

Arduino Workshop:

making the use of sound sensor module

GreenLab Microfactory
feat. Yuji Ogawa



HITOTSUBASHI
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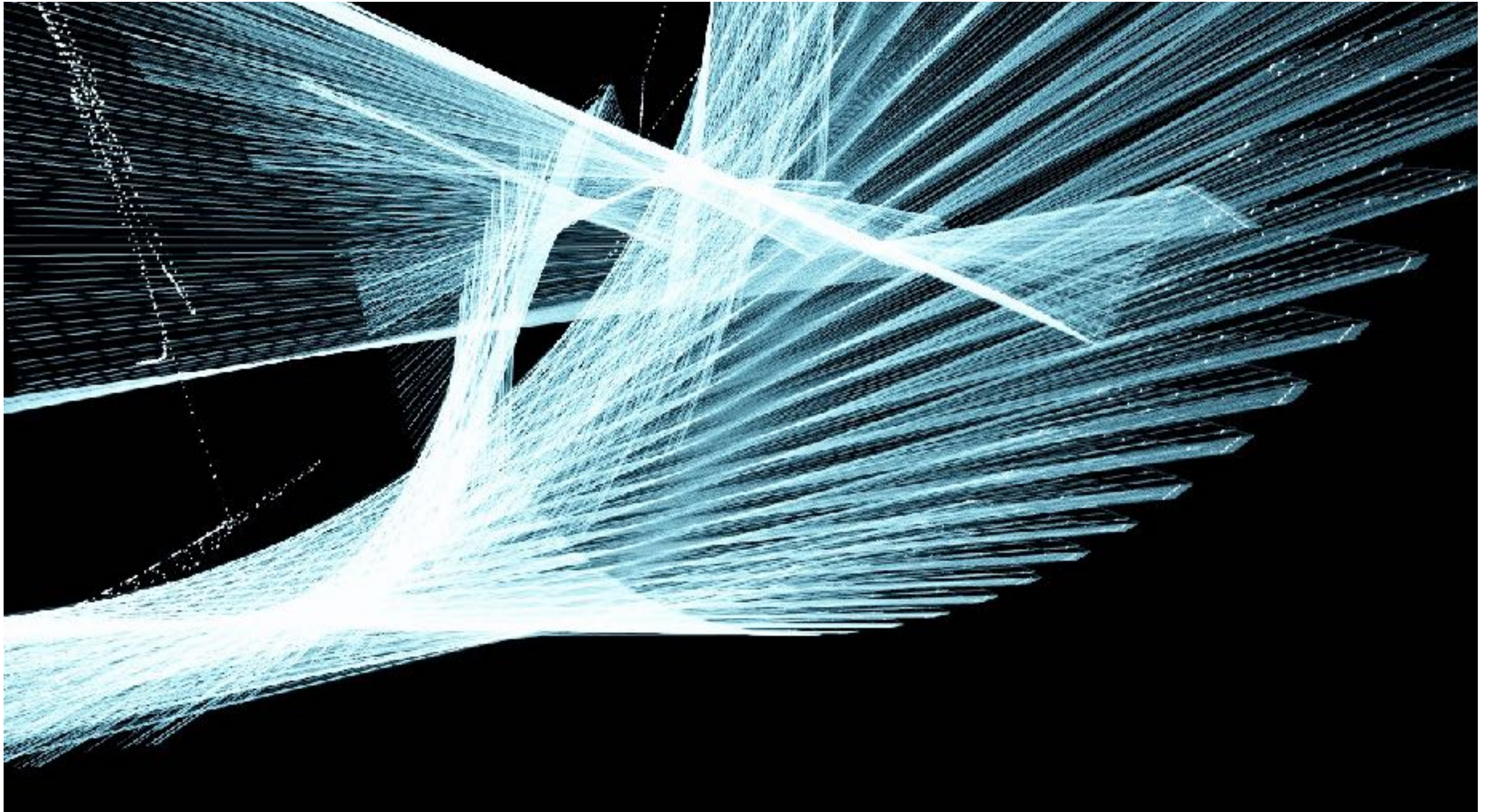
ABOUT ME!

Social Anthropologist of Technology,
and tech enthusiast

From Tokyo, Japan!

