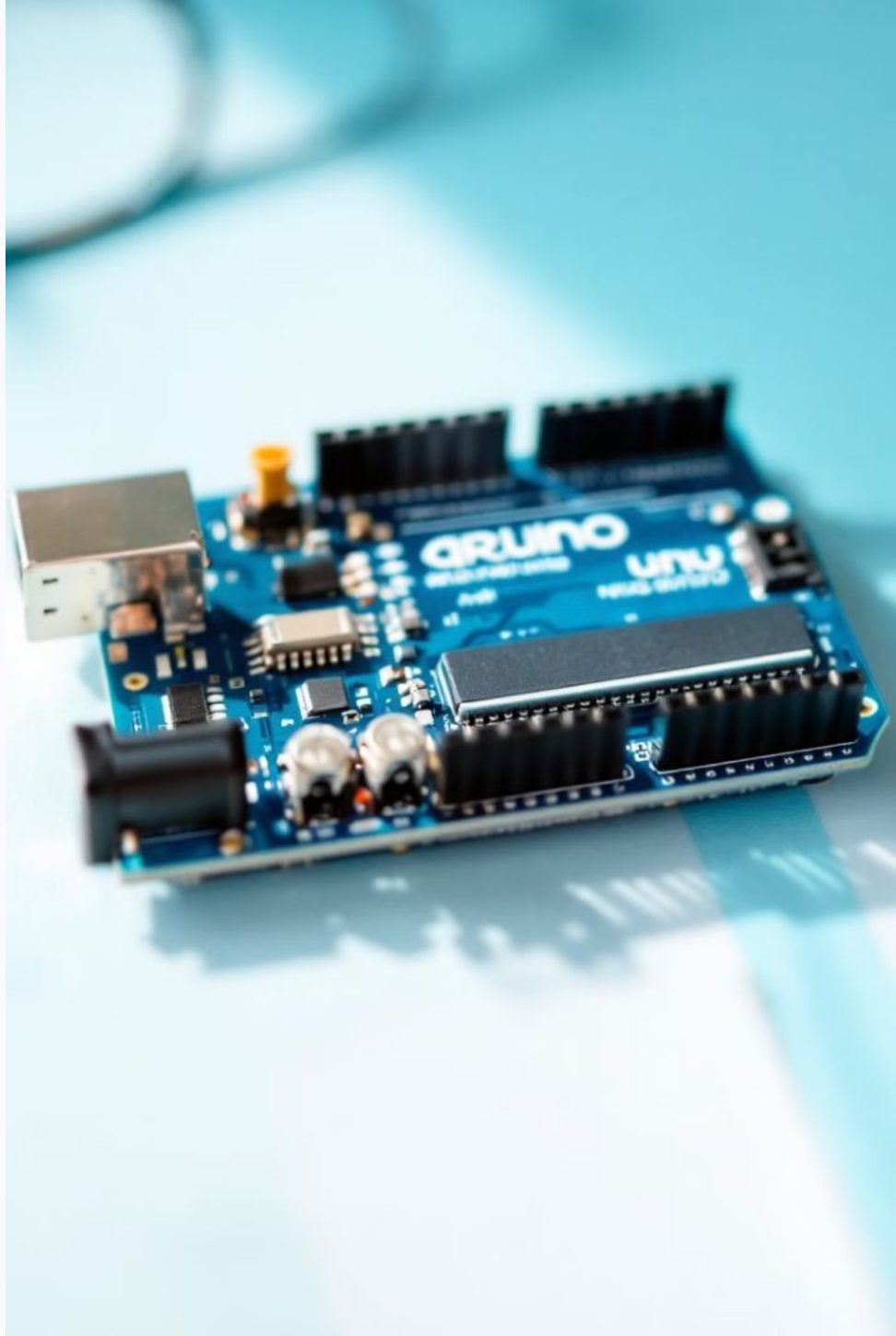
Lesson 3: Conductive Ink as a Sensor

Sensing

Using conductive materials for touch sensitivity.

