



Tree of Knowledge

Neue Natur im Park an der Ilm

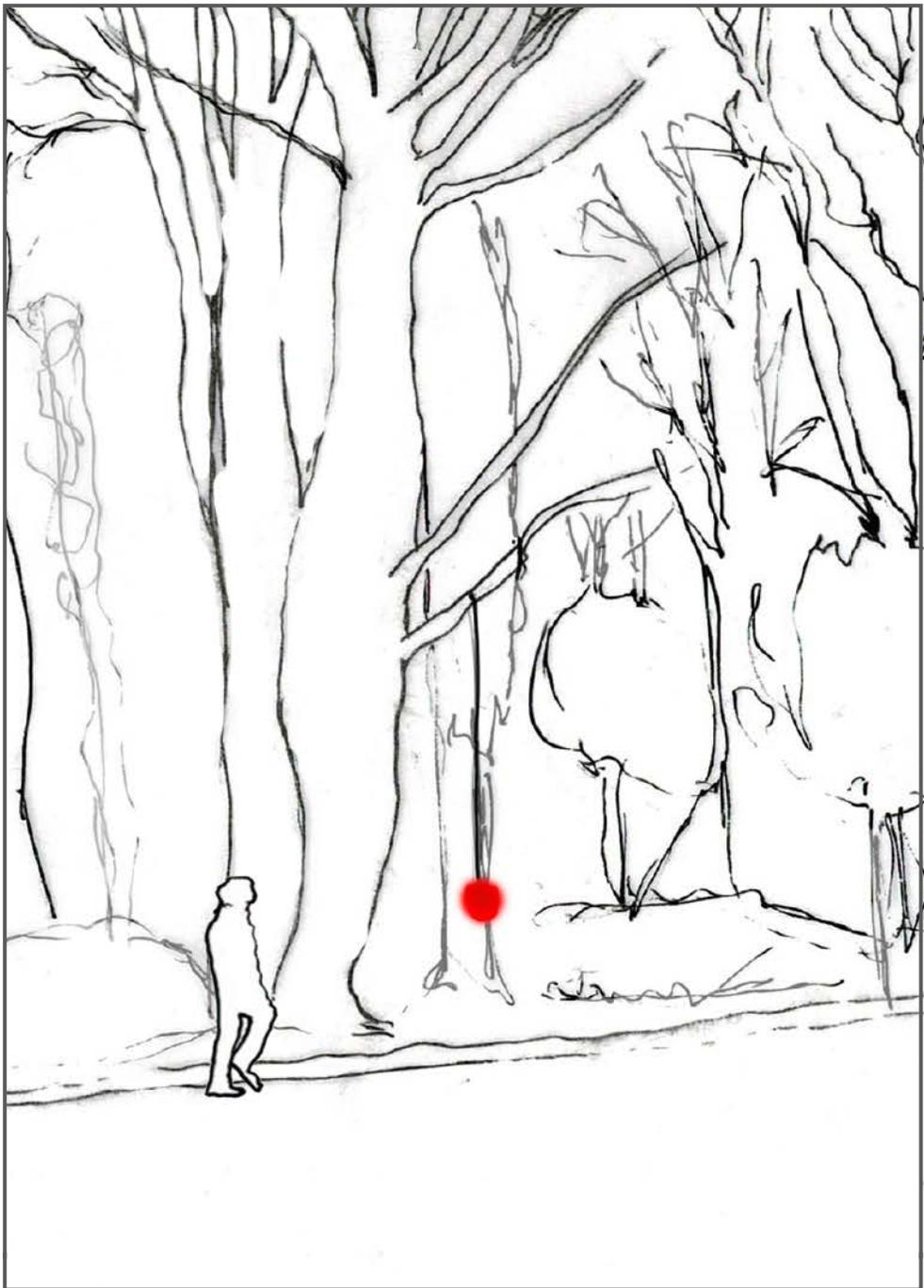
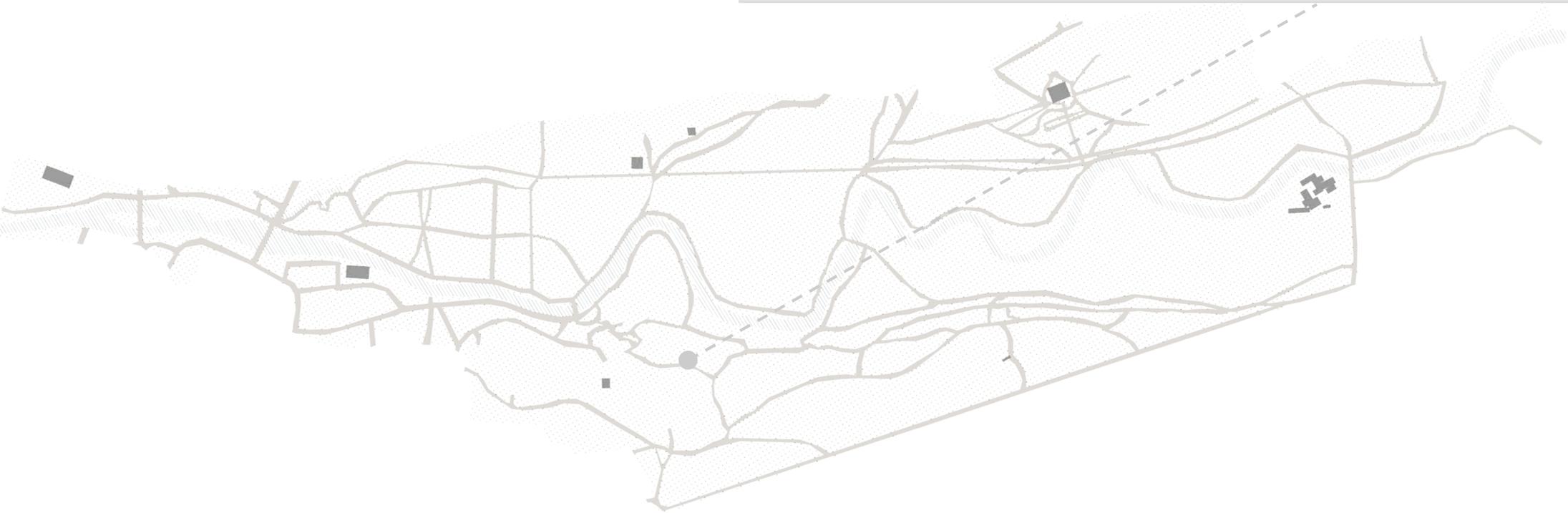
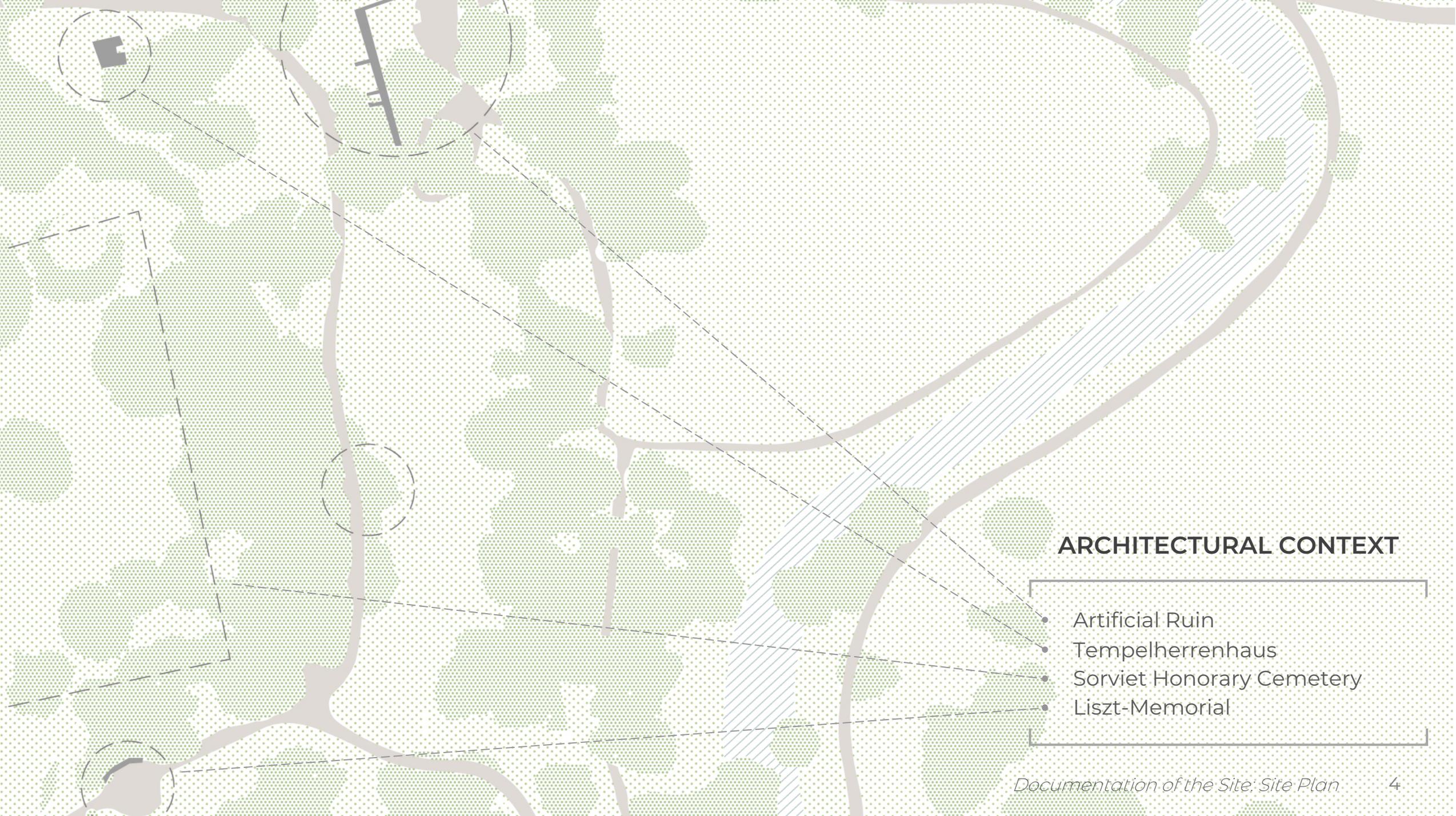


