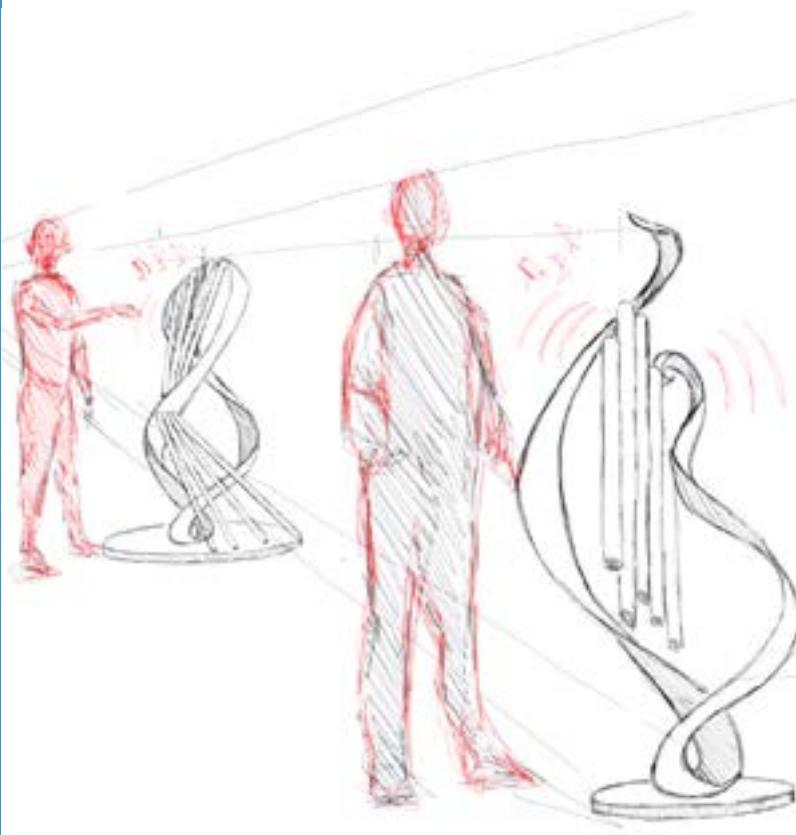




# DESIGN DOCUMENT

TEAM 6  
COLOR FUSION



# DESIGN

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## CONCEPT

For our concept we wanted to use the festival “muziek in de straten” in Enschede as a starting point. For this festival we want to create an interactive musical experience, so that visitors of Enschede can have their own musical experience instead of just listening and watching other people singing and making music.

So, for this coming (future) festival we want to make an interactive installation, where visitors can create their own music. The installation will have around 3 art objects, where every object has his own sound and together they make the song complete. To complete and create a song you play together.

The value we add by creating this installation to “muziek in de straten” is Art & Technology combined in a musical interactive installation, to give the visitors their own musical experience.

## WHY?

Enschede is known as a musical city. Institutions like Orkest van het Oosten, Metropool Enschede, Wilmink theater and muziekcentrum Enschede are good examples of this fact.

We as a group love music, and for this project we wanted to use this as a theme for this installation. That is why we've chosen to combine “Muziek in de straten”, with the musical experience we wanted to create.

“Muziek in de straten” only had choirs, singer song writers, (normal) artist and bands. So there is a gap where the visitors can not make their own music. We want to solve this problem and give the people their own musical experience with this installation.

## LOOK & FEEL

For the look and feel we want to use the theme of the “muziek in de straten” as a guideline which is colour.

We want to make the objects of the installation modern, futuristic and colourful with a touch of Gaudi style because we see that back in the poster about the festival.

# MOSCOW METHOD

## MUST HAVE

- Music output
- Sensors
- Promotion for Enschede
- Database

## SHOULD HAVE

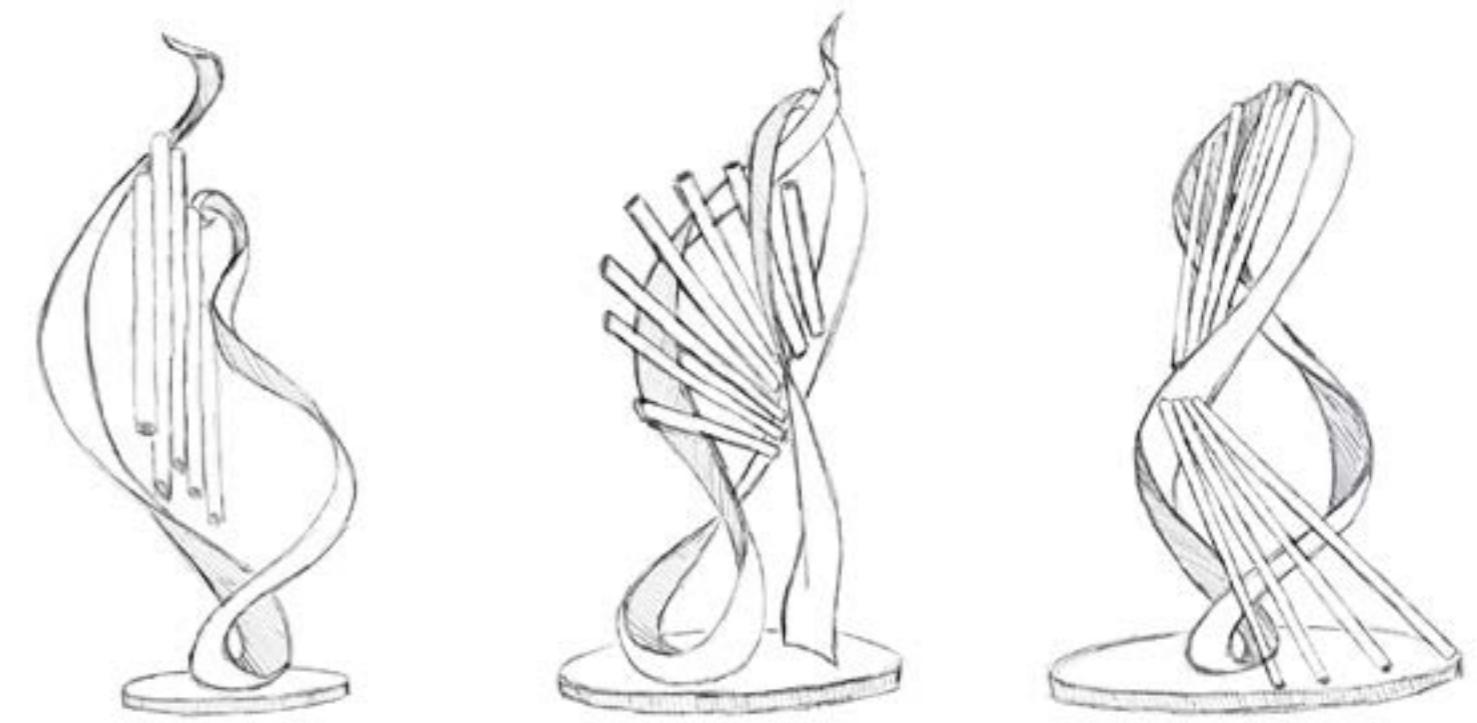
- Artistic design
- Meaningful connection to Enschede
- Sensors that work with the environment
- Sensors that change the music output
- Sponsors
- Sample based music

