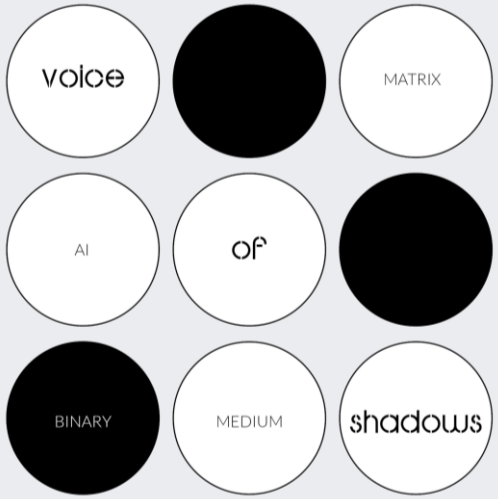
Voice of Shadows

AI-Binary Matrix as Medium



Universal design for visually impaired individuals

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Neda Ezzati

STATSBYGG

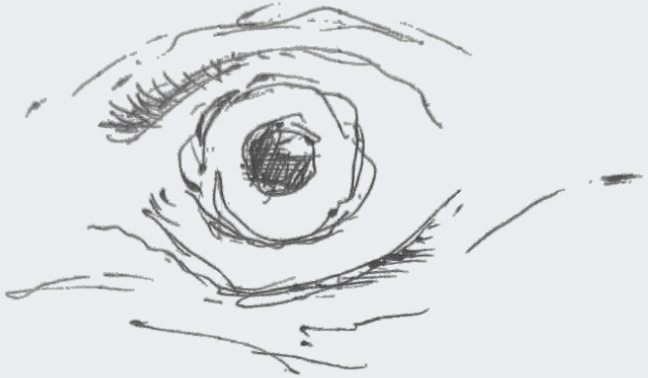
This project awarded by Statsbygg 2024

BORDERS

UD2024 UNIVERSAL DESIGN

The question is…

How should I design for the ones who can not see!



Hear to See …
Hear to Perceive …
Hear to Experience …

Did you know that 1 in every 4 blind individuals experiences mental health issues and may be at risk of suicide?

- Feelings of isolation
- Inadequate communication with society

Ref: WHO, https://nhf.no/om-oss/historien-var/

Sense of place

- Improving social connections
- Enhancing spatial perception

shape our connection and exploration of space perception in physical and cognitive way for simplest daily activity as shopping.

I would like to have my safe corner and be outside at the same time. A place where I'm familiar with, a color I can hear, a material I can relate to, and a sound I can see.

The logic behind "**artificial intelligence**" into "**interior architecture**"
Understanding space without the need for seeing it.

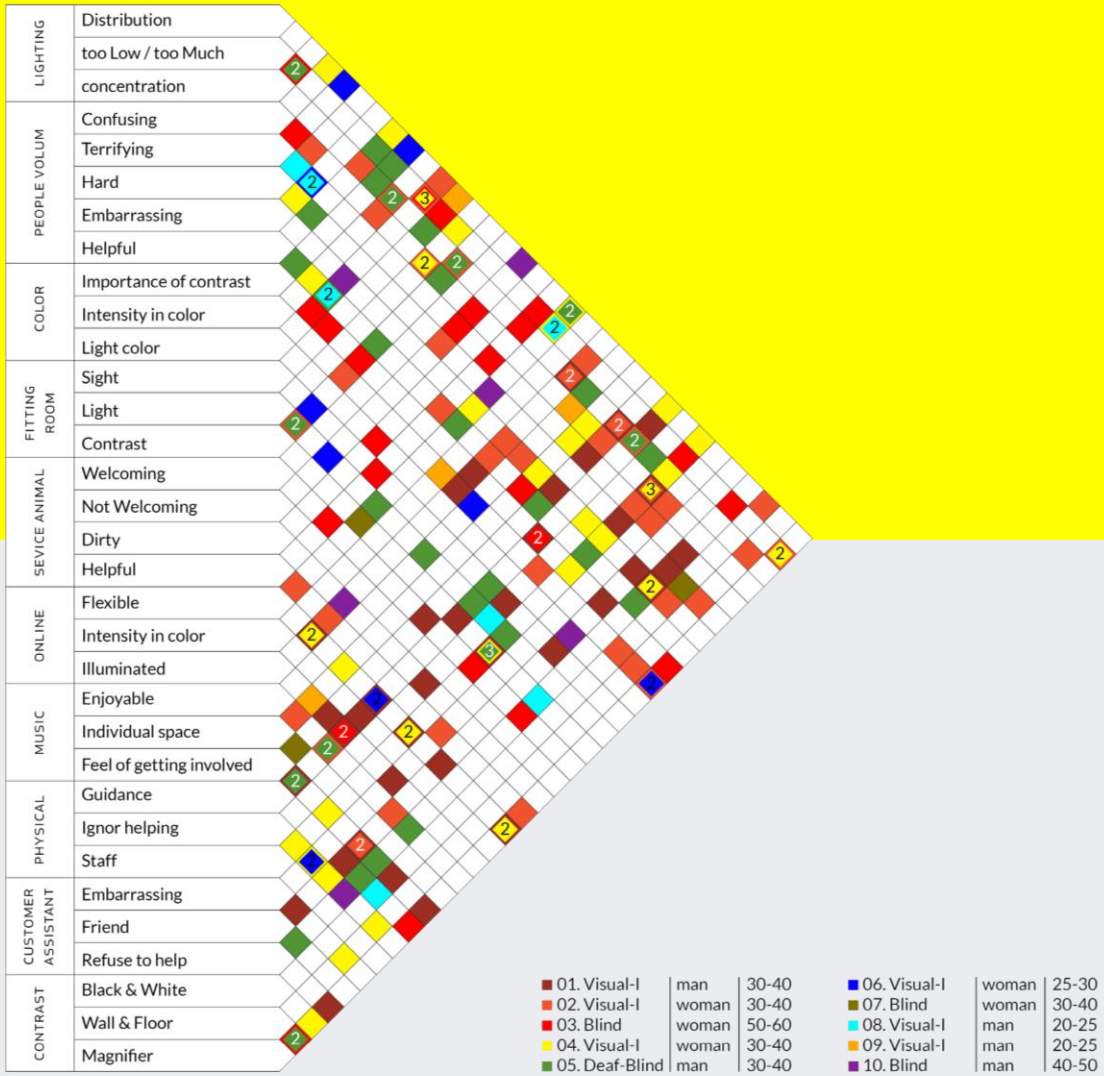
The Monocle, Guid to shops, kiosks and markets. P13. & P21. 2019

WORKSHOP		
SOUND	**INTERVIEW**	**SHOPPING**
COLOR	**MATERIAL**	**SELF EXPERIENCE**

As a designer,
NO Universal Design tool
Visually impaired
such as shape, scale, color, material, ..

Time to Create!

A color that you can hear it
A material which you don’t know its name and,
A sound you can touch



- **10 visually impaired individuals**
- **Categorized in 10 important titles in interior spaces**

The more it's overlapped, the more it's important

Ex: Fitting room: Light - Contrast

Site visit - Blindfolded Urban, Human, Health

How surroundings affect design

Diagram:

- Color gets warmer, the space is perceived more
- Circle get bigger, the space is more crowded

Borders
AS

Voice of
Shadows

UD2024

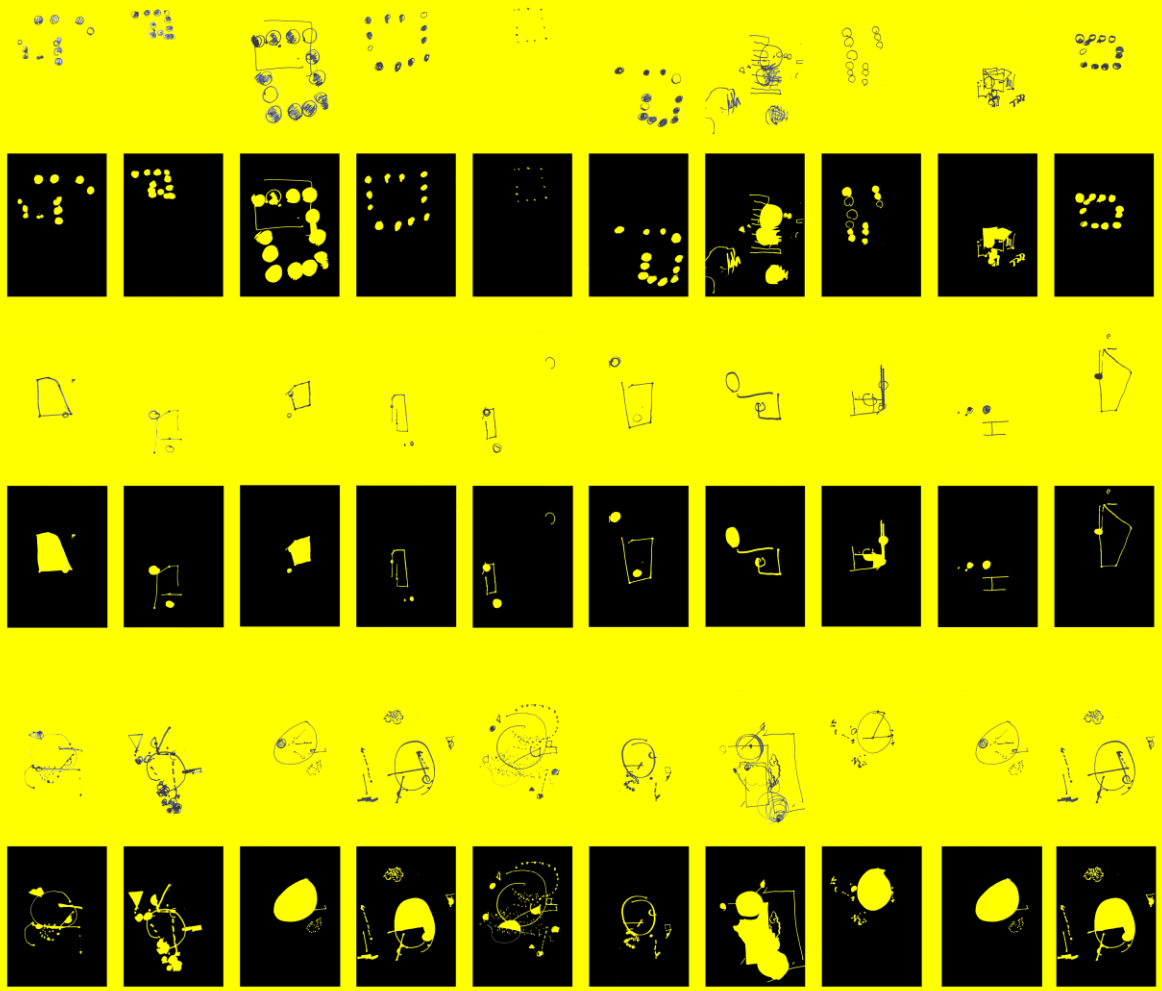
Tell-Draw workshop

To analyse data transfer between two individuals through drawing, without any written instructions involved.

