alison

We’re hear for you

Maxime Arens, Mathilde Cornille, Vincent Erb, Baptiste Schersach, Fayçal Traoré

5 ISS A1

Context

10M French

with hearing issues

More than

1/2

lead to loneliness, isolation

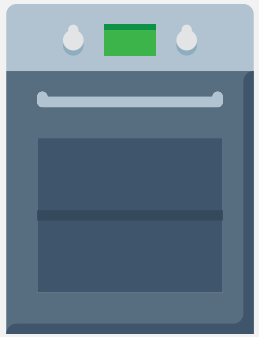
Existing solutions

too expensive

Demo

Recording two sounds in real time

Phone ring: turn on the light in BLUE



Oven timer: turn on the light in RED

The team

Maxime Arens
IR

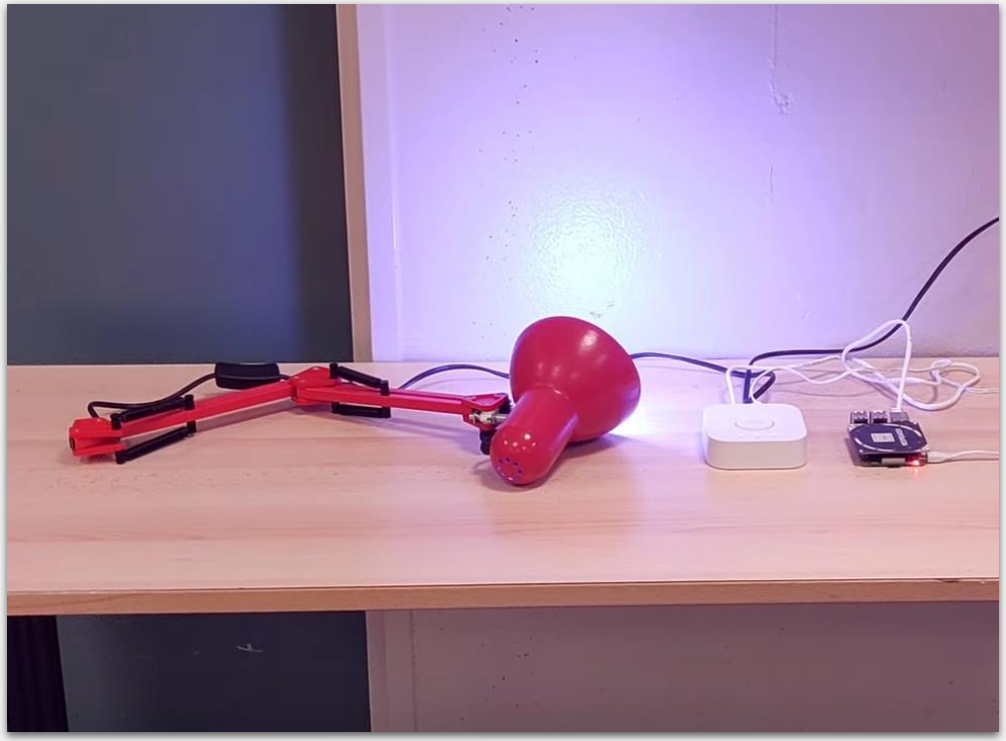
Mathilde Cornille
AE

Vincent Erb
IR

Baptiste Schersach
TBS

Fayçal Traoré
IR + IoT Valley

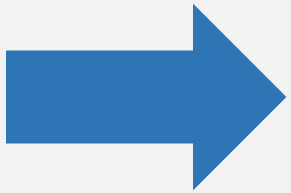
Building from a 4th year project



- Technical proof of concept of sound recognition with no database
- Use of open hardware for prototyping (Raspberry Pi 3B+, Philips Hue)
- Deep research on the NMF method
- There were a lot of False-Positives