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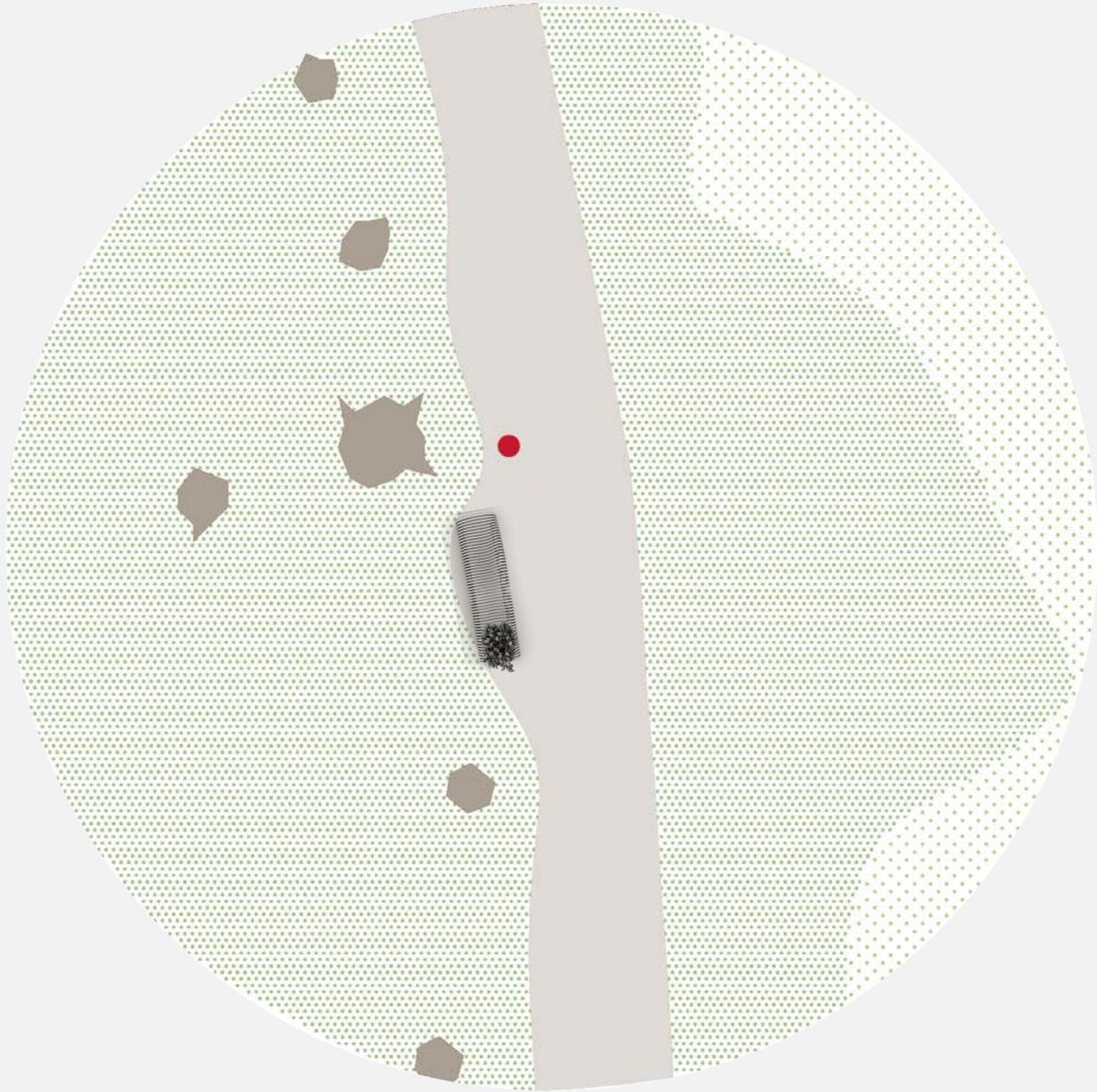
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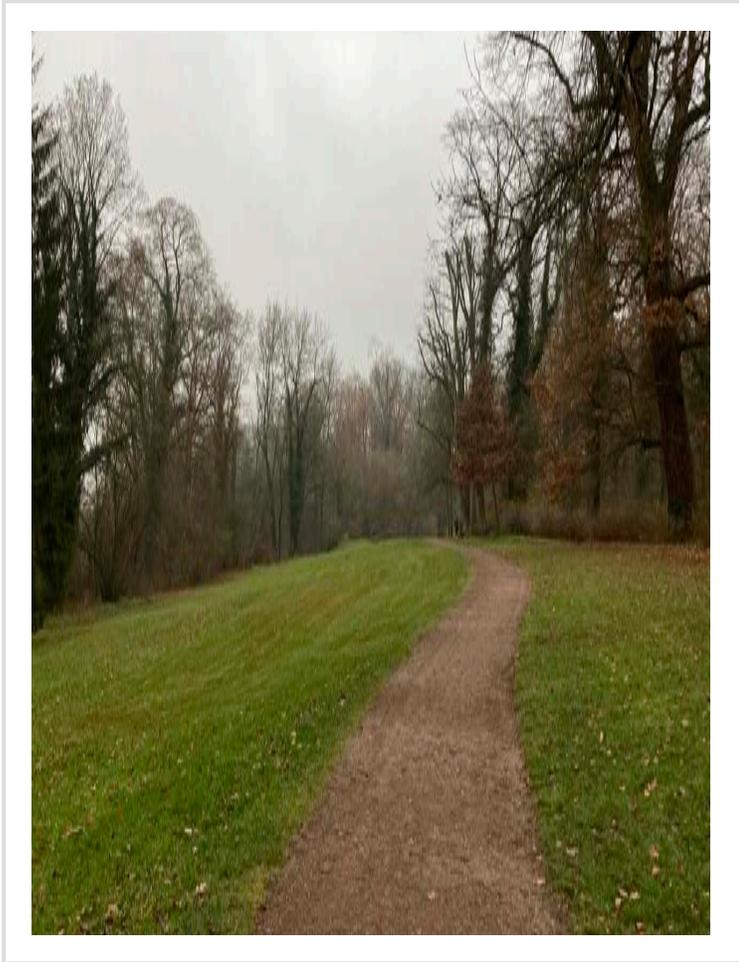