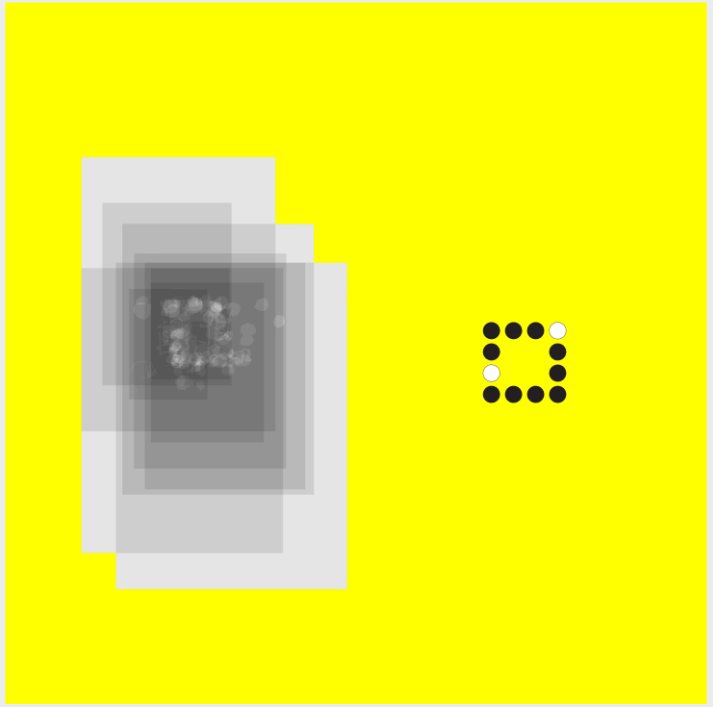
10 groups, consisting of 20 participants
Examined by three drawings, which served as behavioural analysis tools.

Through this process,
Perceive and understand the mass of an object rather than the void or empty spaces.

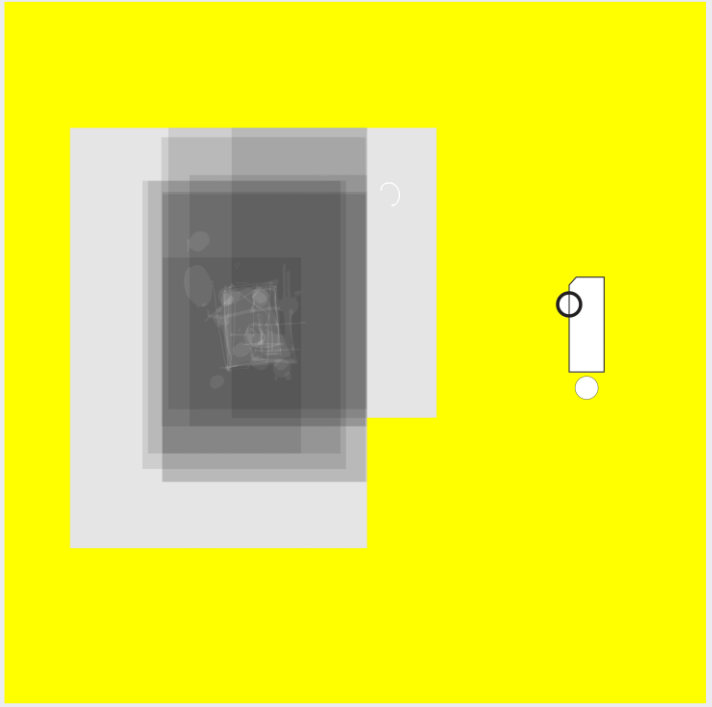
This workshop provided valuable insights into communication and perception, particularly in the context of visual impairment.



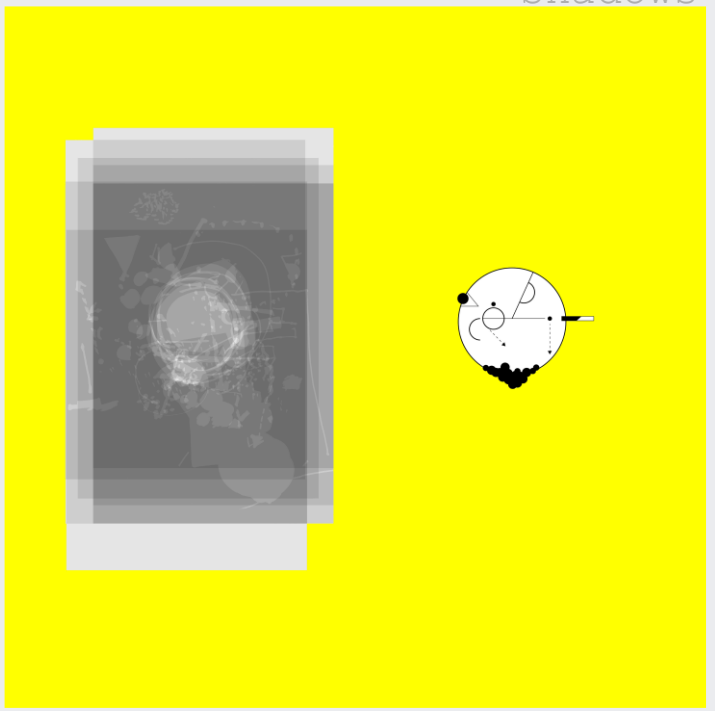
- Over layer drawings
- Analysing drawing behaviours
- Invert negative spaces
- Void and Mass
- Black and White



First drawing-one simple shape, centralized, fill ad borders



Second drawing-two simple shape, x-y direction, edges, thickness



Third drawing-multi shapes, x-y direction, style, degree

00

what creatures (despite human) can perceive space without sight?

Two categories: metaphysical and physical
In the physical realm: Artificial Intelligence (AI)

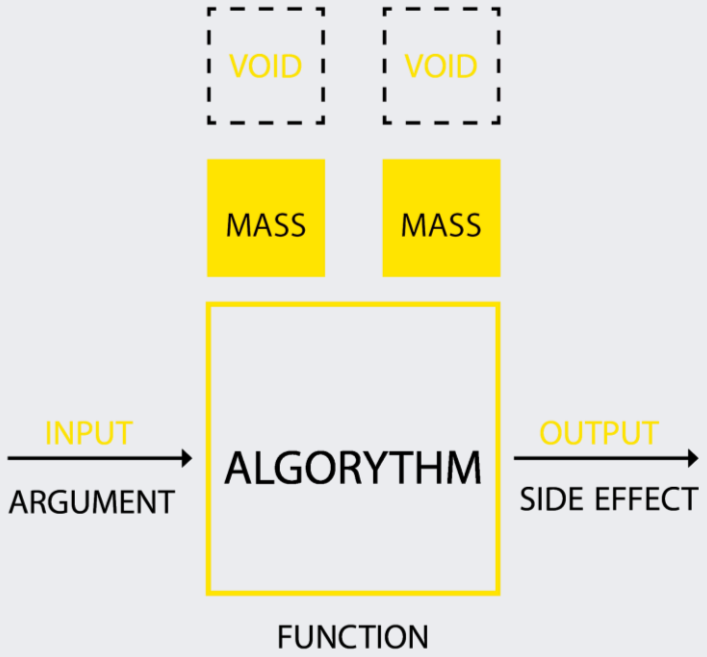
AI is programmed by humans with conditional logic
if this, then that; if this doesn't happen, then that. If, Else, Result
The "if" structure creates four core functions that people supposed to experience in the designed space.

It's not merely about shopping; it's about experiencing the space itself!