Introduction to Arduino

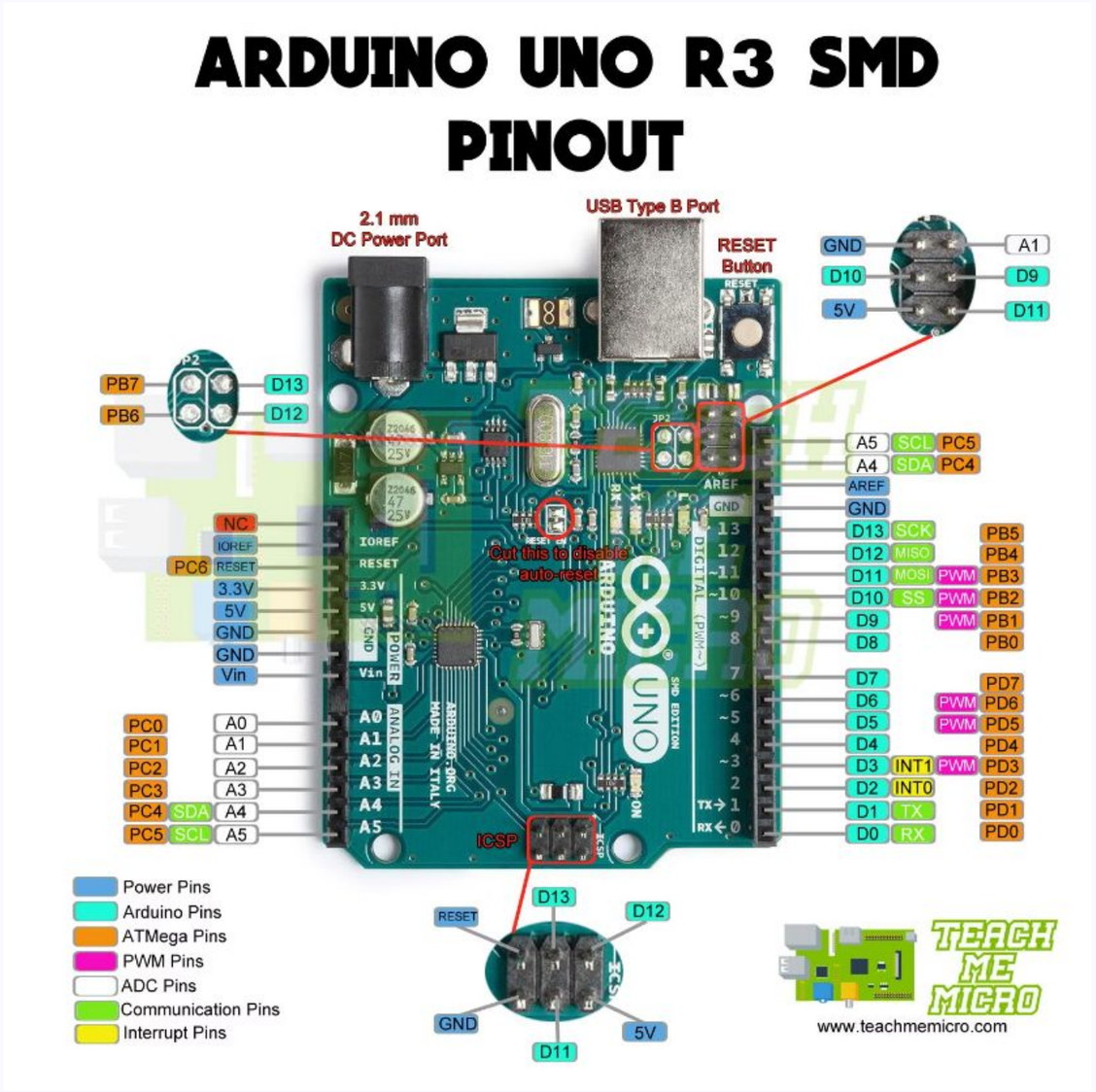
Arduino is an open-source electronics platform based on easy-to-use hardware and software. It is designed to make the process of creating interactive projects more accessible to artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

