

DIY Sensors – Digital

Enchanting More Everyday Objects



Agenda

- VeloStat Material
 - DIY Bend/Pressure Sensor
- Make your fluffy dolls and cushion interactive



What is data glove?

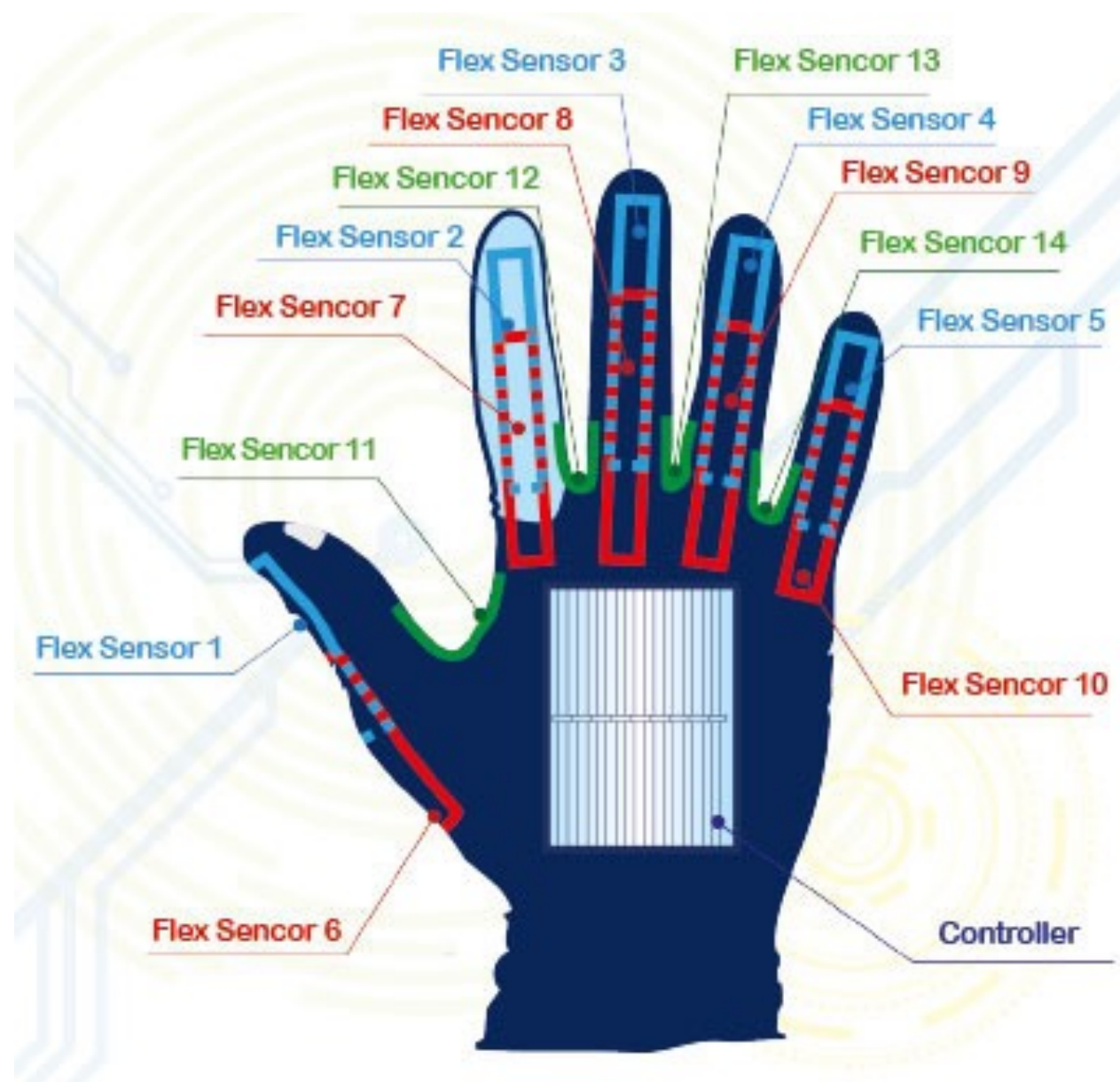
- A **data glove** is an interactive device, resembling a **glove** worn on the hand, which facilitates tactile sensing and fine-motion control in robotics and virtual reality .
- **Data gloves** are one of several types of electromechanical devices used in haptics applications.



