope ran and held for the entire duration without any surprise or crash.

This is not to say the road was smooth. Up until five minutes before, especially in the final phase of the project, many difficulties — mostly tied to the technological equipment — were not on my side. My computer developed a problem with its USB port, which prevented me from using the 8-channel output device and, with it, the camera, so I had to replace my machine with two other computers. One day before the installation, my phone — which had become the connection between the two computers over the network managed by my hotspot — stopped working. Yet despite all the difficulties, small and large (such as being stuck in Spain with the camper van broken down and no way out), I managed to realise the whole thing. For me, the goal always remains to overcome every obstacle and to arrive at the conclusion satisfied and in line with what I want to make.



4. Conclusions

4.1 Analysis of Results

What worked, above all, was the core intention: the installation succeeded in becoming a living, responsive space that people wanted to inhabit and return to. The system held technically through the whole exhibition, and the sound achieved the deep, rotating, bodily quality I was searching for. What was most fragile was the technical infrastructure around it — the dependence on intermediate-level equipment and on improvised solutions (two substitute computers, a phone hotspot as the link between them) introduced risks that revealed themselves up to the very last minutes. The fine-tuning in TouchDesigner, where a few parameters decide the whole experience, also proved to be the most delicate part of the work.

If I were to do it again, I would prefer to exhibit in a space over which I have more control. It was not easy to work in a room I was rarely able to see and use beforehand. I would also want an upgrade in equipment: to re-propose the installation and bring it to a higher level, better material would undoubtedly be necessary.

Technically, the project taught me to build a working real-time chain between camera tracking, a visual programming environment and a sound engine, and to make that chain robust enough to survive a live context. Conceptually, it taught me how to translate a personal, almost intangible experience — the perpetual rotation of wind turbines, the hypnotic rhythm of a bicycle — into a system that others can enter and feel for themselves.

4.2 Personal Reflection

Within my path, Gyroscope is a key point. I consider it the first project seen with an artistic mentality outside the academic context. I made it thinking about my future movements and about venturing into the real art world. I have reached a point where I want to put more commitment and dedication into art beyond the university, where I feel that to establish myself I want to truly put myself on the line. That is the mentality behind Gyroscope: to go beyond the limits in every aspect. Although I realised this project within a university context, my mind was already no longer there. I made this work with the intention of taking it outside the walls of a school and bringing it to the real world of art. It is a project whose potential I recognise, and which is only waiting to push even further beyond the limits I currently know.



5. Bibliography and References

The following references include the artistic works, performances and sources that
informed the conception and development of the project. To be completed and formatted by the author with the specific editions, dates and links consulted.

Artistic and musical references:
• CARDIFF, J., The Forty Part Motet (2001), sound installation.
• APHEX TWIN, live performance, Barbican Hall, London, 10.10.2012.
• MASSIVE ATTACK, live performances with live visuals and TouchDesigner.
• IKEDA, R., interactive audiovisual installations.
• RADIOHEAD, “Videotape”, In Rainbows (2007).
• BOARDS OF CANADA, “Gyroscope”, Geogaddi (2002).
• Diana Charkasava photo documentation

Technical references:
• Ableton Live 11 Suite — official documentation.
• Derivative TouchDesigner — official documentation.
• AbletonOSC — open-source remote control script.

Internetgraphy / context:
• Parque Natural das Serras de Aire e Candeeiros (Chãos, Rio Maior, Portugal) — context for the wind-turbine soundscape that inspired the work.

6. Annexes

The following materials are referenced throughout the report and collected here for completeness:

• Setup diagram: octagonal speaker layout, overhead camera position and signal flow.

• Technical scheme: signal chain from camera ->TouchDesigner -> Ableton Live -> Gigaport eX -> speakers.

• Photographic documentation of the installation and of the public during the exhibition made by Diana Charkasava.

• Audio / video documentation of the installation in its three states (absence, presence, active movement).

• Project poster and trailer.





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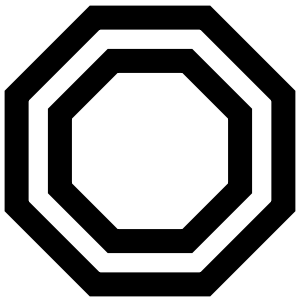
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