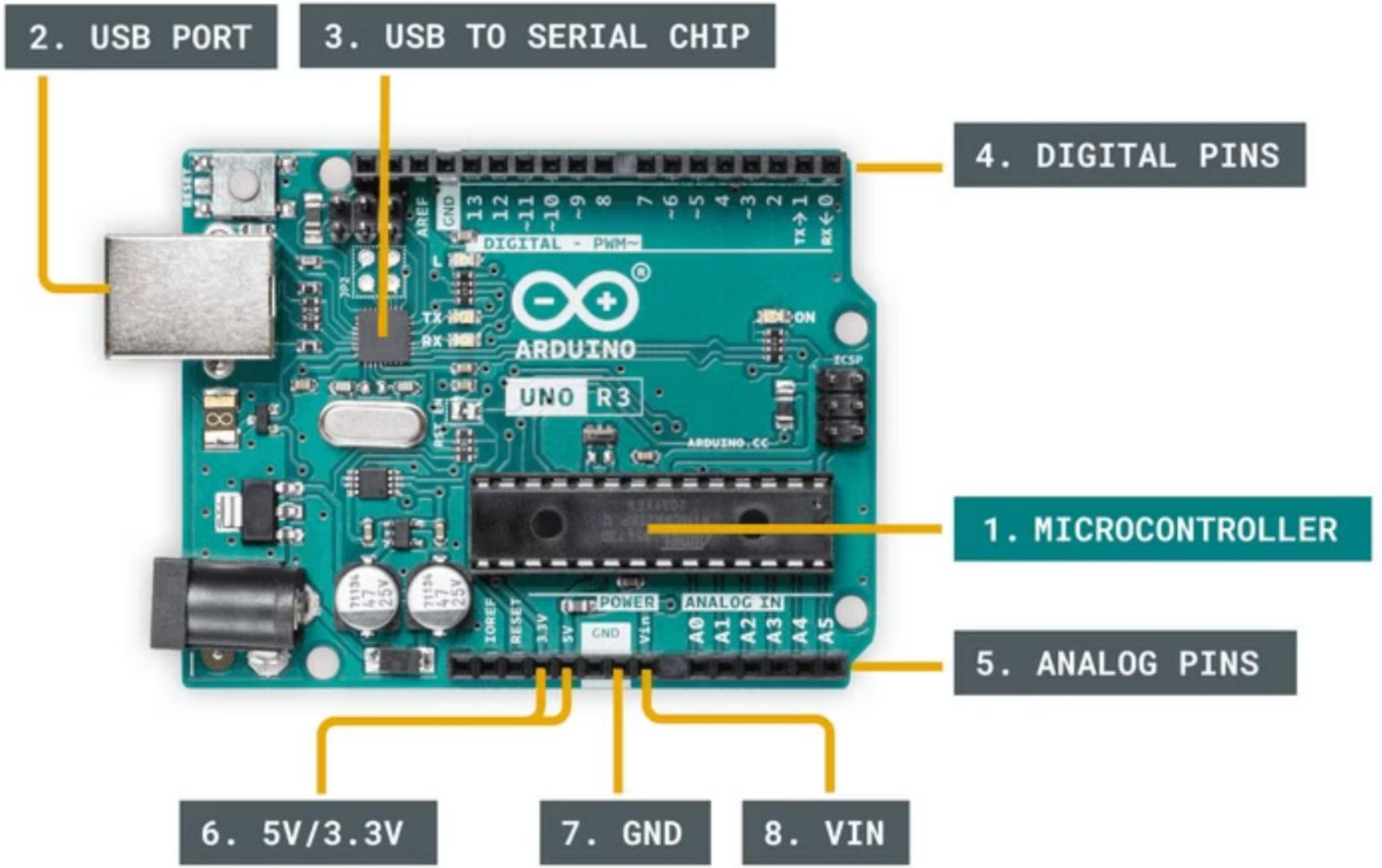


Arduino Uno R3

The Arduino Uno R3 is our microcontroller of choice for the inkstrument project because of its reliability and extensive community support. This board features an ATmega328P microprocessor with:

- 14 digital input/output pins (6 can be used as PWM outputs)
- 6 analog inputs for reading our conductive ink sensors
- USB connection for programming and serial communication




2. USB PORT
3. USB TO SERIAL CHIP
4. DIGITAL PINS
1. MICROCONTROLLER
5. ANALOG PINS
6. 5V/3.3V
7. GND
8. VIN
ARDUINO
UNO R3
DIGITAL - PWM~
POWER
ANALOG IN
ARDUINO.CC

Serial Communication: Connecting Arduino with Creative Software

Arduino can seamlessly exchange data with creative coding platforms through serial communication protocols (RS-232, SPI, USB, CAN, I2C, and Modbus). This connectivity enables our conductive ink sensors to control sound, visuals, and interactive experiences in software below:

Processing

Create visual responses to touch gestures by sending sensor values from Arduino to Processing sketches using the Serial library.