Example of DIY data gloves



<https://www.youtube.com/watch?v=NcWcmEPWSI4>



FlexiSensor

- The essential component in data gloves.

So it is actually like a potentiometer!

Flex sensors are **sensors** that change in resistance depending on the amount of bend on the **sensor**. They convert the change in bend to electrical resistance - the more the bend, the more the resistance value.



- Conductance :
 - the ability for electricity to flow a certain path!
- Resistance :
 - a measure of the degree to which conductor opposes an electric current through it!
- Highly conductive materials are of very low resistance
e.g. wire resistance $\ll 1 \Omega$

$$\text{Conductance} = \frac{1}{\text{Resistance}}$$

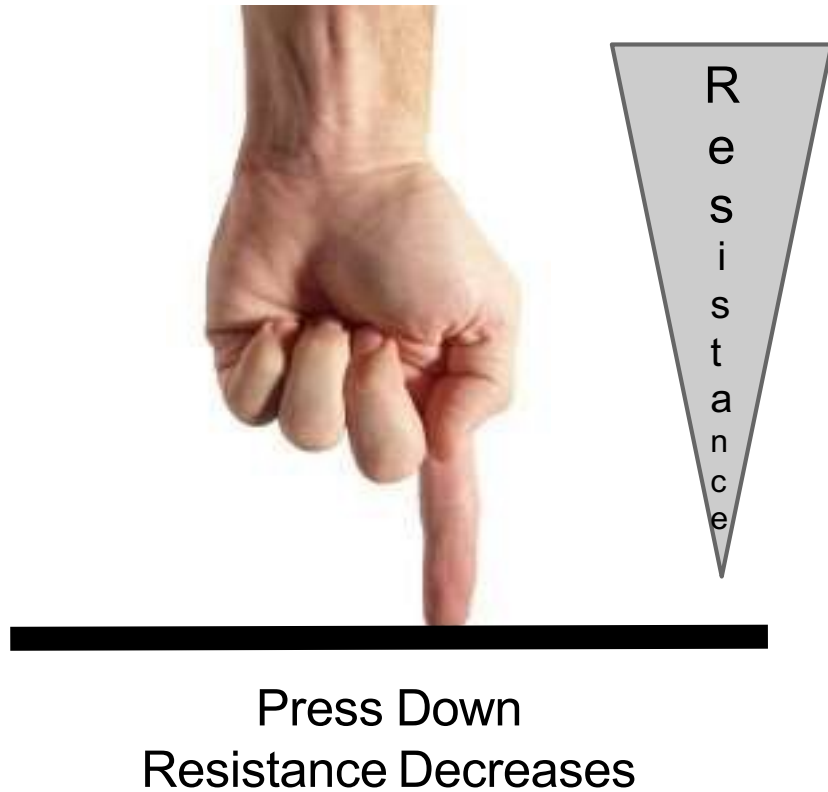
- Electrical insulator is a material whose internal electric charges do not flow freely !
 - Conductance = 0
 - Resistance = ∞ (infinitely large)
- Most plastics, paper, wood, fabric, ceramics, etc. are insulators

$$\text{Conductance} = \frac{1}{\text{Resistance}}$$

Crafting sensors from scratch
using soft conductive
materials

- You can make your own data gloves under \$10!!

Pressure Sensitive Fabric (Velostat)



<https://www.youtube.com/watch?v=2-YMxyYiYm8>

Velostat, also known as Linqstat, is a packaging material made of a polymeric foil (polyolefins) impregnated with carbon black to make it electrically conductive. It is used for the protection of items or devices that are susceptible to damage from electrostatic discharge. It was developed by Custom Materials, now part of 3M. Velostat is now a U.S. registered trademark (4,964,564) of Desco Industries Inc. Desco Industries purchased the assets of the 3M Static Control business on January 2, 2015.