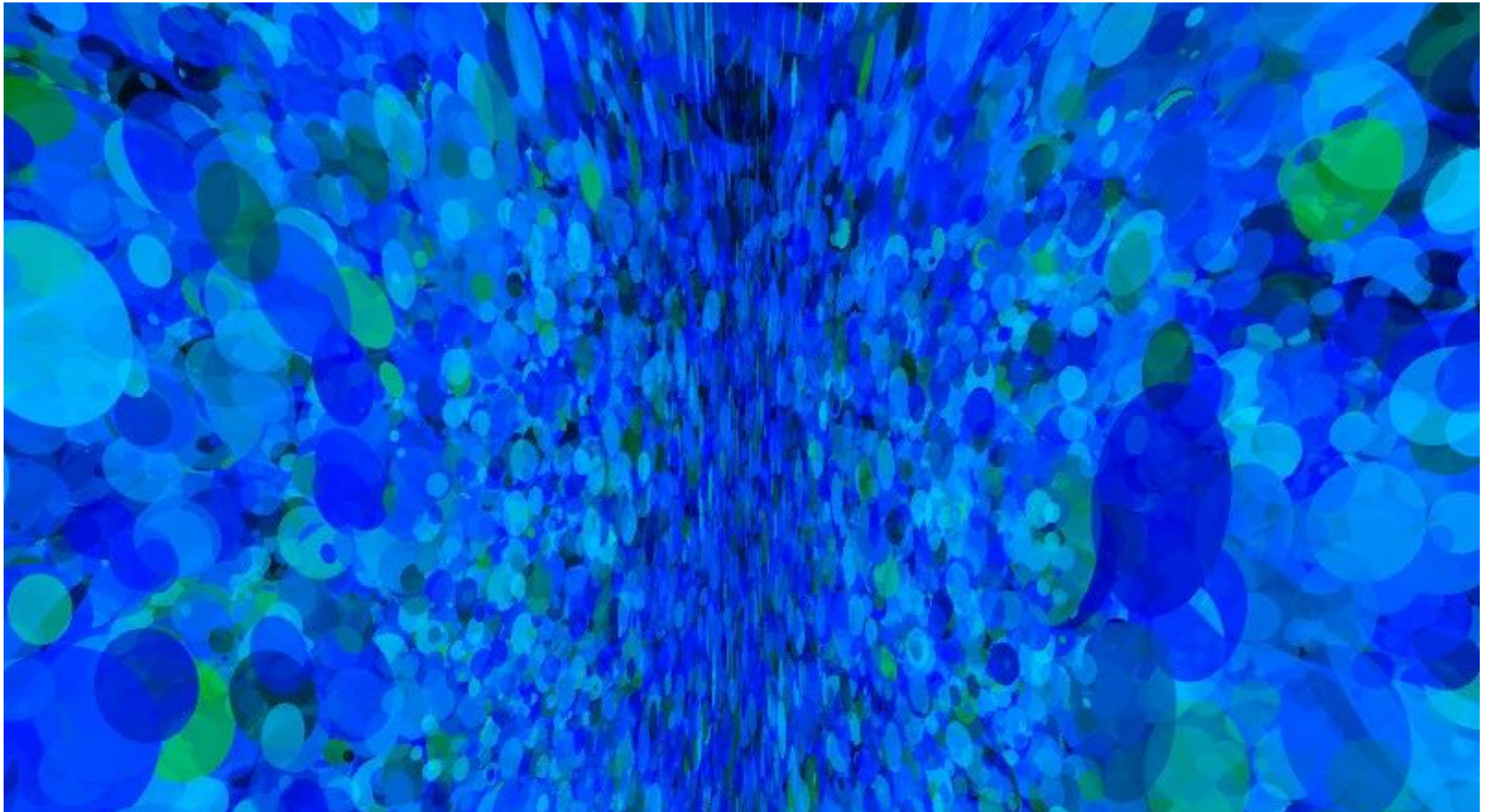


SOME OF MY WORKS



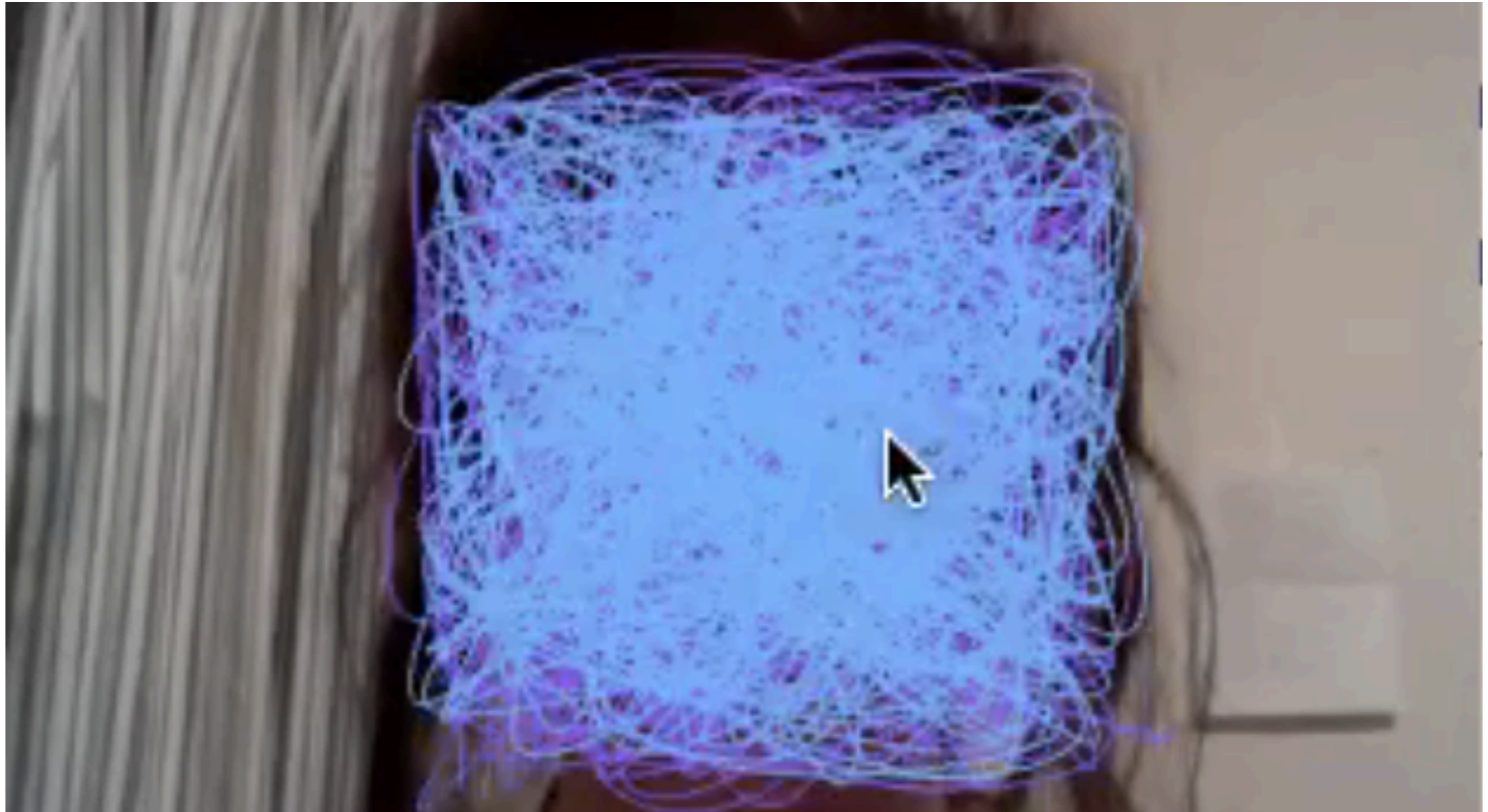
Drawing Program using Arduino and Processing

SOME OF MY WORKS



Drawing Program using Arduino and Processing

SOME OF MY WORKS



Face detection & Drawing Program using Arduino and
openFrameworks

TODAY'S FLOWCHART

- 1. Learn the basics about Arduino and Robots**