Processing

Welcome to Processing!

Processing is a flexible software sketchbook and a language for learning how to code. Since 2001,...

TouchDesigner

Build interactive installations by feeding Arduino sensor data through COM ports into TouchDesigner's real-time node-based environment.

Derivative

Derivati...

Derivative is a software company that offers TouchDesigner, a visual development platform.

Max/MSP

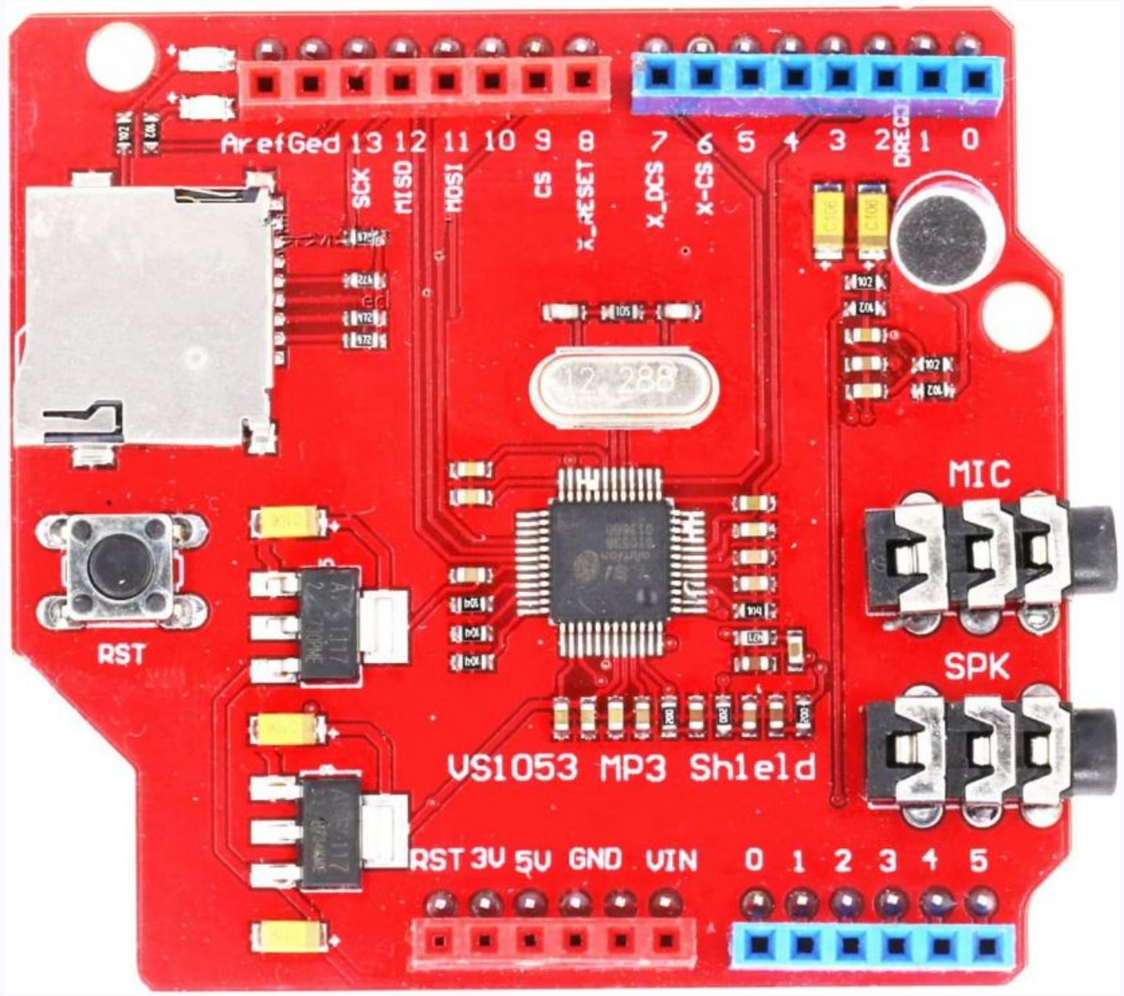
Generate complex sounds and musical compositions by routing conductive ink sensor readings from Arduino into Max/MSP.

