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CART 263: Section B

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Project Proposal: The Galaxy

This proposal outlines the broad ideas surrounding the final CART 263 project in three major sections; concept, mechanics, and implementation. All titles are placeholders, and no specific mechanics have been concluded, all proposal elements are subject to change.

1 - Concept

This section covers all aspects related to the conceptualization behind the project, rather the artistic depth and ideas that shape how we will be programming.

1.1 - Project Brief

Our project will be a fully javascript program with a potential installation portion that converts viewers into particle systems through webcam input, enabling them to interact with their environment by tracking movement. Their image and silhouette will be reproduced in various ways throughout the work, and their bodies will be used as the primary navigation vessel as well as this report will further explain. We aim to reproduce an immersive and surreal experience through both aesthetics and interactivity regardless of whether our project remains on laptop, or is projected onto a wall. This will be done through a narrative that incorporates a minimum of four and a maximum of eight distinct

artworks that use particle systems in unique ways. We took inspiration from a plethora of contemporary artists, notably Yayoi Kusama, and her surreal works incorporating polka dots. Due to the potentially abrasive nature of the visuals, perhaps a seizure warning is needed prior to viewing our project.

1.2 - Project Message

A person is not a fixed form, they are a product of what they have lived and what they will live, constantly dissolving, reforming, and leaving traces behind. As you move, your body disintegrates into swirling dots and fluid waves, becoming one with the digital environment. Each action reshapes reality, blurring the line between self and surroundings. Even when you stop moving, echoes of your past actions remain, slowly fading into the abyss.

1.3 - Aesthetic Choice

After much contemplation, we have settled on a galaxy aesthetic for the project, a dynamic, ever-changing entity, much like a person. Stars are born, die, and transform into new forms, leaving traces of their existence behind. They are sites of constant creation and destruction, stars explode then new ones are born from the old. Everything is interconnected. Stars, planets, and cosmic dust are bound by gravity, influencing one another and creating a unified system. It evokes a sense of the sublime, vast and mysterious, inviting our viewers to explore and introspect. The galaxies themselves will depend on the individual artworks, incorporating various elements like nebulas, black holes and such. Below are some preliminary color palettes we may work with below.

Though ultimately the color choice, despite being of utmost importance, will depend of the final mechanics of the artworks themselves.

2 - Mechanics

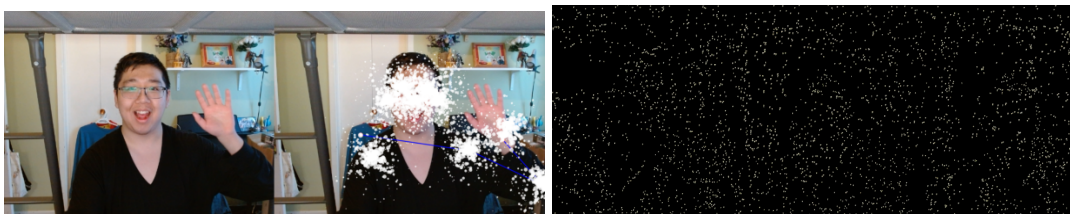
This section covers any specific mechanics that will be included in the project and how they will interact with the user. This does not include any finalized code at the moment, simply ideas and experimentation.

2.1 - Startup & Navigation:

When no user is detected through the webcam, an idle particle animation will show, simply the particles moving around the screen, like stars. Below is a test screen of simple particle generation, as the mapping to a person's body was not yet implemented, this is only to illustrate the materiality of the particles.

Once the person enters the camera's view, the particles will morph to the player's shape and move as they move, as per the example below. The first photo shows all particles following the user, whereas while not very visible, the second photo shows only

the particles within the user's bounds moving to accommodate their shape and location.



These examples are crude and are subject to further tweaking, refining as well as shading, both of these would be done over a non-interactive galaxy particle animation that would rest behind the interactivity enabled particles.

To select the artwork they want to view, several options have been discussed. The most viable option is for the player's body to guide the navigation, triggering a particular artwork when any part of their body hovers over the option, mapping their body's location to button input. Another option may be to use a controller to manually select buttons, but perhaps this removes from the immersive nature of the work.

2.2 - Individual Works

The modular nature of this project was chosen due to its flexibility both in time management and technical requirements. As opposed to a single large project that must be executed with utmost precision, this gives us the freedom to omit or add parts as our time and expertise allows. Currently queued iterations are as follows;

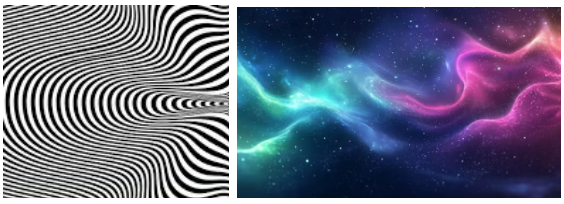
2.2.1 - The Smoke

On startup, the person becomes a smoke particle system, slightly translucent and emitting small particles. This will be computationally heavy, therefore we will need to come up with a less intensive method to render out

many small particles. Furthermore, they will be able to control and move wafts of smoke through the air, almost like a waterbender. These will be a single system of particles mapped to the viewer movement.