- 2. Learn the difference between analog and digital**
- 3. Analog control of servo motor with potentiometer**
- 4. Analog control of servo motor with sound sensor**
- 5. Making the simple robot!**

Today's goal:
“Talkie Walkie” (2009, by Guilherme Martins)

guilhermemartins.net

apresenta

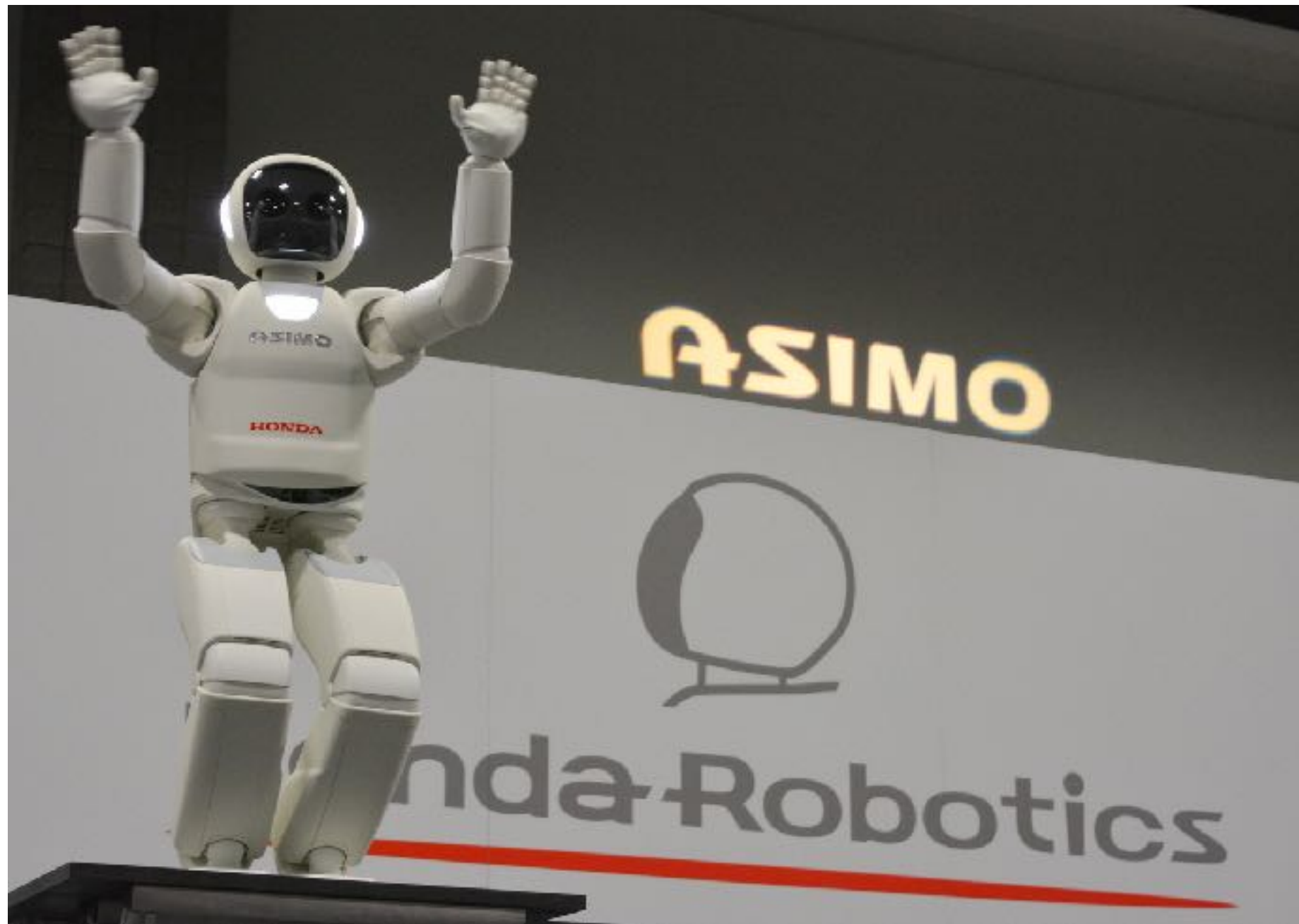
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What is robot?

