INTERACTIVE DIGITEL SYSTEMS

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ASSIGMENT 4

EMOTION *CANVAS*

INTERACTIVE INSTALLATION

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SUMMARY

1. CONTEXT OF THE WORK

Emotion Canvas is a project that transforms a dark room into a canvas of emotions, using a combination of sentiment analysis and speech recognition. The experience translates visitor's emotional reflections into immersive visuals and sounds, creating a unique connection between personal expression and digital art.

ABOUT THE PROJECT

The project ***Emotion Canvas*** represents more than a technological experiment - it is a bridge between human emotion and digital artistry, designed to foster a deeply personal and immersive experience. By merging cutting-edge technology with creative expression, the project aims to highlight the transformative power of interactive systems in understanding and representing emotions.

This project invites participants into a dark, neutral space, free of distractions, where they can engage with their feelings in a unique and interactive way. Through advanced sentiment analysis and speech recognition, visitor's emotions are translated into dynamic visuals and auditory expressions, creating an environment where personal reflections come to life. Each interaction offers a glimpse into how technology can interpret the intangible nature of emotions, transforming internal states into a symphony of colors, shapes, and sounds.

The primary goal of *Emotion Canvas* is to provide a safe, inspiring outlet for emotional expression. It encourages users to externalize their feelings, fostering self-awareness and mindfulness. By blending innovative design, emotional intelligence, and the artistic potential of digital systems, this project aims to deepen the connection between humans and technology, showing how interactive art can serve as a powerful medium for introspection and creative exploration.

STRUCTURE OF THE PROJECT

The structure of the *Emotion Canvas* project outlines the key components and processes that seamlessly integrate technology, art, and user interaction, ensuring a cohesive and transformative emotional experience.

1. **Conceptual framework:** Focuses on exploring the intersection of emotion, technology, and art to foster emotional reflection and self-expression.

2. **Technical architecture:**
    a. Speech recognition: Captures verbal input.
    b. Sentiment analysis: Identifies the emotional tone.
    c. Dynamic content generation: Produces real-time visuals and soundscapes based on emotions.

3. **Artistic design:**
    a. Abstract visual projections and immersive soundscapes create an engaging sensory experience.
    b. Dark, minimalistic room enhance focus on the emotions art representation through visuals and sounds.

4. **User interaction workflow:**
    a. Users enter a room, share emotions via a microphone, and see their feelings reflected through real-time visuals and soundscapes.
    b. They can repeat the process to explore multiple emotions.

5. **Impact framework:** Encourages emotional connection, self-awareness, and intellectual engagement.

6. **Development phases:** Conceptualization, technological integration, content creation, testing, and deployment.

7. **Feedback and iteration:** User feedback and system updates ensure continuous improvement.

This structure ensures a seamless blend of art, technology, and user interaction, creating a transformative and reflective experience.

INTERACTIVE EXPERIENCE

The interactive experience is key to the *Emotion Canvas* project's ability to offer a personalized and transformative experience. By evolving in response to each user's input, the environment deepens the connection between users and their emotions, creating a space for reflection, self-awareness, and emotional growth.

Through repeated interactions, users gain a clearer understanding of their emotional states, recognizing how feelings shift, overlap, and manifest. This real-time engagement not only connects them to the artwork but also to themselves, fostering mindfulness and introspection - core elements of the project's mission.

USER JOURNEY

The **user journey** in *Emotion Canvas* guides participants through an immersive experience of emotional reflection and expression. From entering a dark, contemplative space filled with atmospheric voices and visuals to sharing their feelings via a microphone, users witness their emotions come to life through dynamic animations and soundscapes. This seamless process fosters introspection and connection, transforming the room into a personalized canvas of emotions.

Phase 1: Entering the Black Room

1. **Arrival:** The user enters a dark room where projectors display dynamic, digital contemporary art on the walls. Soft, indistinct voices begin to echo around the space, expressing a range of emotions through fragmented phrases like, "I feel lost" or "I'm hopeful." These voices, along with abstract animations that move fluidly across the walls, create an immersive emotional atmosphere. The visuals respond in sync with the tone and intensity of the voices, deepening the sense of connection between the emotions being expressed and the artwork on display.

Phase 2: The invasion to reflect

1. **Transition :**The voices and visuals gradually fade out, leaving the room in complete silence and darkness, creating a moment of stillness and anticipation.

