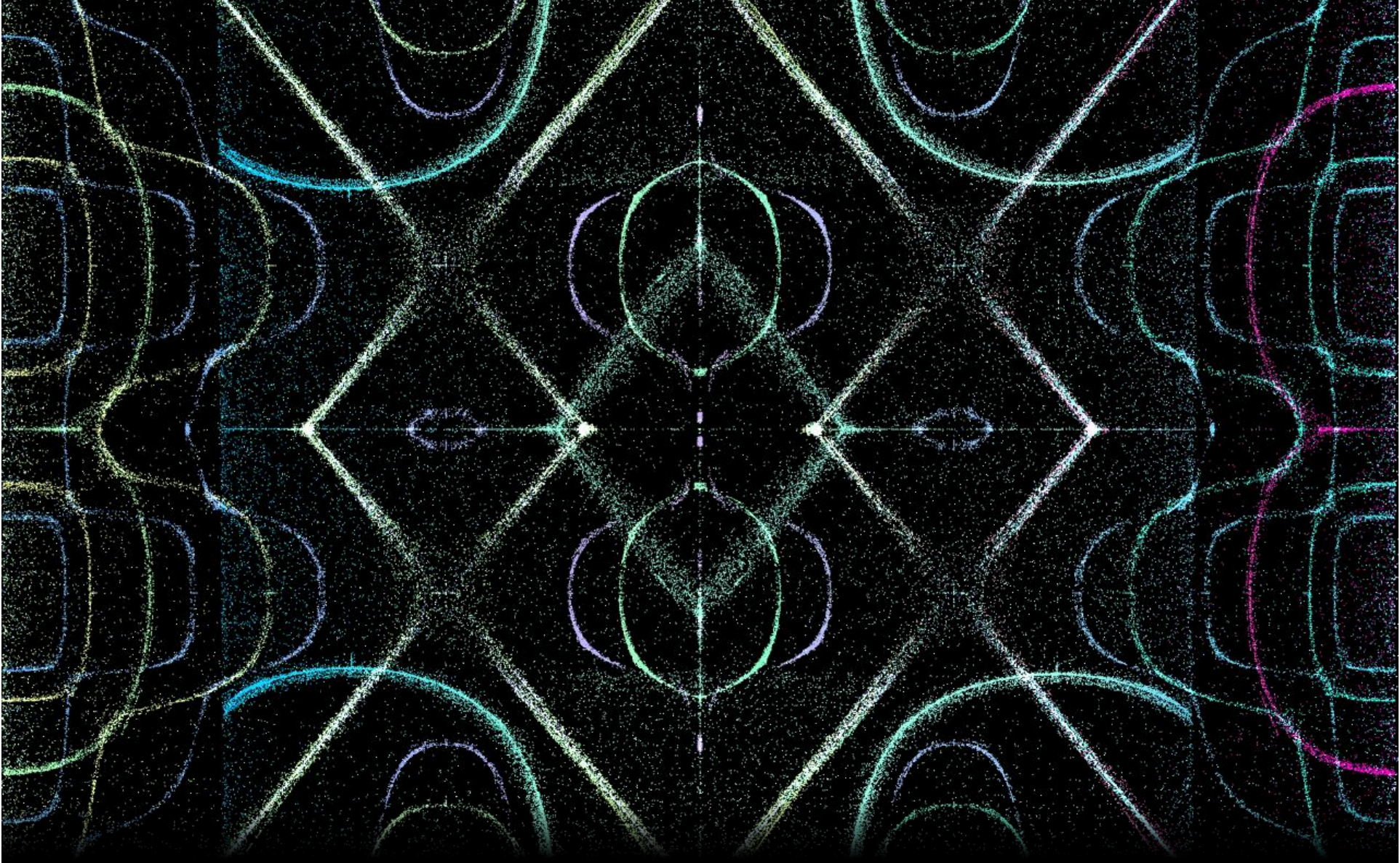


# Reflective resonance

## Contents


PROBLEM STATEMENT

PROJECT OVERVIEW

ARDUINO TOUCH DESIGNER INTEGRATION

MYERS BIGGER TYPE INDICATOR

PSYCHOLOGICAL FRAMEWORKS IN HMI GAMES

MILLER'S LAW

BRAINS AND PATTERNS
16 PERSONALITIES
VISION
MOTIF EXPLORATION
COLOUR & SHAPE PSYCHOLOGY
PATTERN CREATION & BRAINSTORMING
NETWORKING
MOTIF WORKFLOW IN TOUCH DESIGNER
THE UI
NETWORK RIVER
OUTPUT
EXHIBITION ELEMENTS
TAKE HOME BROCHURE
COGNITIVE LOAD THEORY
TEMPORAL DYNAMICS
MNEMONICS

# PROJECT OVERVIEW

In today's globalized world, cultural heritage often feels distant or generalized, and individuals may struggle to connect with traditional art forms in a personal, meaningful way.

through digital interactivity, we provide an engaging way for users to connect with themselves, their cultural roots and a diverse community of people with similar personality types, thus fostering a sense of cultural appreciation and inclusivity.

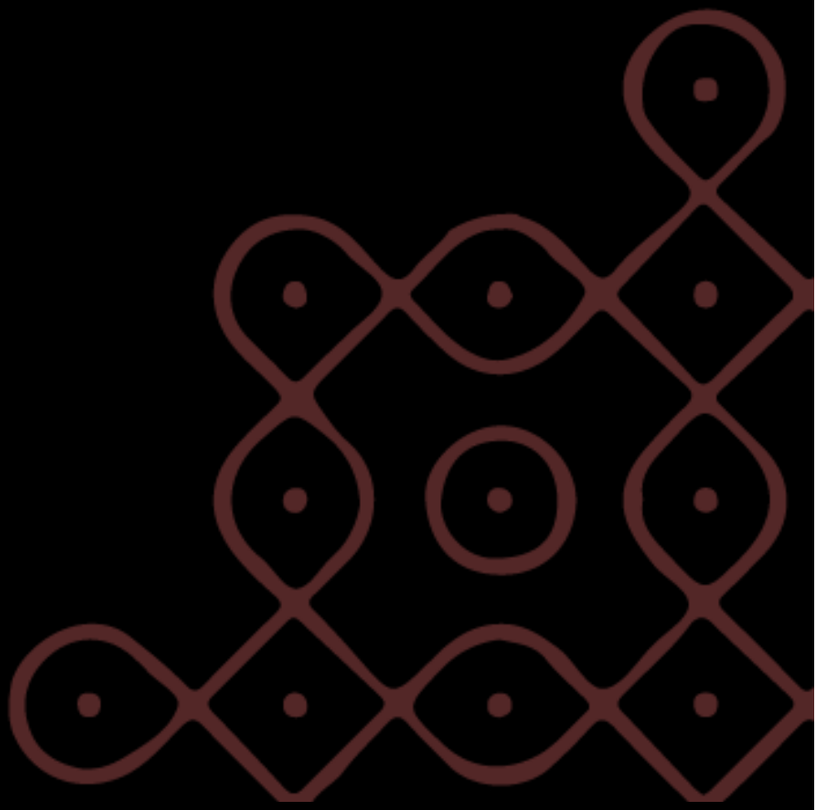
This project aims to bridge this gap by creating an interactive platform where users interact with a physical UI and the narrative unfolds with their inputs,

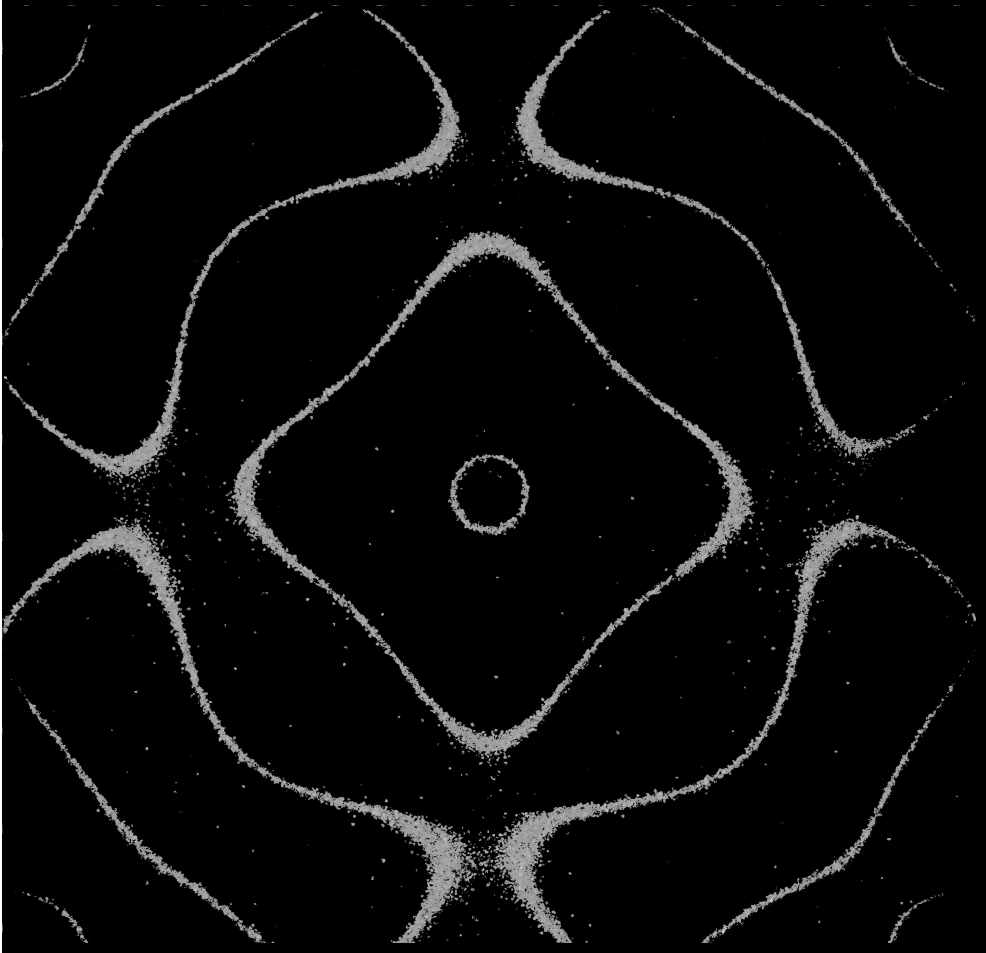
# PROBLEM STATEMENT

To design an immersive, interactive experience using XR, new media, or tangible prototypes that incorporates or enables a narrative through user interaction, with a focus on creating socio-cultural impact.