- Robotics is the study about how to

The Robots in Japan...



ASIMO (Honda Robotics) 2000-2018

Why robots are needed?

- To help our lives, obviously.
- For today, we are making a robot for entertainment (which is important to our life, right?)
- BUT, it is important to connect us with the robot.
→ **INTERACTIVITY** between machine and our world is necessary for it!

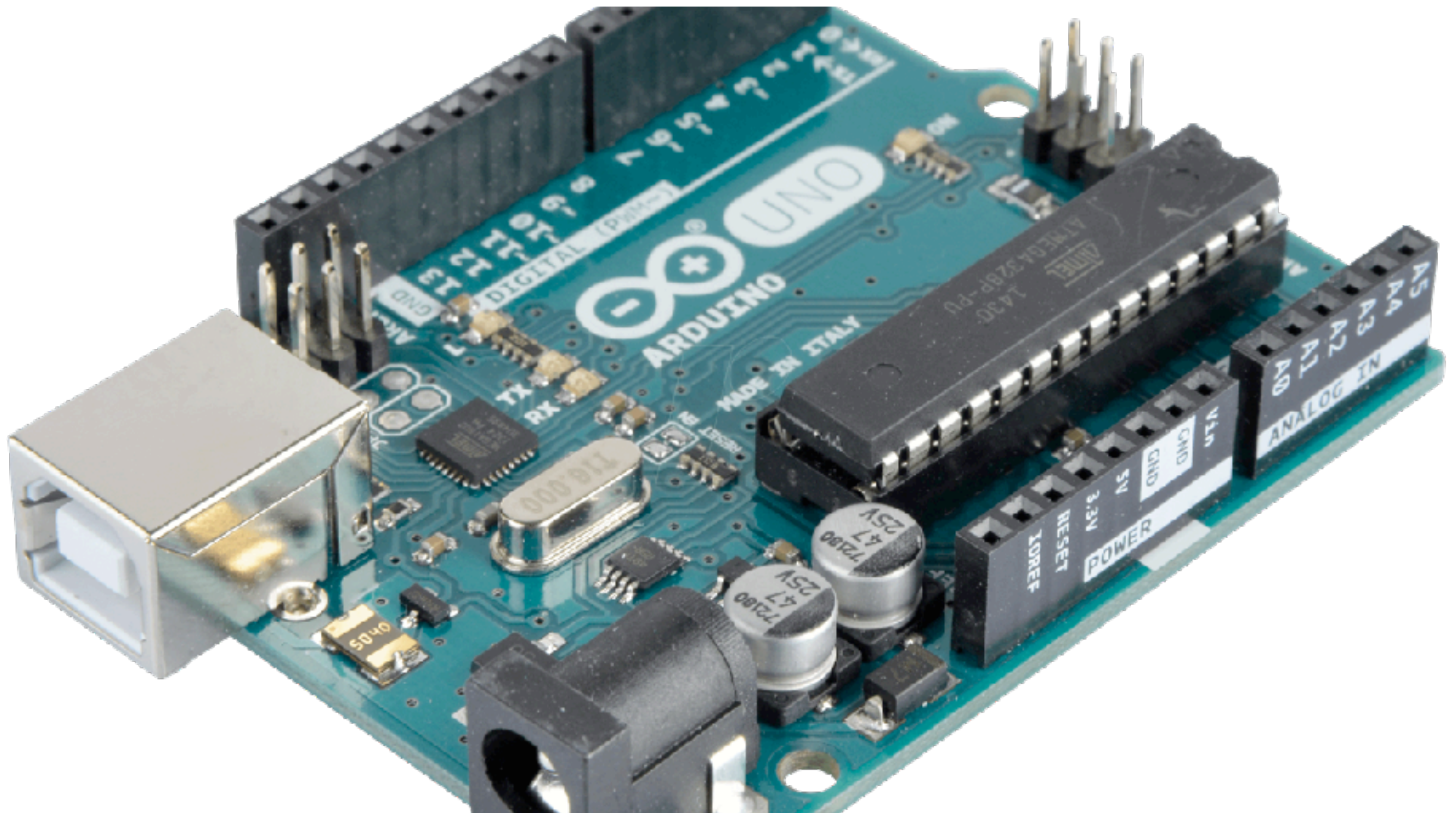
How to make simple robots using handy computer technology