Due to its properties of changing its resistance with either flexing or pressure it is becoming popular with hobbyists for making inexpensive sensors for microcontroller experiments. One example of this is to make shoes which light up when the wearer takes a step. Since the resistance in the circuit is reduced when pressure is applied, this reading can indicate when weight is applied or removed from the shoes.



Quick Experiment Demo

DIY Flex/Force Sensor



- Data Glove



Materials

SINGER
45 Needles

Conductive
tape

Glove

Multimeter

Tape

Conductive
thread

Resistors

Aligator
clips

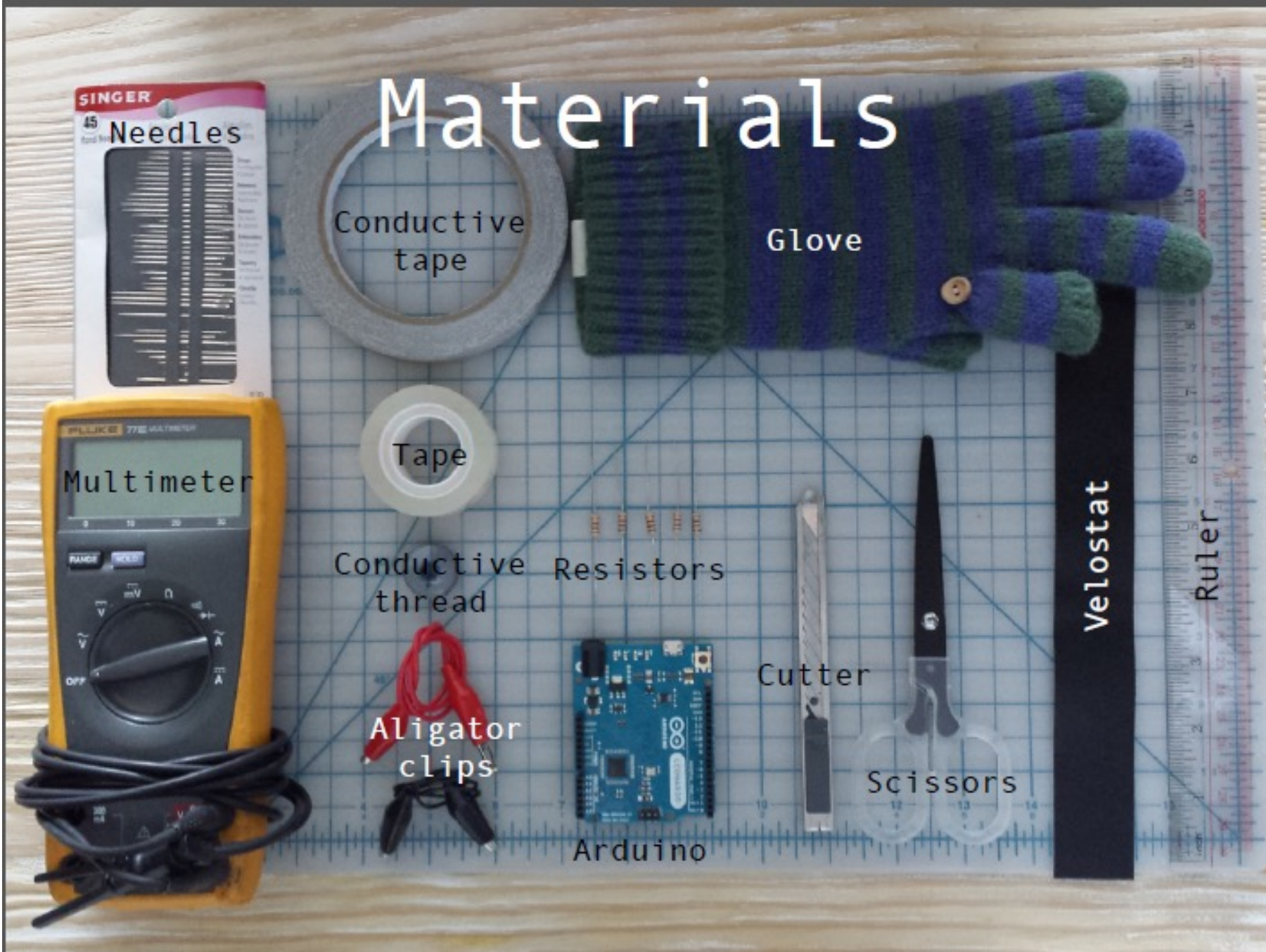
Arduino

Cutter

Scissors

Velostat

Ruler



Make Sandwich!

Scotch tape

**Pay attention
to the sizes!**

Conductive tape

Velostat

Conductive tape

Scotch tape

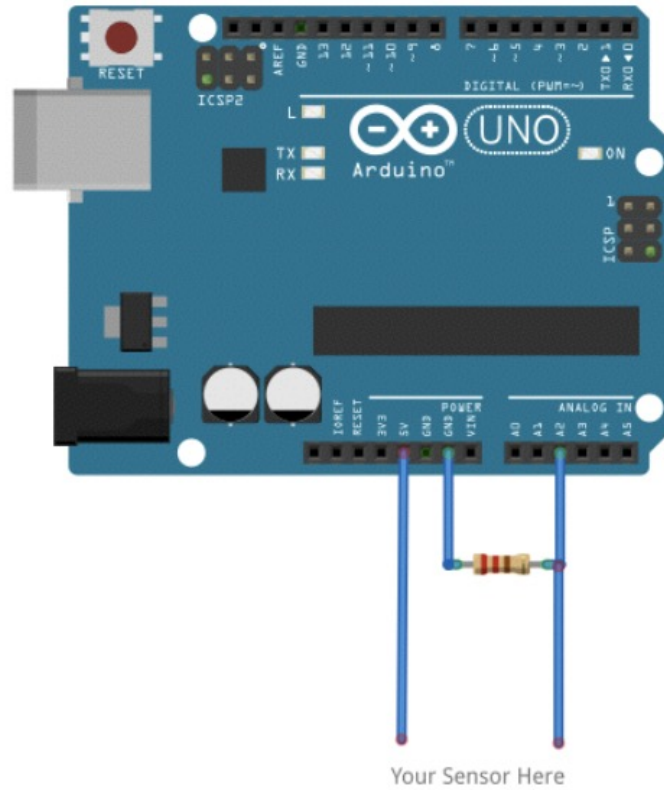
The logo features the word "Velostat" in a white, sans-serif font, centered within a light beige rectangular box. This box is enclosed by a thin, dashed white border. The entire assembly is set against a dark gray rectangular background. To the left and right of this central gray area are two overlapping, semi-transparent gold-colored rectangular blocks. The entire logo is centered on a solid black background.

Velostat