## COULD HAVE

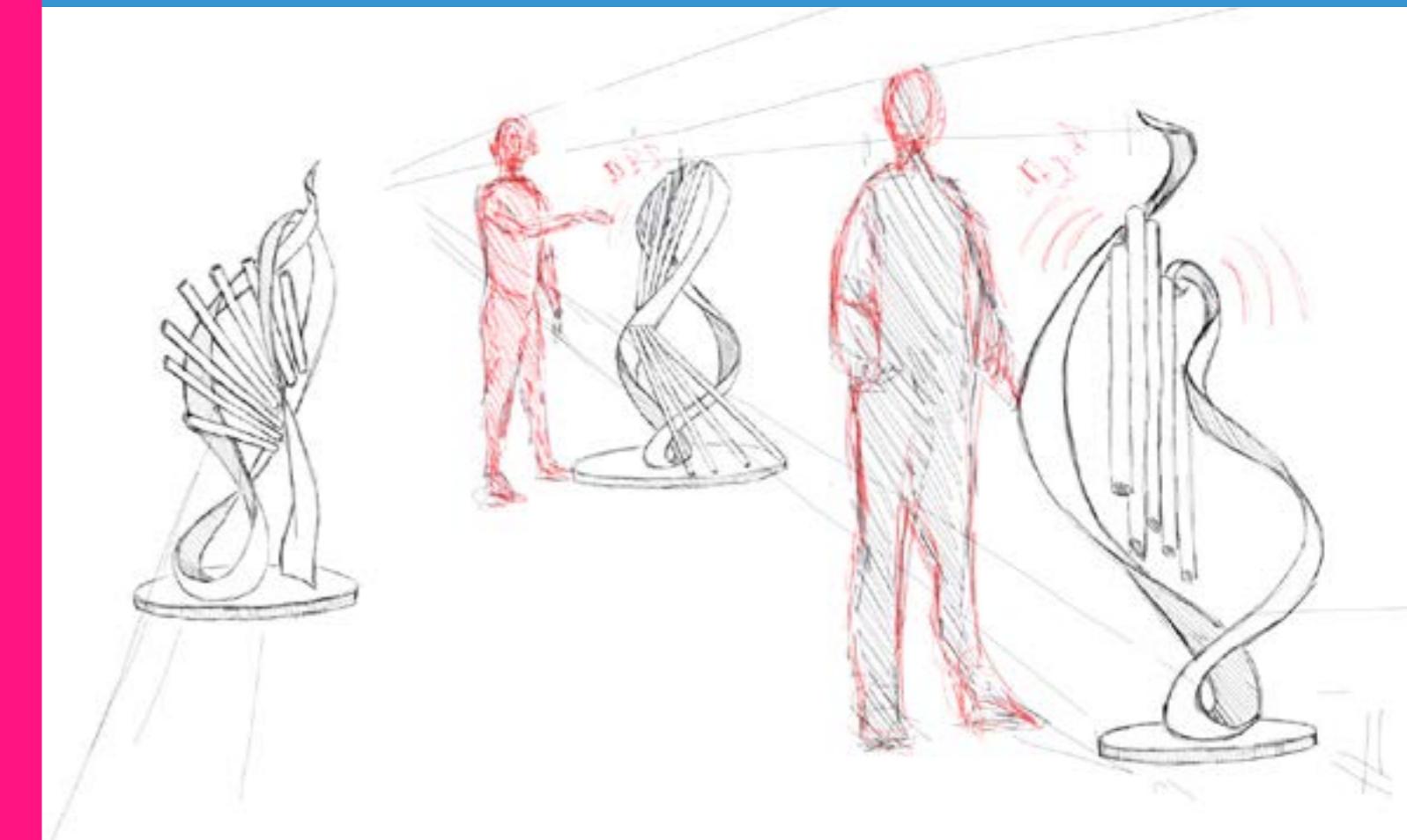
- Conductive paint
- Note based music
- Sonar detection

## WON'T HAVE

- Moveable objects
- Sensing if objects are together



# CONCEPT SKETCHES



# LIST OF REQUIREMENTS – TECHNICAL

## 1 Performance

- the product needs to be able to sense people from a certain distance and output audio at a volume based on the users' distance. Furthermore, if parts that have been linked with the capacitive sensor have been touched, the music and light output will change.
- The objects will be fixed in place, so we do not have to account for speed or movement. It will be powered by at least 2 Arduino's and must be able to detect people at a 4m range. The musical samples need at least 4 variations.