ARCHITECTURAL CONTEXT

- Artificial Ruin
- Tempelherrenhaus
- Sorviet Honorary Cemetery
- Liszt-Memorial







Story Board

How the orb functions as you interact with it

Phase 1

As you walk through the park the glowing orb will catch your attention



Phase 2

The orb starts pulsing as soon as you step in its 5 meters radius



Phase 3

The tree starts talking while you touch the orb





© Lucas Cranach the Elder

Narrative

During the development of our concept, one thing that really struck out was that the Ilmpark seems to be a true heterotopia, distancing itself from nature's and society's laws and therefore creating an utopian space.

Mystical elements, such as the Sphinx-Grotto, the Nadelöhr and the careful placement of trees underline this notion through creating a romantic atmosphere.

Being referred to as the ultimate metaphor for ethereal beauty, Garden of Eden has always served as the ultimate aspiration for landscape design, aiming to replicate its immense grandeur.

Following that trajectory, as well as doting on the uncertain future of the park's most important exhibits, the trees, we aim to create an installation where humankind and nature can interact.

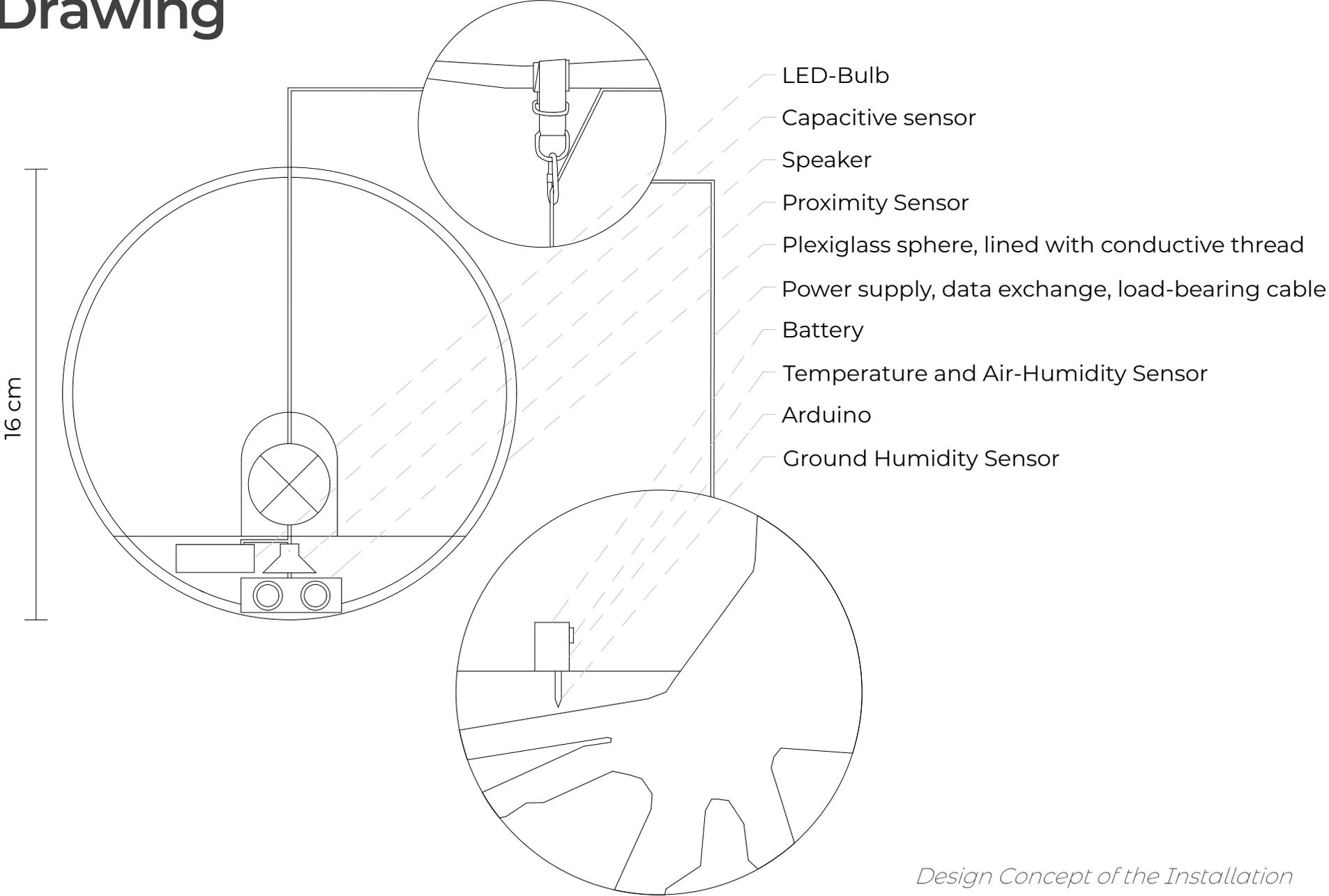
The colourful fruit hanging from these trees are to be seen as the direct visualization of the vividness and the progress constantly happening in nature.

Especially the apple has always been a symbol of change and enlightenment. The often recited biblical story of the end of paradise might be seen as a lecture about sin and immoral pleasure. But even more it defines the start into an era of human self-determination and the beginning of society's civilization.