It is very tricky and expensive to build the advanced robot.

BUT STILL, you can start your own robot making by yourself using **Arduino**.

Arduino is very handy set of micro-controller and IDE (Integrated Development Environment)

Arduino



Arduino IDE

I ntegrated
D evelopment
E nvironment



The screenshot shows the Arduino IDE interface with a sketch named 'servoAnalogControl'. The code is as follows:

```
#include <Servo.h> // add servo library

Servo myservo; // create servo object to control a servo

int potpin = 0; // analog pin used to connect the potentiometer
int val; // variable to read the value from the analog pin

void setup() {
  myservo.attach(9); // attaches the servo on pin 9 to the servo object
}

void loop() {
  val = analogRead(potpin); // reads the value of the potentiometer (will change based on the slider position)
  val = map(val, 0, 1023, 0, 180); // scale it to use it with the servo (set range vs. actual range of values)
  myservo.write(val); // sets the servo position according to the scaled value
  delay(15); // waits for the servo to get there
}
```

At the bottom, the status bar indicates: 'Sketch uses 2096 bytes (6%) of program storage space. Maximum is 32256 bytes. Global variables use 50 bytes (2%) of dynamic memory, leaving 1998 bytes free.' The bottom status bar also shows '15' and 'Arduino/Genuino Uno on /dev/cu.wchusbserial410'.



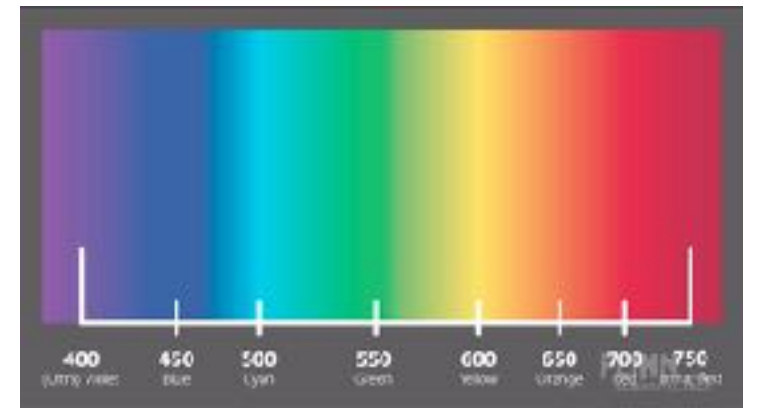
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- ~~5. Making simple robot!~~

Analog and Digital

ANALOG : a range of continuous data

E.g. 0-255 (color code)