# BRAINS AND PATTERNS

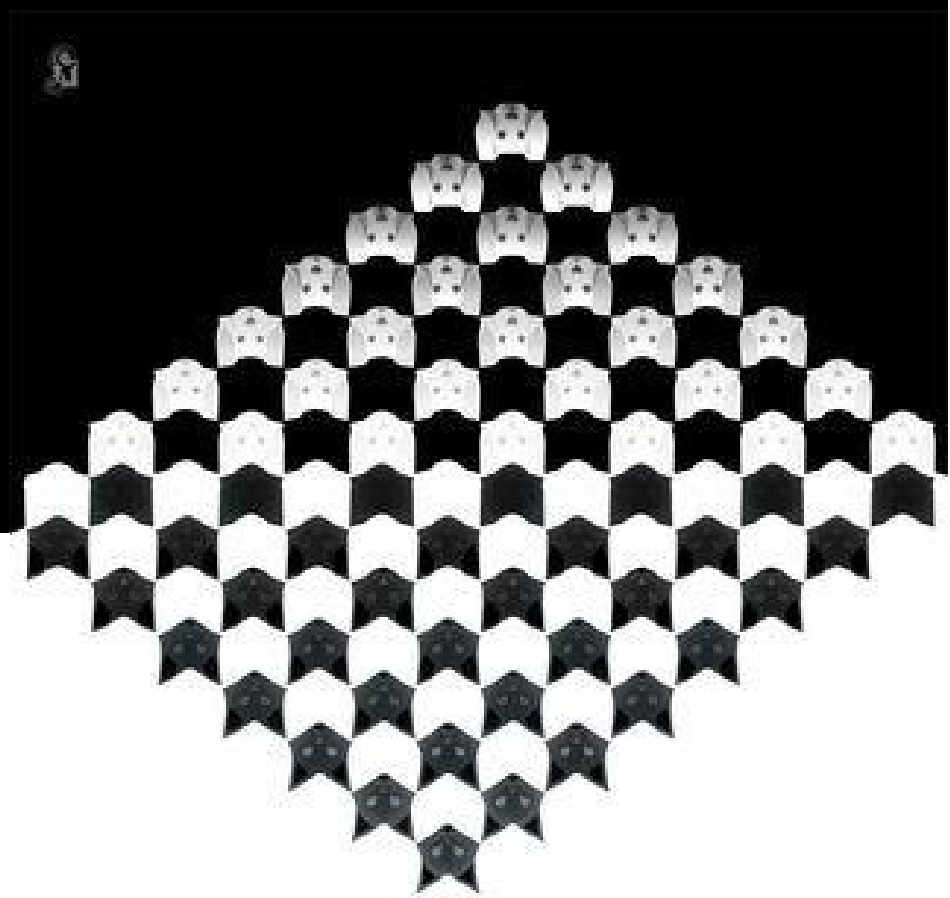
A striking aspect of an orthodox rangoli in dots, specifically 108, joined by curved lines to form a symmetrical design. From an artistic point of view, symmetry represents order, harmony and serenity.





The little research available on harmonics shows that when a longitudinal sound wave agitates particles on a membrane, they settle into symmetrical patterns, much like the rangoli designs. This direct phonetic link between sound waves and visual patterns gives rise to different waveforms producing different designs. The study of such harmonic waveforms is called Cymatics.

Dr. Christopher Tyler even mapped the brain centers that respond to visual harmonics using fMRI. His study reveals that the visual cortex or the occipital lobe activates when one perceives symmetrical patterns. His research goes on to explain that we are capable of discerning symmetry in an object in less than 0.05 seconds, showing that our brain is hard-wired for symmetry.



# 16 PERSONALITIES

16 personalities is a framework that evolved from the Myers-Briggs Type Indicator (MBTI). To understand 16 personalities, we must first understand MBTI.

**Analysts**

Intuitive (**N**) and Thinking (**T**) personality types, known for their rationality, impartiality, and intellectual excellence.

Architect | Logician | Commander | Debater

**Diplomats**

Intuitive (**N**) and Feeling (**F**) personality types, known for their empathy, diplomatic skills, and passionate idealism.

1. ISTJ - Introverted, Sensing, Thinking, Judging (The Inspector)
2. ISFJ - Introverted, Sensing, Feeling, Judging (The Protector)
3. INFJ - Introverted, Intuitive, Feeling, Judging (The Advocate)
4. INTJ - Introverted, Intuitive, Thinking, Judging (The Architect)
5. ISTP - Introverted, Sensing, Thinking, Perceiving (The Crafter)
6. ISFP - Introverted, Sensing, Feeling, Perceiving (The Artist)
7. INFP - Introverted, Intuitive, Feeling, Perceiving (The Mediator)
8. INTP - Introverted, Intuitive, Thinking, Perceiving (The Thinker)
9. ESTP - Extraverted, Sensing, Thinking, Perceiving (The Persuader)
10. ESFP - Extraverted, Sensing, Feeling, Perceiving (The Performer)
11. ENFP - Extraverted, Intuitive, Feeling, Perceiving (The Campaigner)
12. ENTP - Extraverted, Intuitive, Thinking, Perceiving (The Debater)
13. ESTJ - Extraverted, Sensing, Thinking, Judging (The Director)
14. ESFJ - Extraverted, Sensing, Feeling, Judging (The Caregiver)
15. ENFJ - Extraverted, Intuitive, Feeling, Judging (The Protagonist)
16. ENTJ - Extraverted, Intuitive, Thinking, Judging (The Commander)

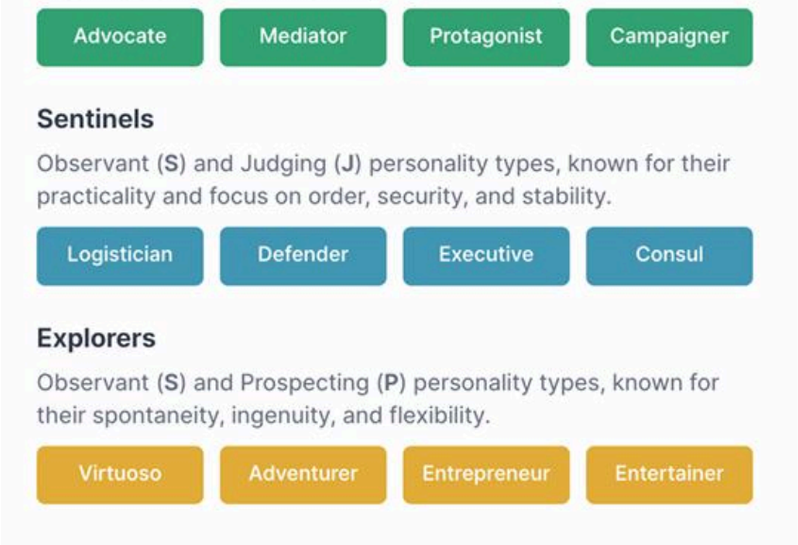
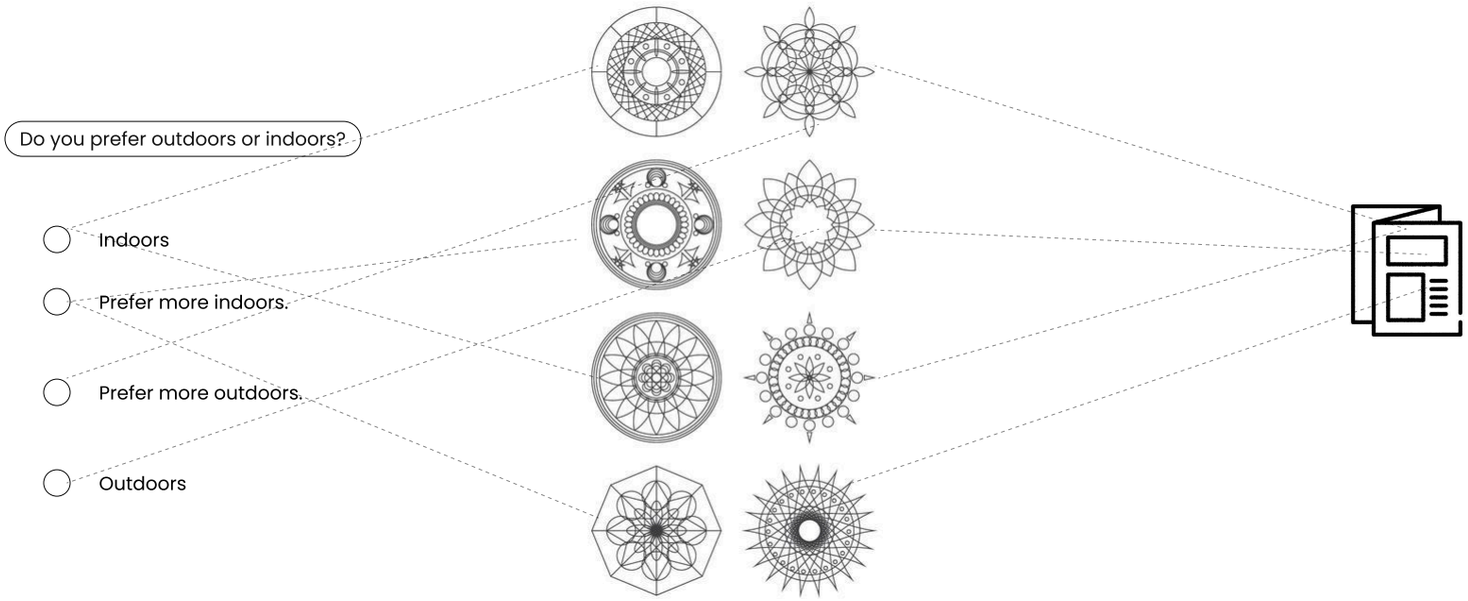



*Fig. 1 Archetypes for each personalities. Credits: https://www.16personalities.com/free-personality-test*