cycling74

Cycling '74

Tools for sound, graphics, and interactivity

VS1053 MP3 Shield



The VS1053 audio codec breakout board

The VS1053 is a versatile audio codec that's perfect for creating interactive music with conductive ink instruments.

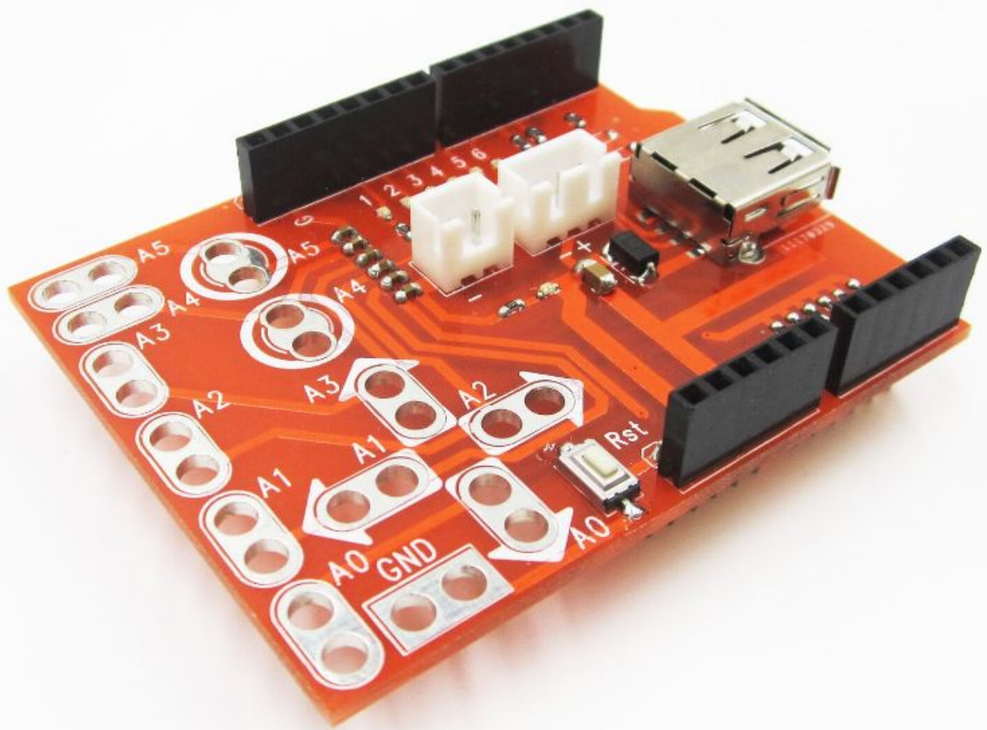
This shield enables Arduino to play MP3, WAV, MIDI, and OGG files, making it ideal for responsive sound installations.

the VS1053 translates capacitive touch inputs into dynamic sound output, creating an intuitive musical interface.

With a microSD card slot (up to 32GB), it can store and trigger complex soundscapes based on different touch gestures.

The 3.5mm audio jack and optional speaker terminals deliver high-quality stereo sound with minimal additional components.

Touch key USB



The Touch Key USB shield is an Arduino-compatible expansion board that transforms conductive surfaces into touch-sensitive inputs via capacitive sensing. This shield connects directly to our Arduino Uno R3, providing up to 16 touch-sensitive channels without requiring physical buttons. It's ideal for our conductive ink projects as it can detect touch through paper, plastic, or fabric coated with conductive ink, allowing us to create custom interactive interfaces that trigger sounds or control parameters in our electronic instruments.

Introduction to Theremins

1

History

Invented in 1920 by Russian physicist Léon Theremin, it was one of the earliest electronic instruments.