It's developed functions by coding in binary matrix (zeros and ones)

SPACE ALGORITHM

[O . 1]



Space algorithm is the way showing how this programming works:

Void
Mass

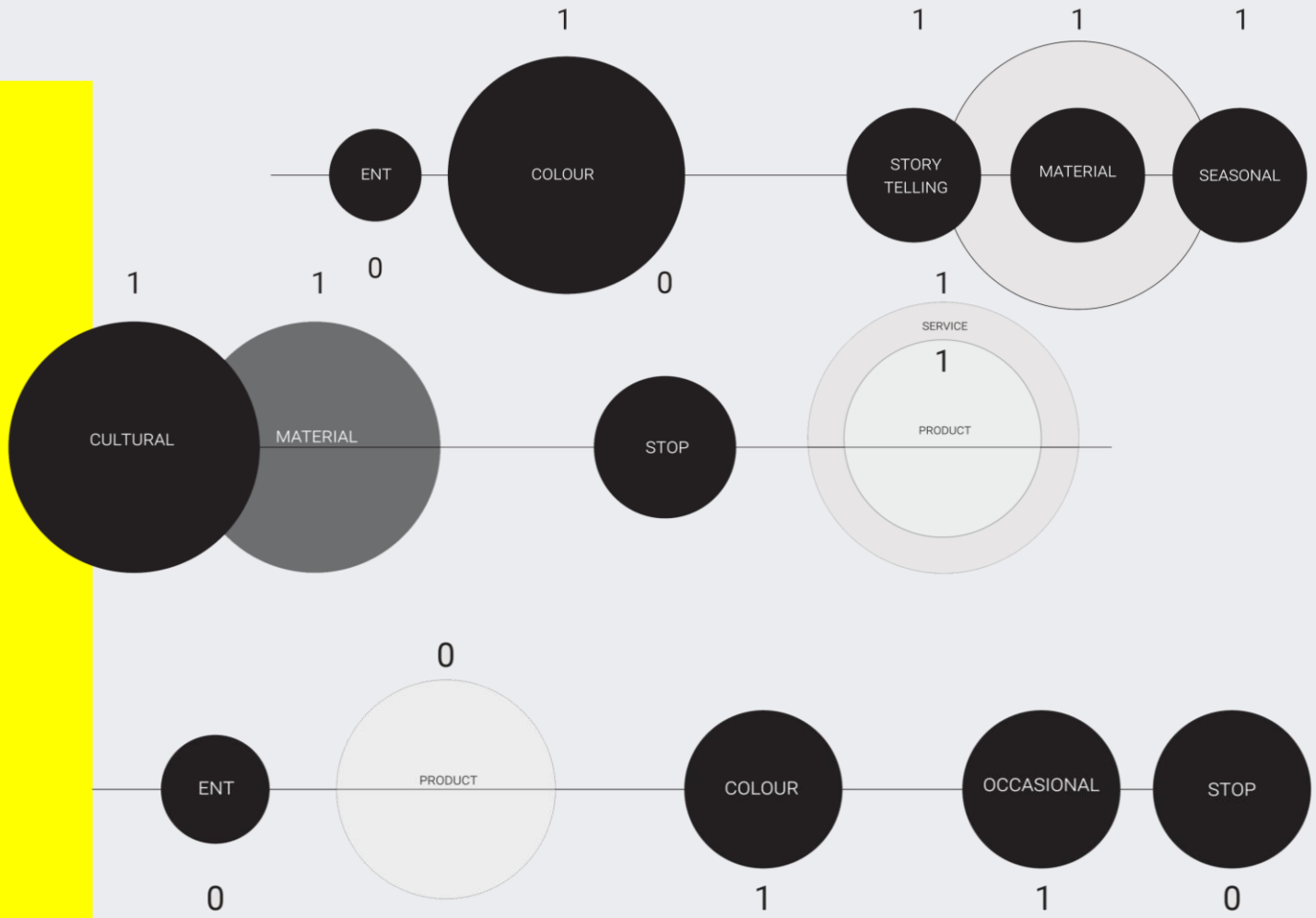
Input - argument - what will happen in the space
Algorithm - the function of matrix - coding space
Output - side effect - universal coded design