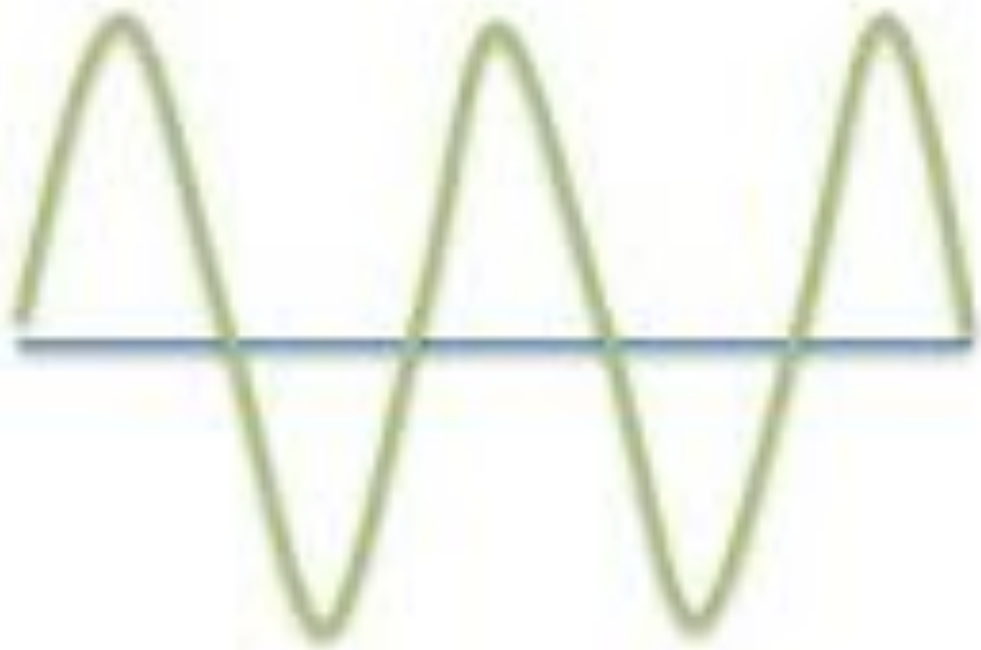


DIGITAL : On and Off, 0 and 1

Just like the light switch!

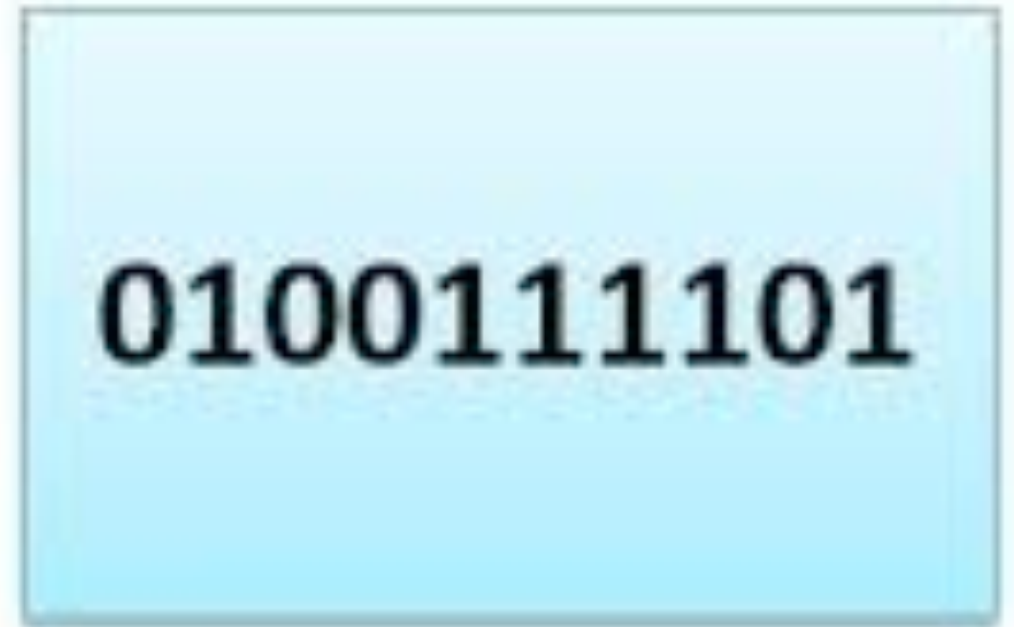


Analog and Digital



**Analog
Signal**

V_s



**Digital
Signal**

Why analog data is important?

- Because: **THE REAL WORLD IS NOT MADE OF 0 and 1, on and off, true and false.**
 - THEN: you have to use ANALOG data too, for making robot **interactive** with our world.
 - We will utilise analog data to control the machine.

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Micro servo motor

- **Servo motor** is one of the motors whose rotation can be controlled.
- The rotation can be controlled from 0° to 180° degrees.



Example #1

- After you get the meaning of analog control and servo motor...

Let's control the servo with **potentiometer**.