2. **Prompt for interaction:** After the fade-out, a question appears on the walls in glowing text: "Now, tell us how you feel today?". The user is then invited to approach the microphone in the center of the room and express their emotions verbally, using a word or phrase such as "I feel anxious" or "I'm excited for today!"

Phase 3: Emotional expression and response

1. **Processing the emotion:** Once the user speaks into the microphone, the system processes their input using speech recognition and sentiment analysis. A brief pause follows as the system interprets their emotions, creating a moment of anticipation before the room responds.

2. **Visual and auditory response:** The room comes alive with an abstract animation of something similar to waves, representing the expressed emotion, using specific colors. At the same time, a soundscape begins to play, carefully crafted to mirror the mood of the emotion, enhancing the immersive experience.

Phase 4: Open exploration

1. **Further interaction:** The user is encouraged to continue interacting by expressing more emotions. Each new emotion triggers a unique combination of visuals and sounds, creating a dynamic and personalized experience.

Phase 5: Closing the journey

1. **Final reflection:** When the user decides to stop interacting, the system transitions into a calming phase. The animations and music starts to fade out, creating a sense of closure.

1. **Exit:** As the user leaves the room, a final message appears, such as: "Always feel free to express your emotions!". The environment gradually returns to silence and darkness, ready for the next participant.

TOOLS USED FOR THE PROJECT

The *Emotion Canvas* project was developed using a combination of web technologies and creative coding tools, carefully chosen to achieve its interactive and artistic goals. Here is an overview of the main tools and frameworks utilized:

1. **Programming Languages:** JavaScript for implementing the logic, sentiment analysis, and interaction within the project. And HTML & CSS, used for structuring the webpage and styling its visual elements, ensuring a user-friendly interface.

2. **p5.js Library:** At the heart of the project is p5.js, a powerful JavaScript library for creative coding. Its features allowed us to seamlessly integrate generative art and interactive elements. Key modules of p5.js used include:

    a. **p5.dom:** This module was essential for manipulating the DOM (Document Object Model). It allowed us to create and style HTML elements dynamically, such as the creation and interaction of buttons.
    b. **p5.sound:** This library was used to generate and control audio. It enabled the project to produce adaptive soundscapes that reflected the emotions detected by the system, enhancing the immersive experience.

3. **Web API:** The speech recognition is enabled by the Web Speech API, specifically the SpeechRecognition interface (or webkitSpeechRecognition for browsers that prefix it).

In conclusion, the project integrates web technologies and creative coding tools to deliver an interactive and immersive emotional experience. The result is a seamless exploration of emotion through technology, art, and interactivity.

PURPOSE AND IMPACT

The *Emotion Canvas* project seeks to bridge the gap between technology, art, and human emotion, offering a platform where individuals can explore their inner worlds in an innovative and interactive way. By translating feelings into dynamic visuals and soundscapes, the project provides a safe, creative outlet for emotional expression while also fostering introspection and mindfulness.

Its purpose extends beyond artistic representation - it aims to contribute to user's psychological well-being and intellectual curiosity by encouraging them to engage with their emotions in a new and meaningful way.

Psychological Impact

1. **Emotional validation and catharsis:** The project creates a non-judgmental space where users can externalize their emotions, whether simple or complex. By giving users an opportunity to express and witness their feelings reflected back in real time, the experience provides a sense of validation and emotional release, which can be deeply therapeutic.

2. **Mindfulness and self-awareness:** The act of verbalizing emotions and observing their visual and auditory transformation encourages users to be more present and mindful. It cultivates a heightened awareness of their internal states, allowing them to recognize, acknowledge, and process their feelings constructively.

3. **Emotional intelligence development:** By engaging with the interactive system, users are encouraged to articulate their emotions and observe how they evolve. This promotes emotional literacy - the ability to identify and express feelings effectively - and supports the development of emotional intelligence, a key skill for personal and interpersonal growth.

4. **Safe exploration of vulnerability:** The immersive and anonymous nature of the experience allows users to explore vulnerable emotions in a safe and controlled environment. This can help reduce emotional stigma and promote acceptance of all feelings, both positive and negative.