2.2.2 - The Waves

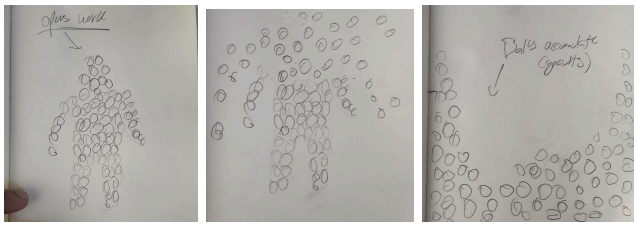
This is inspired by psychedelic lines, but applied to space dust instead. See reference images below. The particle lines will begin horizontally, then bend and morph to accommodate the shape of the player as they move. This is somewhat like a funhouse mirror. Color changing capabilities may also be introduced, for instance, adjusting color values based on whether the player is on the left side or right side of the screen.



2.2.3 - The Planets

On startup, the player appears as a collection of multicolored spheres. Which, after a certain time delay, then falls and spreads in different directions across the screen. The player retains no physical form in this iteration, they do not appear on the screen as matter. Instead, they have the ability to use their body to

move and bounce the spheres. The webcam will track their movements and they may use any part of their body to move the balls. Additional functionality may include strength detection; a simple push can be initiated by a softer movement, whereas a bounce can be initiated by stronger movement.



2.2.4 - The Vortex

Incorporating the concept of black holes, the player's image turns to fragments that vary in opacity, brightness and shape. This is the only iteration that will be using the player's image, though will not be recorded to avoid consent and property troubles. This is also the only iteration where the player does not directly interact with the work, the program does all the work. The person's form will be broken down into small pieces, and distorted and misplaced. This may be the person's eye resting on their leg, or simply creating blurry, darkened or morphed parts randomly. This is intended to look a little like broken glass.

3 - Implementation

This section discusses the delivery of the project, both in programming and in presentation. Some experimentation with the programming has begun, though we do not have a clear pipeline at the moment.

3.1 - Technological Implementation

Specifics for each iteration are to be decided though we know that we will be using the following frameworks below. A brief description of the uses as well as the challenges we may encounter are briefly discussed.

3.1.1 - Three.js

Three.js is a highly versatile tool for rendering and creating 3D graphics in the browser using WebGL. For this project, we will primarily use its particle effects, taking advantage of its support for point clouds and built-in particle systems. Additionally, the EffectComposer will help refine the visuals with effects like motion blur. Overall, Three.js will be a great asset to the project thanks to its particle system, animation capabilities, physics integration, and overall versatility.

3.1.2 - Tensorflow.js

Tensorflow.js will be primarily used for tracking. It will be used for pose and silhouette tracking with PoseNet or BlazePose to track users' bodies and MediaPipe Hands/FaceMesh to track users' hands and faces. This makes it an ideal tool for tracking user movement to drive reactions in the particle system. However, learning TensorFlow.js can be tricky due to the extensive

documentation and numerous setup instructions required. Implementing Tensorflow correctly will require major time commitment as well as debugging and coding labour.

3.1.3 - OpenGL Shaders

As its name suggests, OpenGL is a graphics rendering API. We will be using it for its real-time rendering, graphics effects, and shaders. This is going to be tied in with the visuals.

3.1.4 - Tone.js (Potential)

Tone.js can be used as a synthesizer to map the player movement to play certain notes. As this is dominantly a visual project, sound interactivity is in limbo but we hope to integrate it if time allows.

3.2 - Physical Installation & Delivery

While a physical installation is not a confirmed aspect of the project, it has been discussed as a potential enhancement to elevate the final presentation. Otherwise, at the core of the project, a laptop with a webcam and mic is all that is required. If we choose to expand the project to a room with a projector, at this stage, no specific ideas have been fully conceptualized to align with the project's aesthetic and theme despite previous leads with other project directions. Of course, it can remain a simple projection, requiring a projector, an empty wall, a mic plus a corresponding stand, and a laptop to run the program. However, some elements under consideration include movement or voice

activated string lights, a sheer cloth canopy, or cut up then put back together materials such as plastic bottles.

A major challenge in implementing the physical portion is the time consuming nature of setup and construction. The installation could also overwhelm or dilute the core message of the work rather than reinforcing it. As such, strategic integration will be necessary to maintain coherence and create an immersive experience.

We have already visited the CUCCR to familiarize ourselves with the materials available to us. The installation will be constructed exclusively from these materials, with the exception of any technology needed on our end. This decision ensures that the project remains cost and transport effective while avoiding material waste.