## 2 Environment

- The product needs to be able to withstand being enclosed in a space closed by acrylic plastic. Furthermore, it should be able to withstand operation in sun and overcast weather. It can be possible that it works in rain. Lastly, it should be transportable by foot or car.
- The product should not create an excessive amount of noise pollution.

## 3 Life and service

The product will be used for a month during prototyping and testing purposes, including heavy testing. The product will be exhibited for several days with a hopefully large audience and intensity.

## 4 Maintenance

There are not any parts that need to be maintained if something is not broken, except possible reapplications of conductive paint. All of the electronics needs to be accessible to some degree.

## 5 Target product cost

For our installation we need some materials to realize it. The costs can be divided into three categories. The categories are technology, building (design) and promotion. The prices vary considerably on the Internet. That is why I have chosen an average amount for the costs, since we have not yet bought anything.

## Technology

We need some sensors for our installation. We have 3 objects who need all the same technology.

- 2 ultrasonic sensors per installation

Price per piece: € 4,00

Price for two: € 8,00

- Capacitive sensor per installation

Price per piece: € 4,00

- Conductive paint (once)

Price for 50 ml: € 20,00

Total price per object: € 16,00

Total price conductive paint: € 20,00

**Total price for technical part:** € 68,00

## 6 Transport

The product needs to be easily built, in order to transport the product hassle free. Furthermore, the product needs to be assembled on site of exhibition.

## 12 Materials

Glass is not used because of fragility and potential injuries.

## 13 Product life span

The production of the product should not last longer than 2 weeks. Sold for several months.

## 15 Ergonomics

The user must understand that the product works on detecting your range and touching conductive parts of the product.

## **16 Reliability**

It is acceptable that the range detection does not work well on 10 cm >, as the sensor has problems on this range. Furthermore, the capacitive sensor should work, with 1 possible failure every intended interaction. Complete failure of range detection and capacitive touch in any parts must be avoided.

## **18 Testing**

The product must be checked for range detection in crowds in various weather conditions. Furthermore, various types of conductive ink must be tested. Lastly, the building material (acrylic plastic) must be tested with all sensors in mind.

## **19 Safety**

The product should not create excessive noise, use non-toxic conductive paint and acrylic plastic.

## **20 Product policy**

We require funding for sensors.

## **21 Societal and political implications**

It might produce too much noise and has not enough connection to Enschede.

## **22 Product liability**

Noise pollution

## **23 Installation and initiation of use**

- Ease of accessing the electronics, but they still must be hidden.
- Semi weatherproof design
- Constant power supply
- The sensors and electronics need to be handled carefully, while the plastic objects can take a beating.
- The user needs to be informed about the range and touch interaction in some way.



# LIST OF REQUIREMENTS – DESIGN

## 5 Target product cost

We need some materials for our installation. We have to build 3 object with the same materials. We don't know yet what kind of material we want to use. So we can't say what it will cost. for now we assume € 20 per object.

Total price per object: € 20,00

Total price for installation: € 60,00

## Promotion

To promote our installation, we want to launch a social media campaign on Facebook on Instagram. There are therefore no further costs involved. We also want to put up some posters and hand out flyers to promote the week of the exhibition.

10x A2 poster: € 8,95

50x A5 flyer: € 15,95

Total price for promotion: € 24,90

## Total cost

We need quite a bit for our installation. That is why we want to look for sponsors who can support us in terms of costs. The total cost for now are: € 152,90 (included technical part).

## 6 Transport

We only need something to bring the installation from school to our place for Bakker Bart. The plan for now (depends on how large the objects become) is a shopping cart. We can pick up this cart at the Jumbo and bring it back later.

## 7 Packaging

We do not need any further packaging. Only the shopping cart.

## 8 Quantity

We're going to make three objects. These three objects will look alike but they are all

different. So it really becomes a series of objects. So it doesn't have batches or continuous productions.

## 9 Production facilities

it will be an art and music project. This means that it is made once. As a result, we have nothing to do with production facilities of new production solutions

## 10 Size and weight

All three objects will be approximately 1.20 meters. We have chosen this length so that children and small people can also discover the installation. The weight is not yet known, because we do not yet know which materials we will use for the installation.

## 12 Materials

We don't know yet what kind of materials we are gonna use.

## 17 Storage

During the project, we can leave our parts at school. We all get a place where we can store things. We will take important things home with us. In the week of the exhibition can can store our installation in Bakker Bart.

## 19 Safety

For safety reasons, the installation may not be more than 1 meter on the street. This is so that an emergency can go through the street in an emergency. We can only go a little further into the street if we can quickly remove it again.

## 24 Reuse & recycling

The objects eventually become one "mass". As a result, it will not be easy to dismantle for recycling. We hope that our installation will be so beautiful that Saxion will put it somewhere in school, so we don't have to break it down.