Potentiometer

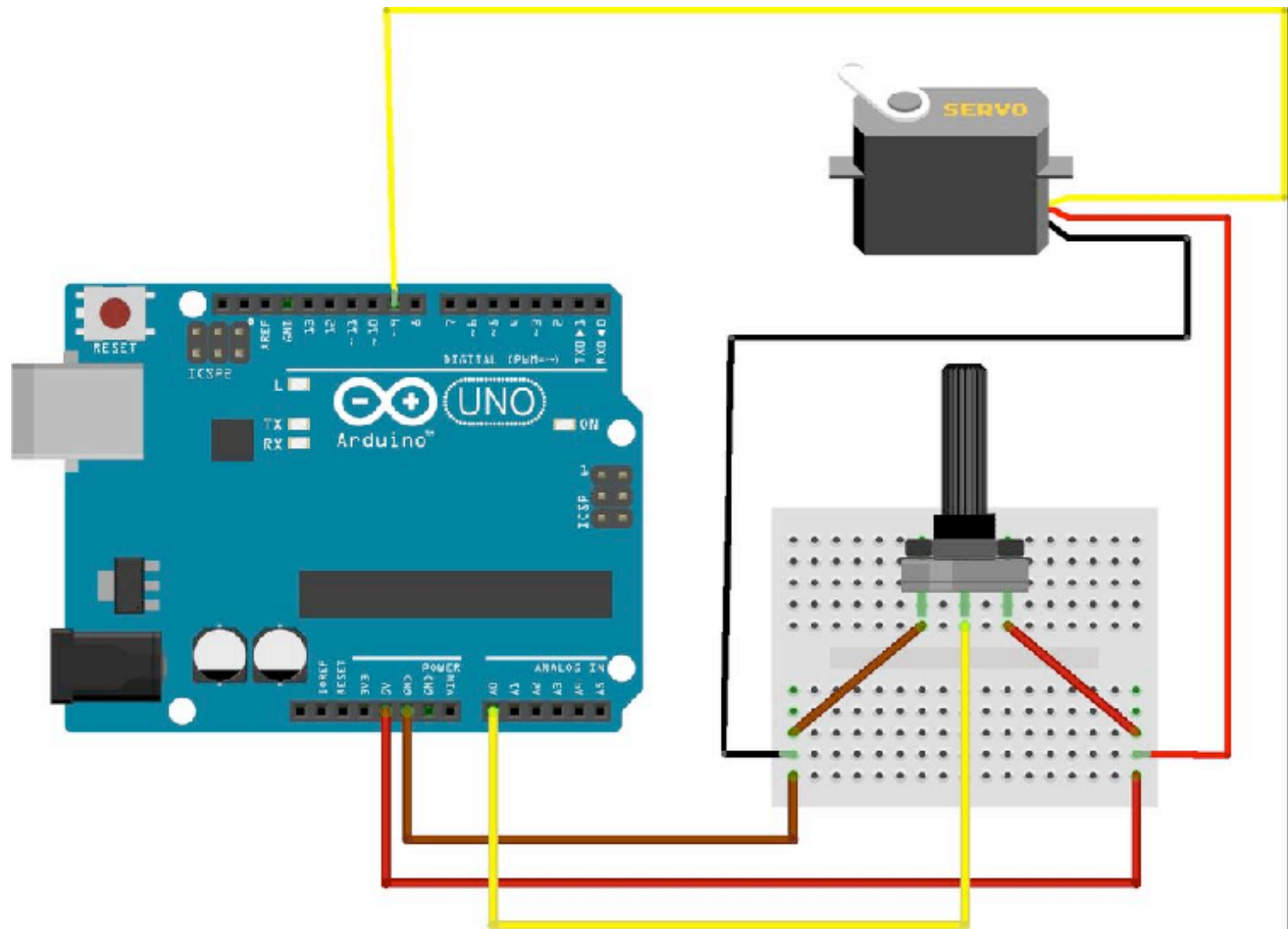
Potentiometer: “a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider.”

→ in short “analog variable setter.”

→ We are going to use it to control the servo motor.



Circuit



Arduino Code

```
#include <Servo.h> // add servo library

Servo myservo; // create servo object to control a servo

int potpin = 0; // analog pin used to connect the potentiometer
int val; // variable to read the value from the analog pin

void setup() {
  myservo.attach(9); // attaches the servo on pin 9 to the servo object
}

void loop() {
  val = analogRead(potpin); // reads the value of the potentiometer (value
  // between 0 and 1023)
  val = map(val, 0, 1023, 0, 180); // scale it to use it with the servo (value
  // between 0 and 180)
  myservo.write(val); // sets the servo position according to the scaled
  // value
  delay(15); // waits for the servo to get there
}
```


Uploading the code to Arduino

Connect Arduino to Laptop with USB

→ Press Upload () button



How to Wire (1)

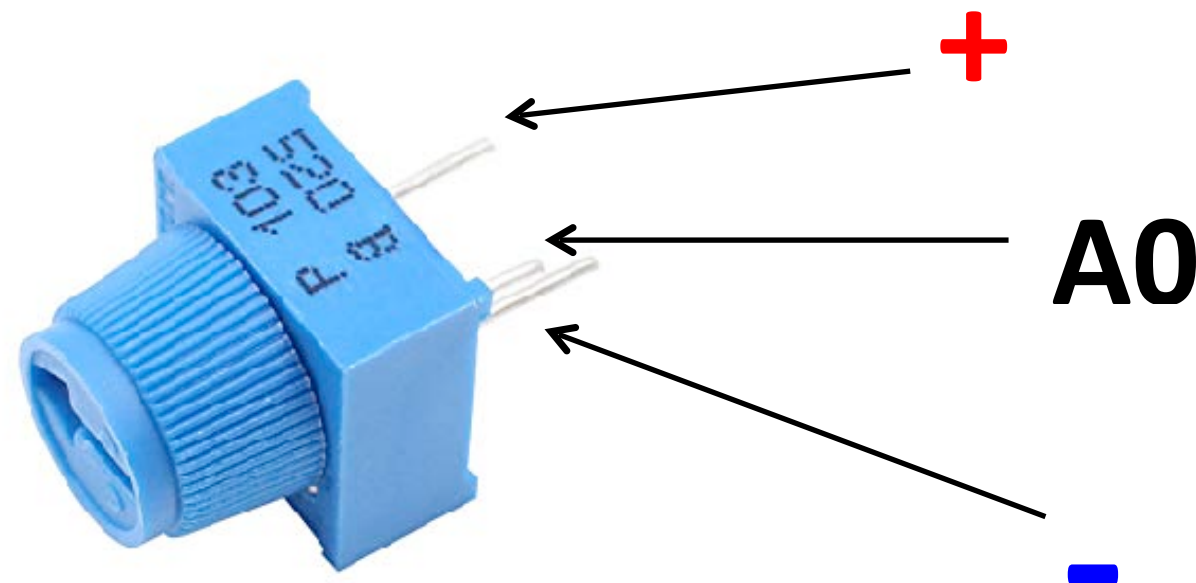
- **5V** pin on Arduino → “**+**” on breadboard
- **GND** pin on Arduino → “**-**” on breadboard