# VISION

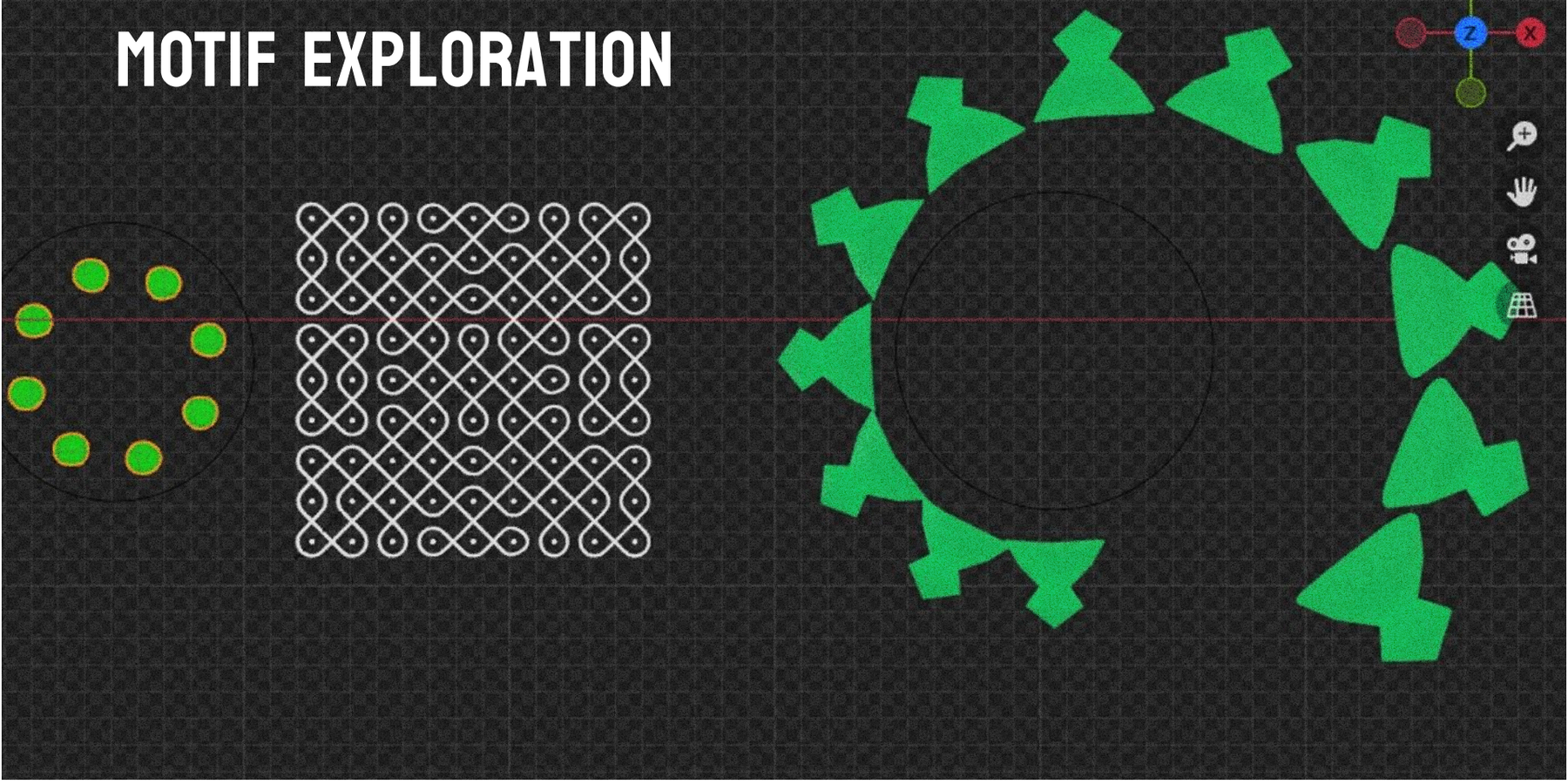



**INPUT**
Personality or intrinsic Values

**MEDIUM**
Pattern Geometry and symbolism

**OUTPUT**
Abstract representation of you

# MOTIF EXPLORATION



# COLOUR & SHAPE PSYCHOLOGY

*Fig. 4* *Colour Psychology Model*

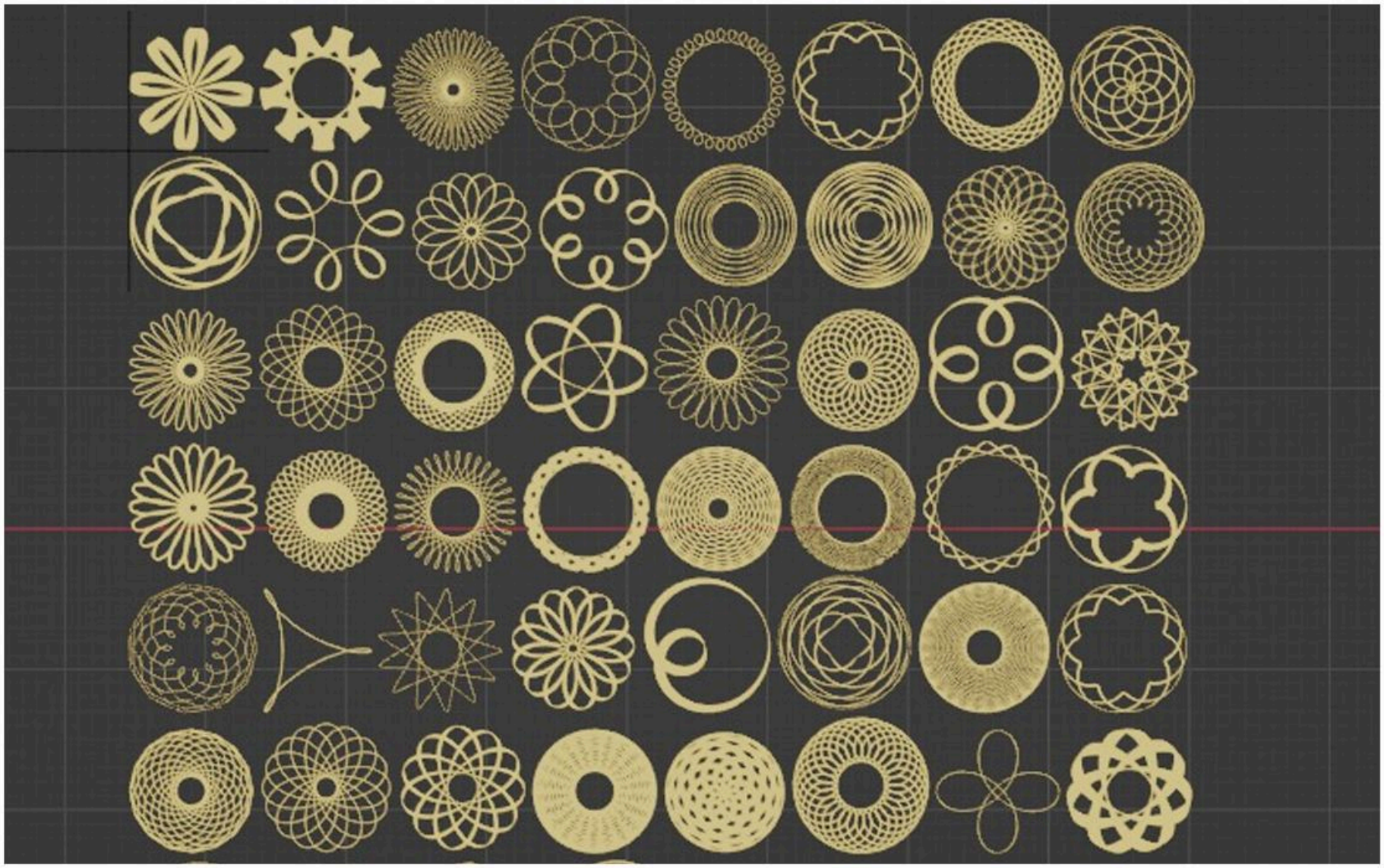


*Fig. 5* *Motif exploration for different personalities*

# PATTERN CREATION AND BRAINSTORMING

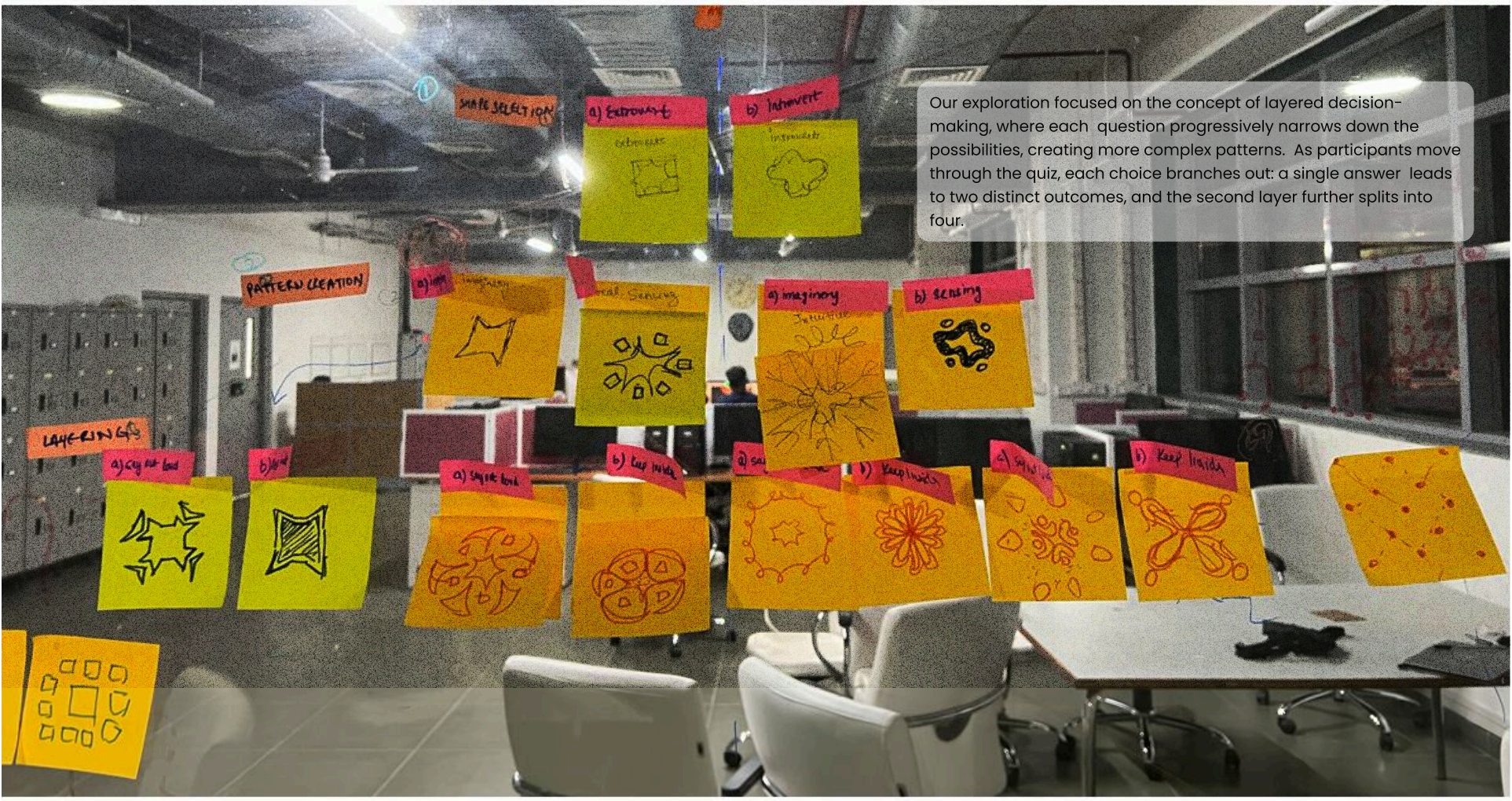
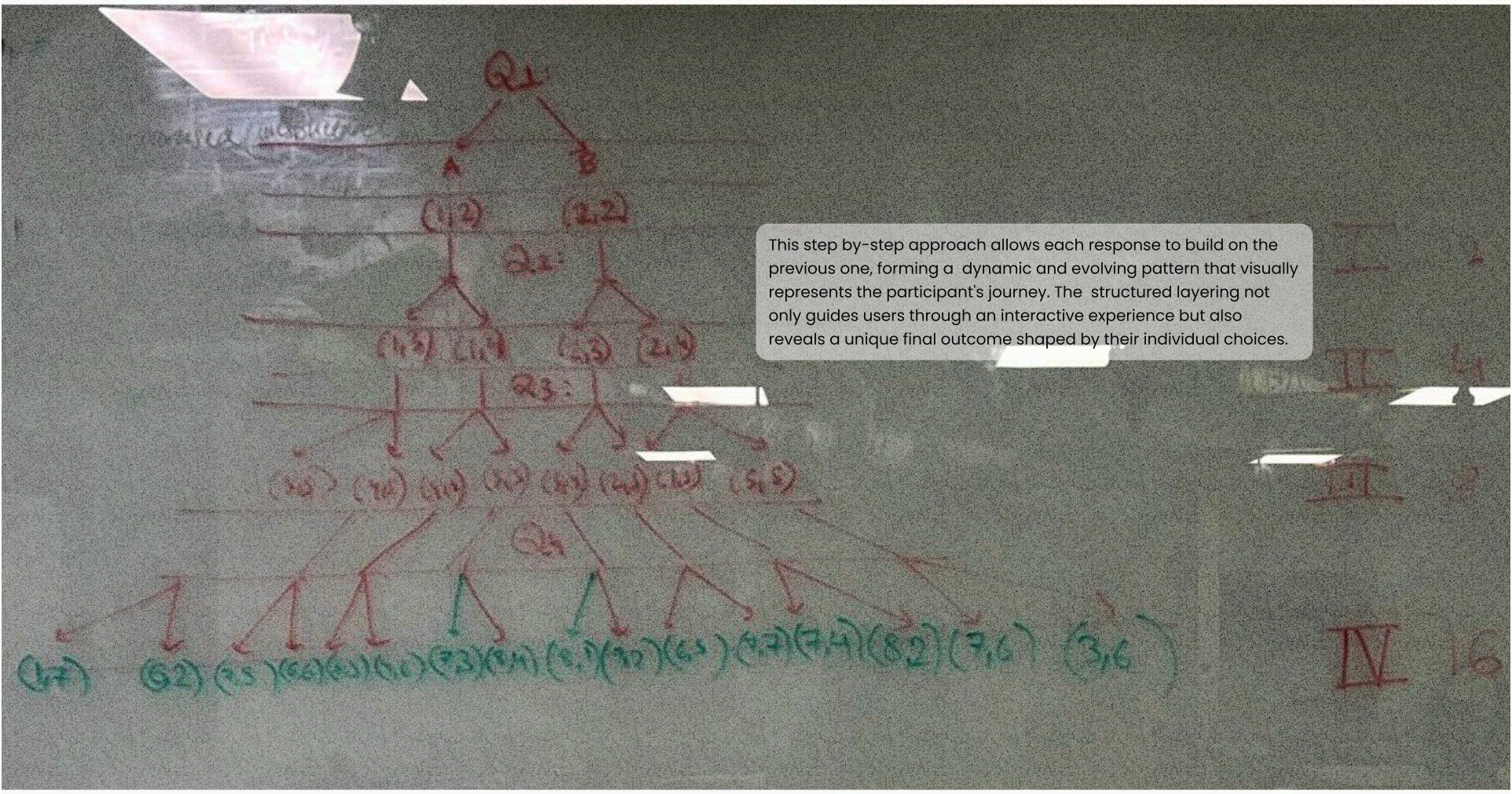