# COSTUMER JOURNEY

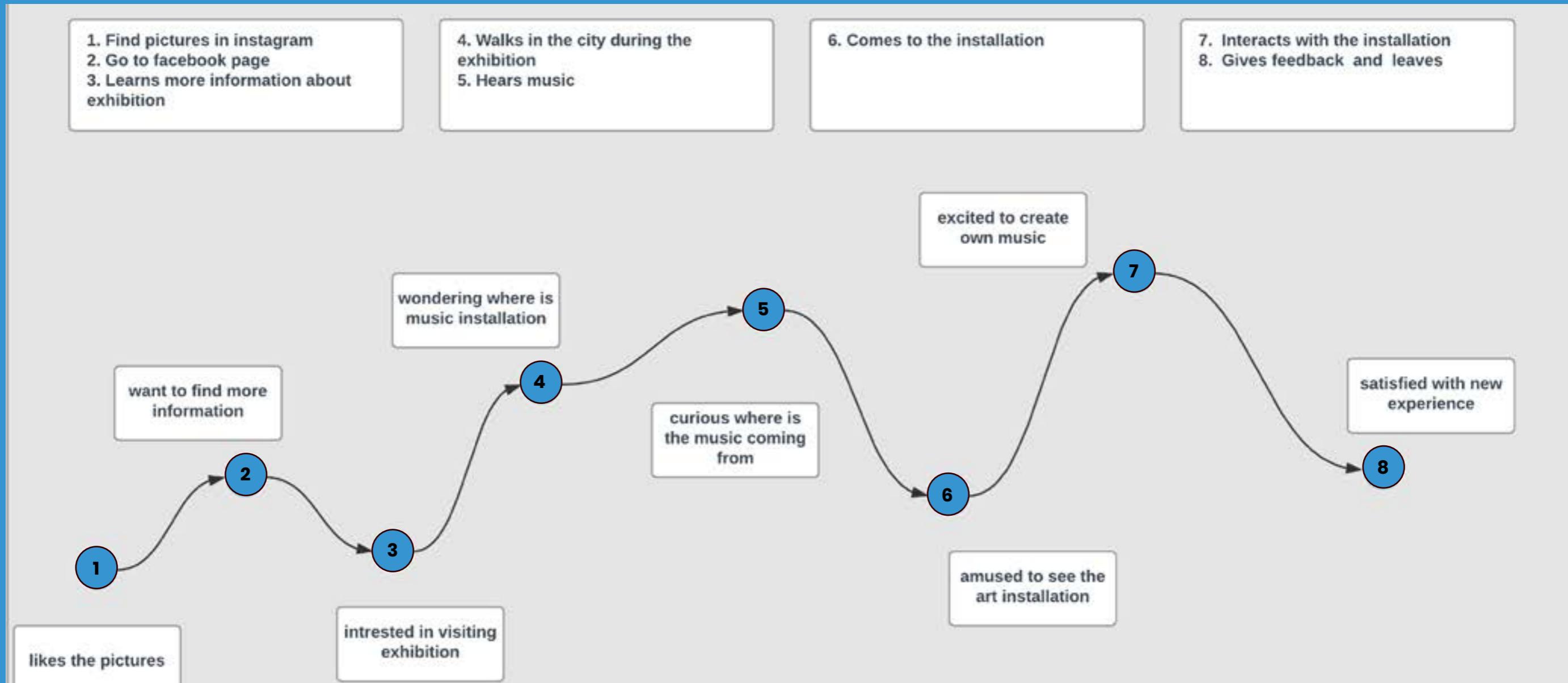
## INTERACTION WITH INSTALLATION – JONG ADULTS

### PHASE 1

### PHASE 2

### PHASE 3

### PHASE 4



Create eye catching visuals for social media.

Make unusual shapes and colors for installation to catch more attention.

Create intuitive installation, to be able to attract more people to participate.

Give people possibility to leave feedback for future improvements.

# MORPHOLOGICAL CHART

Person-Registration	PIR sensor	Close range IR sensor	Ultrasonic sensor	Laser Sensor	Image recognition
Touch sensing	Touch Sensor	Capacitive Sensor	Light Sensor	Buttons	webcam
Changing Music	Potentiometer	Buttons	IR distance sensor	Touch panel	strings

# TEST/EXPERIMENT

## Person registration

- PIR [1]: this sensor can only detect movement and cannot give us a value of how far or close the user is
- IR sensor [2]: Tested and prototyped in the Sprint 1 Demo. Conclusion is that it works fine on 5cm to 80cm range, but further than that the readings are unreliable. Since we are detecting users potentially as far as 4m we decided only to use for initial prototyping of code.
- Ultrasonic Sensor [3]: This is currently our sensor of choice. It provides accurate readings in the 5cm to 400cm range which is acceptable for our usage. Currently it is being prototyped and will be soon tested with a crowd.
- Laser Sensor [4]: not financially viable
- Image recognition: too much work

## Touch Sensing

- Touch sensor [5]: possible but might distract from the immersion of the art installation. Was ordered recently for testing.
- Capacitive sensor [6]: currently in testing and seems to be the way we will proceed due to the use of conductive paint to increase the experience.
- Light Sensor [7]: Too inaccurate readings
- Buttons [8]: takes away from the artistic experience and immersion, too intuitive
- Webcam: too hard and costly

## Changing Music

- Potentiometer [9]: possible
- Buttons [8]: too widespread/ intuitive
- IR distance sensor [2]: possible application as proven in prototype sprint 1
- Touch panel [10]: possible high costs
- Strings: not explored yet

## Source

[1] (2019). Retrieved from <https://cdn-learn.adafruit.com/downloads/pdf/pir-passive-infrared-proximity-motion-sensor.pdf>

[2] (2019). Retrieved from <https://www.sparkfun.com/datasheets/Components/GP2Y0A21YK.pdf>

[3] (2019). Retrieved from <https://www.parallax.com/sites/default/files/downloads/28015-PING-Sensor-Product-Guide-v2.0.pdf>