Jumper Wire

How to Wire (2)

- Connect potentiometer to breadboard
- **Right** pin of potentiometer → “+” on breadboard
- **Left** pin of potentiometer → “-” on breadboard
- **Center** pin of potentiometer → A0 on Arduino



How to Wire (3)

- **Orange** wire of servo motor → **D9** on Arduino
- **Red** wire of servo motor → **“+”** on breadboard
- **Brown** wire of servo motor → **“-”** on breadboard



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Example #2

Let's swap the potentiometer with the sound sensor module, to make servo motor **interactive** to the world.



Code (1)

```
#include <Servo.h>
Servo myservo;
int pos = 0;
int soundSensor=2;
int LED=4;
boolean LEDStatus=false;

void setup() {
  myservo.attach(9);
  pinMode(soundSensor, INPUT);
  pinMode(LED, OUTPUT);
}
```

Code (2)

```
void loop() {  
  
    int SensorData=digitalRead(soundSensor);  
    if(SensorData==1){  
  
        if(LEDStatus==false){  
            LEDStatus=true;  
            digitalWrite(LED,HIGH);  
            for (pos = 0; pos <= 180; pos += 1) { // goes from 0 degrees to 180 degrees  
// in steps of 1 degree  
myservo.write(pos);           // tell servo to go to position in variable 'pos'  
delay(15);                    // waits 15ms for the servo to reach the position  
}  
}  
else{  
    LEDStatus=false;  
    digitalWrite(LED,LOW);  
    for (pos = 180; pos >= 0; pos -= 1) { // goes from 180 degrees to 0 degrees  
myservo.write(pos);           // tell servo to go to position in variable 'pos'  
delay(15);                    // waits 15ms for the servo to reach the position  
}  
}  
}  
}
```


How to Wire (1)

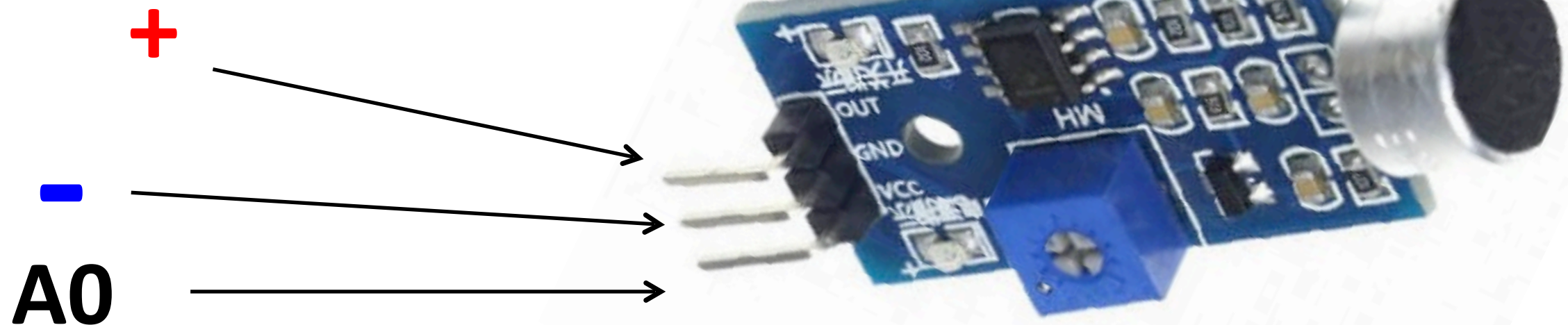
- **5V** pin on Arduino → “+” on breadboard
- **GND** pin on Arduino → “-” on breadboard



Jumper Wire

How to Wire (2)

- Connect sound sensor to breadboard
- **VCC** pin of sound sensor → “+” on breadboard
- **GND** pin of sound sensor → “-” on breadboard
- **OUT** pin of potentiometer → A0 on Arduino



How to Wire (3)

- **Orange** wire of servo motor → **D9** on Arduino
- **Red** wire of servo motor → **“+”** on breadboard
- **Brown** wire of servo motor → **“-”** on breadboard



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Example #3... Robot!

- We are going to use Example #2 for making robots.