Objective for this year

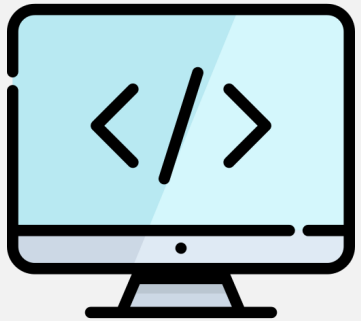
Proof Of Concept



Product

Agile method using Trello for management

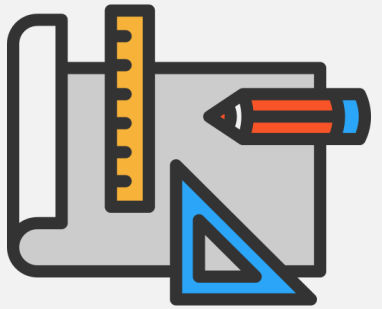
Technical parts



SOFTWARE

COMMUNICATION

HARDWARE



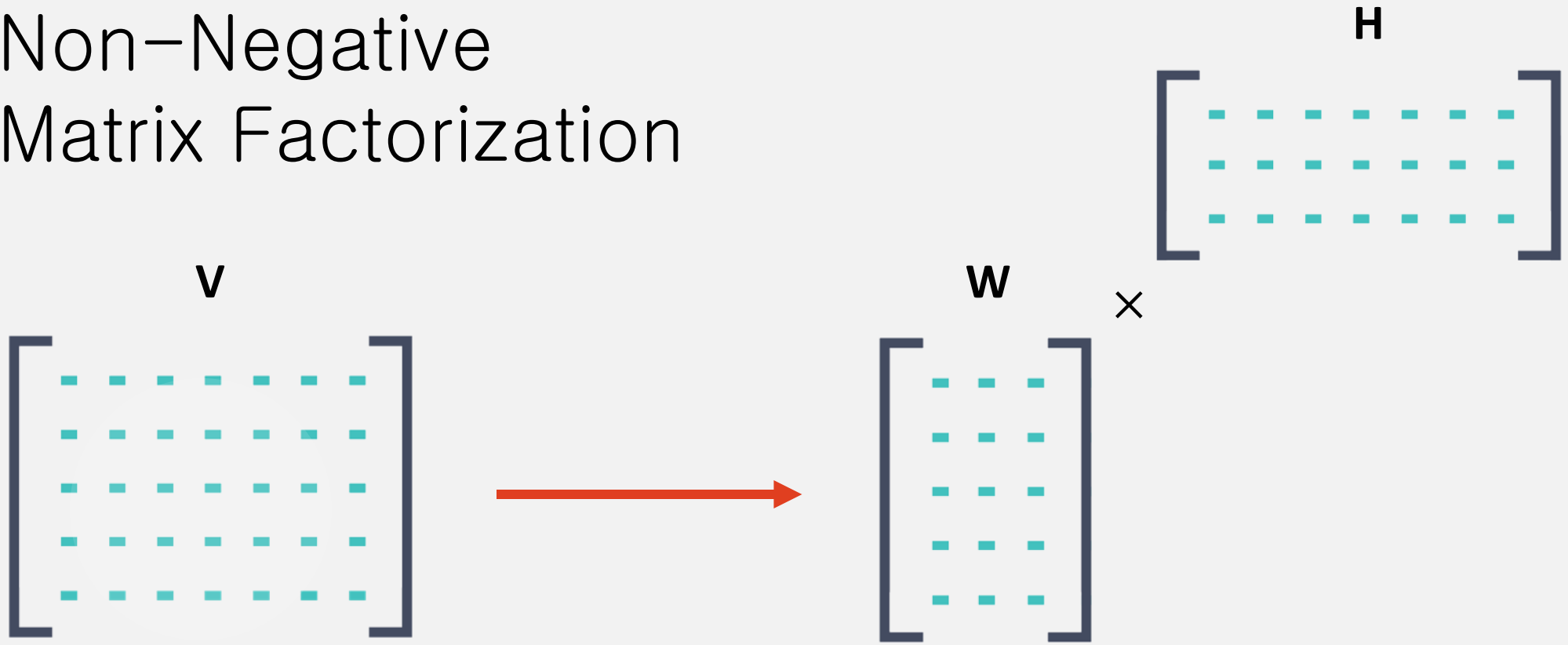
DESIGN

Software

- What is NMF?
- Improvements on the method
- The companion app

What is NMF?

Non-Negative
Matrix Factorization



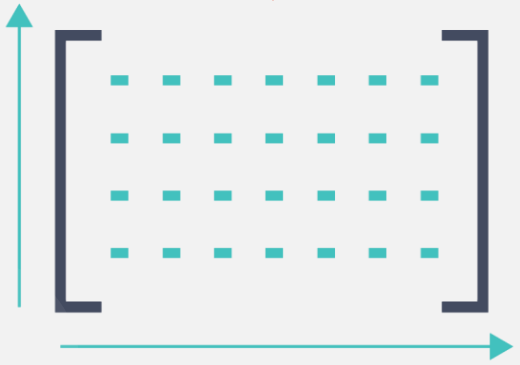
What is NMF?