Intellectual impact

1. **Curiosity and engagement with technology:** The project introduces users to advanced technologies like speech recognition and sentiment analysis in an accessible, creative way. By observing how the system interprets and responds to their emotions, users are prompted to consider the intersection of human psychology and artificial intelligence, sparking intellectual curiosity.

2. **Stimulating creativity and imagination:** The dynamic animations and soundscapes are not just representations of emotion; they are artistic interpretations that inspire users to think about their feelings in abstract and creative ways. This interplay between art and emotion fosters a deeper intellectual engagement with the self and the creative process.

3. **Encouraging reflective thinking:** The iterative nature of the experience, where users can repeatedly explore different emotions, prompts reflective thinking. It invites them to consider questions like:
- How do my emotions shape my perception of the environment?
- How do colors, sounds, and visuals influence my understanding of feelings?
- How do my emotional states change over time?

4. **Understanding the human-technology relationship:** The project raises questions about how technology interprets human emotion, encouraging users to critically think about the limitations and potentials of AI in understanding complex human experiences. It opens a dialogue about the future of emotional interaction with digital systems, sparking deeper intellectual debates.

Holistic growth

By combining psychological and intellectual stimulation, *Emotion Canvas* provides a multidimensional experience. It nurtures emotional well-being by offering an outlet for feelings and enhances intellectual growth by inviting users to reflect on the mechanisms and implications of the system. The project not only connects users to their emotions but also broadens their perspective on the interplay of technology, art, and human expression, making it a profoundly transformative experience.

TECHNICAL RIDERS/IMPLICATIONS

The *Emotion Canvas* project relies on a well-integrated system of technologies and equipment to deliver an immersive and interactive experience. Below are the key technical requirements and considerations:

1. **Technical riders:** These are the specific technical requirements necessary to set up and operate the Emotion Canvas project.

Equipment requirements

- **Projection system:** High-resolution projectors for full-wall coverage, to project the dynamic animations.

Note: The concept for the *Emotio Canvas* was inspired by immersive experiences like the Van Gogh Alive exhibition, where the entire space is transformed into a dynamic canvas through moving projections. Our vision was to create a similar setup - a room fully enveloped in projections of abstract, emotional art that reacts to user input in real-time.

Unfortunately, recreating this idea for the project's presentation proved unfeasible due to the complexity and specificity of the required technologies. High-quality projection systems, advanced motion mapping, and real-time interaction software demand resources that go beyond our current capabilities. While the prototype reflects the essence of our concept, the immersive scale we envisioned remains an aspiration for future iterations with access to more advanced equipment.

- **Audio system**: Surround sound speakers for immersive audio. Mainly for the music that accomplishes the visual.

- **Input devices:** High-quality, noise-canceling microphone for accurate speech capture. The idea is to have just one microphone in the middle of the room, and each person approached to share their thoughts and emotions

Software and processing

The javascript file uses the Web Speech API to listen to human input. It then turns the input into a string and passes it to a jason file. The server file then reads this jason file and performs a sentiment analysis using our model. The emotion, color and sound are then passed back into a jason file which is then read by the javascript file. The program then updates the color of the perlussian noise accordingly, while simultaneously playing the appropriate sound.

- **Speech recognition software:** Real-time conversion of user speech into text. This software came from the Web Speech API. This was a simple plug in into Javascript. Only downside was that it only worked in certain search softwares (like Google Chrome).

- **Sentiment analysis:** Machine learning models for identifying emotional tones. This one was done using a Roberta Base model that was trained on Go Emotions that we found on huggingface.

- **Content generation software:** Tools for dynamic visuals and soundscapes, triggered by emotional data. The dynamic noise was generated using perlian noise, with the color being updated by sending the input back to server.py where our model performed a quick sentiment analysis. To do this, we used the p5 library.

Spatial and environment setup

- **Room design:** Darkened space with matte, smooth walls for distortion-free projections.

- **Acoustic treatment:** Soundproofing and balanced acoustics for clear playback.

- **Interaction zone:** A designated area with a microphone for user input.

Connectivity and integration

- **Network infrastructure:** Stable local network for device communication and real-time processing.

- **Power outlets:** for the computer, projector, and sound system;

2. **Technical implications**

The technical implications of this project refer to the challenges and technical requirements necessary to ensure the installation operates correctly.

- **Hardware:** we need to ensure compatibility between the microphone, computer, projector, and sound system, as well as provide enough electrical power and keep the cables organized to avoid failures.