*Fig. 6* *Motif exploration for different personalities*

# NETWORKING



This step by-step approach allows each response to build on the previous one, forming a  dynamic and evolving pattern that visually represents the participant's journey. The  structured layering not only guides users through an interactive experience but also reveals a unique final outcome shaped by their individual choices.

# MOTIF WORKFLOW IN TOUCH DESIGNER

**We started with a visual equation**

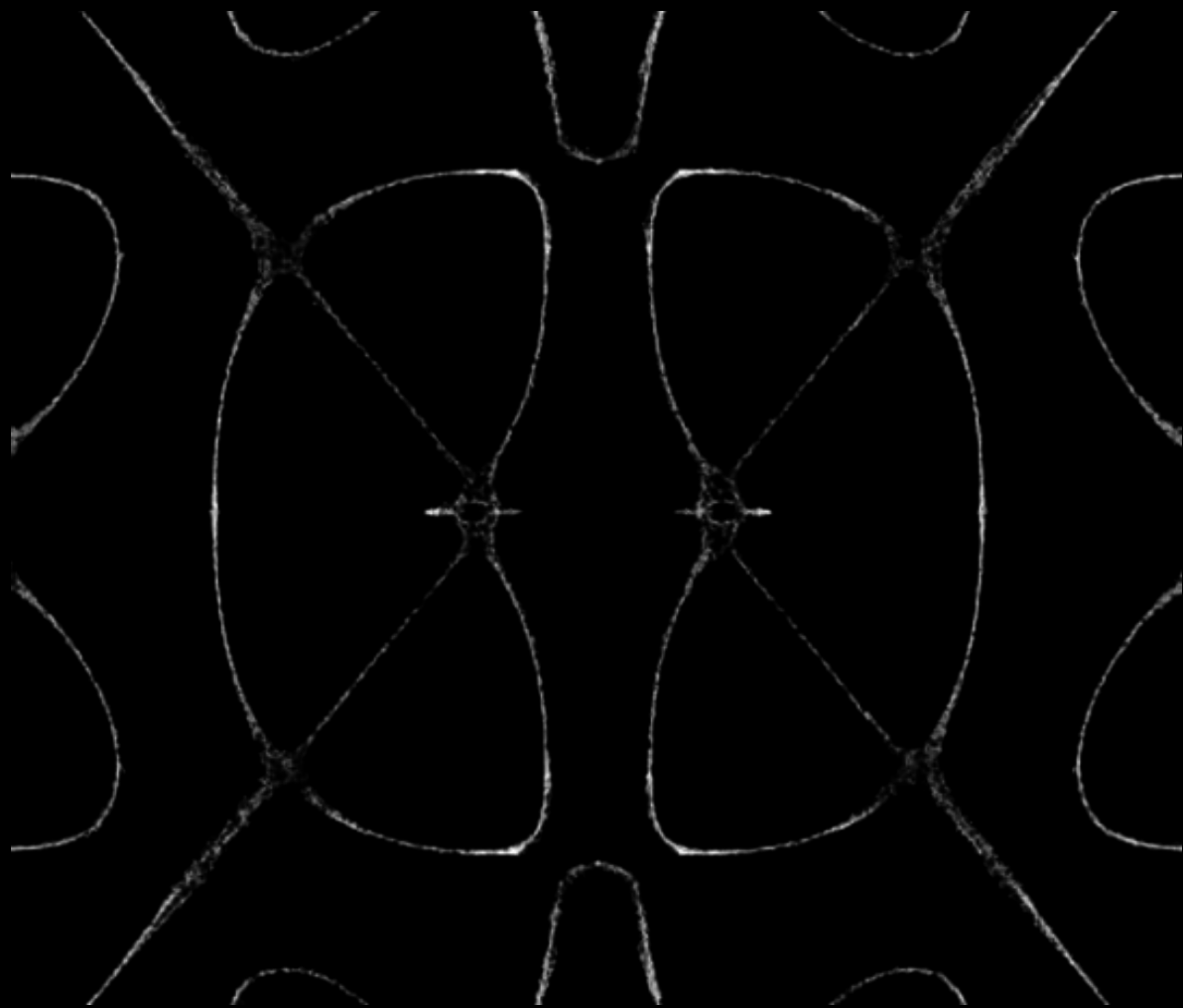
$$\cos\left(\frac{n\pi x}{L}\right)\cos\left(\frac{m\pi y}{L}\right) - \cos\left(\frac{m\pi x}{L}\right)\cos\left(\frac{n\pi y}{L}\right) = 0$$

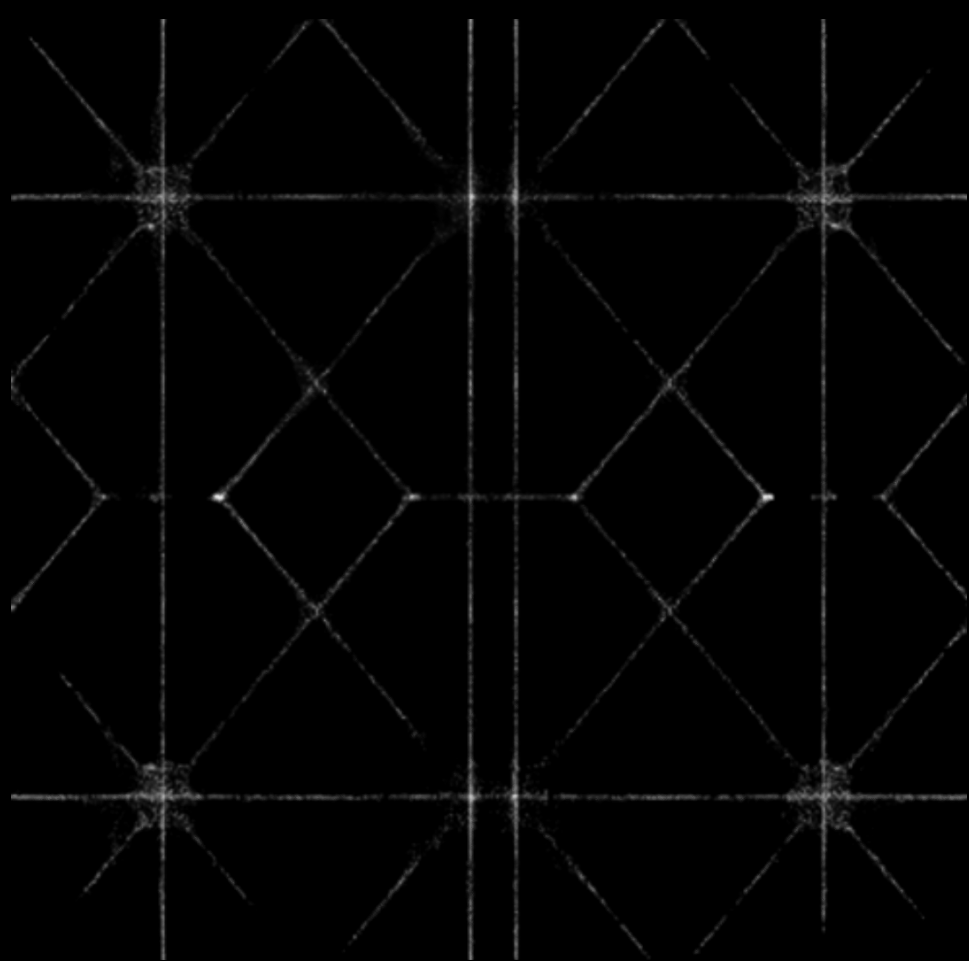
Gather variables : Create constant n and m

Add a code to use these constants in the input values in math node.

Cosine function

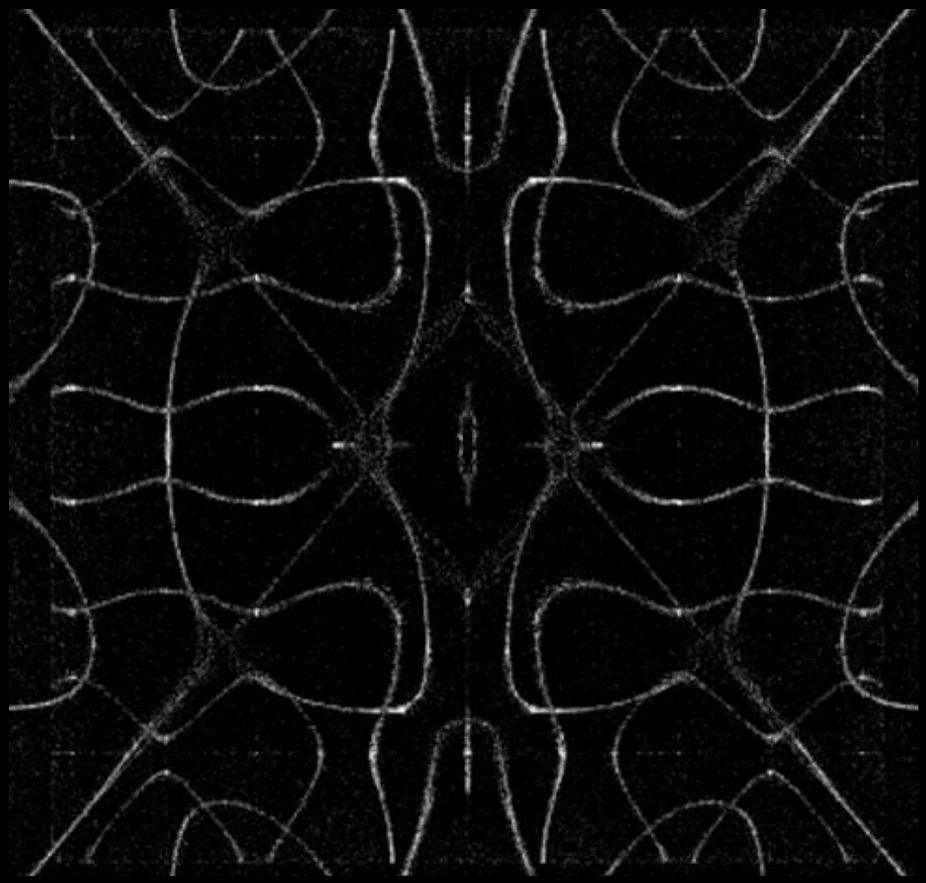
Team Frieduino HMI Horizon To start, variables are gathered by defining constant n and m, which control key  parameters in the equation. Code is then used to incorporate these constants as input values within the math node.