Incoming sound

STFT

Short Term Fourier Transform

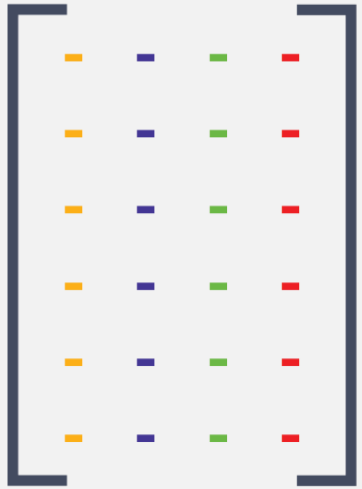
Fourier values



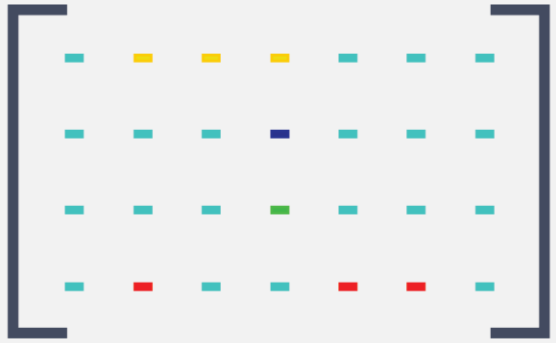
Time

NMF

Dictionary



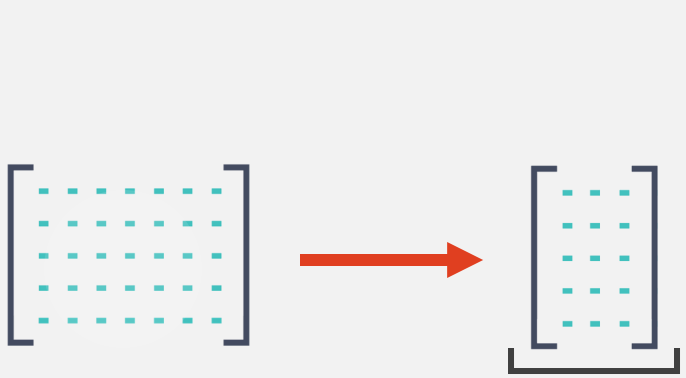
Activation



What is NMF?