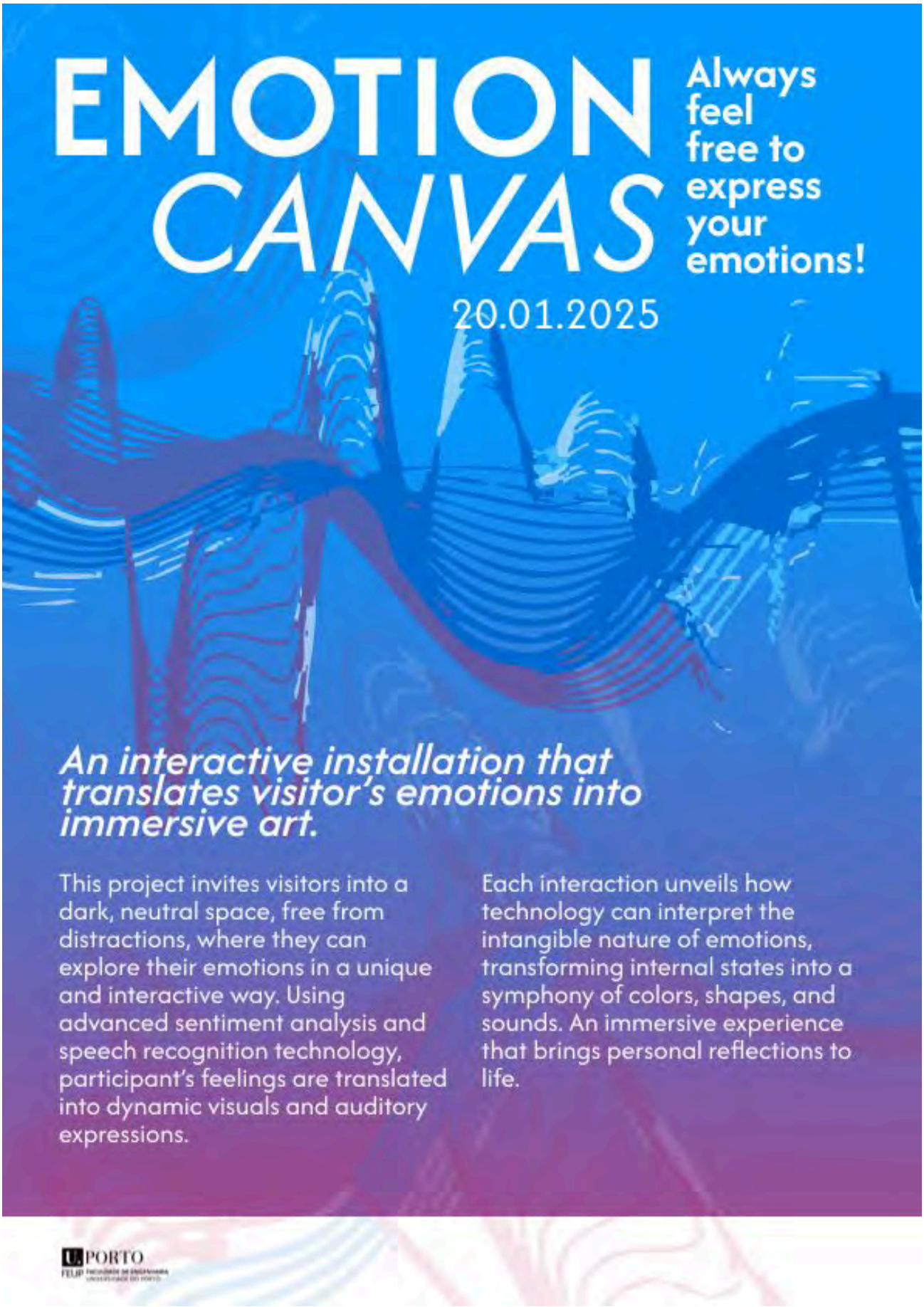
- **Software:** the emotion detection algorithm, based on voice analysis, must be accurate. It is also essential to synchronize the audio input with the projected animations and music, in addition to planning for potential failures or updates.

- **Physical space:** the environment needs to be dark for clear projections and acoustically isolated to capture the voice without interference.

- **Maintenance:** on-site technical support is required to address unexpected problems and ensure continuous operation.

