



Heart to Heart

An interactive project shows how animals feel and think.

This project collects animals' emotions by detecting and recording their heartbeat and body temperature using a Pulse sensor and a TMP93 sensor and visualizes these data into nine designed patterns based on the abstract shapes and lines of each animal's skins.

The first "heart" in the name of this project, Heart to Heart, represents the human heart, while the second one is regarded as animals' hearts.



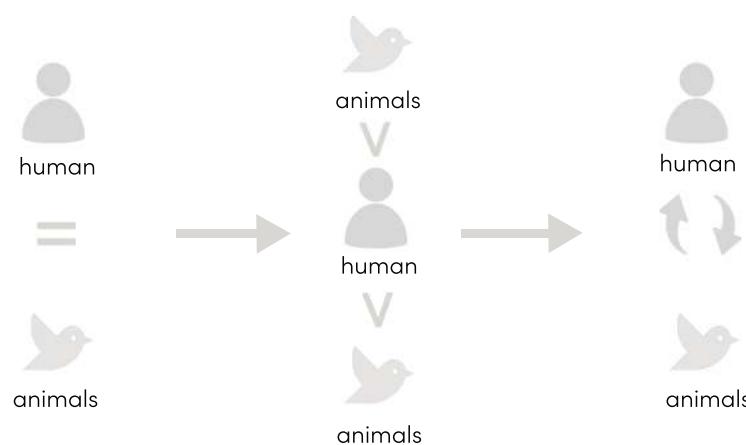
The concept of the project is to remind us to treat animals as intellectual beings that are on the same level as humans and not some lower form of life that need our pity.

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Research

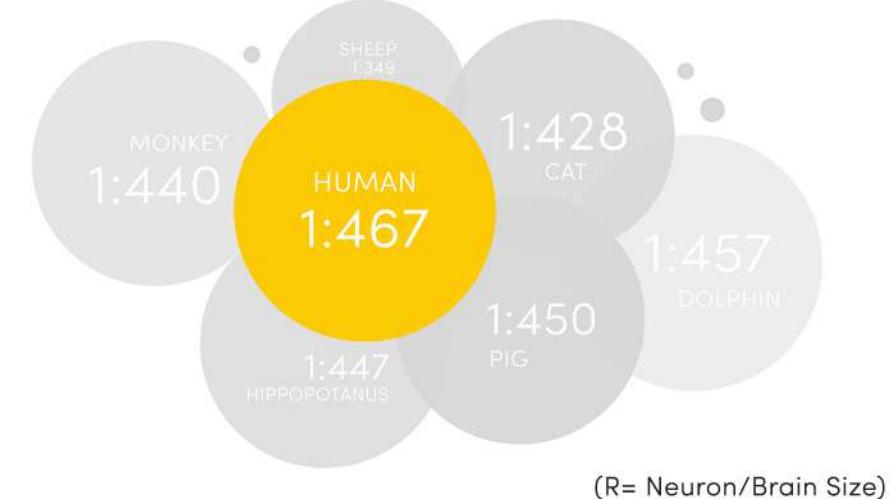
Human-Animal Interaction (History)

There is a long history of the interaction between humans and animals. Both evolutionary science and biologists hold, at the prehistoric times, **humans are animals** that have changed and adapted over thousands of years to take on their current form. As times went by, in order to survive, **human beings** started to create a variety of weapons to **hunt animals**. And some tribal people, because of their religious beliefs, have **offered sacrifices of animals** to keep typical animal that they regard as spirits happy. Until nowadays, with the development of science and technologies, humans are a dominant presence for animals, so that human always stand at the highest point of morality to **sympathize and protect animals**.



Brain Size and Neuron Count (Ratio)

Size is not everything, though, when it comes to intelligence, humans compare to animals have more cortical neurons, which put us at the top of the intelligence rankings.