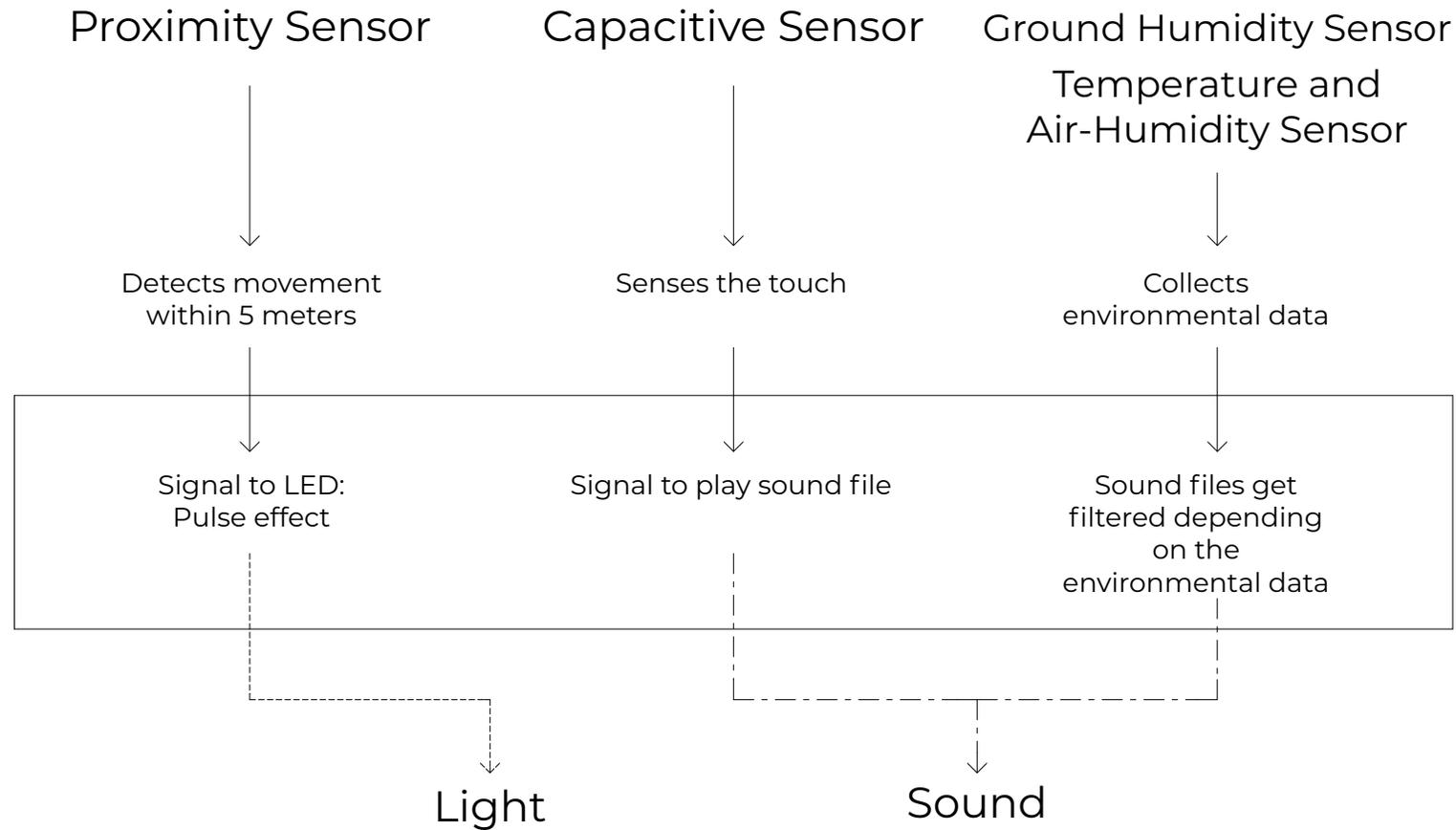
Our installation seeks to initiate a discussion on rethinking nature's relevance. For too long, it has been taken for granted, with no obligations of maintaining this fortune. The events of the last couple of years have strongly shown the necessity to prevail and protect, by informing ourselves and to face the concerning truth. With our installation we want to bring back more people into the discussion, as it simply should not be an abstract topic, but an accessible one allowing all those passing by to participate with no exceptions. It truly is a universal issue affecting each and everyone of us.

Following nature's ever generous and forgiving character, our installation is supposed to be seen as a gesture of reconciliation. The low hanging fruit offers the opportunity to regain knowledge and start off into a new understanding of nature.