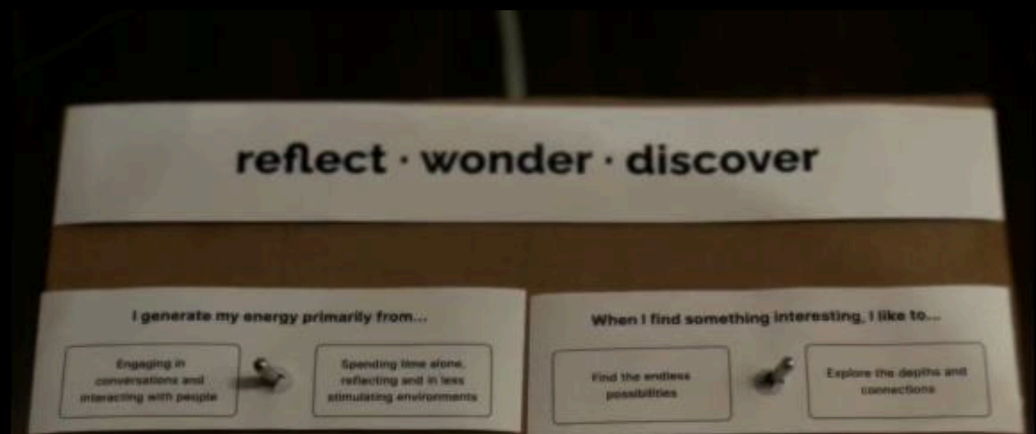
A cleaner form

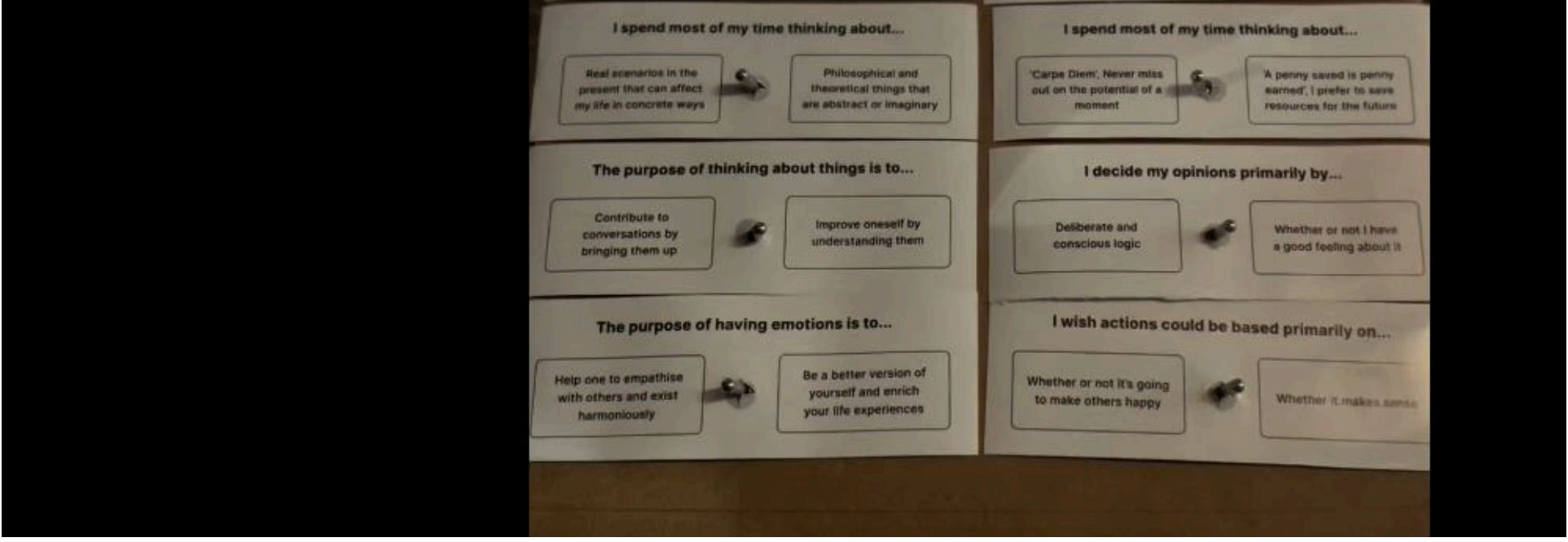
another one..



Little too chaotic
but cool...