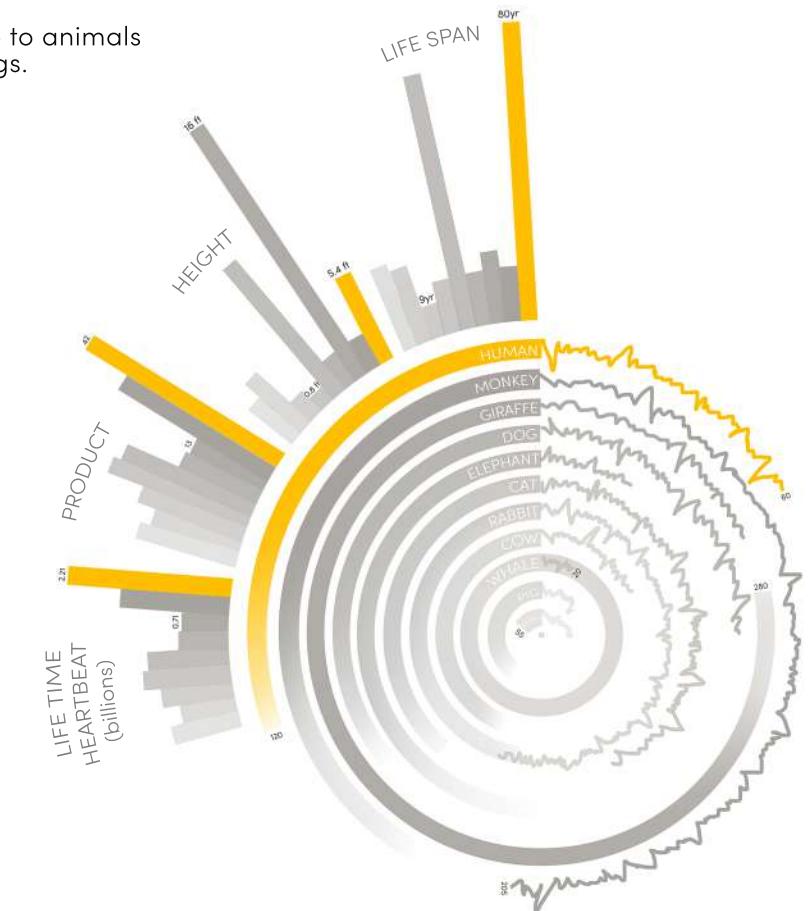
Encephalization Quotient

HUMAN	6.56
WHALE DOLPHIN	5.55
BOTTLENOSE DOLPHIN	5.26
COMMON DOLPHIN	4.97
MACAQUES	3.15
CHIMPANZEE	2.63
GORILLA	1.75
COYOTE	1.69