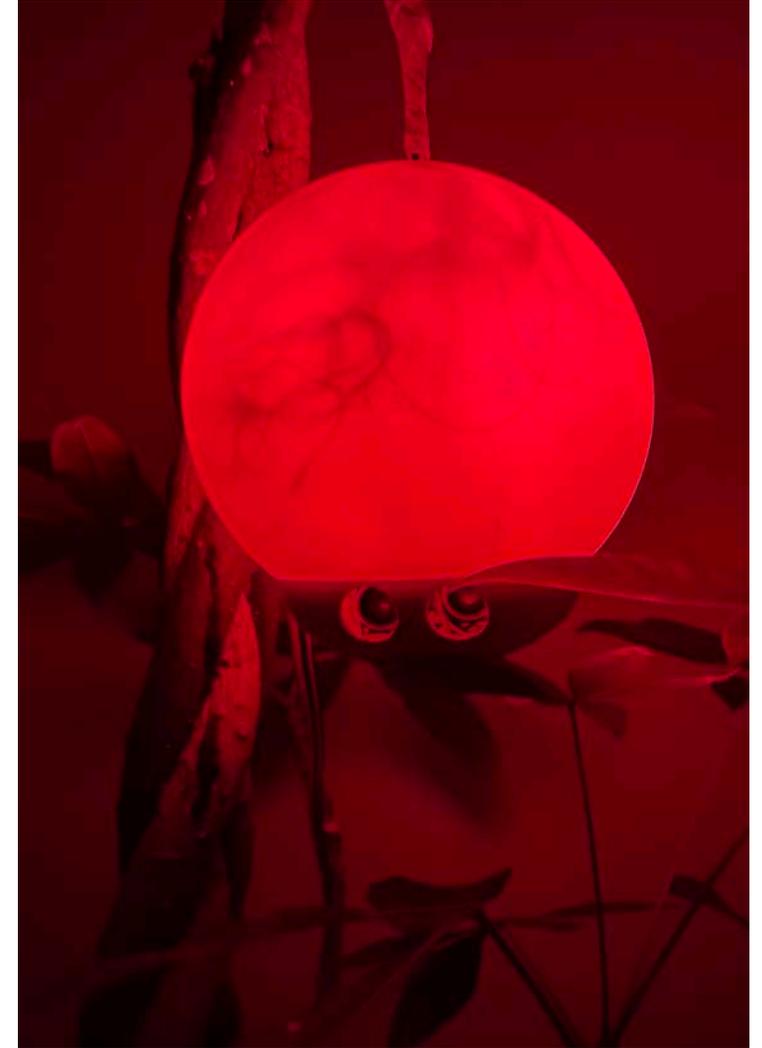
Technical Drawing

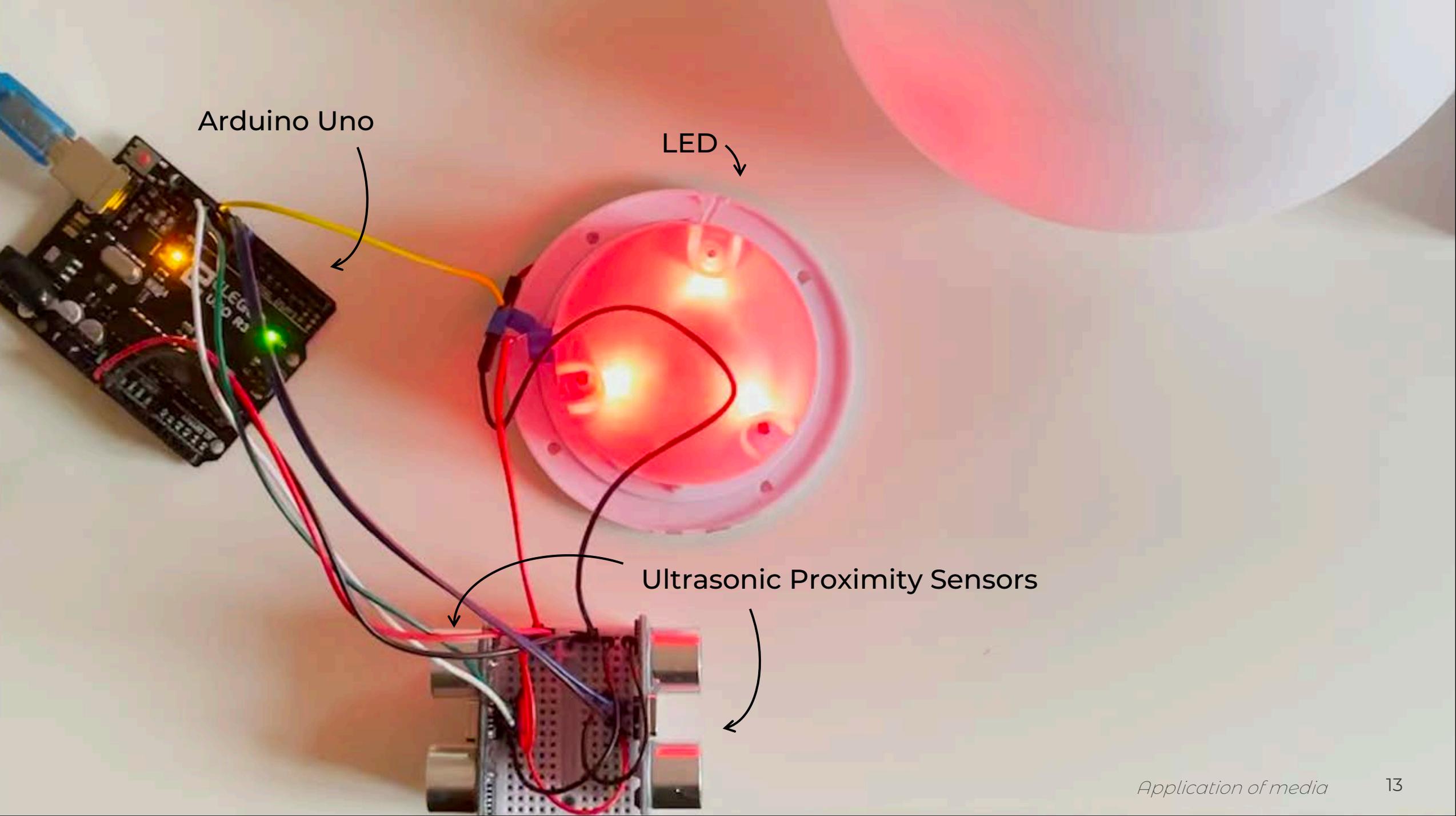


Input > Output



Photos of the prototype





Arduino Uno

LED

Ultrasonic Proximity Sensors

Code for Light

```
1  int trigPIN2=9;
2  int echoPIN2=10;
3  const int LED = 11; //LED pulse effect requires a pin capable of PWM
4  int trigPIN1=12;
5  int echoPIN1=13;
6  long previousMillis = 0;
7  long interval = 100;
8  unsigned long currentMillis = 0;
9
10 void setup(){
11     Serial.begin(9600);
12     //LED ON
13     digitalWrite(11, HIGH);
14     delay(1000);
15     pinMode(trigPIN1,OUTPUT);
16     pinMode(echoPIN1,INPUT);
17     pinMode(trigPIN2,OUTPUT);
18     pinMode(echoPIN2,INPUT);
19 }
20
21 void loop(){
22     //ULTRASONIC SENSORS RUNNING
23     digitalWrite(trigPIN1,LOW);
24     delay(10);
25     digitalWrite(trigPIN1,HIGH);
26     delay(10);
27     digitalWrite(trigPIN1,LOW);
28     long duration1 = pulseIn(echoPIN1,HIGH);
29     int distance1 = duration1 * 0.034 / 2 ;
30     Serial.print("Sensor 1 : ");
31     Serial.println(distance1);
32     delay(1000); //Wait before collecting data from the second sensor to prevent int
33     digitalWrite(trigPIN2,LOW);
34     delay(10);
35     digitalWrite(trigPIN2,HIGH);
36
37     delay(10);
38     digitalWrite(trigPIN2,LOW);
39     long duration2 = pulseIn(echoPIN2,HIGH);
40     int distance2 = duration2 * 0.034 / 2 ;
41     Serial.print("Sensor 2 : ");
42     Serial.println(distance2);
43     delay(10);
44
45     //When object is detected within 500 cm distance from one of the sensors
46     if (distance1<=500 || distance2 <= 500){
47         Serial.println("Object within the distance detected ");
48         Serial.write('\r');
49         Serial.println("LED Pulse Effect Activated ");
50         Serial.write('\r');
51
52         //Sine Wave Code
53         float in, out;
54         for (in = 0; in < 6.283; in = in + 0.001) {
55             out = sin(in) * 127.5 + 127.5;
56             analogWrite(LED,out);
57             currentMillis = millis();
58             if(currentMillis - previousMillis > interval) {
59                 previousMillis = currentMillis;
60             }
61         }
62     }
63 }
```

```
Final_210205 | Arduino 1.8.13 (Windows Store 1.8.42.0)
File Edit Sketch Tools Help
Serial Monitor
Final_210205
float t = dht.readTemperature();

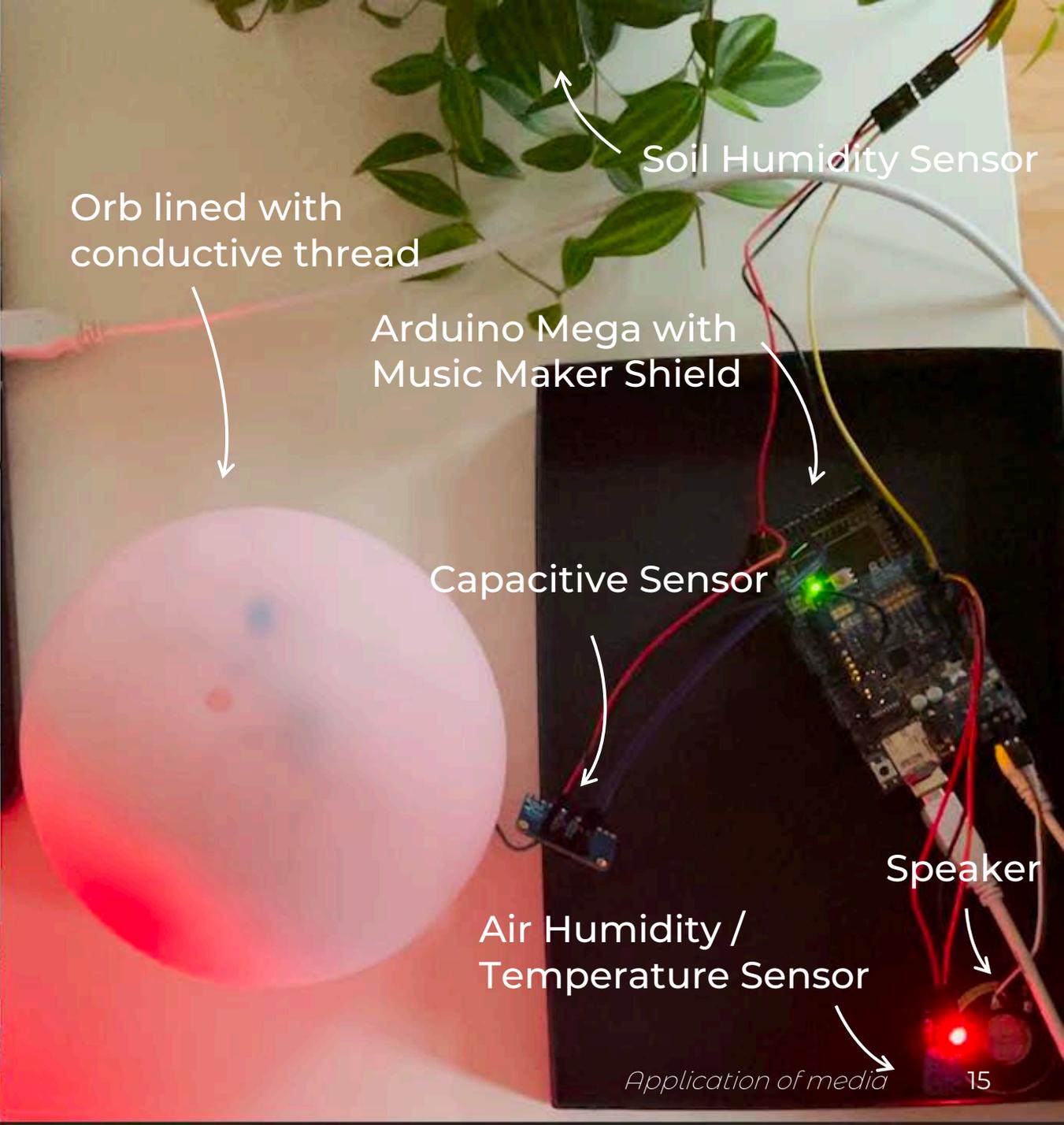
//CHECK DATA FAILURE
if (isnan(h) || isnan(t) || isnan(f)) {
  Serial.println("Humidity or temperature not available!");
  return;
}
Serial.print(F("Humidity: "));
Serial.print(h);
Serial.print(F("% "));
Serial.print(F("Temperature: "));
Serial.print(t);
Serial.print(F("°C "));
Serial.print(F("Fahrenheit: "));
Serial.print(f);
Serial.println();

delay(3000);

currTouched = cap.touched();
for (uint8_t i=0; i<3; i++) {
  // it if *is* touched
  if ((currTouched && !lastTouched) ||
      // if it *was* touched but isn't anymore, probably just
      // flicked to the capacitor's physical STOP or LOCK point and
      // is now returning to normal operation
      !currTouched && !lastTouched) {
    if (!!(currTouched)) {
      Serial.println("Capacitor touched!");
    }
    lastTouched = currTouched;
    Serial.println(cap.filteredData(3));
    capVal = cap.filteredData(3);
  }
}

Sketch uses 24668 bytes (9%) of program storage space. Maximum is 253952 bytes.
Global variables use 2295 bytes (28%) of dynamic memory, leaving 5897 bytes for local variables.

110 Arduino Mega or Mega 2560 on COM9
```