# THE UI

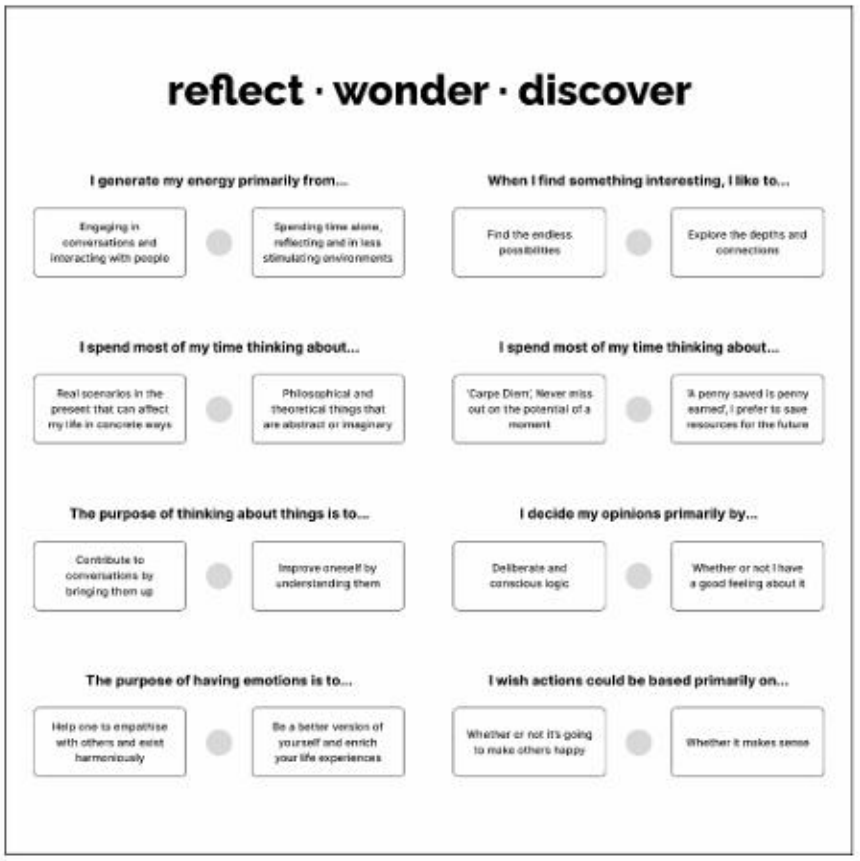


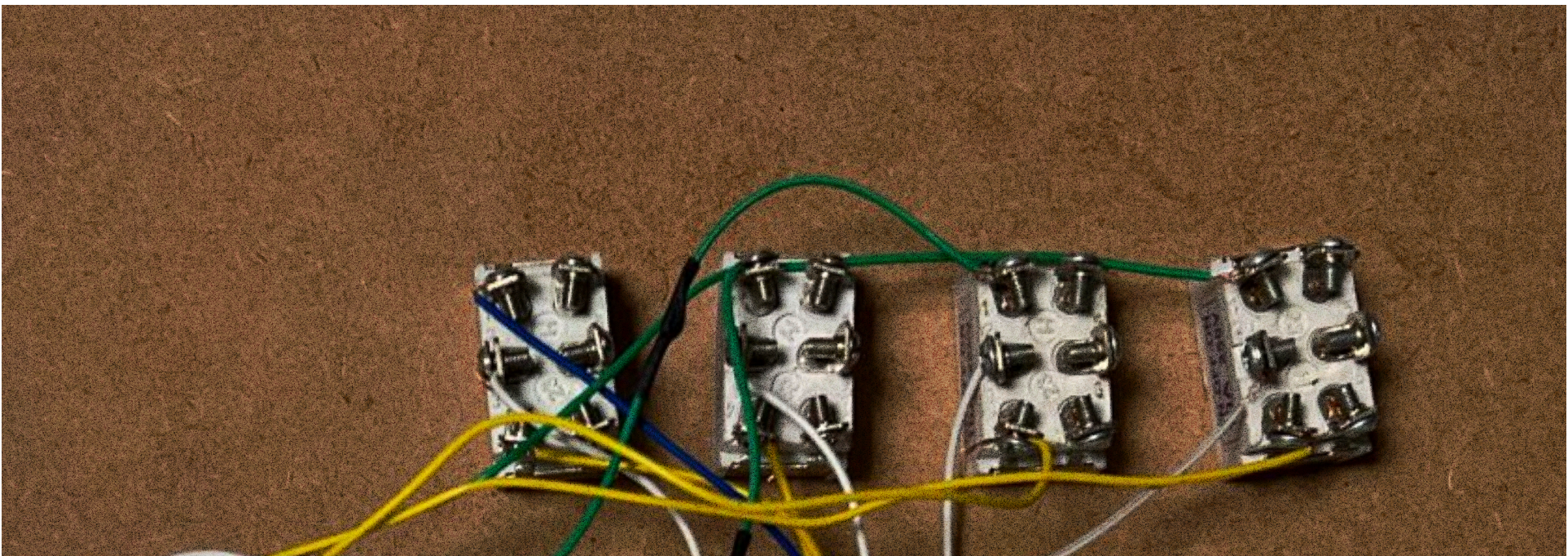


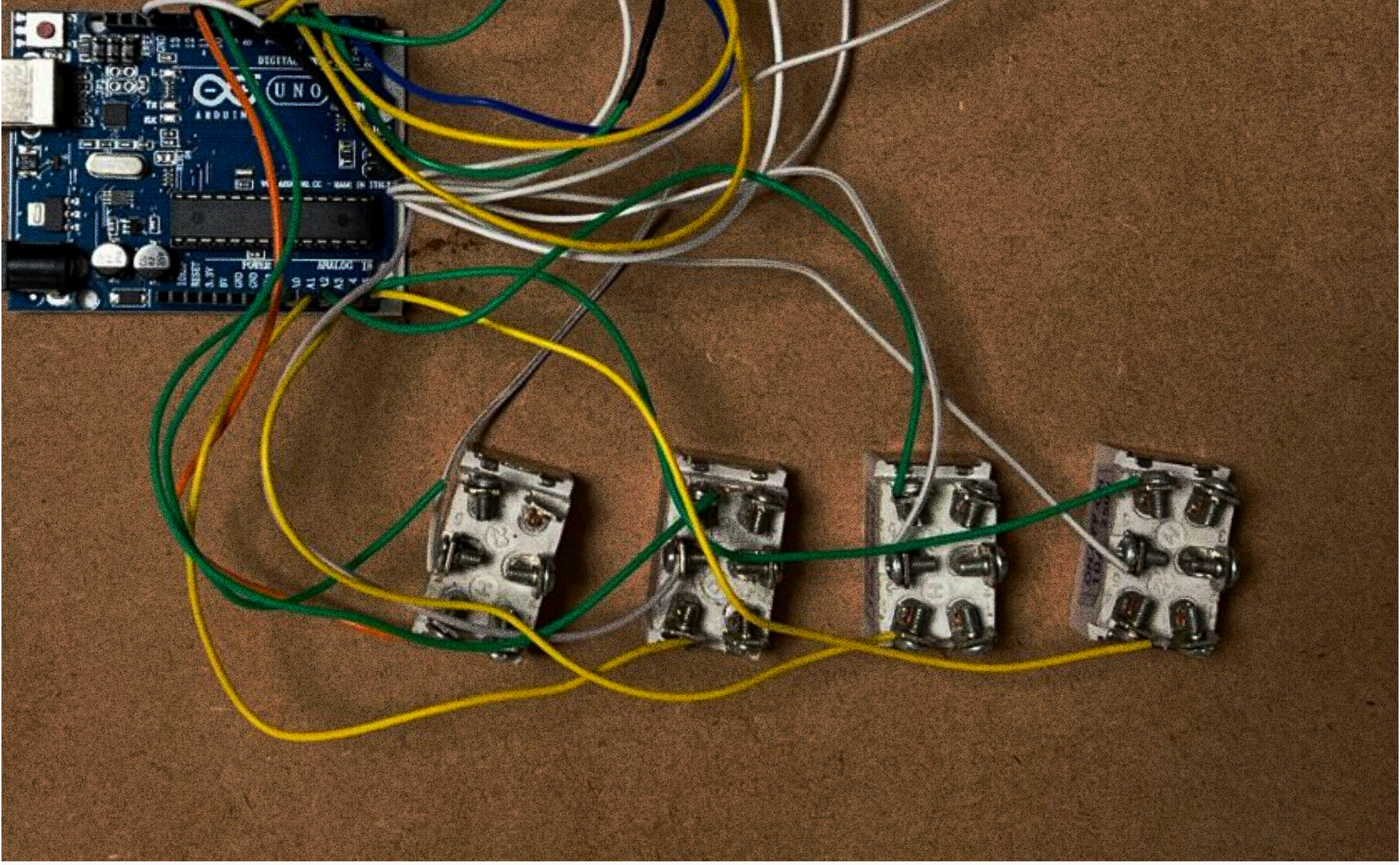

Physical UI-Arduino-Button Integration  Each switch is configured with three distinct output positions: left, neutral, and right.  Through coding, each switch was mapped precisely to its designated function, creating  a clear system where:

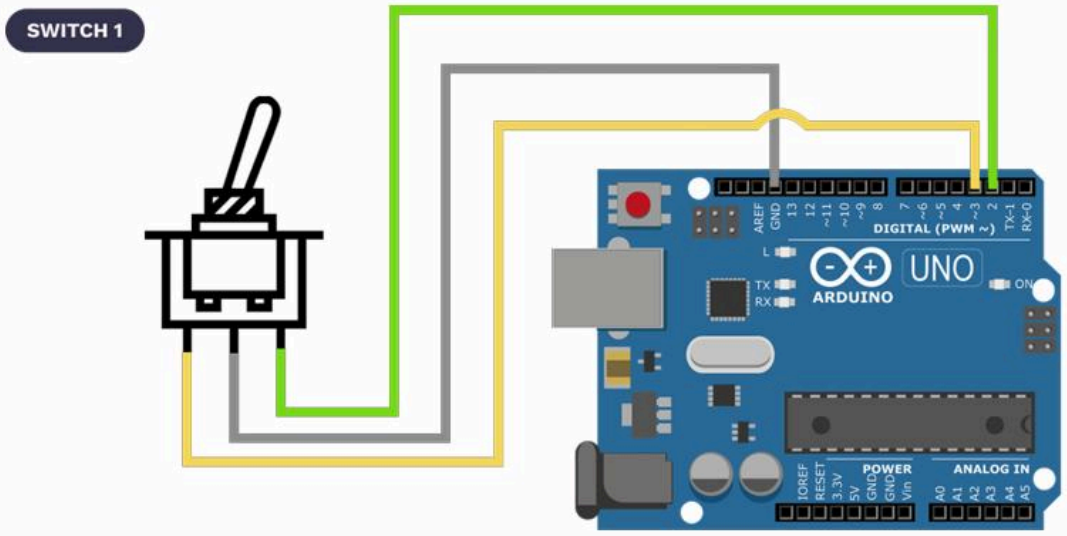
Position "1" represents the left switch position,
Position "0" is the neutral or center position,
Position "2" represents the right switch position.

This setup allows each switch to perform multiple functions based on its position, with  outputs dynamically adjusting as each switch is toggled between left, center, and right.








```
// Assign pin names and numbers
int switch1Pin1 = 2;
int switch1Pin2 = 3;
int switch2Pin1 = 4;
int switch2Pin2 = 5;
int switch3Pin1 = 6;
int switch3Pin2 = 7;
int switch4Pin1 = 8;
int switch4Pin2 = 9;
int switch5Pin1 = 10;
int switch5Pin2 = 11;
int switch6Pin1 = A0;
int switch6Pin2 = A1;
int switch7Pin1 = A2;
int switch7Pin2 = A3;
int switch8Pin1 = A4;
int switch8Pin2 = A5;
```

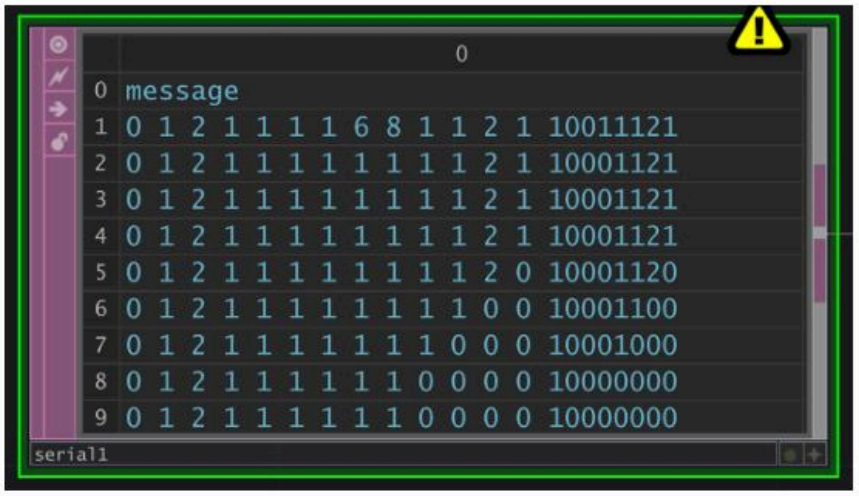
***Fig. 10*** *Input and Circuit Mapping*

# ARDUINO TOUCH DESIGN INTEGRATION

1. The Arduino was coded to give the outputs in a linear line based on the switches which are activated.
2. Using DAT Serial, the Arduino output entered TouchDesigner.
3. DAT Convert made it into a table.
4. CHOP Datto then converted it into a form, from which the vales could used to create CHOP references and control which visuals got displayed.

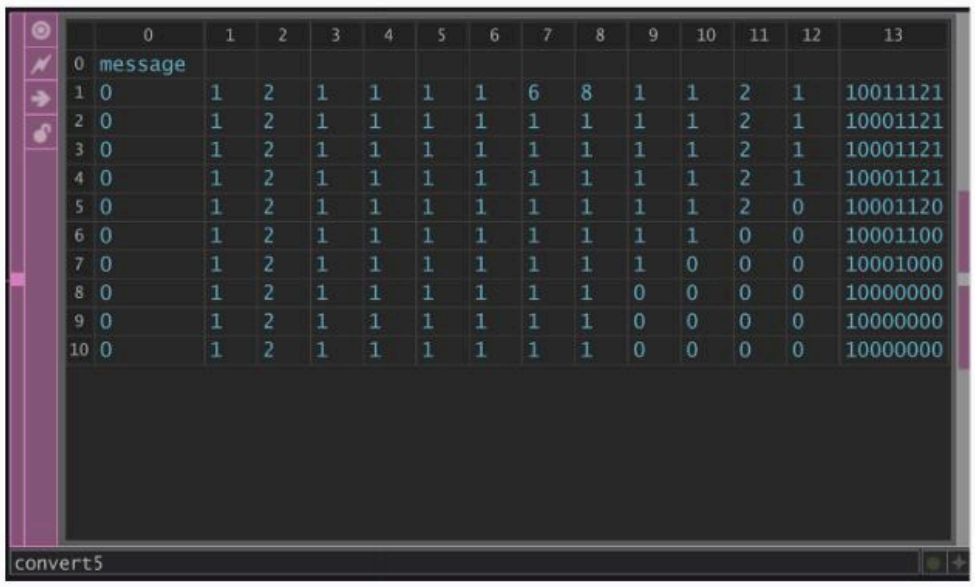
```
// Switch 6
if ((switch6State1 == LOW) && (switch6State2 == HIGH)) {
  Serial.print("1");
  Serial.print(" ");
  c6 = 1;

} else if ((switch6State1 == HIGH) && (switch6State2 == HIGH)) {
   Serial.print("0");
   Serial.print(" ");
} else if ((switch6State1 == HIGH) && (switch6State2 == LOW)) {
   Serial.print("2");
   Serial.print(" ");
   c6 = 2;
}
```