Oral Bioavailability

HUMAN	72%
RAT	18%
DOG	42%
MOUSE	38%
PIG	37%
CAT	33%
CALF	52%
CHICKEN	29%

Difference Between Human and Animals

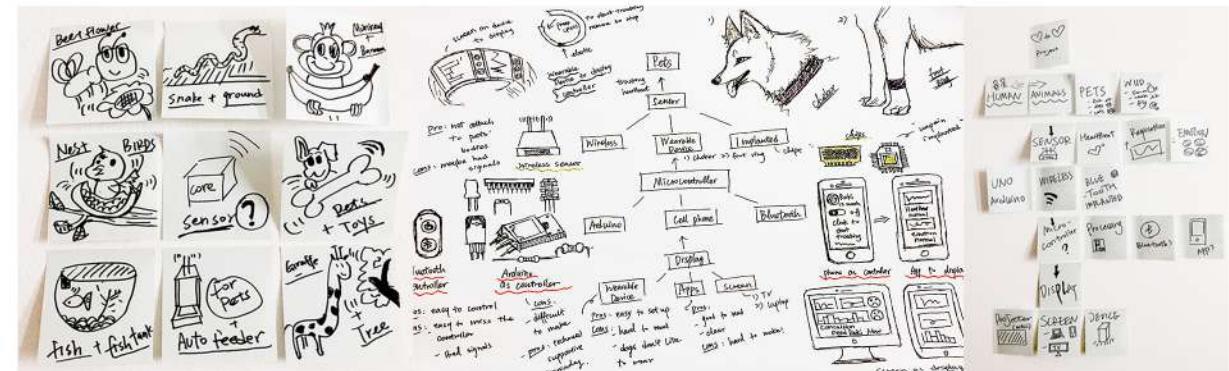
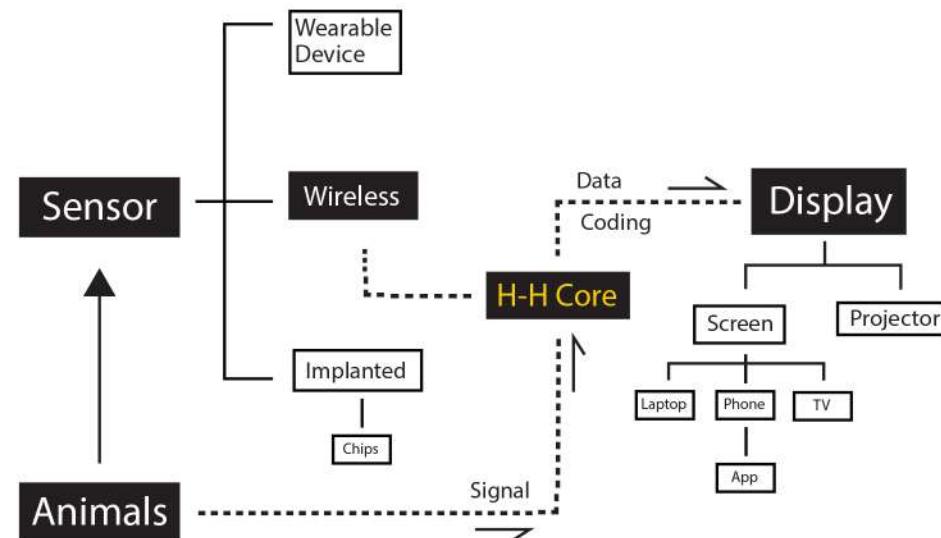