Orb lined with conductive thread

Soil Humidity Sensor

Arduino Mega with Music Maker Shield

Capacitive Sensor

Speaker

Air Humidity / Temperature Sensor

Application of media

Code for Sound I

```
1 #include "Boards.h"
2 #include "DHT.h"
3 #include "Wire.h"
4 #include "Adafruit_MPR121.h"
5 #include "SPI.h"
6 #include "Adafruit_VS1053.h"
7 #include "SD.h"
8
9 #define DHTPIN A0
10 #define DHTTYPE DHT11
11 #define SoilSensorPin A1
12 #define BREAKOUT_RESET 9
13 #define BREAKOUT_CS 10
14 #define BREAKOUT_DCS 8
15 #define SHIELD_RESET -1
16 #define SHIELD_CS 7
17 #define SHIELD_DCS 6
18 #define CARDCS 4
19 #define DREQ 3
20
21 Adafruit_VS1053_FilePlayer musicPlayer =
22 Adafruit_VS1053_FilePlayer(SHIELD_RESET, SHIELD_CS, SHIELD_DCS, DREQ, CARDCS);
23
24 #ifndef _BV
25 #define _BV(bit) (1 << (bit))
26 #endif
27
28 DHT dht(DHTPIN, DHTTYPE);
29
30
31 Adafruit_MPR121 cap = Adafruit_MPR121();
32 uint16_t lasttouched = 0;
33 uint16_t currtouched = 0;
34
35 int sensorVal=0;
36
```

```
37 /*long previousMillis = 0;
38 long interval = 1000;
39 unsigned long currentMillis = 0;*/
40 int touched = 0;
41 int capVal = 0;
42
43
44 void setup(){
45
46     Serial.begin(9600);
47
48     //TEST CAPACITIVE SENSOR
49     Serial.println("Adafruit MPR121 Capacitive Touch sensor test");
50     if (!cap.begin(0x5A)) {
51         Serial.println("MPR121 not found, check wiring?");
52         while (1);
53     }
54     Serial.println("MPR121 found!");
55
56     //TEST TEMPERATURE/HUMIDITY SENSOR
57     Serial.println(F("DHT11 test!"));
58     dht.begin();
59
60
61     //TEST MUSIC MAKER SHIELD
62     Serial.println("Adafruit VS1053 Library Test");
63     // initialise the music player
64     if (! musicPlayer.begin()) {
65         Serial.println(F("Couldn't find VS1053, do you have the right pins defined?"));
66         while (1);
67     }
68     Serial.println(F("VS1053 found"));
69     musicPlayer.sineTest(0x44, 500);
70
71     //TEST SD CARD
72     if (!SD.begin(CARDCS)) {
73         Serial.println(F("SD failed, or not present"));
74         while (1);
75     }
76     Serial.println("SD OK!");
77     //SET VOLUME: LOWER VALUES == HIGHER VOLUME!
78     musicPlayer.setVolume(10,10);
79     if (! musicPlayer.useInterrupt(VS1053_FILEPLAYER_PIN_INT))
80         Serial.println(F("DREQ pin is not an interrupt pin"));
```

Code for Sound II

```
81 }
82
83 void loop(){
84     Serial.println("Measuring Current Environmental Data...");
85     //TEMPERATURE/HUMIDITY SENSOR READ
86     sensorVal = analogRead(SoilSensorPin);
87     //SOIL MOISTURE SENSOR READ
88     Serial.print("Soil Moisture= ");
89     Serial.println(sensorVal);
90     float h = dht.readHumidity();
91     // Read temperature as Celsius (the default)
92     float t = dht.readTemperature();
93     // Read temperature as Fahrenheit (isFahrenheit = true)
94     float f = dht.readTemperature(true);
95
96     //CHECK DATA FAILURE
97     if (isnan(h) || isnan(t) || isnan(f)) {
98         Serial.println(F("Failed to read from DHT sensor!"));
99         // return;
100     }
101     Serial.print(F("Humidity: "));
102     Serial.print(h);
103     Serial.print(F("% Temperature: "));
104     Serial.print(t);
105     Serial.print(F("°C "));
106     delay(6000);
107
108     currTouched = cap.touched();
109     for (uint8_t i=0; i<12; i++) {
110         // it if *is* touched and *wasnt* touched before, alert!
111         if ((currTouched & _BV(i)) && !(lastTouched & _BV(i)) ) {
112             // if it *was* touched and now *isnt*, alert!
113             if (!(currTouched & _BV(i)) && (lastTouched & _BV(i)) ) {
114                 }
115             }
116         lastTouched = currTouched;
117         Serial.println(cap.filteredData(3));
118         capVal = cap.filteredData(3);
119         if(capVal>0 && capVal<220) {
```

```
125     Serial.println("touched");
126     touched = 1;
127 }
128 else {
129     Serial.println("not touched");
130     touched = 0;
131 }
132 if(touched == 1 && !musicPlayer.playingMusic) {
133     //WHEN IT IS FREEZING
134     if (t<0){
135         musicPlayer.playFullFile("track003.mp3");
136         if (! musicPlayer.startPlayingFile("/track001.mp3")) {
137             Serial.println("Could not open file track001.mp3");
138             while (1);
139         }
140     }
141     //WHEN IT IS TOO HOT AND DRY
142     else if (t>30 && sensorVal>350){
143         musicPlayer.playFullFile("track001.mp3");
144         if (! musicPlayer.startPlayingFile("/track001.mp3")) {
145             Serial.println("Could not open file track001.mp3");
146             while (1);
147         }
148     }
149     //WHEN IT IS RAINING
150     else if (90>h>99 && 260<sensorVal<350){
151         musicPlayer.playFullFile("track004.mp3");
152         if (! musicPlayer.startPlayingFile("/track001.mp3")) {
153             Serial.println("Could not open file track001.mp3");
154             while (1);
155         }
156     }
157     //NORMAL OR IDEAL DATA
158     else {
159         musicPlayer.playFullFile("track002.mp3");
160         if (! musicPlayer.startPlayingFile("/track002.mp3")) {
161             Serial.println("Could not open file track002.mp3");
162             while (1);
163         }
164     }
165     Serial.println(F("Started playing"));
166 }
167 }
168 }
```