To simplify understanding, we can represent this with a block diagram showing the technical flow:

EXIBITIONS POSTER



2. RELATED WORK AND ARTISTS

The ***Emotion Canvas*** project draws inspiration from a variety of interactive art installations, digital creators, and technological innovations that bridge the gap between emotional expression and artistic representation. Here are key areas of influence, interactive art installations, digital emotion representation and artists exploring emotion and abstraction.

INTERACTIVE ART INSTALLATIONS

The Moco Museum, in Barcelona and Van Gogh Alive, an exhibition that was in Alfandega, Porto, for a while, are a perfect combination of immersive interaction arts that puts the user's emotions heightened.

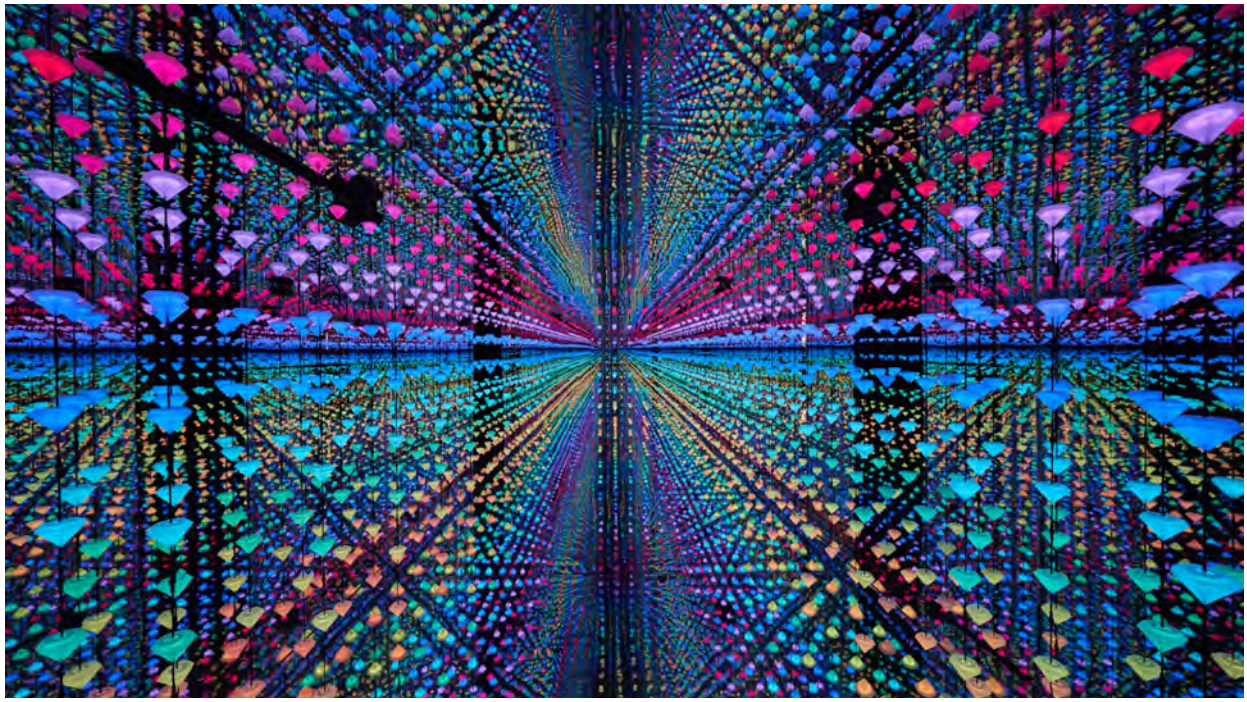
1. **The Moco Museum**

"Discover a dynamic blend of modern, contemporary, and digital immersive art, where every visit sparks creativity, invites reflection, and fuels innovation. Moco Museum showcases iconic pieces from world-renowned artists and today's rising stars, making it a must-see destination for anyone eager to be inspired."

In this museum, we count on exhibitions of many artists such as, Keith Haring, Salvador Dalí, Jean-Michel Basquiat, Banksy, Marina Abramovic, KAWS, Hayden Kays, Studio Irma and Robbie Williams.