● Human
● Animals
 (anti-clockwise: monkey, giraffe, dog, elephant, cat, rabbit, cow, pig)

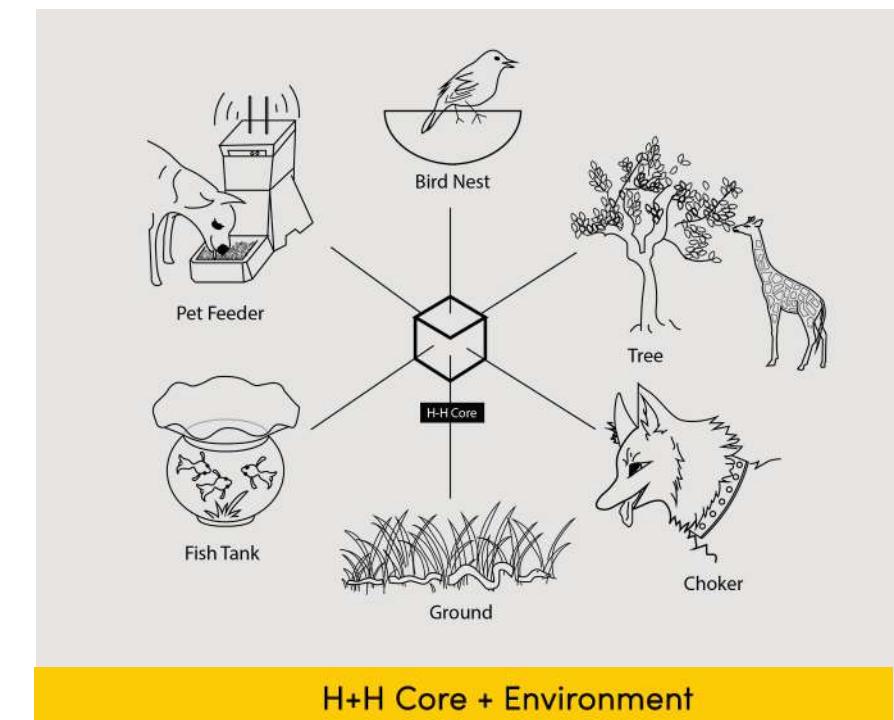
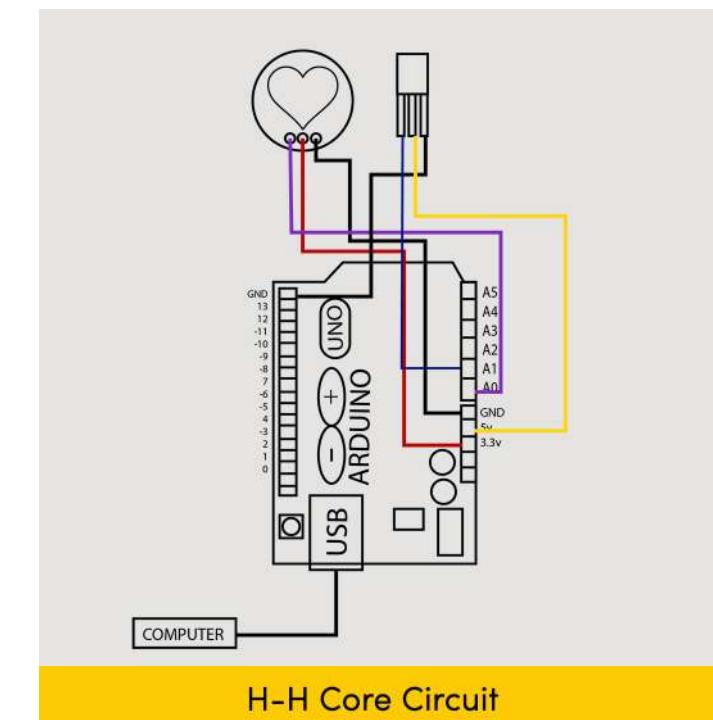
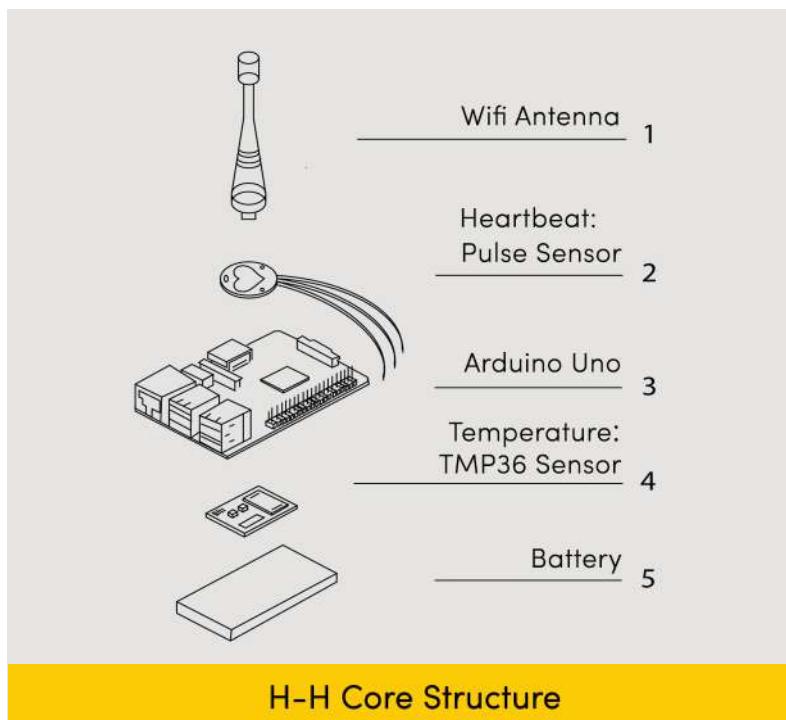
Blood Pressure, Heartbeat, Longevity, Height