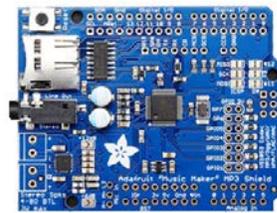
Components



**Arduino Uno
Starter Kit**

microcontroller board
– we used one based
on the ATmega328P

33€



**Adafruit Music
Maker Shield**

an
encoding/decoding
(codec) chip that can
decode a wide variety
of audio formats form
a micro sd-card

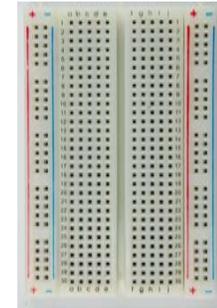
42€ + 5€



**2x HC-SR04
Ultrasonic Sensor**

measures the
distance of a target
object by emitting
ultrasonic sound
waves

4€



mini-Breadboard

a way of constructing
electronics without
having to use a
soldering iron

“Included in the
starter kit”

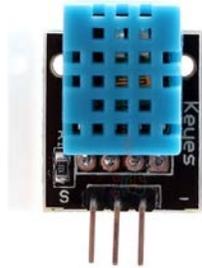


Adafruit MPR121

detecting when a
person (or animal)
has touched one of
the sensor electrodes

9€

Components



DHT11

commonly used
Temperature and
humidity sensor

“Included in the
starter kit”



**Capacitive Soil
Moisture v1.2**

Soil moisture sensors
measure the
volumetric water
content in soil

5€



LED

Used for the glowing
and pulsing function
of the orb

“20€ for the LED
Effect Ball



Speakers

Plays the audio of the
tree talking - 8 ohms,
2 watts

5€



**Conductive
Thread**

Used Inside the orb to
turn into a touchable
surface

12€

Text Tree Speech I

Too hot

It's waay too hot today!

I'm a mountain maple. My Ancestors come from the mountain regions, which have a more humid and cooler climate. It's always been a bit too hot and dry for me here. And it is getting worse every year. Isn't there something you can do about it?

wish you people would take it easier on me.

Did you ever think about how you would feel if people kept stepping and running on your feet every day? Well, it hurts!

Every year, I fear that it might be my last year. That's why I'm shedding lots of seeds, but gardeners keep removing them.

Some of my old buddies are already gone. They were replaced with these kids that you see around here. I wonder what will happen to my spot when I'm gone. Will there be another member of my family? Or will they choose a local tree over us?

Despite all the difficulties, I've managed to grow 32 meters high.

It's hot in here today, my bark doesn't protect me well and because I stand by myself here, no other trees cast shade on my trunk and roots to protect me. The grass drinks away much of my water. I am thirsty.

Please don't leave the path or try to climb on me. When I was young, I took it pretty well, but as I got older, it's become harder for me to heal injuries.

So, how do you like the park? All the trees you see here have been planted specifically in favor of looking beautiful to your eyes. Even today, the park is maintained so that the views created look the same as they did over 200 years ago.

Normal/Ideal

I'm a mountain maple. My Ancestors come from the mountain regions, which have a more humid and cooler climate. It's always been a bit too hot and dry for me here. And it is getting worse every year. Isn't there something you can do about it?

I wish you people would take it easier on me.

Did you ever think about how you would feel if people kept stepping and running on your feet every day? Well, it hurts!

Every year, I fear that it might be my last year. That's why I'm shedding lots of seeds, but gardeners keep removing them.

Some of my old buddies are already gone. They were replaced with these kids that you see around here. I wonder what will happen to my spot when I'm gone. Will there be another member of my family? Or will they choose a local tree over us?

Despite all the difficulties, I've managed to grow 32 meters high.

Please don't leave the path or try to climb on me. When I was young, I took it pretty well, but as I got older, it's become harder for me to heal injuries.

So, how do you like the park? All the trees you see here have been planted specifically in favor of looking beautiful to your eyes. Even today, the park is maintained so that the views created look the same as they did over 200 years ago.

Text Tree Speech II

Too cold

I'm a mountain maple. My Ancestors come from the mountain regions, which have a more humid and cooler climate. It's always been a bit too hot and dry for me here. And it is getting worse every year. Isn't there something you can do about it?

I wish you people would take it easier on me.

Did you ever think about how you would feel if people kept stepping and running on your feet every day? Well, it hurts!

Every year, I fear that it might be my last year. That's why I'm shedding lots of seeds, but gardeners keep removing them.

Some of my old buddies are already gone. They were replaced with these kids that you see around here. I wonder what will happen to my spot when I'm gone. Will there be another member of my family? Or will they choose a local tree over us?

Despite all the difficulties, I've managed to grow 32 meters high.

My foliage is supposed to protect my roots from the cold in the winter. But it always gets taken away by the gardeners because otherwise, it would suffocate the grass. My bark also keeps me warm so that the water in my vessels doesn't freeze. The burnt crust fungus doesn't make it any better, though.

Please don't leave the path or try to climb on me. When I was young, I took it pretty well, but as I got older, it's become harder for me to heal injuries.

So, how do you like the park? All the trees you see here have been planted specifically in favor of looking beautiful to your eyes. Even today, the park is maintained so that the views created look the same as they did over 200 years ago.

Raining

Ahh, it's raining!

I'm a mountain maple. My Ancestors come from the mountain regions, which have a more humid and cooler climate. It's always been a bit too hot and dry for me here. And it is getting worse every year. Isn't there something you can do about it?

I wish you people would take it easier on me.

Did you ever think about how you would feel if people kept stepping and running on your feet every day? Well, it hurts!

Every year, I fear that it might be my last year. That's why I'm shedding lots of seeds, but gardeners keep removing them.