One of the artists and exhibitions that inspired us for this project was Studio Irma's immersive exhibition - Digital Immersive Art . It is a stunning example of digital art, because it transforms a physical space into an all-encompassing sensory experience. In this installation, vibrant lights coming from the roof are projected onto every surface of the room, creating the illusion of being enveloped by the art itself. The use of mirrors enhances this effect, reflecting the lights infinitely and giving the impression of a vast, boundless environment.

Combined with a calming soundtrack, the space invites visitors to lose themselves in a magical, meditative atmosphere.



Similarly, the *Emotion Canvas* project aims to immerse users completely in the art by projecting visuals onto all the walls of a darkened room. This technique creates a sense of being "inside" the artwork, much like Studio Irma's exhibition, but with a key difference: the art in Emotion Canvas is interactive and personalized. Rather than being surrounded by pre-designed visuals, participants in this project contribute to the art through their emotions.

Both projects highlight the transformative power of art to engage people on a deeply emotional level, making them active participants in the experience.

3. Van Gogh Alive

The Van Gogh Alive exhibition immerses visitors into the world of Vincent Van Gogh through 360° projections of over 150 paintings, synchronized soundscapes, and light effects. This experience allows participants to step into the artist's universe, deeply connecting with his emotions and thoughts. Additionally, visitors can engage in an activity where they create their own digital paintings, further enhancing their interaction with the art.

This concept inspired the *Emotio Canvas* project, which similarly aims to create an immersive environment where art surrounds participants. While Van Gogh Alive brings the emotions of a historical artist to life, Emotion Canvas focuses on personal expression, letting users shape the art with their own emotions in real time. Both projects demonstrate how technology can merge art and emotion to create deeply engaging experiences.

PROJECTS MADE BY DIGITAL EMOTION REPRESENTATION

Here, we will talk about projects that are made by AI, and we will also talk about "We feel fine" by Jonathan Harris and Sep Kamvar.

1. **Emotional AI projects**

Applications like Replika and Affectiva use advanced technologies to analyze and interpret human emotions, providing a foundation for understanding how artificial intelligence can process and respond to emotional data. Replika is an AI chatbot designed to build emotional connections by engaging in empathetic conversations, while Affectiva specializes in sentiment analysis, leveraging facial expressions and tone of voice to assess emotional states.

These systems served as technical inspiration for the Emotion Canvas project, demonstrating how data-driven approaches can create adaptive and emotionally responsive environments. By analyzing user input - such as voice tone or sentiment - these technologies showcase the potential for AI to bridge the gap between raw data and personalized emotional experiences.

In our project, this concept is adapted and expanded. Instead of passively analyzing emotions, the system actively transforms them into dynamic visuals and soundscapes, creating a highly interactive and immersive environment. Inspired by the emotional responsiveness of Replika and Affectiva, the project highlights the connection between AI-driven sentiment analysis and real-time artistic expression, offering users a new way to externalize and engage with their emotions.

3. **"The Listening Post" by Mark Hansen & Ben Rubin**

The "The Listening Post" is an installation composed of 231 electronic displays set onto a curved wall. This installation visualizes real-time online conversations by displaying random words and vocalizing them with a text-to-speech program. "It is a real-time visualization of thousands of ongoing online conversations. The screens display random words picked from these conversations, and these words are being told by a text-to-speech program as they change, all overlapping and creating strange harmonies. With each changing word comes a clicking sound, adding to the piece's sonic landscape."

"*There are an untold number of souls out there just dying to connect, and we want to convey that yearning. I hope people come away from this feeling of the scale and immensity of human communication*" - Mirapaul, 2001

This one inspired our project, Emotion Canvas, because both projects use immersive technology to engage audiences with the complexity of human communication and emotions, with The Listening Post reflecting collective expression and Emotion Canvas emphasizing personal emotional experience. Through this link you can see the "The Listening Post" project: https://www.youtube.com/watch?v=dD36IajCz6A

PROJECTS MADE BY ARTISTS EXPLORING EMOTION AND ABSTRACTION

1. **Kandinsky's Synesthetic art**

Wassily Kandinsky's non-representational works were groundbreaking in linking colors and shapes to emotions, offering a historical perspective on how art can convey feelings without directly representing the physical world. Kandinsky believed that colors and forms could evoke emotional responses in the viewer, and this concept significantly influenced the visual language of our project.