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Hardware Design

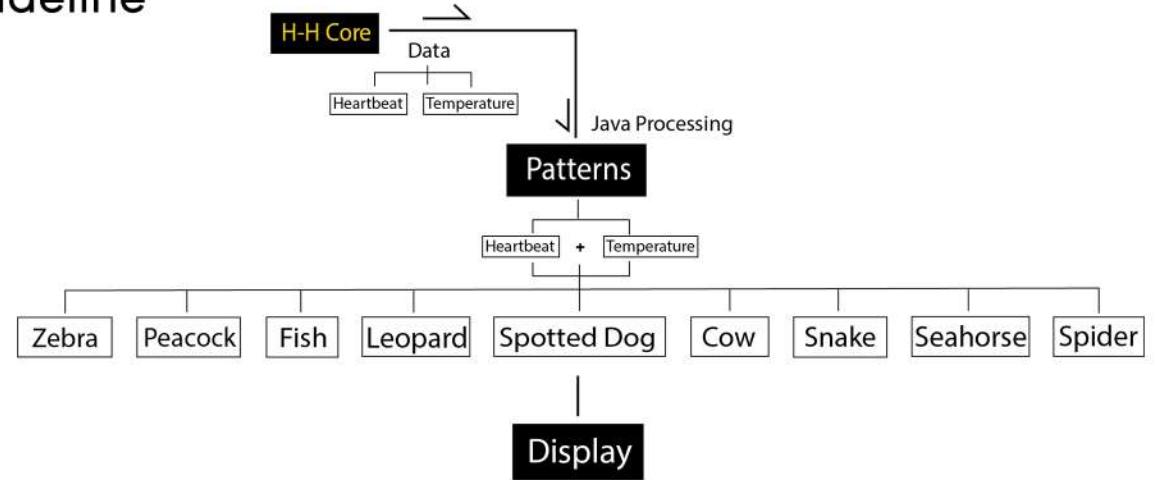


Sketch

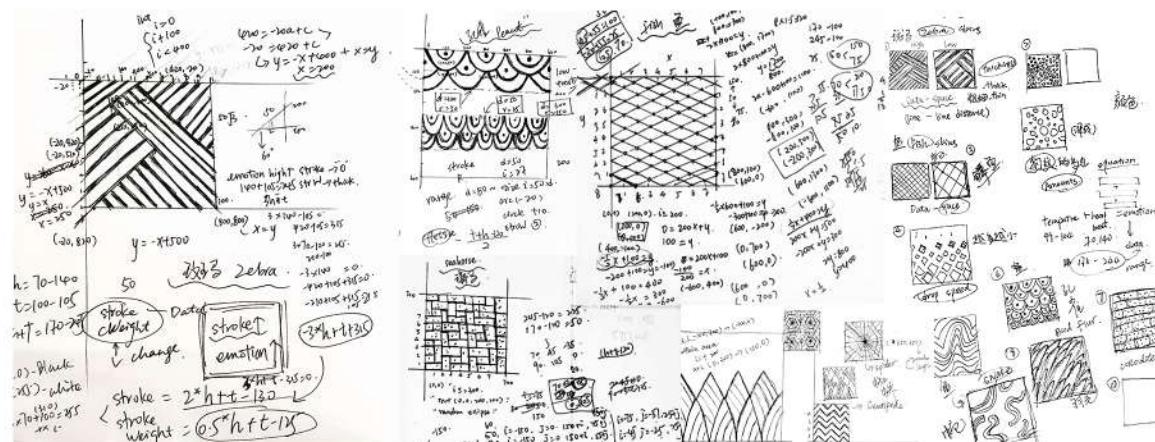


04 Visualization

Guideline



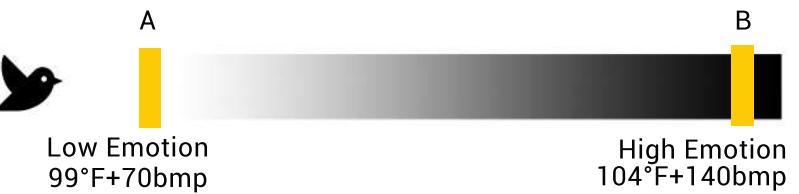
Sketch & Calculation



Process of Making

- Materials: pulse sensor kits, Arduino Uno Boards, TMP39 sensor, battery)
- Pattern design and measurements
- Pattern code writing (Java Processing)
- Prototype making
- Testing on Guinea pig
- Pattern printing
- 9 Girds structure display

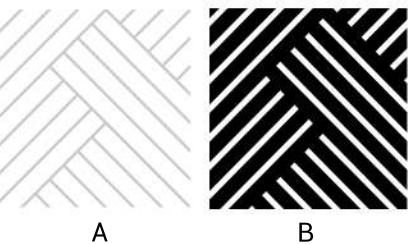
Pattern Design & Equation



A: Lowest Emotion $t = 100^\circ\text{F}$; $h = 70\text{bmp}$
B: Highest Emotion $t = 104^\circ\text{F}$; $h = 140\text{bmp}$
 h = Data from Heartbeat Sensor
 t = Data from Temperature Sensor