Learning mode

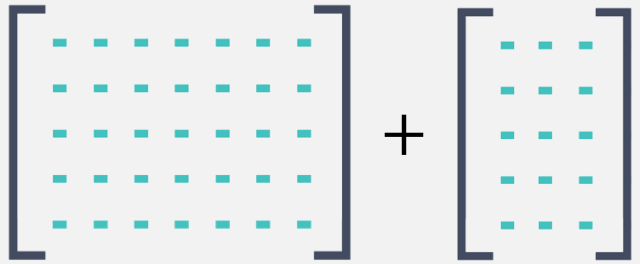
Run NMF on "clean" sound



Save dictionary

Real time mode

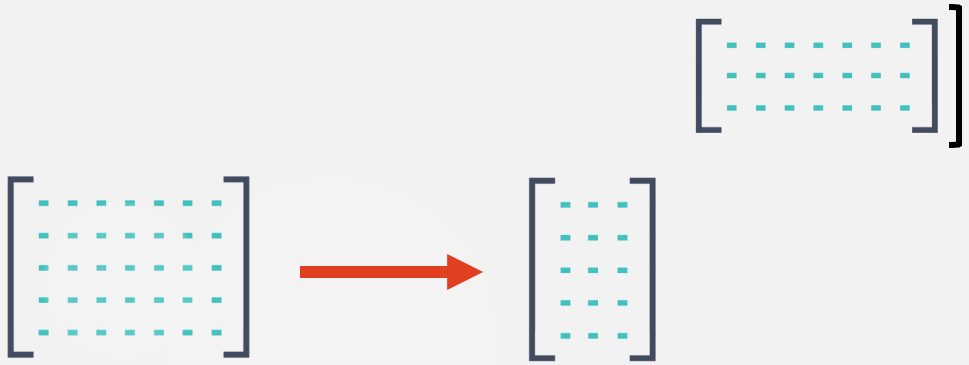
Incoming sound + dictionary



Check activation values

NMF with Pearson correlation

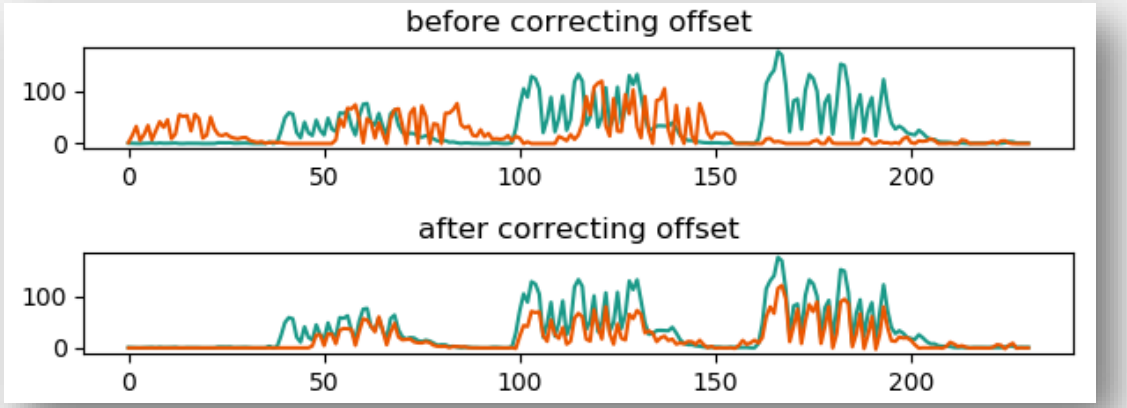
Learning phase



Save activation

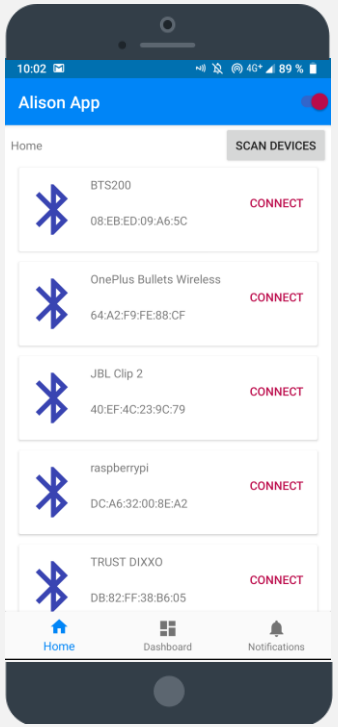
Set reference line (the densest)

Validation phase

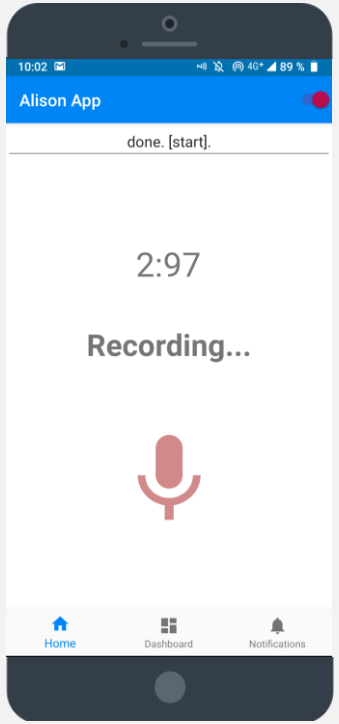


Correlation > 0.70?