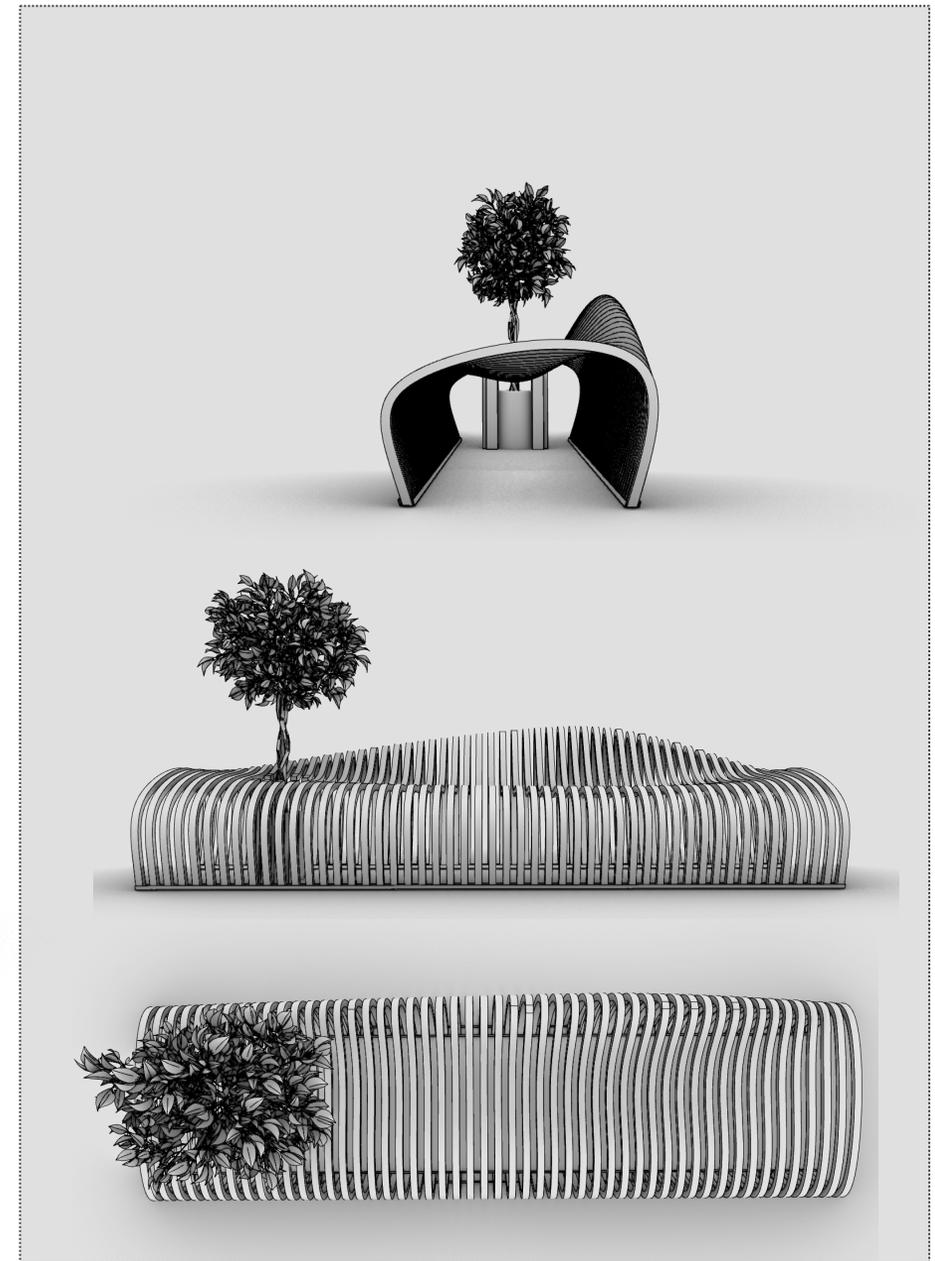
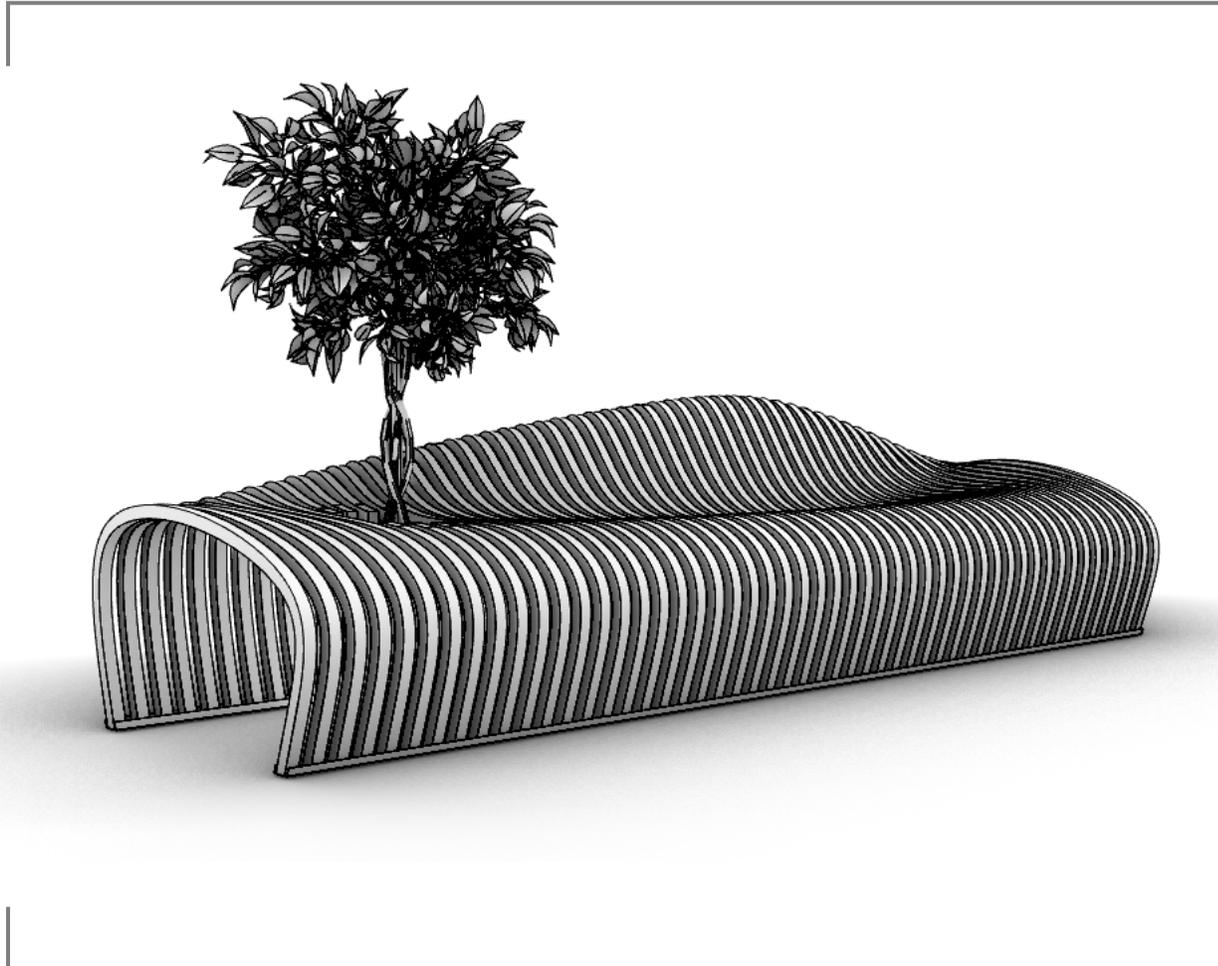
Some of my old buddies are already gone. They were replaced with these kids that you see around here. I wonder what will happen to my spot when I'm gone. Will there be another member of my family? Or will they choose a local tree over us?

Despite all the difficulties, I've managed to grow 32 meters high.

Please don't leave the path or try to climb on me. When I was young, I took it pretty well, but as I got older, it's become harder for me to heal injuries.

So, how do you like the park? All the trees you see here have been planted specifically in favor of looking beautiful to your eyes. Even today, the park is maintained so that the views created look the same as they did over 200 years ago.

Bench Proposal



- Arduino
- Music Maker Shield(Adafruit) and Speakers
- Weather Station inside the park
- 4G(LTE) arduino shield (FDRobots)
- Solar Panel or Wind Power
- Touch Light Sphere



PROPOSED SETUP

Collect local data and send data through internet to the Arduino

Video Links

Animation, Design process

<https://vimeo.com/509463741>

Prototype Showcase

<https://vimeo.com/509461118>

Prototype Interaction & Audio Sample 'Too Hot'

<https://vimeo.com/509490244>

Prototype Interaction & Audio Sample 'Normal/Ideal'

<https://vimeo.com/509437045>

Prototype Interaction & Audio Sample 'Freezing'

<https://vimeo.com/509463741>

Prototype Interaction & Audio Sample 'Raining'

<https://vimeo.com/509660577>