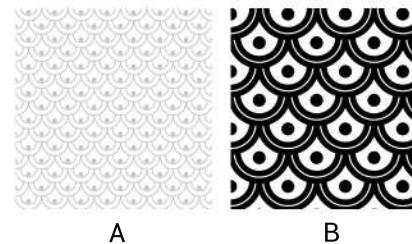
Zebra

Stroke = $-3 \cdot h + t + 315$
StrokeWeight = $0.5 \cdot h + t - 125$



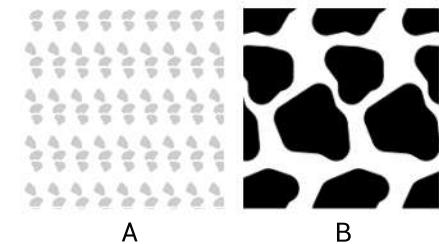
Peacock

Arc's Height = $h + t - 120$
OffsetSize = $1/2 \cdot (t + h - 120)$



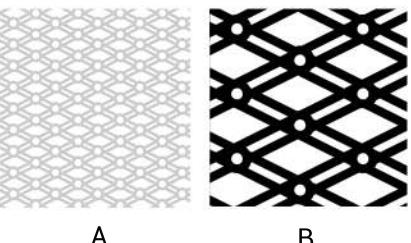
Cow

Fill = $-3 \cdot h + t + 315$
Scale = $h / 500 + t / 500$



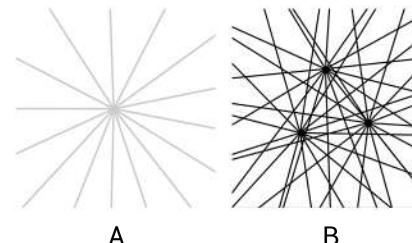
Snake

Ellipse'space = $((h + t - 120)) / \tan(22.5)$
Lines'space = $h + t - 120$



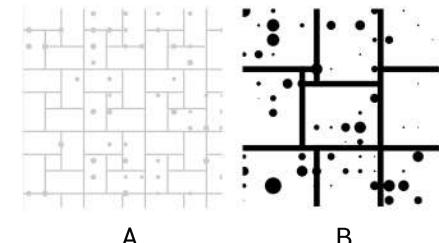
Spider

Stroke = $-3 \cdot h + t + 315$
Distance = $6 \cdot h + t$



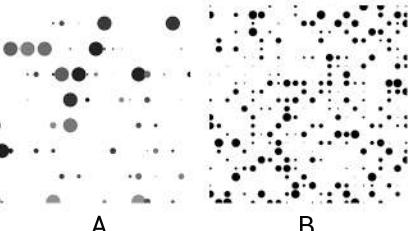
Seahorse

Rectangle Amount = $150 + 4 \cdot (h + t) - 640$
Ellipse Amount = $-1/2 \cdot (h + t) + 50$



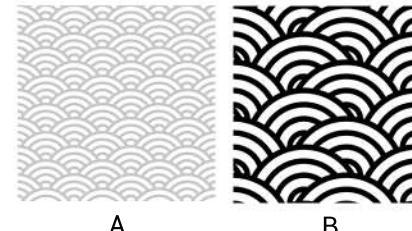
Spotted Dog

Circle Dimension = $(10 + 2 \cdot h - t) \% 48$
Circle Position = $(i + h + t, i + h + t)$
Spacing = $-1 \cdot (h + t) + 260$