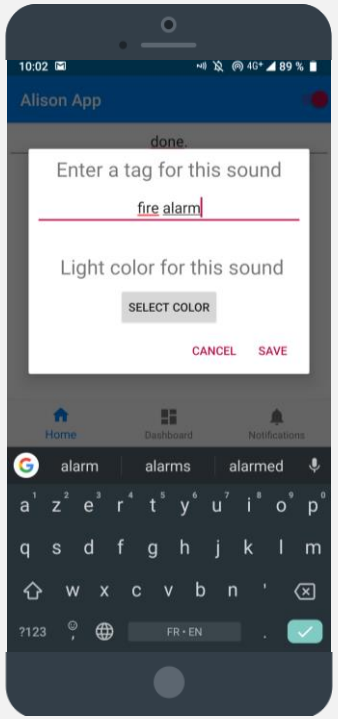
The companion app



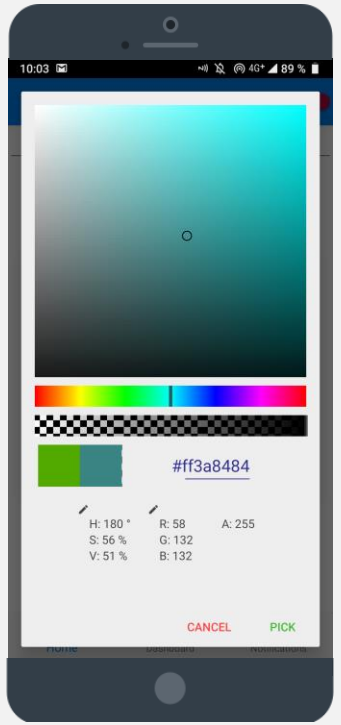
1. Connect to the Raspberry Pi



2. Record a sound



3. Give a name to recorded sound

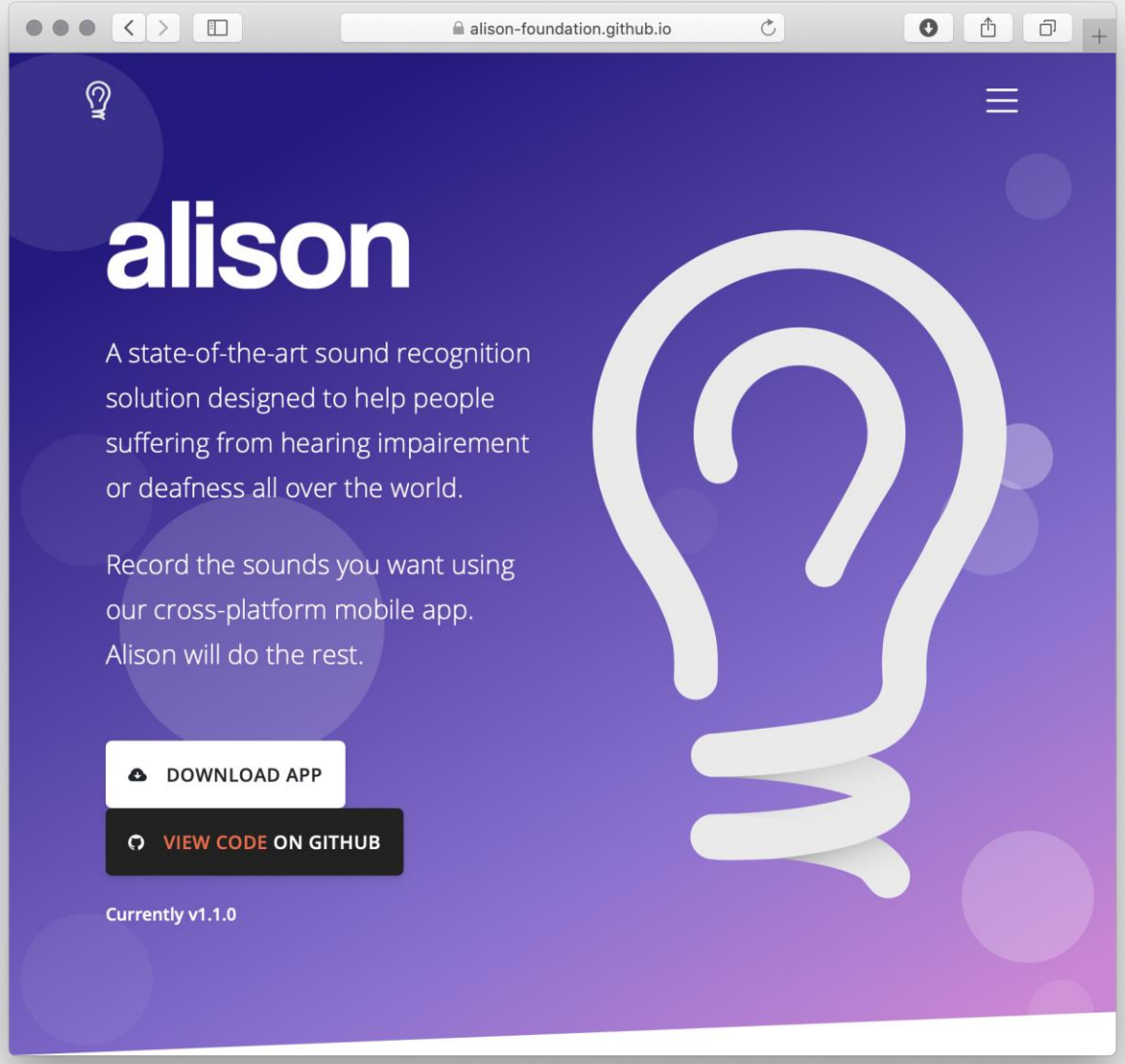


4. Choose a color

Communication

- An open project
- Meetings with seniors

An open project



Code open source, available on GitHub foundation under GPLv3 license

Website with all documentation available

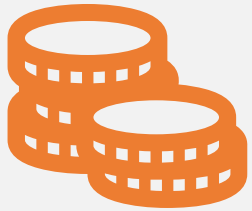
Meetings with seniors

- 2 meetings with RNI (Rencontres Numériques Intergénérationnelles)
- Feedback & constructive criticism