01 IF

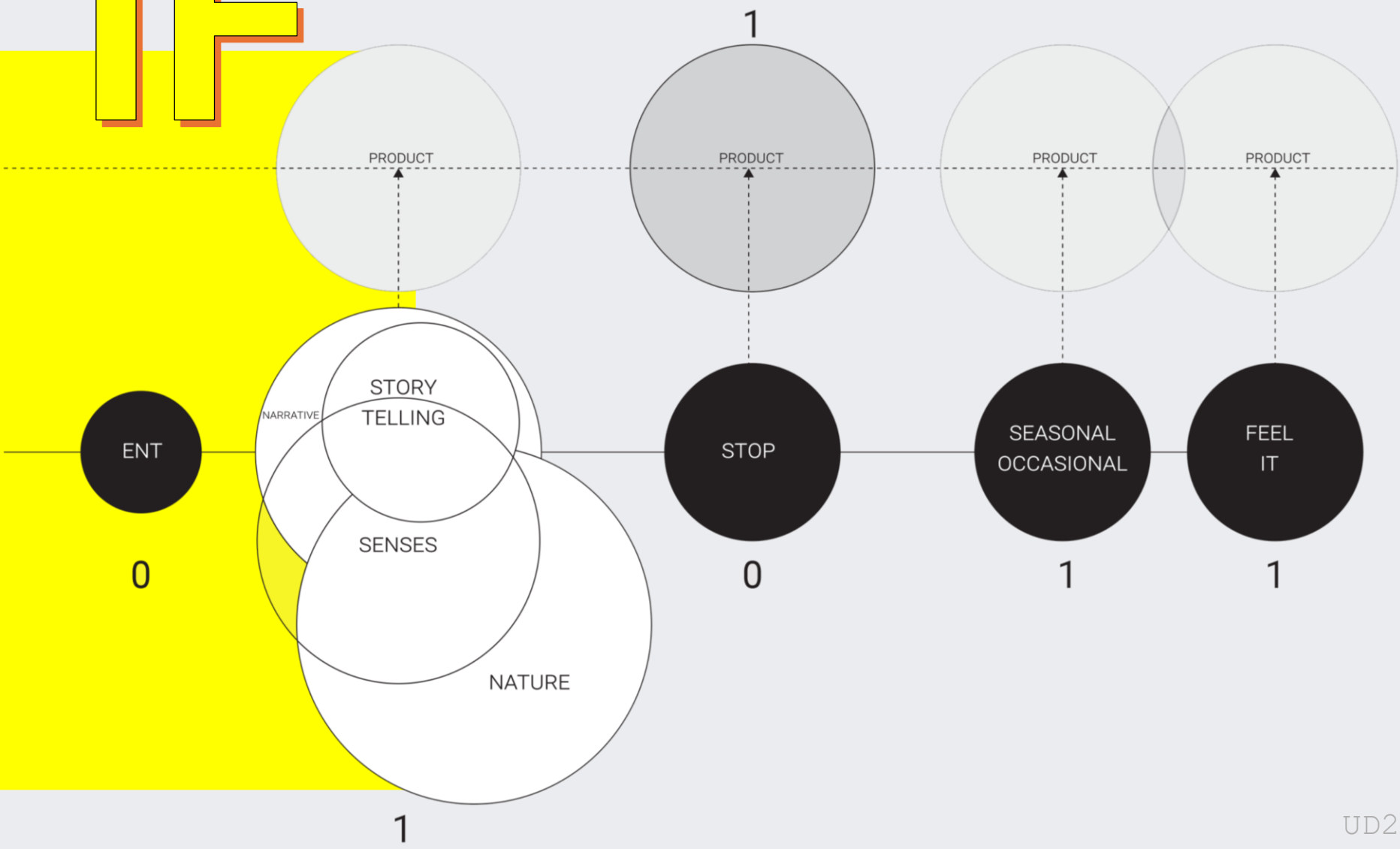
Four functions designed to explore

0 : if the function has no direct effect on the design

1 : if the function has direct effect on the design



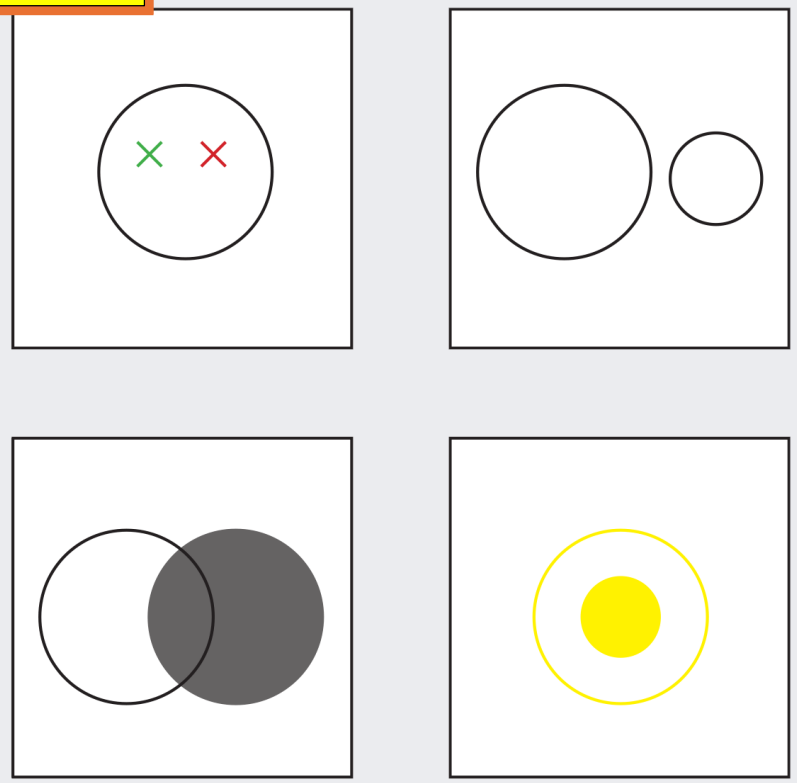
01 IF


1
PRODUCT
PRODUCT
PRODUCT
PRODUCT
ENT
0
NARRATIVE
STORY
TELLING
SENSES
NATURE
1
STOP
0
SEASONAL
OCCASIONAL
1
FEEL
IT
1

01 ELSE

Four visually impaired category

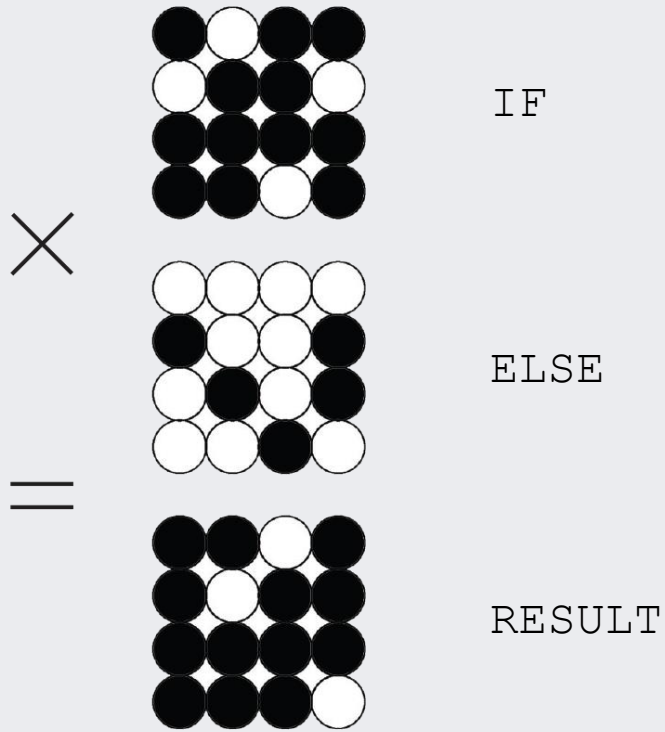
Color blind
Diplopia
Depth, Size problem
Light glare



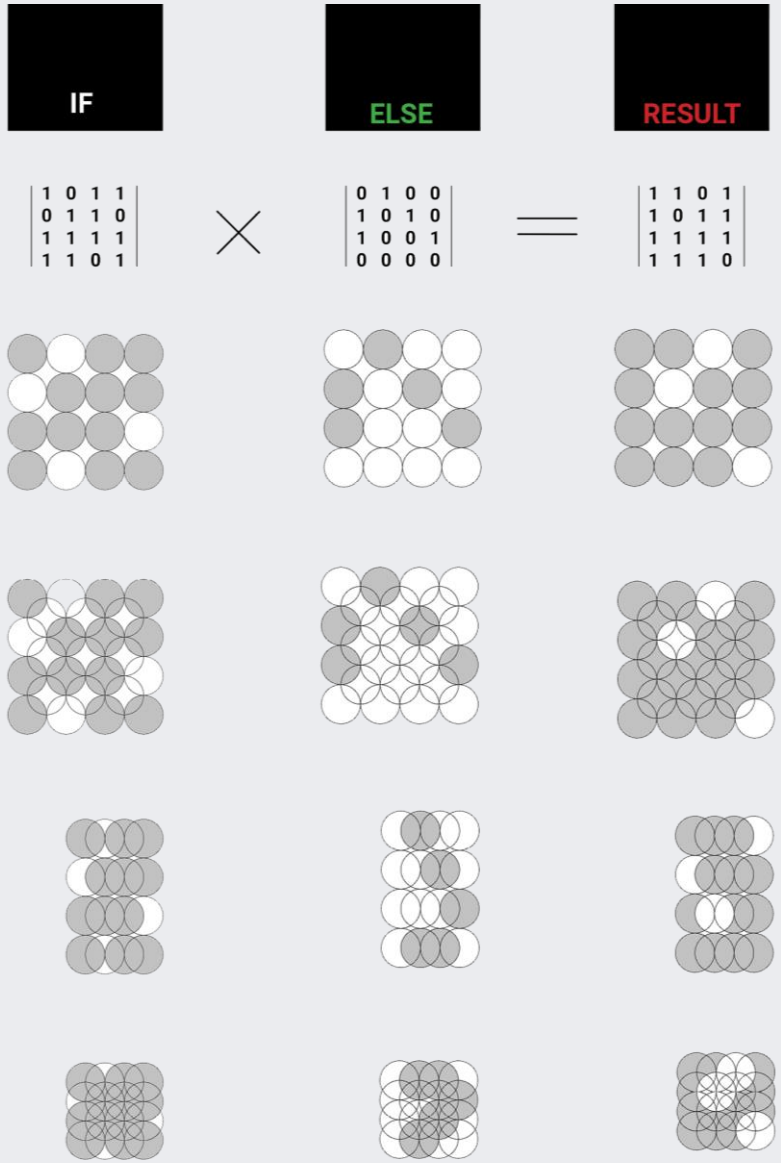
01 RESULT

Four functions designed
to explore

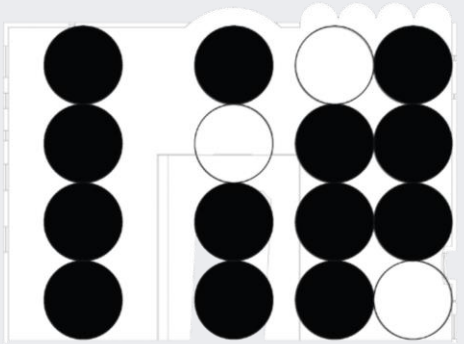
0 : if the function has no
direct effect on the design
1 : if the function has
direct effect on the design

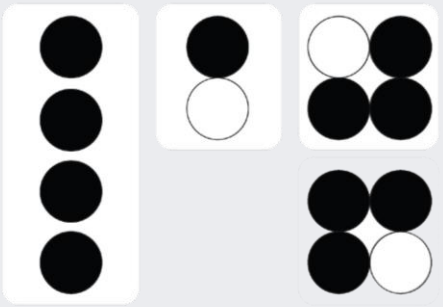


Borders
AS



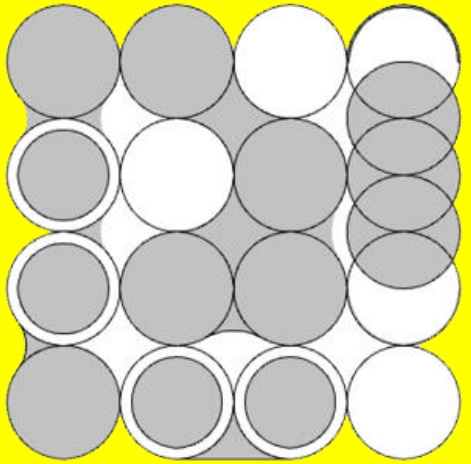
Voice of
Shadows





Methodology
into action

3*3 binary matrix
3-Row Circulation



Shopping-Expo

2D . 3D	90 m²
Magnifier	90 m²
Light-Color	75 m²
Moving	135 m²
Size	75 m²
Self-act	75 m²
4D	40 m²
Sheet	50 m²