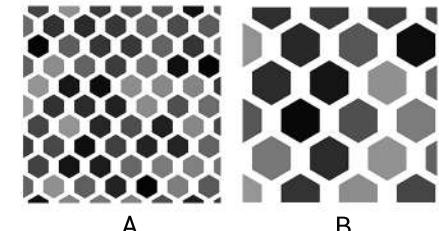
Fish

OffsetSize = $1/2 \cdot (t + h - 120)$
StrokeWeight = $0.5 \cdot h + t - 125$



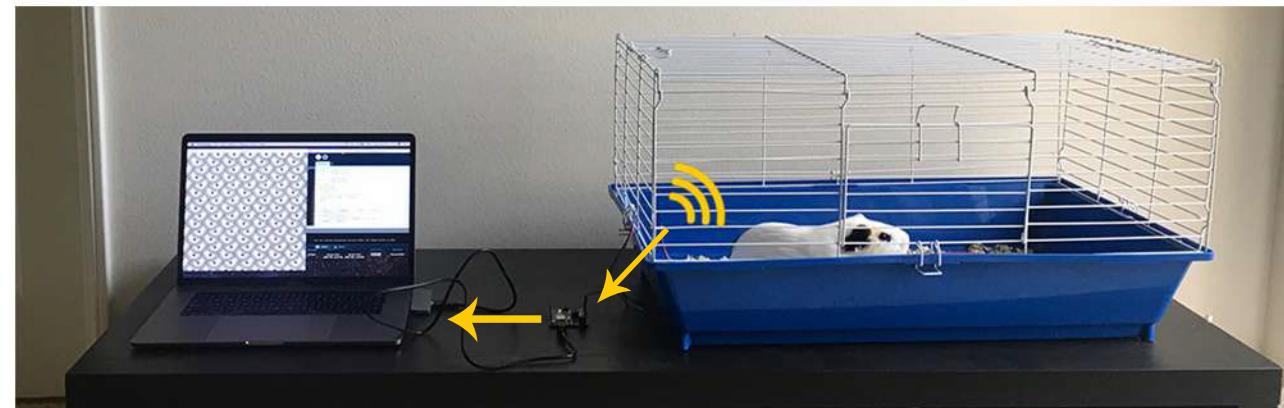
Leopard

Backgrpdun = $-3 \cdot h + t + 275$
Size = $h - t + 60$

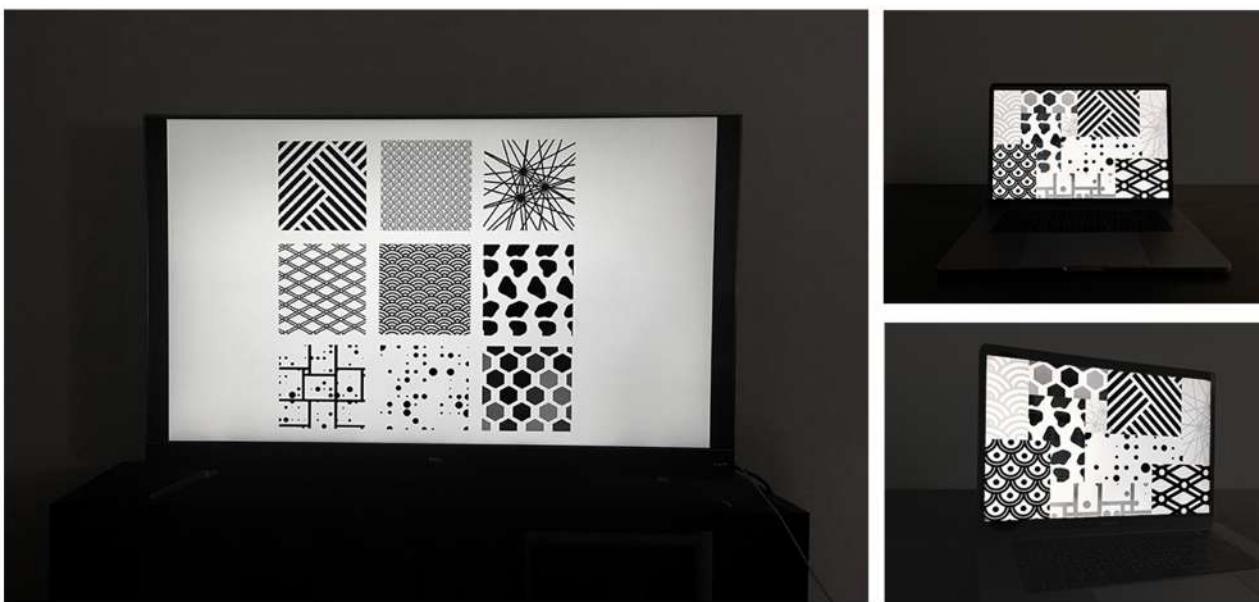


05 Prototype

Data Recieving



Data Visualization



Print Installation



Print Installation vs. Digital Installation