Hardware

- Hardware requirements
- The current version

Hardware requirements



Affordable

Private

Open

The current version

+

Respeaker microphone

20€

Raspberry Pi 4

35€

A solution for 70€

The current version

+

+

Respeaker microphone
20€

Raspberry Pi 4
35€

Philips Hue
(lamps + bridge)
80-100€

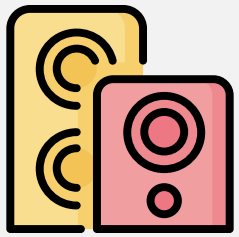
A **full** solution for 155€

Design

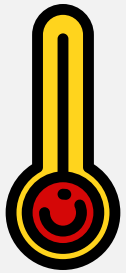
- Constraints
- Designs
- Open Design

Constraints

3 main constraints



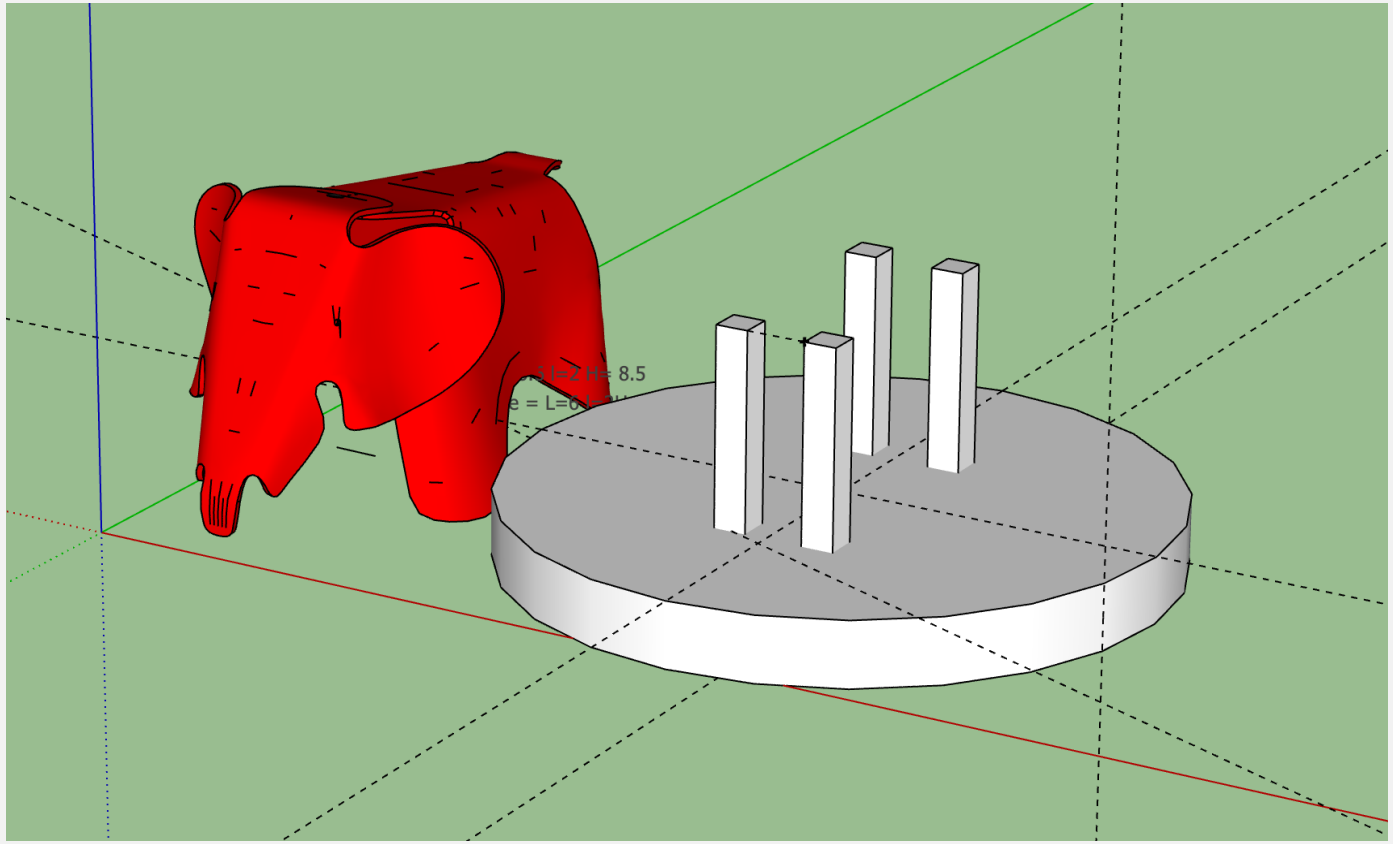
Sound recognition