Material-Matrix

Nature-Walk	375 m²
Matrix	175 m²

Material-Object

2D . 3D	150 m²
Magnifier	150 m²

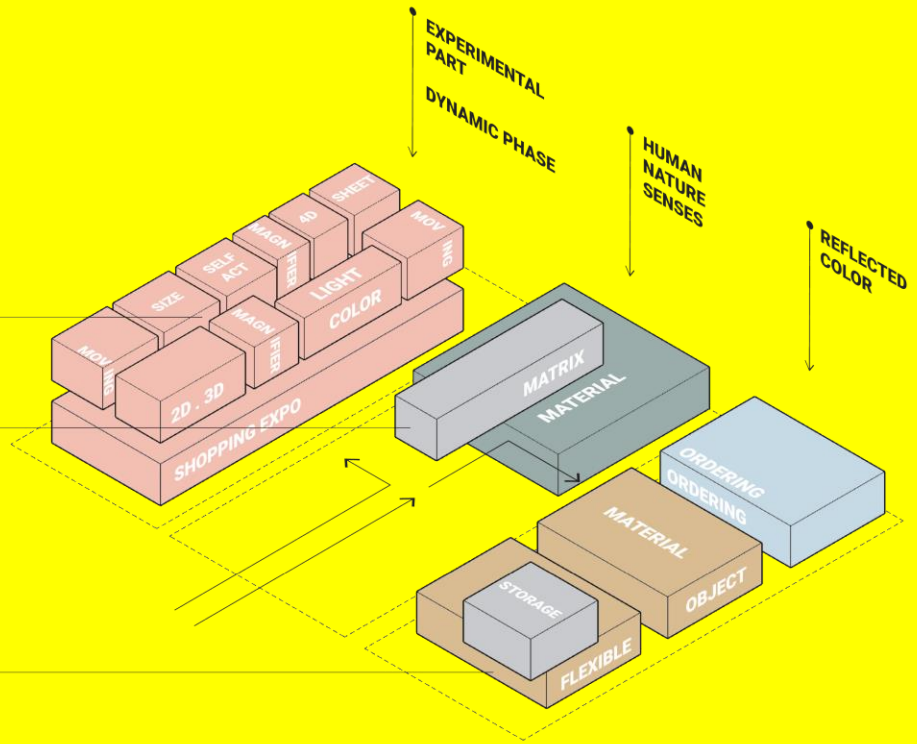
Storage

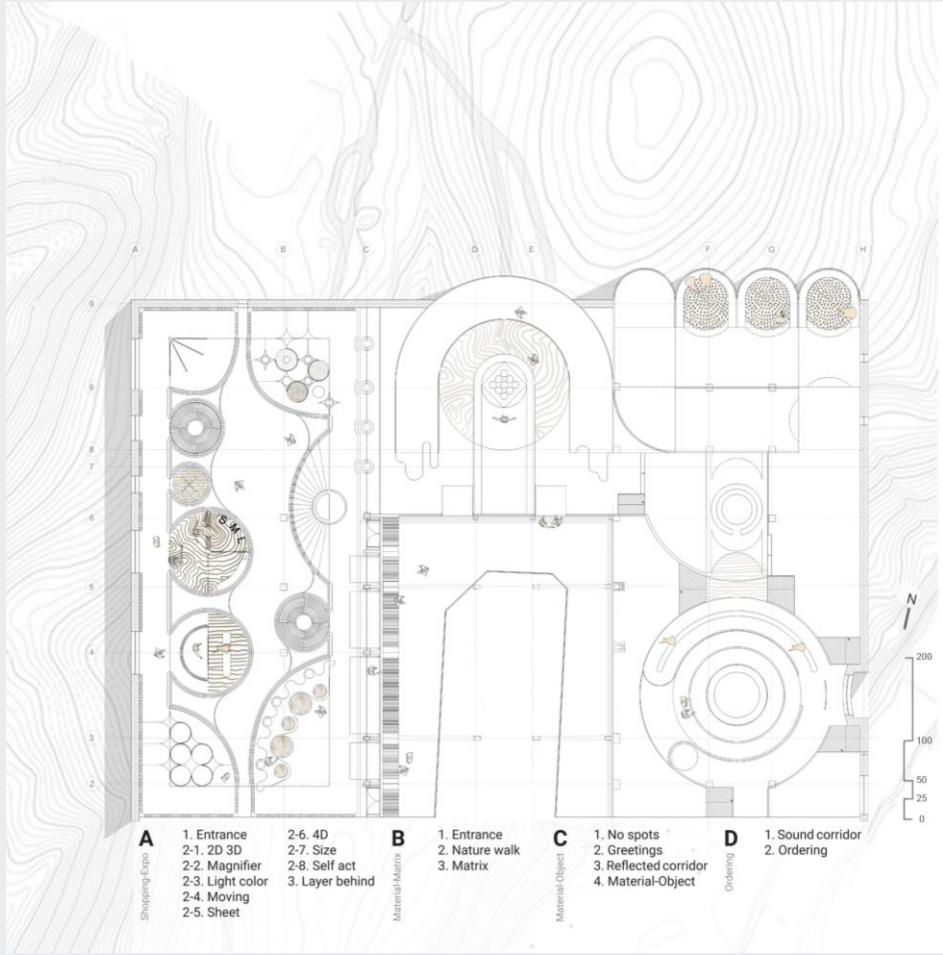
2D . 3D	60 m²
Magnifier	60 m²

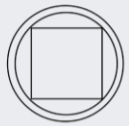
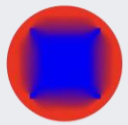
Ordering

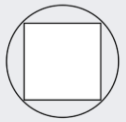
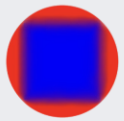
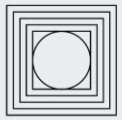
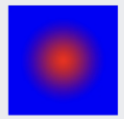
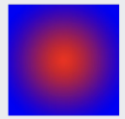
4x ordering spot	300 m²

Total area	1900 m²



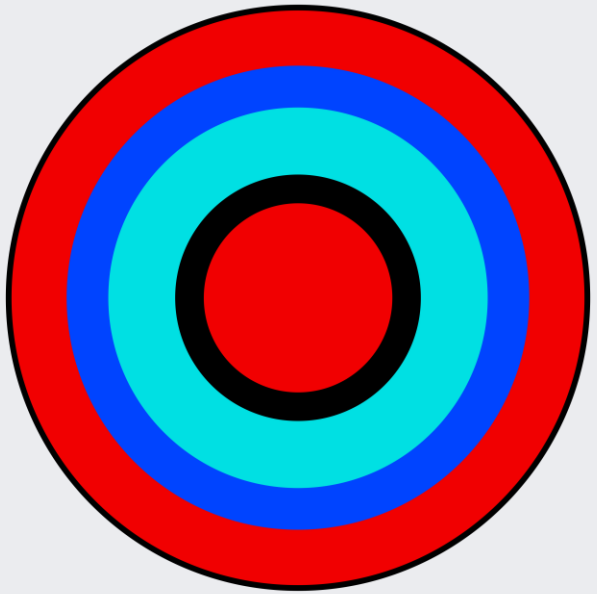


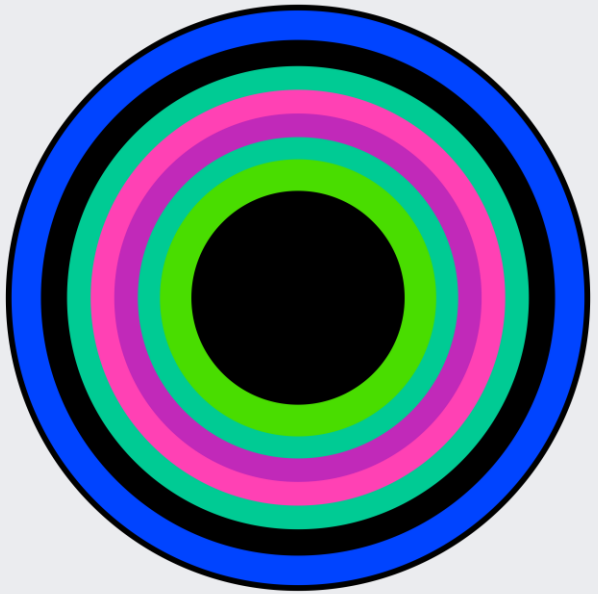
color code	color name	color wavelength	color shape	colored shape	reflected color	reflected light		reflected sound	
						frequency	wave length	frequency	wave length
#008000	Green	1 green				575.3	521.1	523.2	65.99
#9acd32	Spring green	2 green . 1 yellow				543.0	552.1	493.9	69.92
#ffff00	Yellow	1 yellow				512.5	584.9	466.2	74.07
#ffa500	Orange	1 red . 1 yellow				483.8	619.7	440.4	78.48
#e34234	Vermilion	2 red . 1 yellow				456.6	656.5	415.3	83.15
#dc143c	crimson	2 red . 1 blue				431.0	695.6	392.0	88.09
#ff0000	Red	1 red				406.8	736.9	370.0	93.33

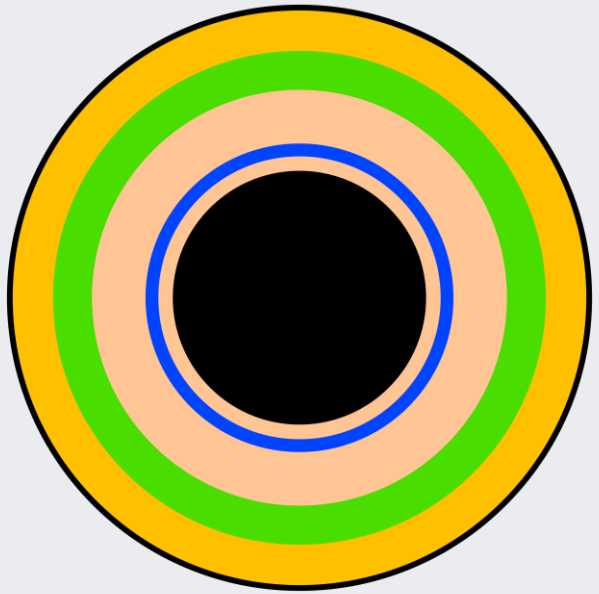
color code	color name	color wavelength	color shape	colored shape	reflected color	reflected light		reflected sound	
						frequency	wave length	frequency	wave length
#ff0000	Red	1 red				406.8	736.9	370.0	93.33
#ff00ff	Magenta	1 red . 1 blue				768.0	390.4	698.5	49.44
#f33a6a	Rose	5 blue . 1 red				0	0	0	0
#a020f0	Purple	4 blue . 3 red				768.0	390.4	698.5	49.44
#0000ff	Blue	1 blue				684.2	438.2	622.2	55.49
#40e0d0	Turquoise	2 blue . 1 green				609.5	491.8	554.4	62.29
#008c77	Aqua green	1 blue . 2 green				590.5	561.4	536.2	63.11