In Emotion Canvas, we adopt a similar approach, creating contemporary abstract art that reflects the user's emotions. Through dynamic, randomly moving waves within the canvas, the visuals evolve in real time. These waves are colored according to the emotions expressed by the user, allowing the viewer to experience the direct connection between their feelings and the visual language, just as Kandinsky did in his work, but with a modern, interactive twist.

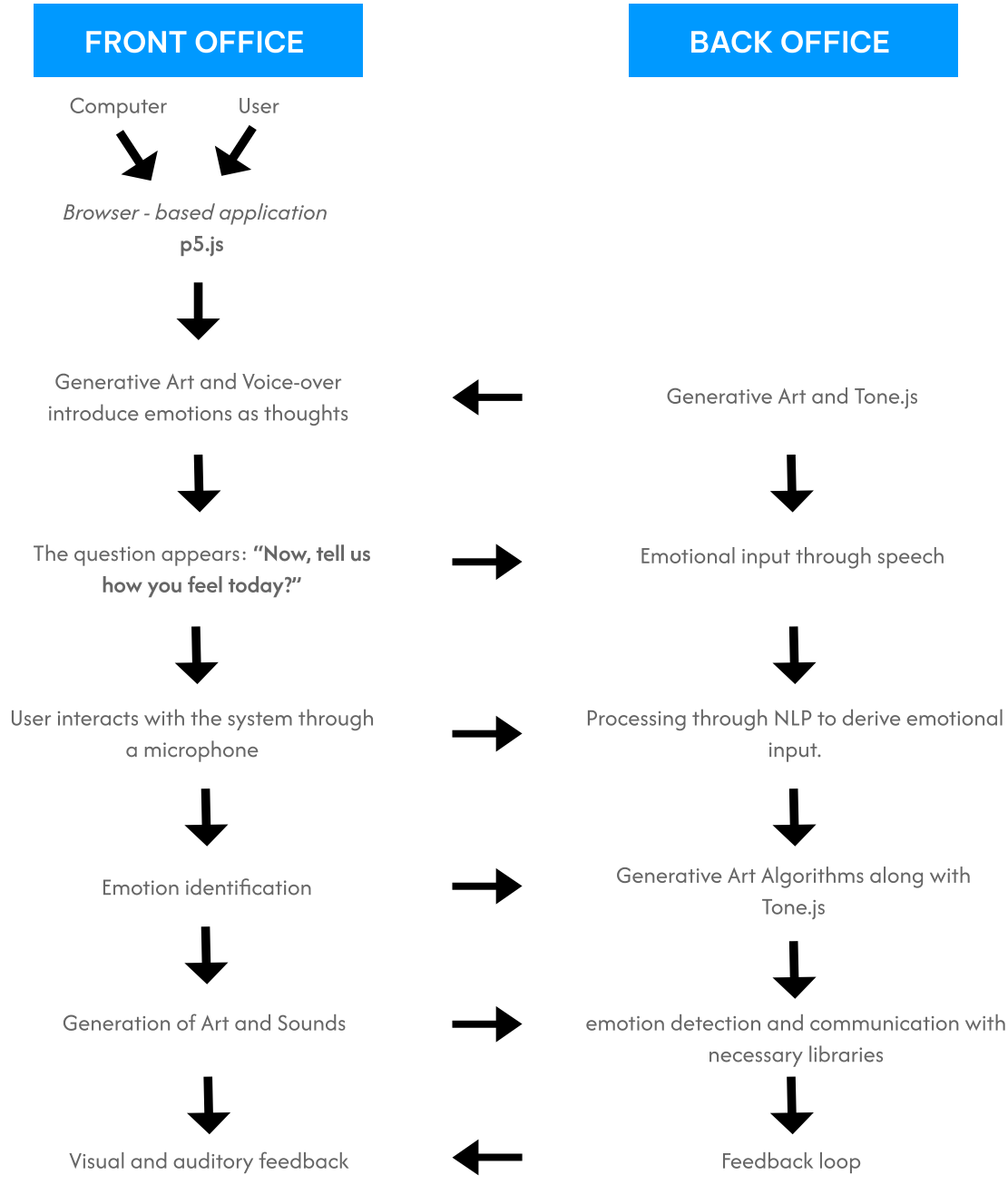
2. Olafur Eliasson

The artist is known for his large-scale installations that bring out the emotional and sensory responses. His works inspired the focus on atmosphere and user immersion like our project *Emotion Canvas.*

The most equal characteristics of these projects and artists with our project, *Emotion Canvas*, it's because they combine the emotions of the humans with technologies and digital arts, making each experience unique and mind blowing. Changing the perspective of art by showing different ways of it by creating immersive and interactive exposures.