Using a Multimeter



With Arduino




Upload the code from canvas



The screenshot shows the Arduino IDE interface with the file 'VelostatSensor' open. The code is as follows:

```
VelostatSensor | Arduino 1.0.5  
  
void setup(){  
  Serial.begin(9600);  
}  
  
void loop(){  
  int sensorReading = analogRead(A2); // Reading from analog pin 2  
  Serial.println(sensorReading);  
  delay(250); //delay to slow down the output for easier reading  
}
```



The screenshot shows the Arduino IDE interface with the file 'VelostatSensor01' open. The Serial Monitor is also open. The code is as follows:

```
VelostatSensor01 | Arduino 1.0.5  
Serial Monitor  
  
int threshold = 500; // sensorReading ranges from 0 to 1023  
  
void setup(){  
  Serial.begin(9600);  
}  
  
void loop(){  
  int sensorReading = analogRead(A2); // Reading from analog pin 2  
  if (sensorReading>threshold)  
    Serial.print("ON_");  
  else  
    Serial.print("OFF_");  
  Serial.print(sensorReading);  
  Serial.print(" ");  
  delay(250); //delay to slow down the output for easier reading  
}
```

EeonTex Conductive Fabric



EeonTex NW170-PI fabric is a conductive, nonwoven microfiber for use in e-textiles as well as electromagnetic and resistive heating applications.