Borders
AS

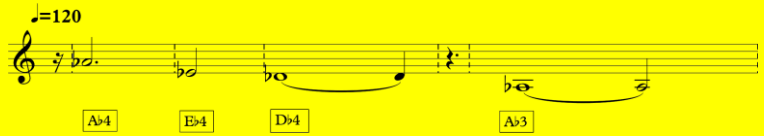
Voice of
Shadows



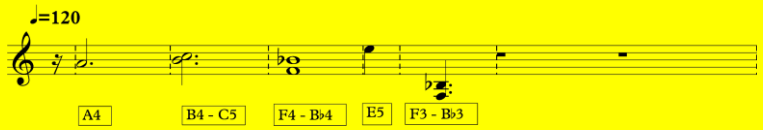




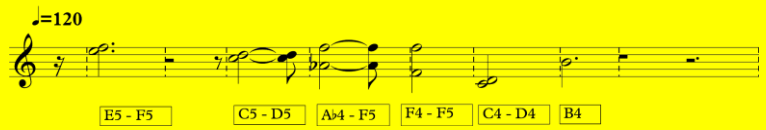
Circle 1



Circle 2

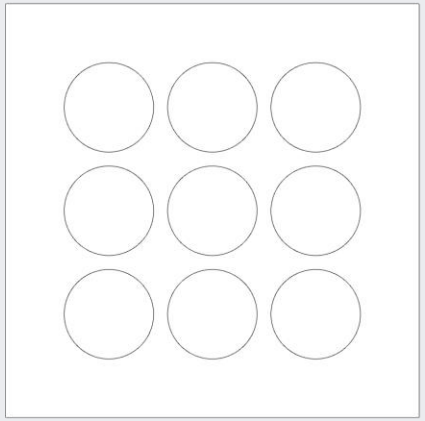


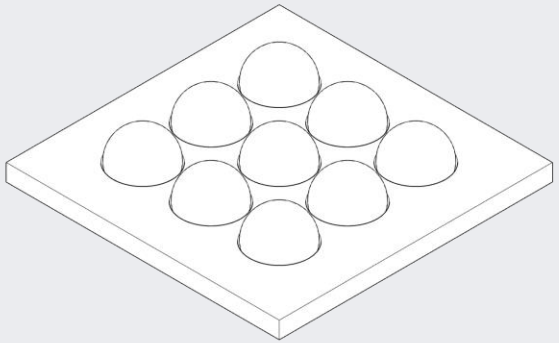
Circle 3

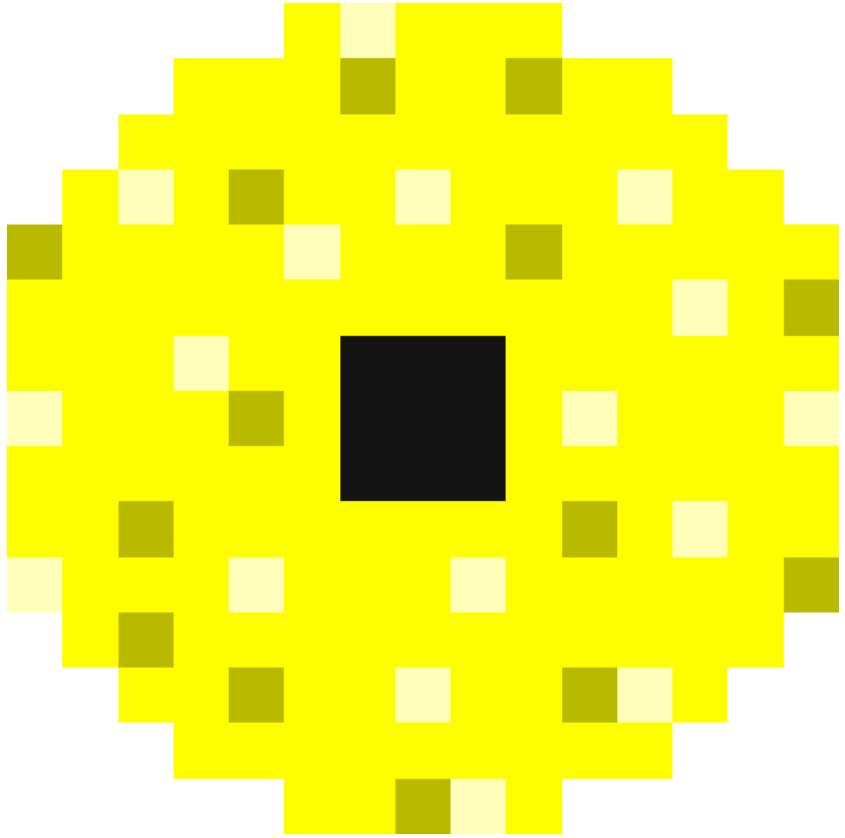


Music Professor: Shahab Sharafi

UD2024



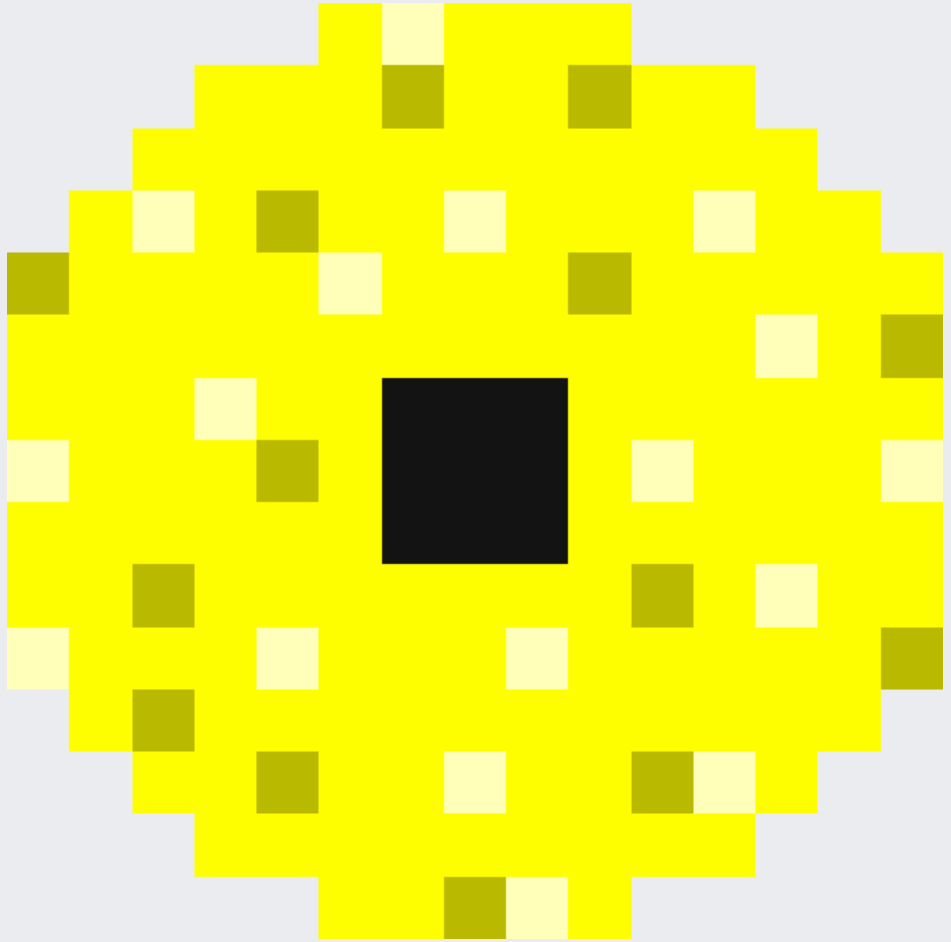




Voice of Shadows Application

Imagining “hearing” colors instead of seeing them inspired us to explore sensory perception.

The **Voice of Shadows** application is based on **universal design**, which means it’s made to be accessible for everyone, especially people who are visually impaired.



Lack of connection leads to

- **Feelings of isolation**
- **Serious mental health issues**

This application aims to bridge that gap,

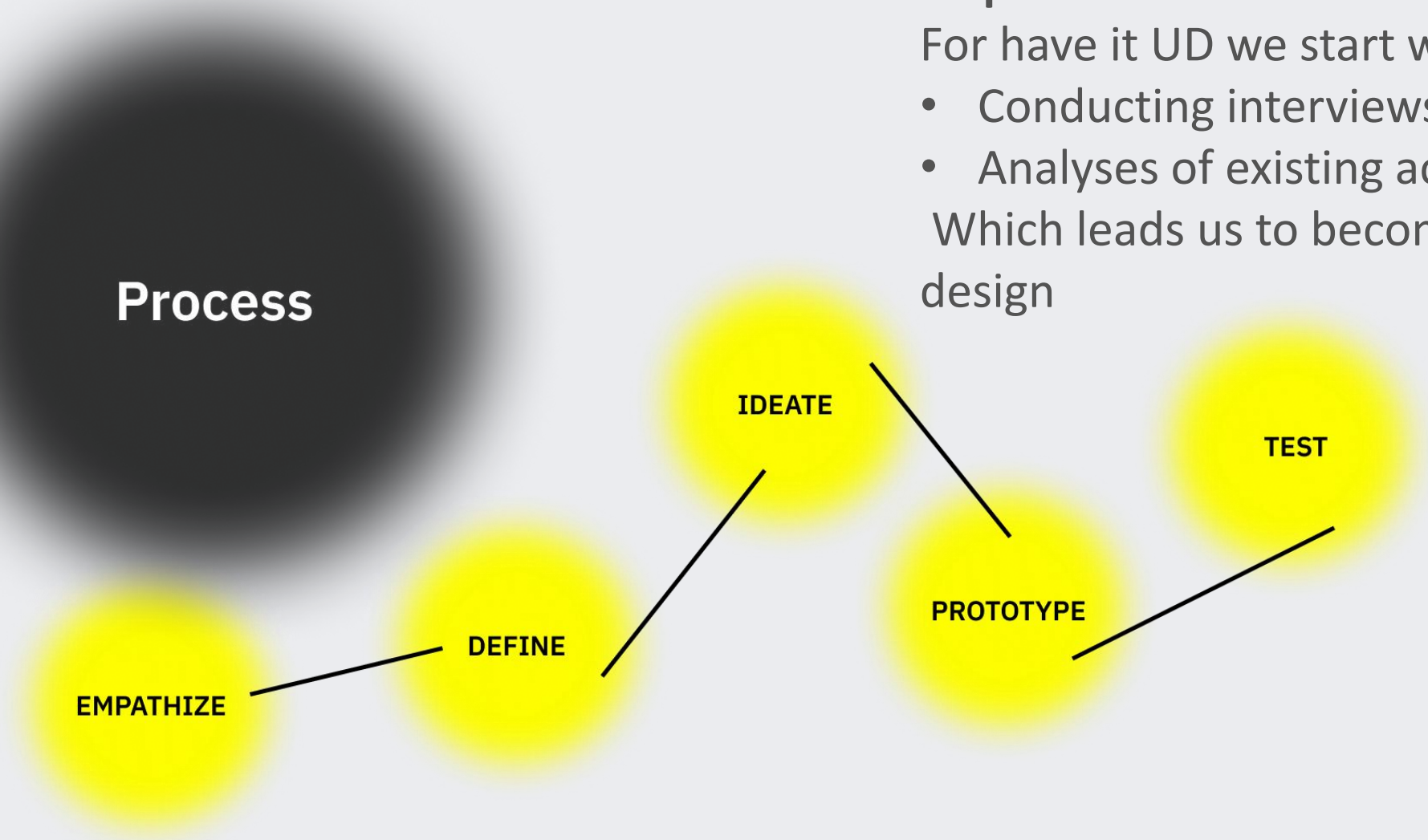
- Enriching daily experiences
- Improving a deeper connection to the world.