3. THE TECHNICAL ARCHITECTURE OF THE WORK

The architecture of the project combines interaction and processing technologies. In the Front Office, the user interacts with the system through a microphone, receiving visual and auditory feedback based on emotions. In the Back Office, NLP techniques, generative art, and adaptive sound work together to analyze emotions and generate dynamic responses, ensuring seamless integration between components.



4. EXPIRIENCE OF THE USER

This user experience immerses participants in a creative, interactive environment with two projectors. A narration introduces emotions like sadness or anger, and users respond to an interactive question. Their answers trigger unique auditory and visual feedback, sparking creativity while reflecting the detected emotion in a personalized, engaging way.

Room

↓

People enter a black room

↓

Generated voices and art
(introduction)

↓

They hear a narration, as if they were thoughts of other people

↓

Interactive question

↓

User Response

↓

When they respond through the microphone, they receive auditory and visual feedback with sounds associated with the detected emotion.

↓

Visual and Auditory Feedback

5. TASKS

For the balanced development of this project, we divided the tasks among the group members as follows:

Pjotr: Responsible for the backend logic, developed the emotion detection system using a pre-trained model. Ensured the correct functioning of sentiment analysis and communication with the necessary libraries through NLP. Additionally, worked on algorithm integration and data processing optimization to improve overall efficiency. Contributed to writing the report.

Ângela: Focused on the development of the visual interface, ensuring interactivity and a user-friendly experience. She was responsible for creating graphic elements and presenting the emotion analysis results intuitively, guaranteeing effective user interaction with the system. Moreover, contributed to writing the report.

Beatriz Reis: Worked on the musical component of the project, programming the adaptive generation of soundtracks based on emotion analysis results. Used sound libraries to synchronize the identified emotions with music in real-time, enhancing the emotional component of the project. Ensured that the sound complemented the user experience and amplified the impact of the emotions. Participated in writing the report.

Luísa Cardoso: Responsible for the overall design and aesthetics of the project, developed the visual concept, including color choices, the harmony between graphic elements, and animated movements. Worked to ensure the final experience was immersive and cohesive, integrating sound and visuals harmoniously. Collaborated on defining a visual identity that reflected the essence of the project. Helped in writing the report.

Linda Rodrigues: Coordinated the integration between backend and frontend systems, ensuring that the emotion detection logic was aligned with the visual and auditory components. She was responsible for implementing user interaction, including voice activation and the creation of dynamic feedback with sound and visuals. Additionally, she developed generative sounds associated with each emotion in the Canva application, optimizing the synchronization with the system's responses. Organized the group workflow and contributed to writing the report.

6. FINAL REFLECTION

In the development of the ***Emotion Canvas*** project, we were able to deepen our knowledge in JavaScript, p5.js, and audiovisual interaction tools, exploring how technology can interpret and represent human emotions in a dynamic and creative way.

Working with these technologies allowed us to create an immersive experience that combines generative visuals and adaptive soundscapes, providing users with a space to convey and express their emotions.
The process was especially challenging due to the complexity of integrating libraries like p5.sound and p5.dom to generate art and music in real-time. We faced technical difficulties, but overcoming them was an opportunity for learning and growth throughout the development. This project was an enriching experience both technically and conceptually. The process of iterating and refining ideas helped us better understand the relationship between art, technology, and emotion.

Additionally, we were able to explore the positive impact that multimodal experiences can have in promoting mindfulness and self-expression, which we consider particularly relevant in contexts of well-being and emotional education.

During the presentation, we tried to highlight what modernized us in this work, emphasizing that it could be exhibited at the Moco Museum in Barcelona due to its interactivity. This project creates auditory and visual feedback, generating immersive art, with colors and lines merging into one another, creating beautiful and unique art.
In the final analysis of technology, Emotion Canvas demonstrates how technology can be used to create empathetic and human experiences, transforming emotions into art and sound. This project not only reinforced our confidence in developing interactive systems but also highlighted the potential of technology as a tool for self-exploration, creativity, and emotional connection.

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