Heat

Light

Design

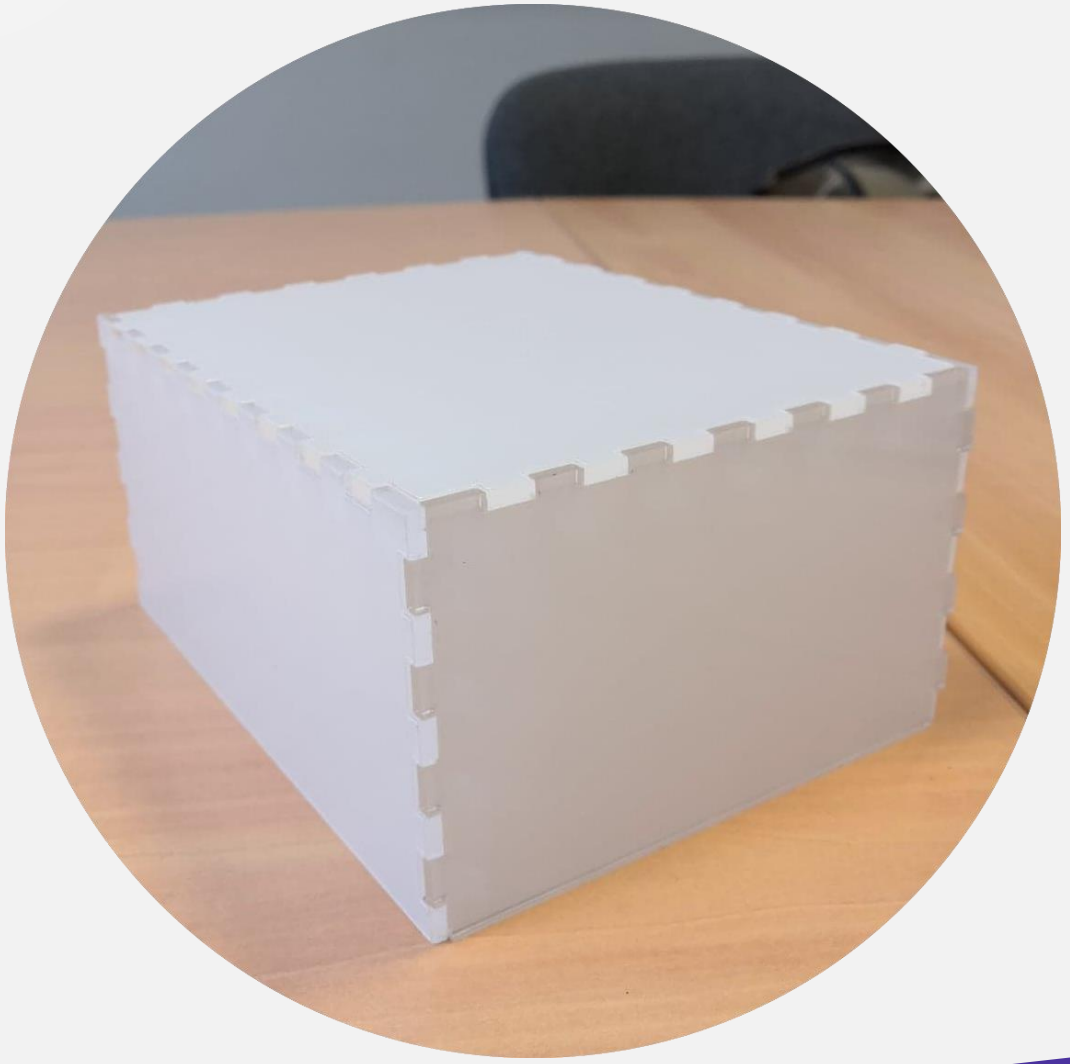


- Works better for LEDs

- Harder to choose the light color

- More expensive and longer to print

Design

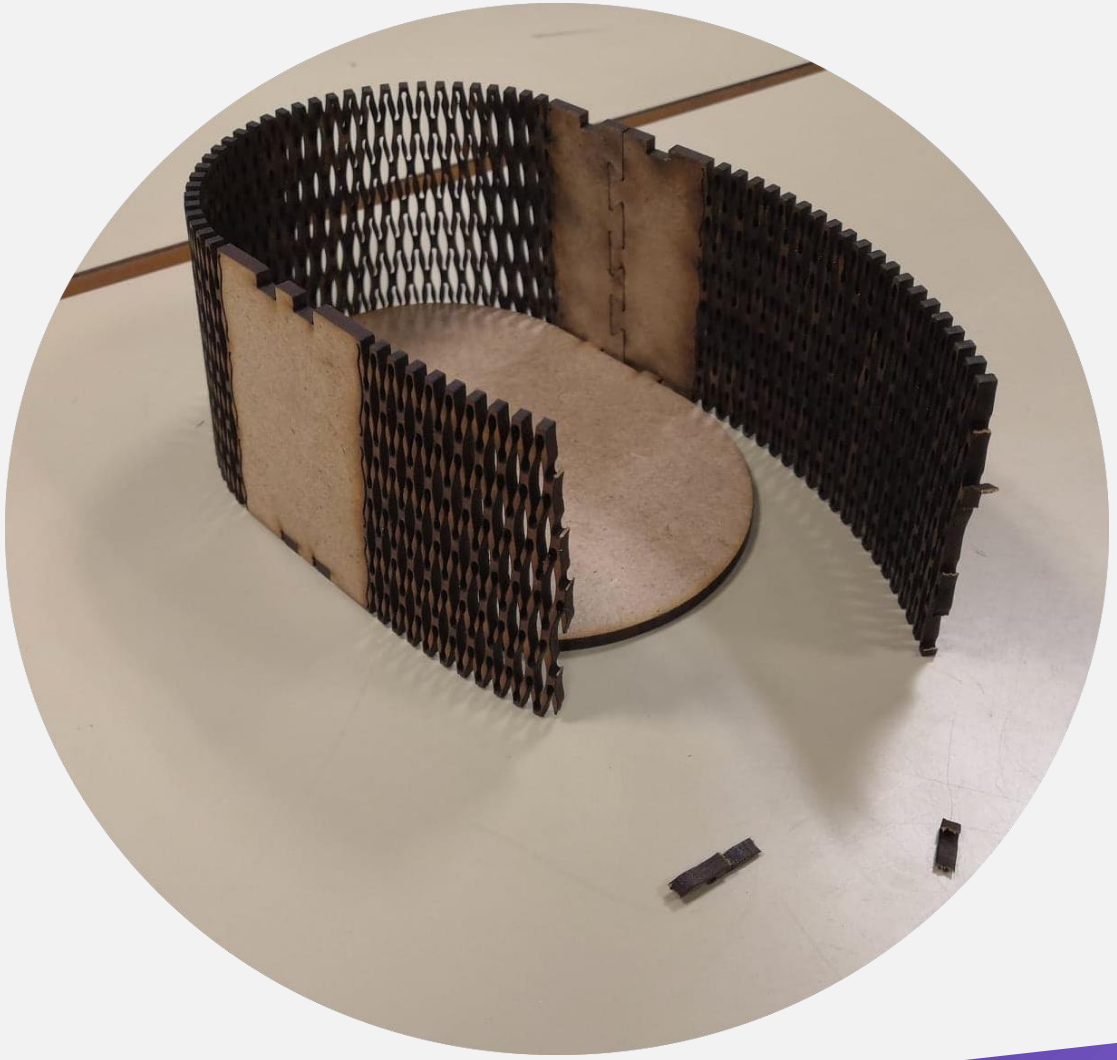


- More solid
- Light is diffused in the whole box
- Less expensive

- Too simple
- Closed box
- Needs materials to attach each part

Design

Design



Design

The costs*:

- 5€ for the cut
- 10€ for the materials

**Using INSA Fablab's price*

Design

We fulfilled our 3 constraints

Sound recognition

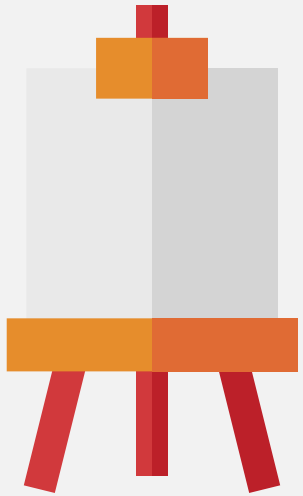
Heat

Light

Open Design

This design is open source

You can create your own



You just need access to a fablab

Ethical concerns

RESPECT USER PRIVACY

DO NOT TAKE ADVANTAGE OF SENIORS

Current state

- Fully packaged product
- Robust NMF sound recognition
- Only one recording of a sound needed
- Real time client experience
- New website with documentation

Future improvements

Portable solution
(necklace, connected watch etc.)

Multiple wireless microphones

Integration of other type of light bulbs

Possible partnership with Toulouse City hall

Thank you

Visit our website !