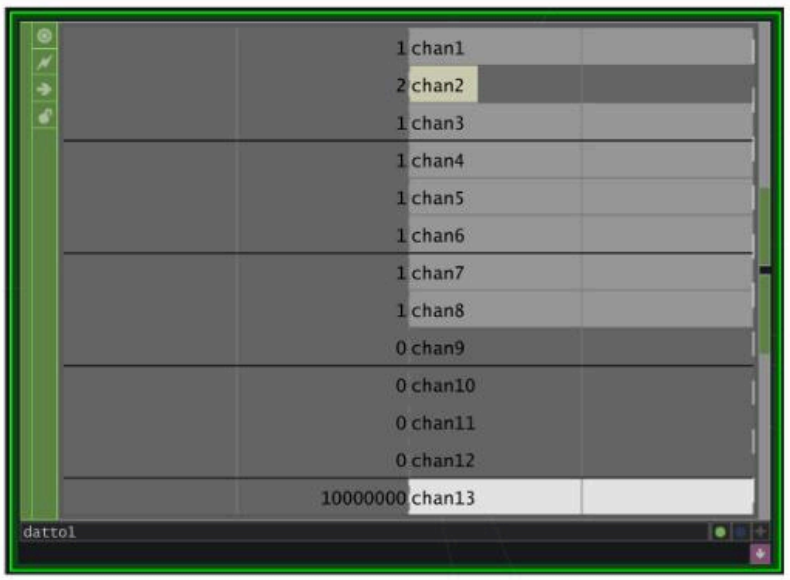
| | 0 |
|---|---|
| 0 | message |
| 1 | 0 1 2 1 1 1 1 6 8 1 1 2 1 10011121 |
| 2 | 0 1 2 1 1 1 1 1 1 1 1 2 1 10001121 |
| 3 | 0 1 2 1 1 1 1 1 1 1 1 2 1 10001121 |
| 4 | 0 1 2 1 1 1 1 1 1 1 1 2 1 10001121 |
| 5 | 0 1 2 1 1 1 1 1 1 1 1 2 0 10001120 |
| 6 | 0 1 2 1 1 1 1 1 1 1 1 0 0 10001100 |
| 7 | 0 1 2 1 1 1 1 1 1 1 0 0 0 10001000 |
| 8 | 0 1 2 1 1 1 1 1 1 0 0 0 0 10000000 |
| 9 | 0 1 2 1 1 1 1 1 1 0 0 0 0 10000000 |

serial1



| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | message | | | | | | | | | | | | | |
| 1 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 6 | 8 | 1 | 1 | 2 | 1 | 10011121 |
| 2 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 10001121 |
| 3 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 10001121 |
| 4 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 10001121 |
| 5 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 10001120 |
| 6 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 10001100 |
| 7 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 10001000 |
| 8 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 10000000 |
| 9 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 10000000 |
| 10 | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 10000000 |

convert5



| | |
|---|---|
| 1 | chan1 |
| 2 | chan2 |
| 1 | chan3 |
| 1 | chan4 |
| 1 | chan5 |
| 1 | chan6 |
| 1 | chan7 |
| 1 | chan8 |
| 0 | chan9 |
| 0 | chan10 |
| 0 | chan11 |
| 0 | chan12 |
| 10000000 | chan13 |

datto1

***Fig. 12*** *TouchDesigner operators*

# MYERS-BRIGGS TYPE INDICATOR

Additionally, each switch contributes to an 8-digit code consisting of 1s and 2s. A pre prepared key, created by running the quiz 256 times, allows for a corresponding lookup of each digit. This system provides instant feedback on the current code, revealing the participant's input in real-time. The 8-digit pin also functions as a diagnostic tool, indicating which switch is active and in what position, facilitating easy troubleshooting for any loose or incorrect connections.

```
int c1 = 0;
int c2 = 0;
```

```
// Switch 8
if ((switch8State1 == LOW) && (switch8State2 == HIGH)) {
  Serial.print("1");
  Serial.print(" ");
  c8 = 1;

} else if ((switch8State1 == HIGH) && (switch8State2 == HIGH)) {
   Serial.print("0");
   Serial.print(" ");
```

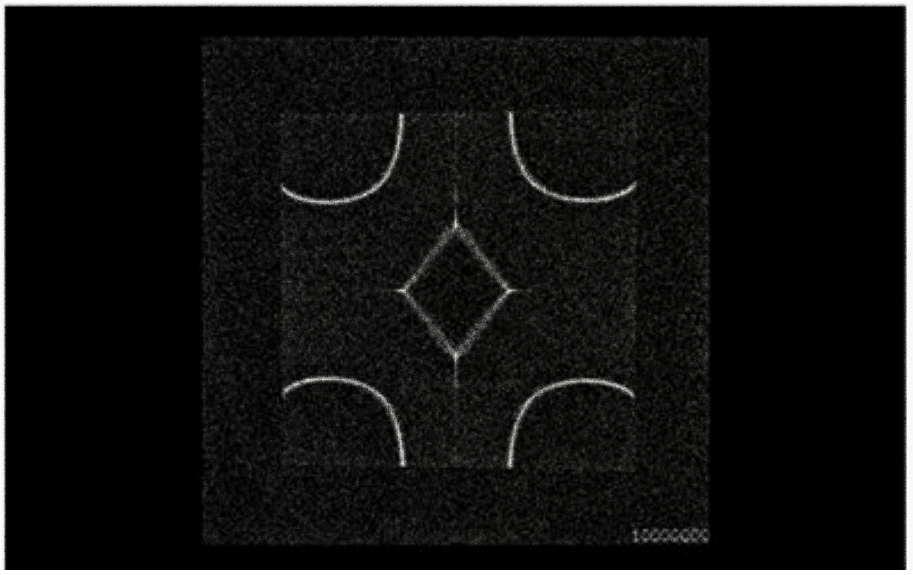
| | |
|---|---|
| 1 | 0 1 2 1 1 1 1 6 8 1 1 2 1 10011121 |
| 2 | 0 1 2 1 1 1 1 1 1 1 1 2 1 10001121 |
| 3 | 0 1 2 1 1 1 1 1 1 1 1 2 1 10001121 |
| 4 | 0 1 2 1 1 1 1 1 1 1 1 2 1 10001121 |
| 5 | 0 1 2 1 1 1 1 1 1 1 1 2 0 10001120 |
| 6 | 0 1 2 1 1 1 1 1 1 1 1 0 0 10001100 |
| 7 | 0 1 2 1 1 1 1 1 1 1 0 0 0 10001000 |
| 8 | 0 1 2 1 1 1 1 1 1 0 0 0 0 10000000 |
| 9 | 0 1 2 1 1 1 1 1 1 0 0 0 0 10000000 |

serial1

```
} else if ((switch8State1 == HIGH) && (switch8State2 == LOW)) {
    Serial.print("2");
    Serial.print(" ");
    c8 = 2;

}

// Combine the values of c1 to c8 into a single number
Serial.print(c1);
Serial.print(c2);
Serial.print(c3);
Serial.print(c4);
Serial.print(c5);
Serial.print(c6);
Serial.print(c7);
Serial.println(c8);
```



# NETWORK RIVER

As there were over 70 operators, feeding different lines and switching on and off, proper spatial arrangement was required to keep things manageable. Here's a glimpse:

**SECTION 1**
Input from Arduino and converting it

**SECTION 2**
Chladni Effect Formation

**SECTION 3**
Switch interactions

**SECTION 4**
Assigning colour ramps

**SECTION 5**
Combining different visuals and effects part. Layering.

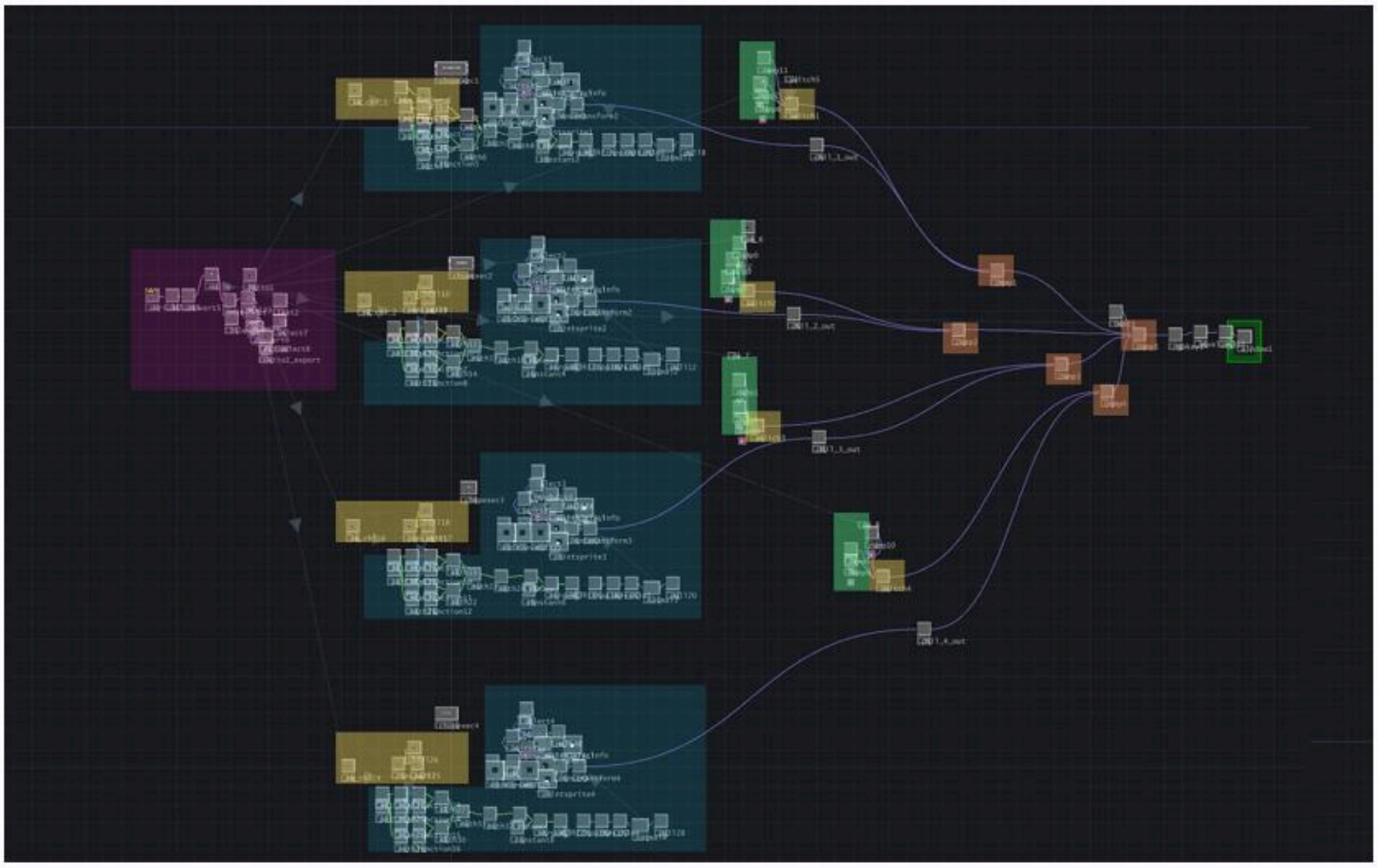
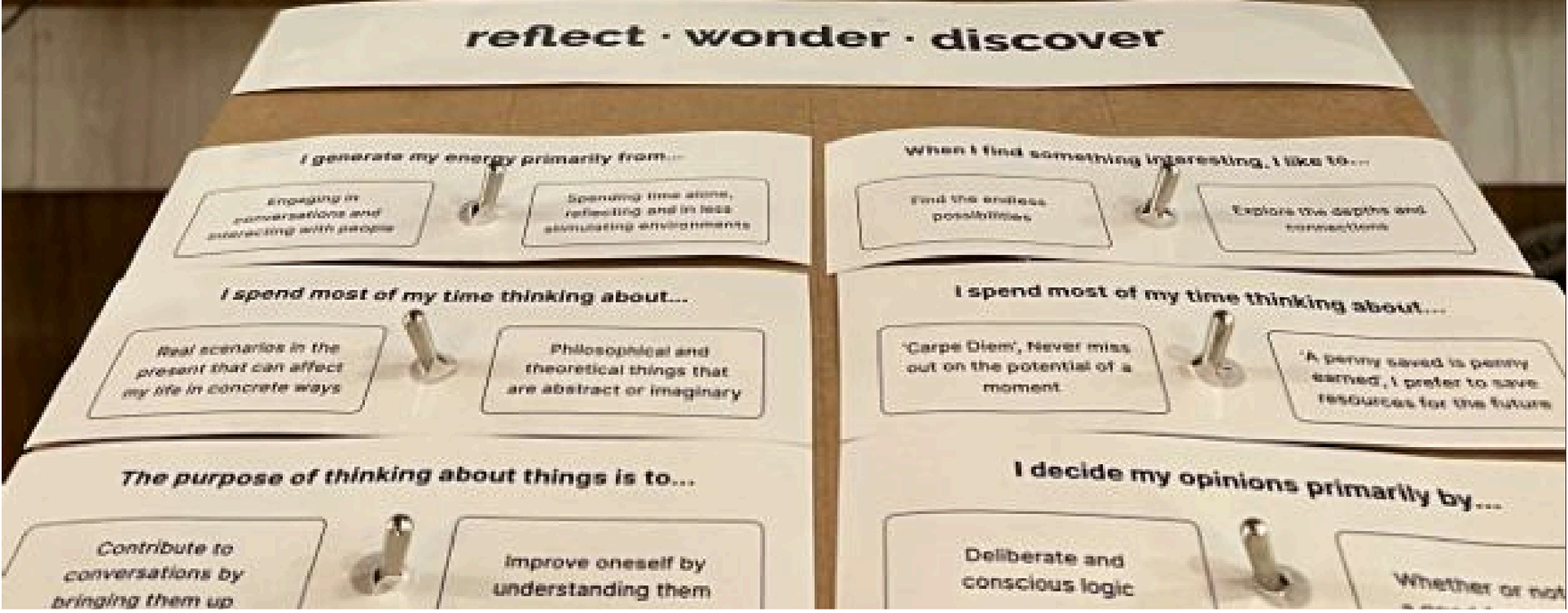