To start with the design process, as a ux designer you should follow these bellow steps.

For have it UD we start with:

- Conducting interviews
- Analyses of existing accessibility tools,

Which leads us to become a user cantered design



Core Problem

In the beginning, we focused on interior spaces. The first thing you will communicate there is color. How you as a human being would integrate to a space while you can not see it.

Color which you can hear it
In the physical world, each color has its own sound frequency

Value Proposition:

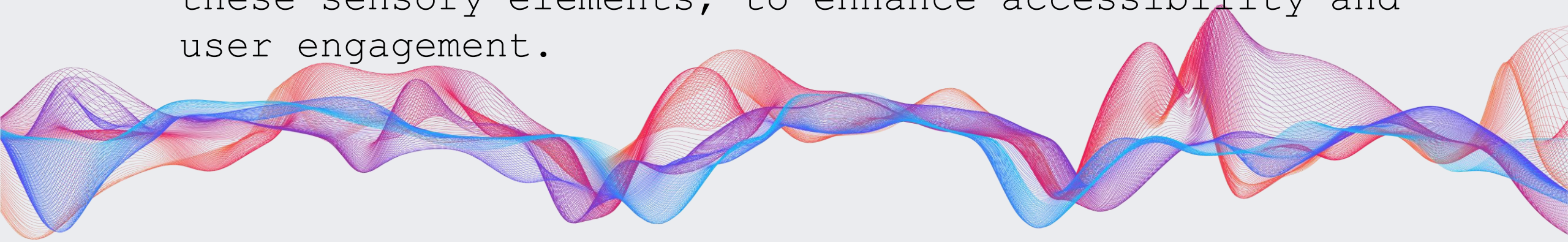
Voice of Shadows bridges this gap by turning colors into sounds, creating a unique sensory experience that enhances emotional
connection and engagement.

Key insights from researches:

Our research highlighted the need for an app that goes beyond an assistance. **Users want a tool that makes color an interactive, immersive experience, helping them reconnect with their environment in meaningful ways.**

Value of Multisensory Design:

- Connects sensory experiences—**visual and auditory**—by transforming colors into sounds.
- By developing **systematic strategies** that harmonize these sensory elements, to enhance accessibility and user engagement.

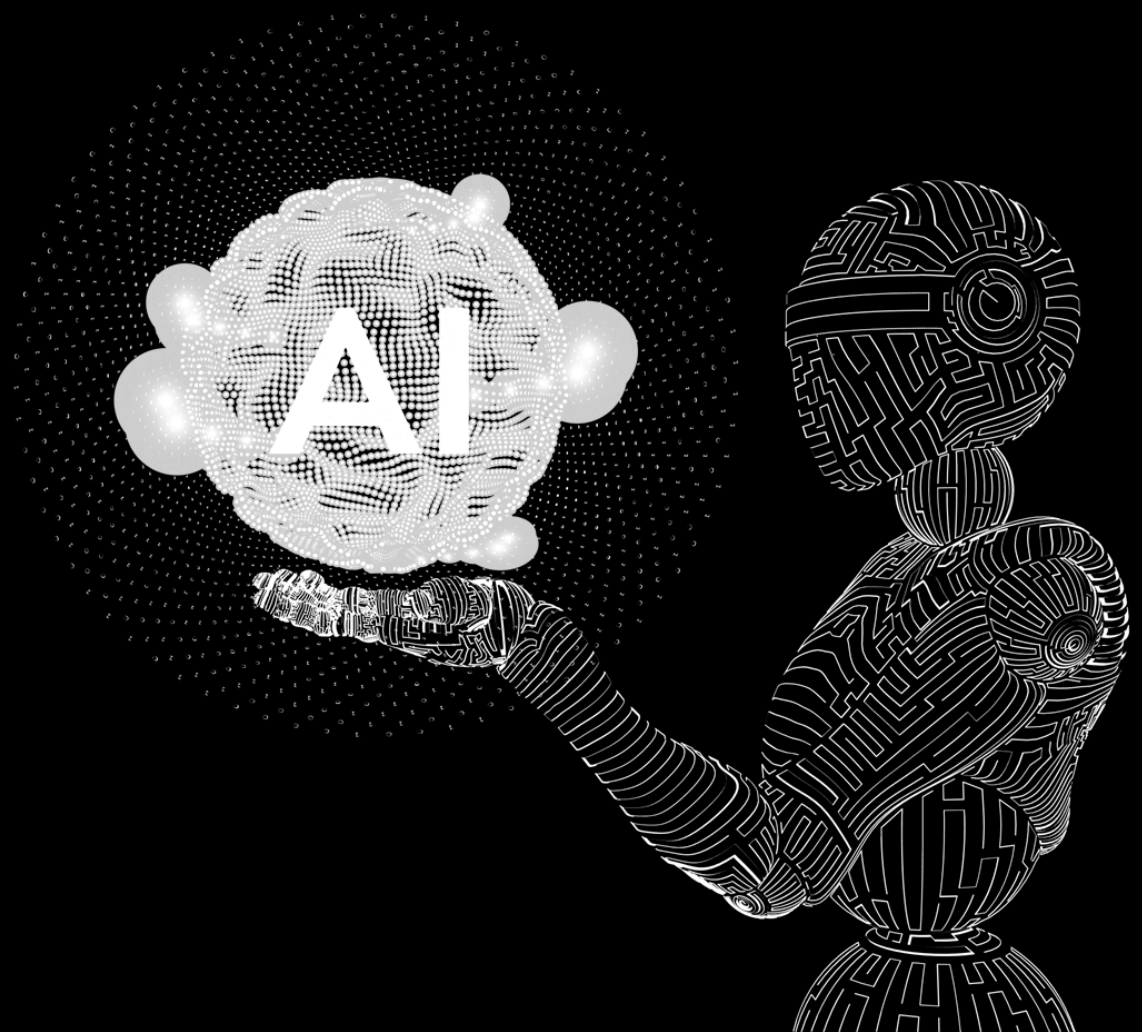


- By **transcends traditional design**, creating a unique connection between individuals and their surroundings.
- **Inclusive and meaningful sensory experiences.**

The Monocle, Guid to shops, kiosks and markets. P13. & P21. 2019

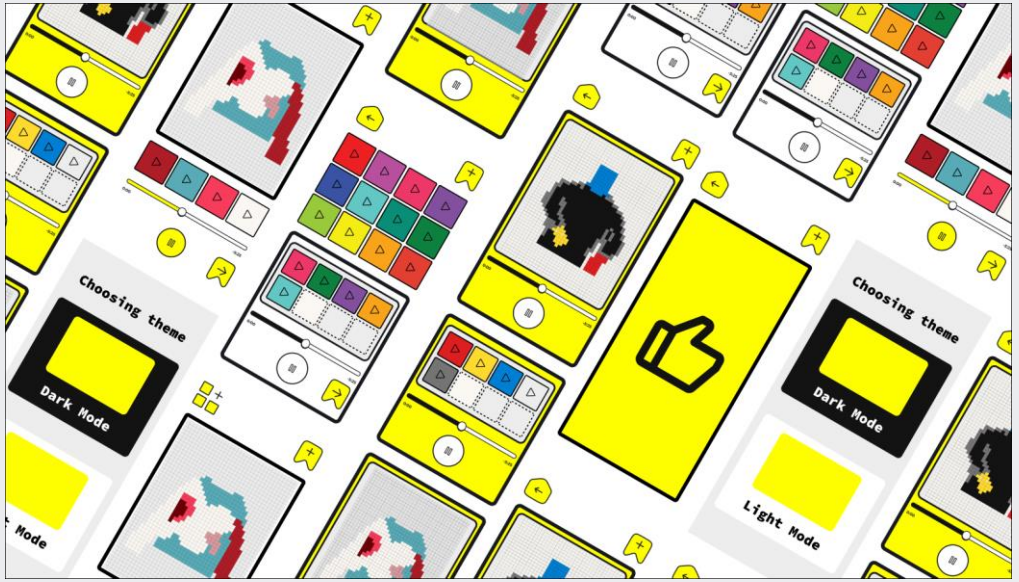
Artificial Intelligence

- **Detecting color palettes** of objects and surroundings.
- **Generating sound palettes** based on unique sound frequencies for each color.
- **Sharing emotions, ideas, and daily experiences,** creating a bridge to