[4] Detail Feedback Questions about ToF TOF10120 10 180cm Laser Range Sensor Module Distance Sensor RS232 Interface For Arduino I2C 3 5V on Aliexpress.com | alibaba group. (2019). Retrieved from <https://www.aliexpress.com/i/32955537121.html>

[5] (2019). Retrieved from [https://www.uploadarchief.net/files/download/ttp223\\_modul.pdf](https://www.uploadarchief.net/files/download/ttp223_modul.pdf)

[6] (2019). Retrieved from <http://micropython.org/resources/datasheets/MPR121.pdf>

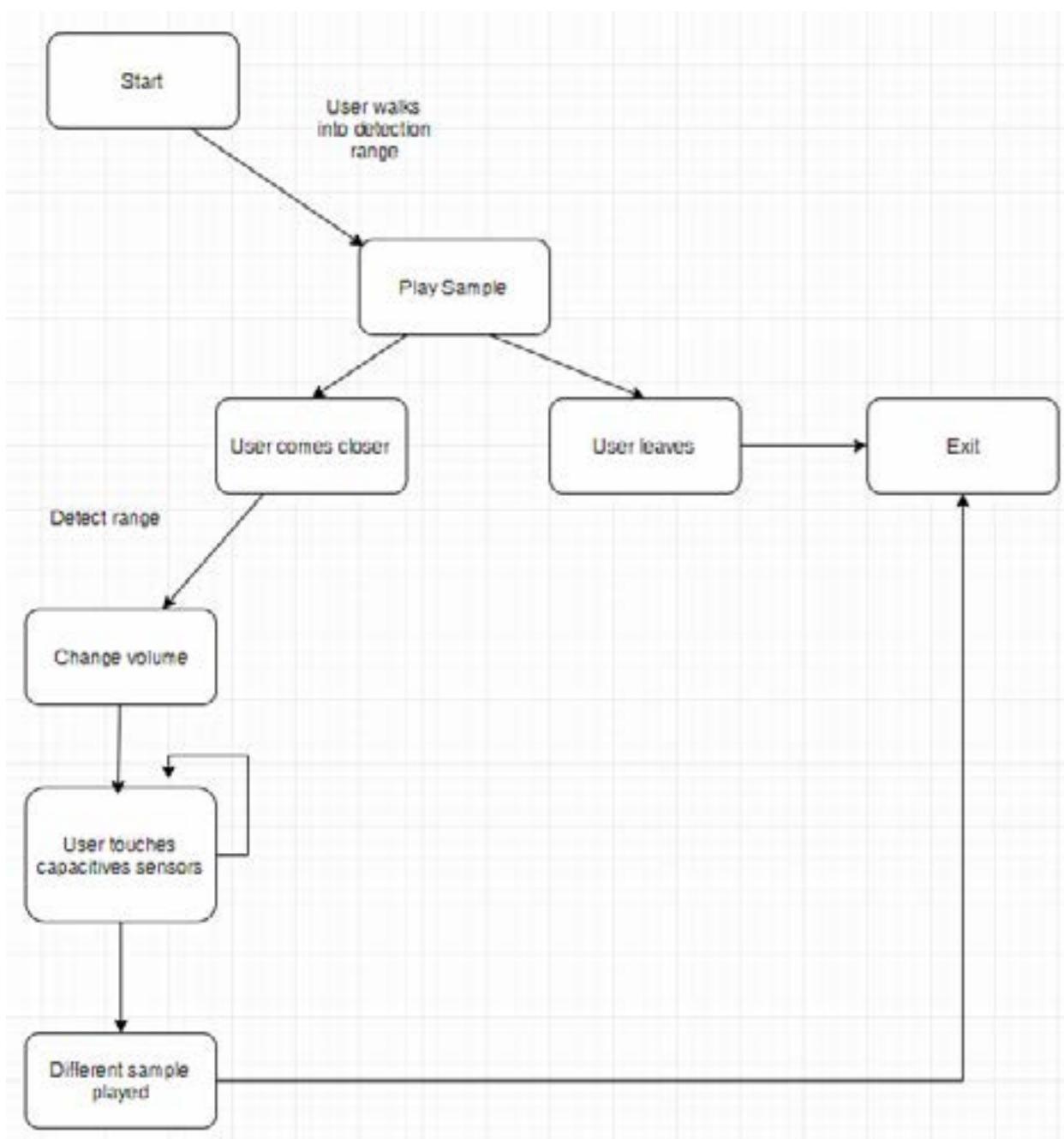
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[8] (2019). Retrieved from <https://www.arduino.cc/documents/datasheets/Button.pdf>