*Fig. 14* *Working in sections*

# OUTPUT




# EXHIBITION ELEMENTS

Our team took a hands-on approach in designing the HMI Horizon Exhibition, aiming to create a space that was as engaging as it was informative. We crafted interactive corners, where visitors could experience. To ensure a seamless and intuitive user flow, we organized the exhibition into clearly defined thematic zones, allowing visitors to move fluidly through each section and engage with the content step-by-step.

***Fig. 15*** *Exhibition Design, Self Branding and Interactive pieces for exhibition experience design*

# TAKE HOME BROCHURE

The experience concludes with a printed zine of each participant's creation, offering a  tangible keepsake of their journey and a potential way to connect with like-minded  individuals or "tribe."

*Fig. 18* Visuals for Zines

*Fig. 17* Zine Station: Zines for the participants

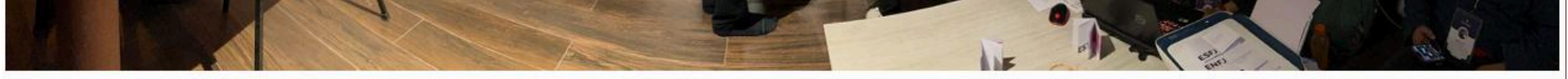


*Fig. 21* A panoramic view of the curation

# MESSAGE OF CONNECTION AND MINDFULNESS

Interactive elements invite participants to become co-creators, highlighting the connection between the individual and the collective. Each movement or choice adds to a larger design, symbolizing how personal contributions shape a shared cultural tapestry.

# CELEBRATION OF CULTURAL HERITAGE THROUGH MODERN TECHNOLOGY

This experience combines Arduino and TouchDesigner with traditional Indian art, blending cultural heritage with modern technology. By reimagining a traditional form like rangoli digitally, it celebrates these ancient art forms as evolving expressions, bridging a sense of personal connection and honoring the centuries old tradition.

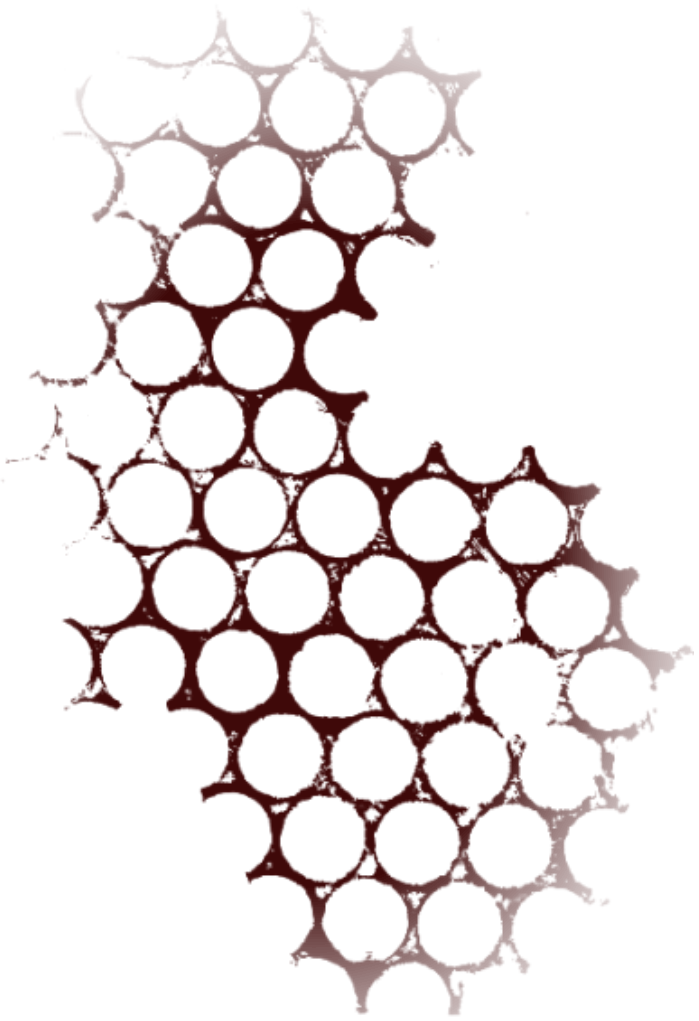
# CUSTOMIZABLE PATTERNS

# REFLECTING SELF-DISCOVERY

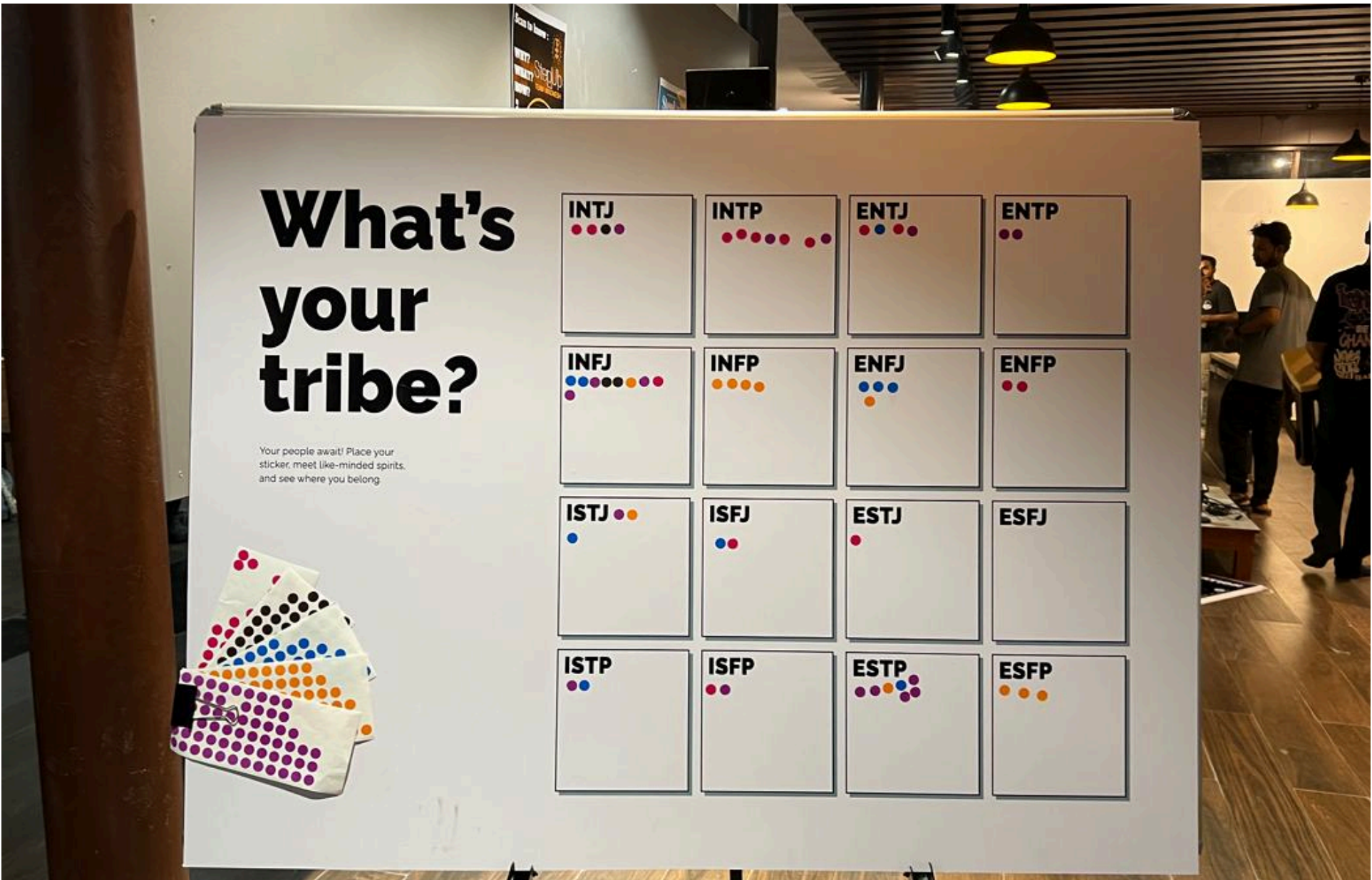
Participants engage in a journey of self-exploration through an MBTI-inspired personality test. Each choice deepens their connection with their inner self, gradually forming a unique pattern that reflects their personality and identity.

# TAKE-HOME EXPERIENCE

The experience concludes with a printed zine of each participant's creation, offering a tangible keepsake of their journey and a potential way to connect with like-minded individuals or "tribe."



# SOCIAL CULTURAL IMPACT




# TAKE-HOME EXPERIENCE

The interactive corner at IIT Kanpur provided a snapshot of the personality dynamics within the campus, revealing a predominance of INFJ and INTP participants, personality types known for their introspective and analytical qualities.

INF

INTP

The space became a communal meeting point, where diverse perspectives and backgrounds could intersect through shared artistic experiences. It allowed participants to co-create, reinforcing the idea of individual contributions shaping a larger, collective narrative. By connecting with cultural symbols digitally, individuals saw themselves as part of a larger, evolving tradition, blending personal stories with collective heritage.

Participants not only engaged with cultural heritage through digital mediums but also reflected on their personal identities. The experiment confirmed that personality-driven and culturally adaptive interfaces can enhance inclusivity and resonance, offering both an educational and emotionally engaging experience. This project sets a precedent for how cultural traditions can evolve in the digital era, creating a bridge between the past and present while celebrating individuality and collective identity.