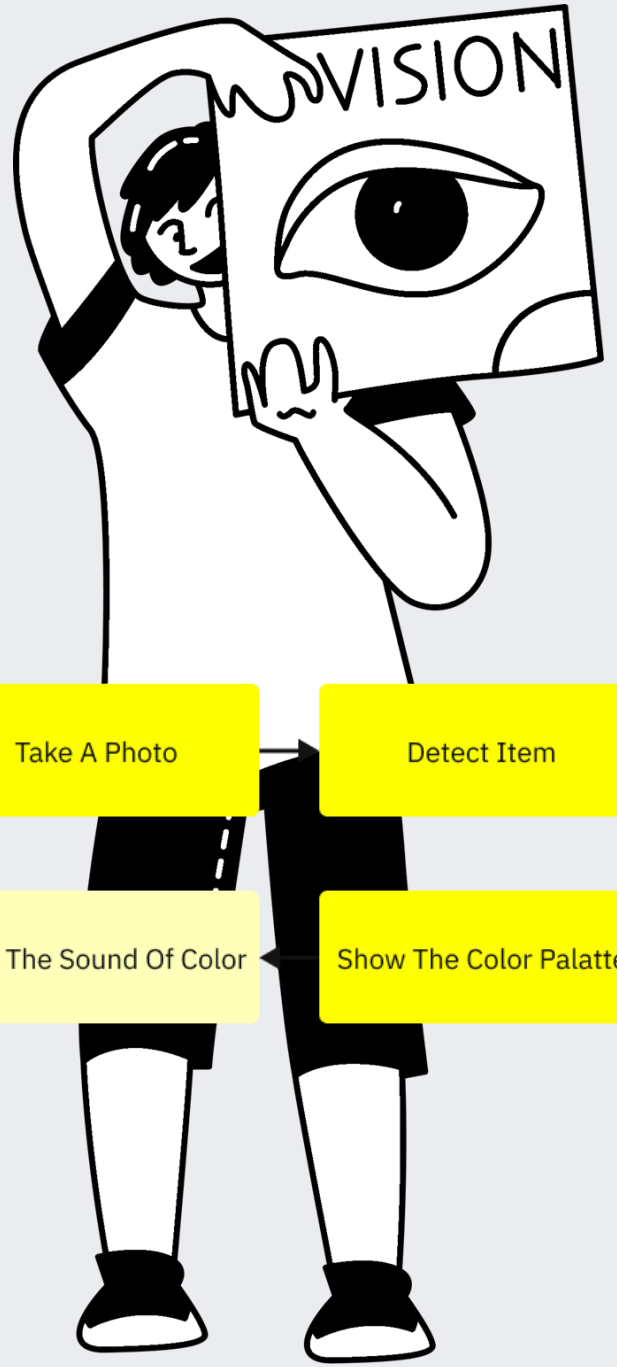


Project Scope:

This project will focus on developing an MTP (minimum testable product) for a mobile app that enables visually impaired users to experience color through sound. The MTP will cover core functionalities like color recognition and sound mapping.



User journey map



START → Open Application → Choose Theme And Size → Take A Photo → Detect Item → Picture Pixilisation → Detect Color Item → Show The Color Palatte → Play The Sound Of Color → Export Or Mark To Favorite Page → Show To The Seller → Buy The Item → END

Color Recognition:

The app uses the smartphone camera to detect colors and transforms them into unique sound patterns, enabling users to "hear" colors.

Simple, Accessible Interface:

Accessible design optimized for visually impaired users.

Unique Sound Patterns:

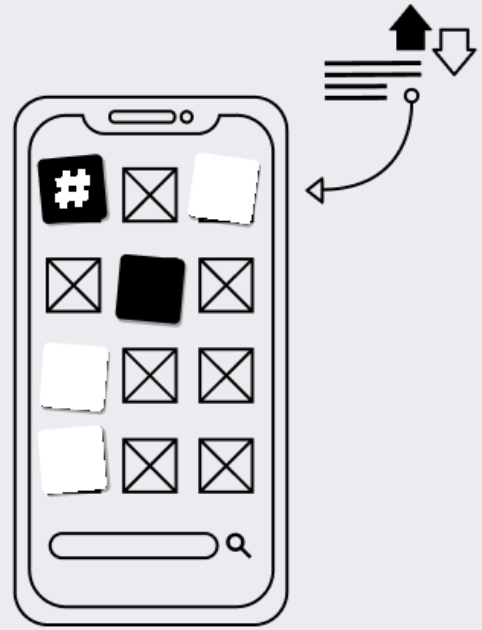
Colors are turned into distinct sounds, making the experience engaging and encouraging interaction with the surroundings.

Personalization:

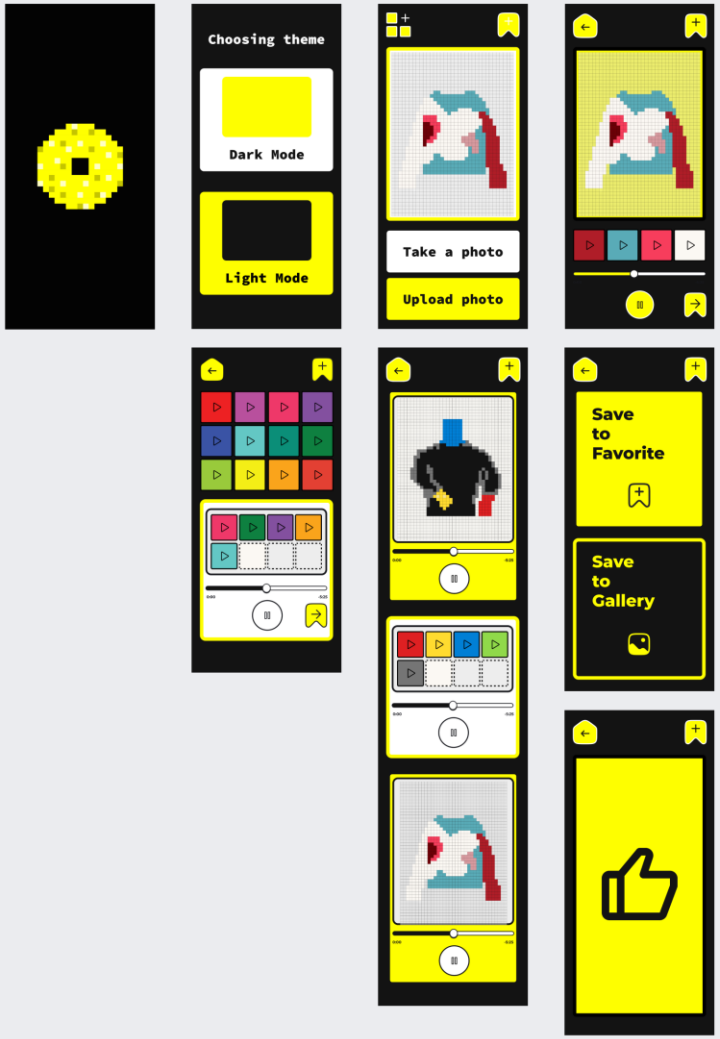
Allows users to adjust their own color-sound palette.

Social Sharing:

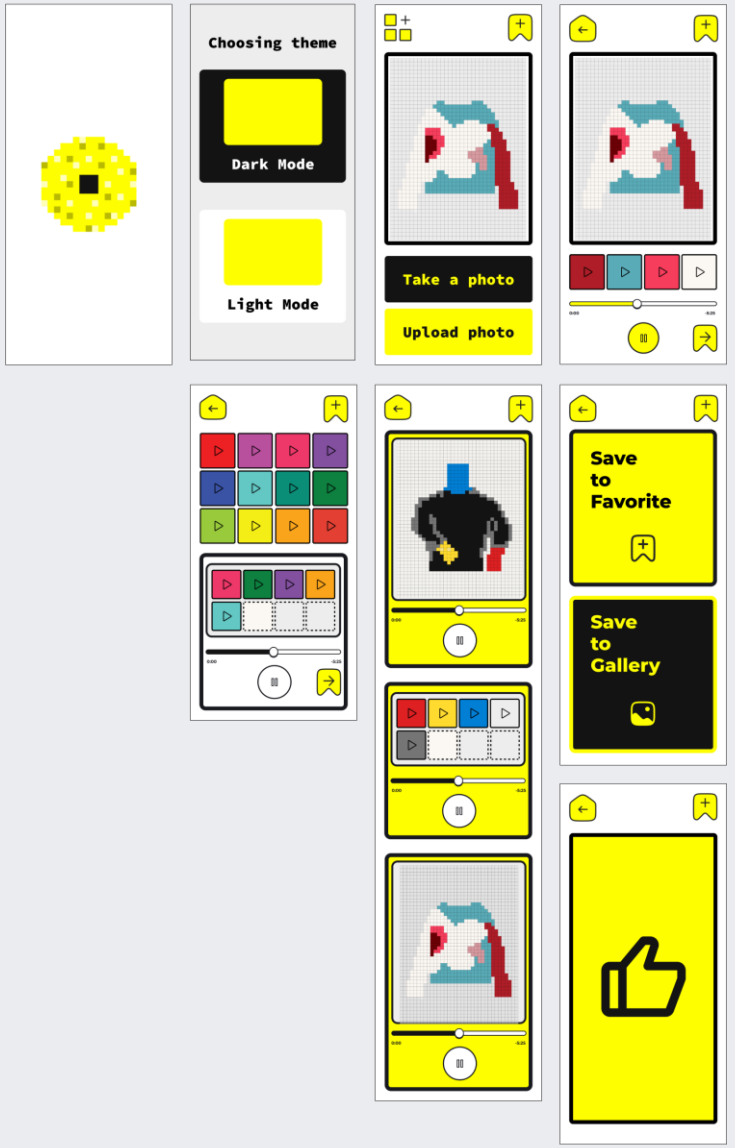
Option to share color experiences, fostering social interaction.



Dark Mode



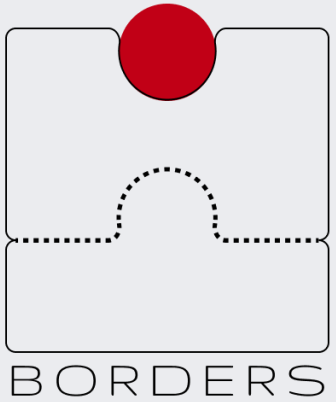
Light Mode



Voice of Shadows is more than just an app; it’s a testament to the power of universal design and accessibility. Our goal was to create an experience that everyone can connect with, regardless of ability, giving all individuals a sense of inclusion in the world around them.

conclusion

This app demonstrates how thoughtful design can make everyday life richer and more meaningful for everyone, especially for those with visual impairments. We hope that Voice of Shadows opens a path toward a future where spaces and experiences are accessible to all.



Thank You