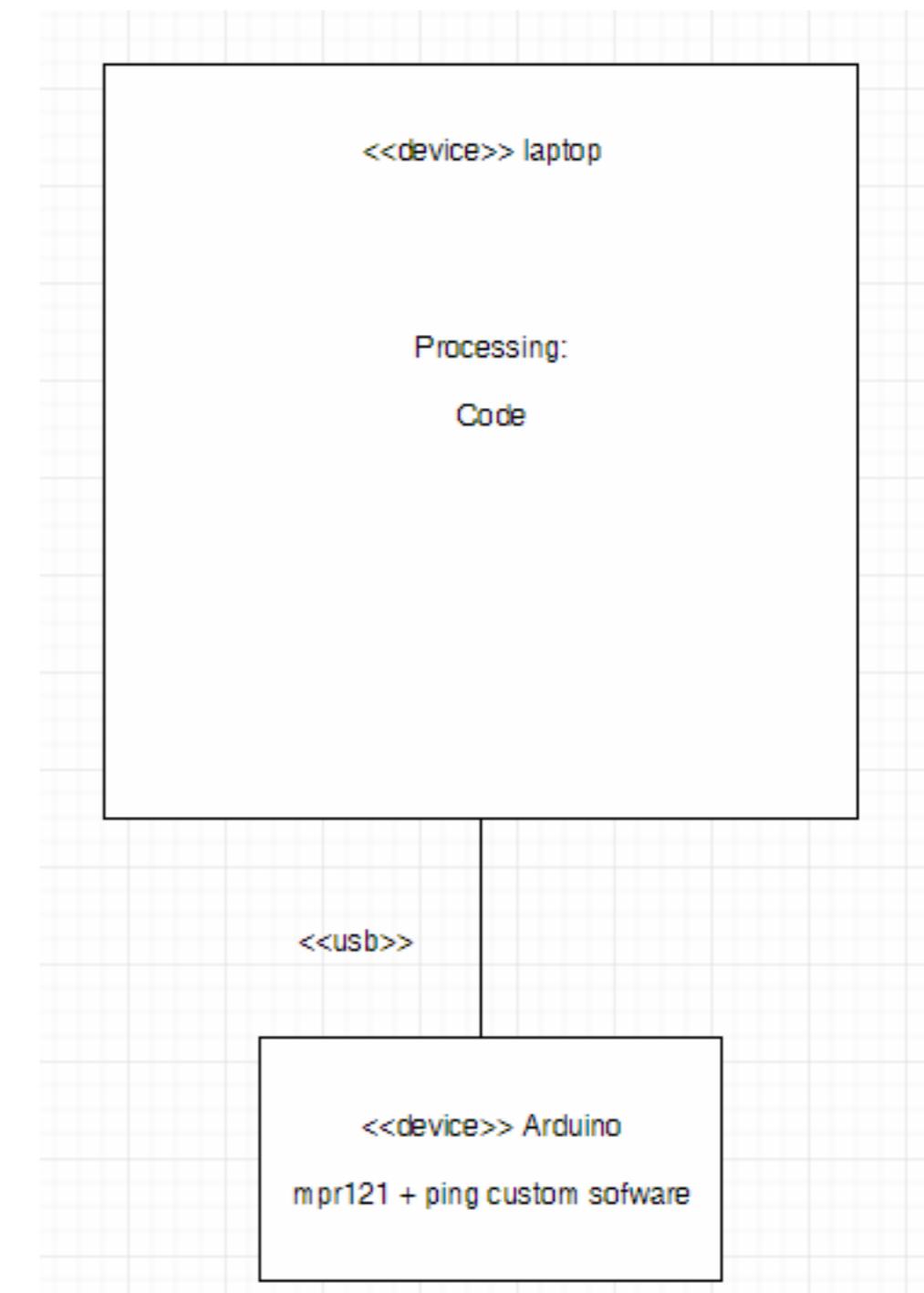
[9] (2019). Retrieved from [https://www.arduino.cc/documents/datasheets/ACP\\_potentiometers.pdf](https://www.arduino.cc/documents/datasheets/ACP_potentiometers.pdf)

[10] (2019). Retrieved from [http://www.produktinfo.conrad.com/datenblaetter/1500000-1599999/001525436-an-01-en-AUSFUEHRLICHE\\_ANL\\_320X240\\_COLOUR\\_TFT\\_LCD.pdf](http://www.produktinfo.conrad.com/datenblaetter/1500000-1599999/001525436-an-01-en-AUSFUEHRLICHE_ANL_320X240_COLOUR_TFT_LCD.pdf)