EeonTex Conductive Fabric is highly conductive with a tunable surface resistivity of 8 Ohm/sq to 105 Ohm/sq.



SPARKFUN
PRODUCT SHOWCASE

EeonTex Conductive Fabric


sparkfun

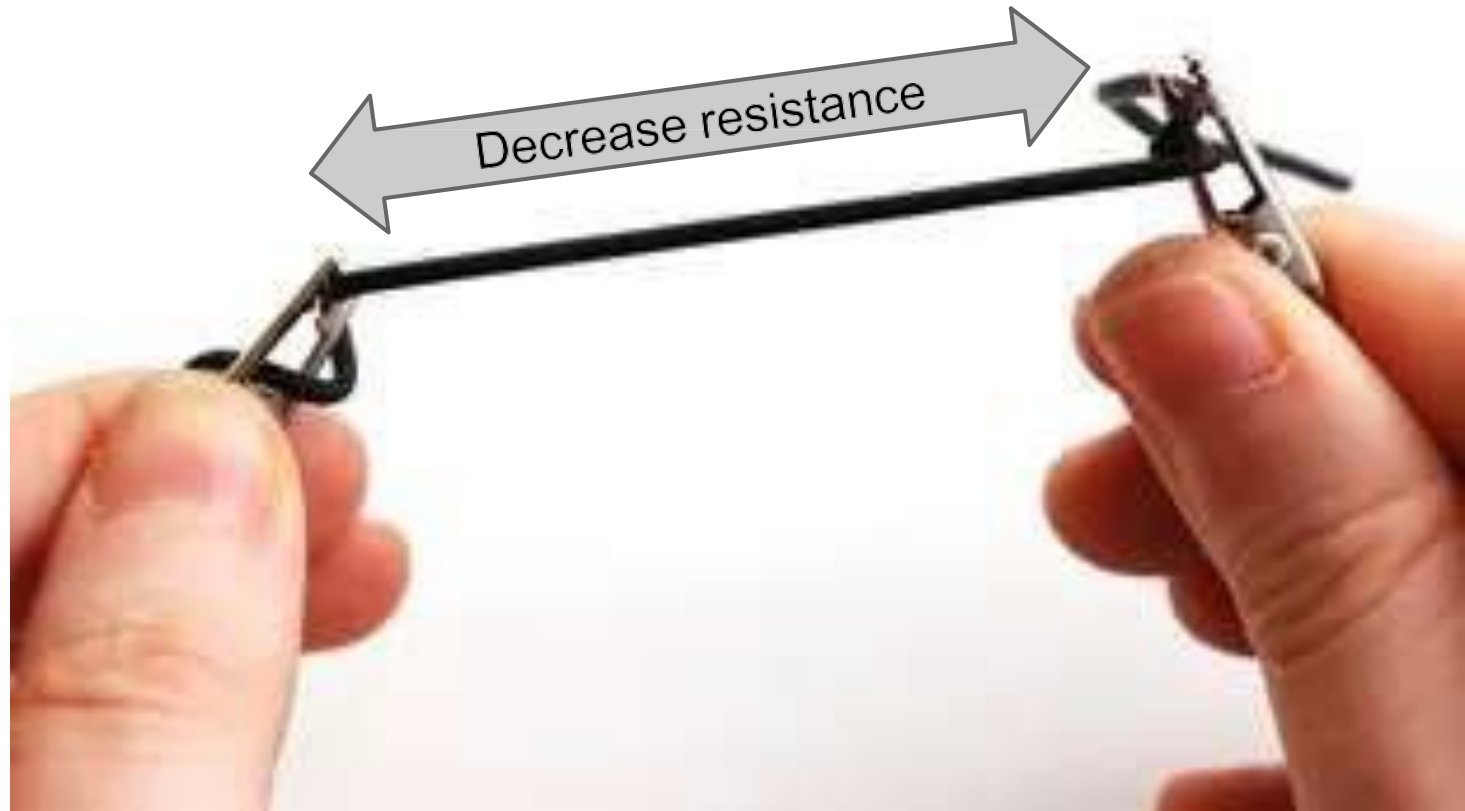
Digitally Fabricating the Fabric Sensors