# STATE TRANSITION DIAGRAM

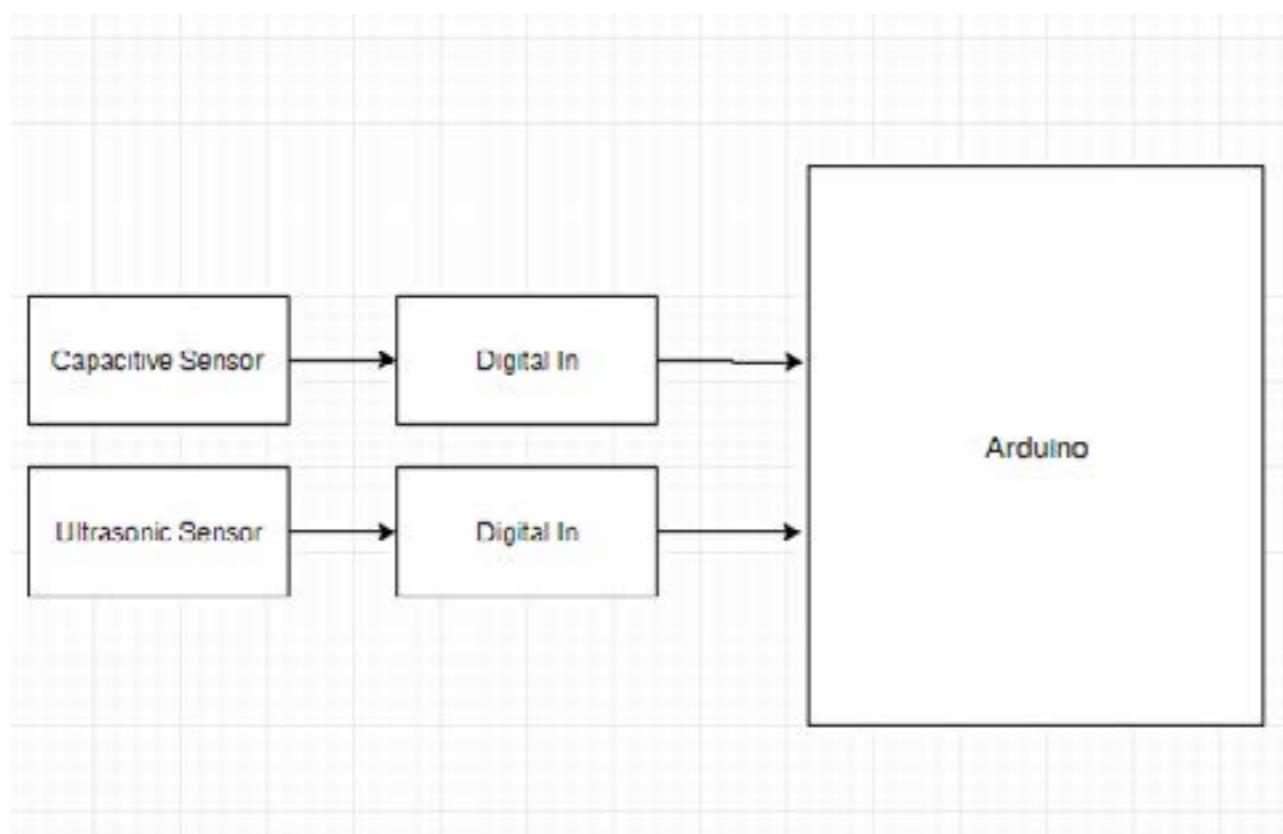


# DEPLOYMENT DIAGRAM

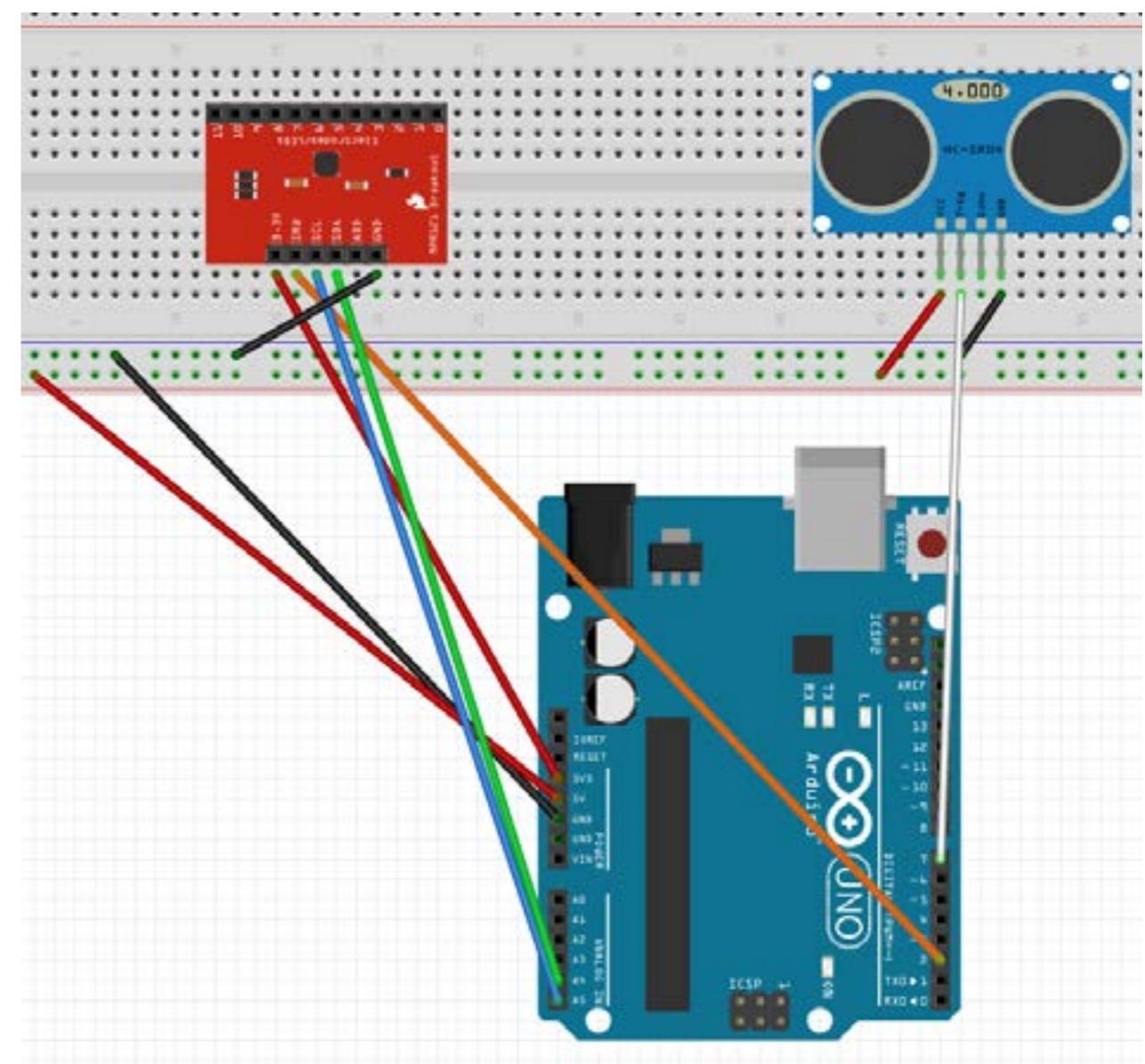


# HARDWARE

## DIAGRAM

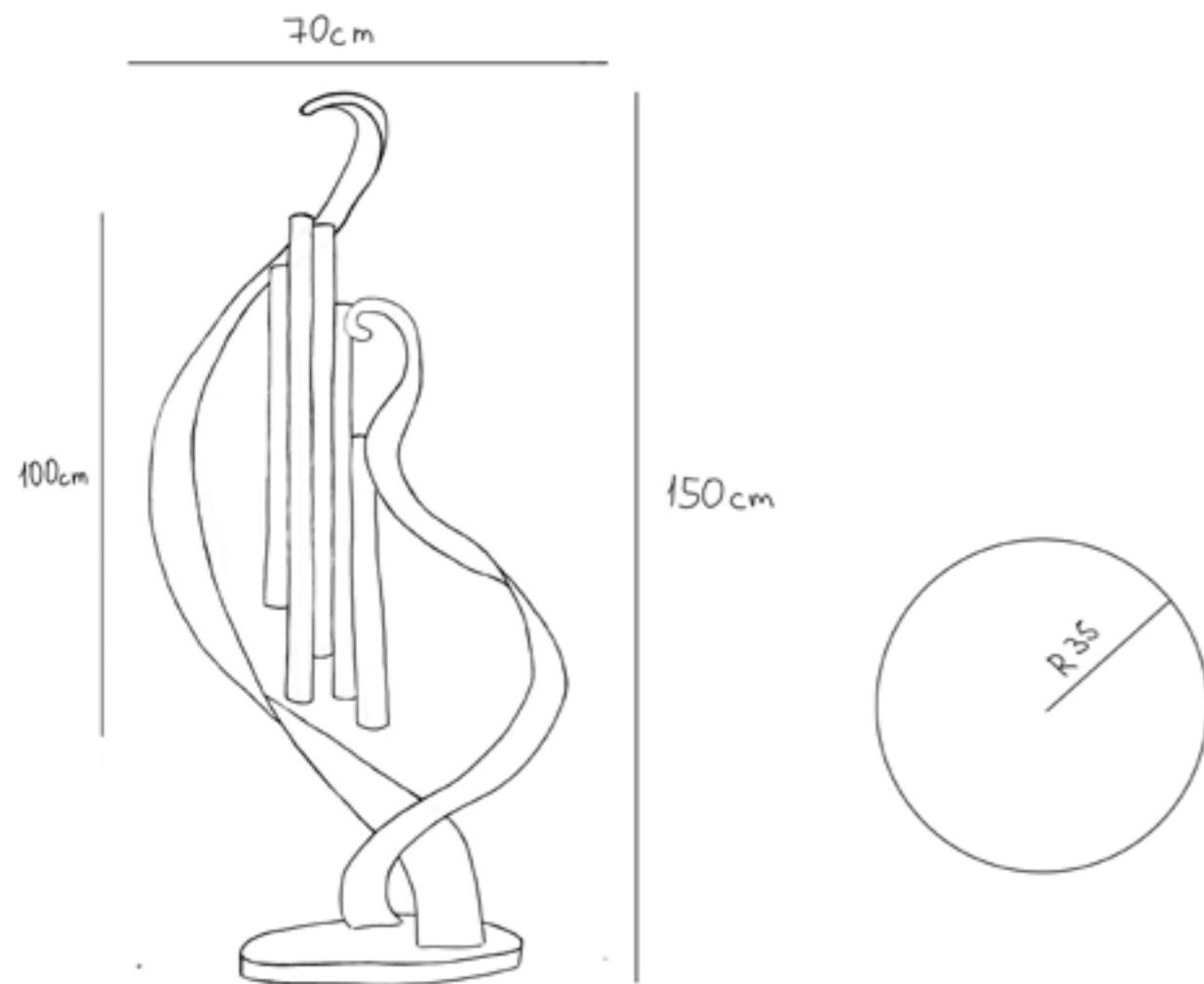


# CONNECTION DIAGRAM



# CONSTRUCTION

## DRAWINGS



# SOURCES

Sources used for List of Requirements – Target product cost

[https://www.google.com/search?q=ultrasonic+sensor+arduino&source=lnms&tbm=shop&sa=X&ved=0ahUKEwjnnlb\\_\\_rPiAhUPKIAKhdnjChwQ\\_AUIDygC&biw=1422&bih=728](https://www.google.com/search?q=ultrasonic+sensor+arduino&source=lnms&tbm=shop&sa=X&ved=0ahUKEwjnnlb__rPiAhUPKIAKhdnjChwQ_AUIDygC&biw=1422&bih=728)

[https://www.google.com/search?biw=1422&bih=728&tbm=shop&ei=-cvnXPzMA9HW-wAK006SoAg&q=Capacitive+sensors&oq=Capacitive+sensors&gs\\_l=psy-ab.3..0i19k1.239857.239857.0.240390