https://www.youtube.com/watch?v=ByR_TMYiWgA

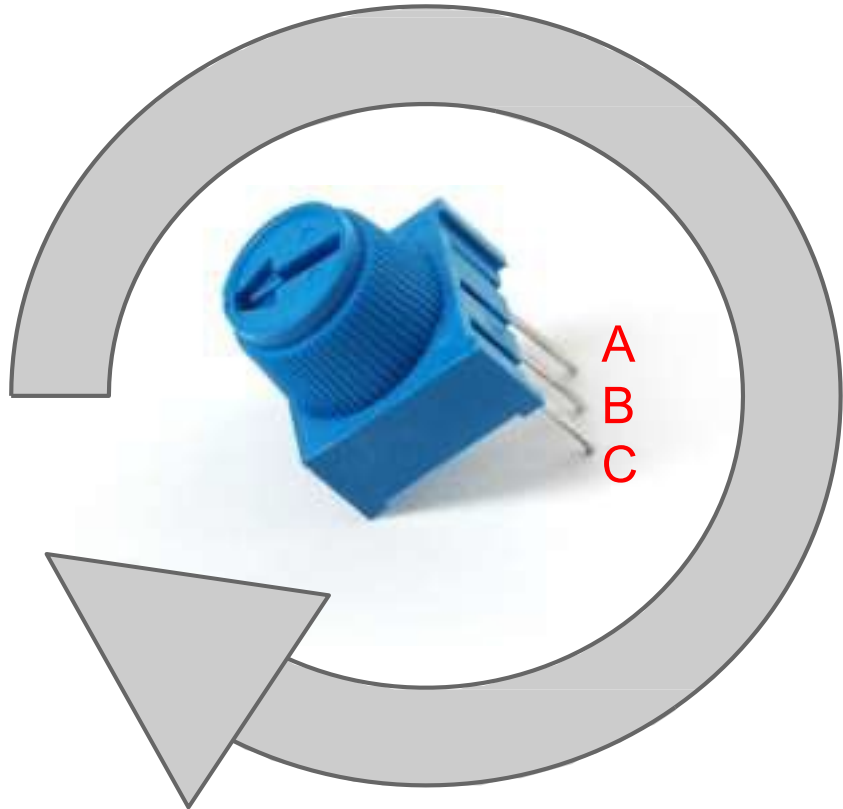
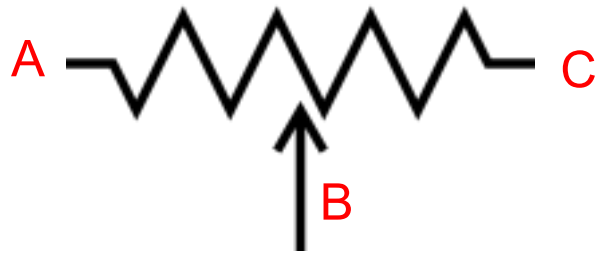
<https://www.youtube.com/watch?v=ITYGILCULPo>

Other Wearable Sensitive Material

Conductive Stretch Cord



Soft Potentiometer



Enchanting More Everyday Objects

Cuddly:

Enchant Your Soft Objects with a Mobile Phone



<https://www.youtube.com/watch?v=krbvQG14DSM>

Let's try to make it using a light sensor