.1.1.0.0.0.82.82.1.1.0....0...1c.2.64.psy-ab..0.1.82....0.zTuNPFiCF-SE#spd=6158108460312300827](https://www.google.com/search?biw=1422&bih=728&tbm=shop&ei=-cvnXPzMA9HW-wAK006SoAg&q=Capacitive+sensors&oq=Capacitive+sensors&gs_l=psy-ab.3..0i19k1.239857.239857.0.240390.1.1.0.0.0.82.82.1.1.0....0...1c.2.64.psy-ab..0.1.82....0.zTuNPFiCF-SE#spd=6158108460312300827)

[https://www.google.com/search?q=conductive+paint&tbm=shop&source=lnms&sa=X&ved=0ahUKEwi\\_u9\\_1gLtiAhVJGpoKHcHkBjAQ\\_AUICigB&biw=1422&bih=728&dpr=1.8](https://www.google.com/search?q=conductive+paint&tbm=shop&source=lnms&sa=X&ved=0ahUKEwi_u9_1gLtiAhVJGpoKHcHkBjAQ_AUICigB&biw=1422&bih=728&dpr=1.8)

<https://www.drukwerkdeal.nl/nl/producten/promotie/posters#tab-upload>

<https://www.drukwerkdeal.nl/nl/producten/promotie/flyers?ref=search>