2

Principle

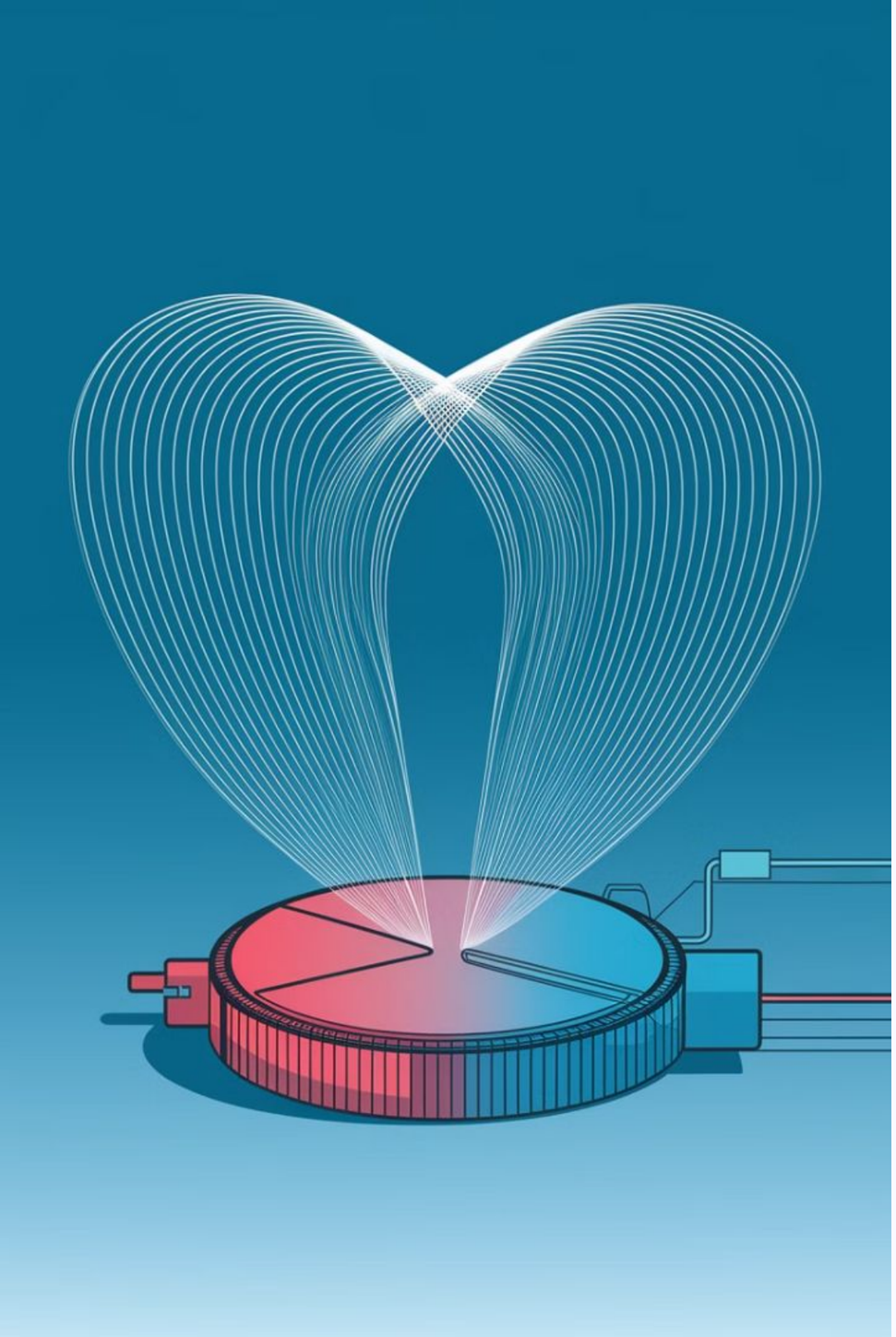
The theremin is controlled by hand gestures without physical contact, using antenna that sense the position of the player's hands.

3

Demonstration

Let's listen to the unique, ethereal sound of a theremin and see how hand movements affect the pitch and volume.

THEREMIN
a short
introduction



Capacitive Sensing Basics

1 **How it Works**

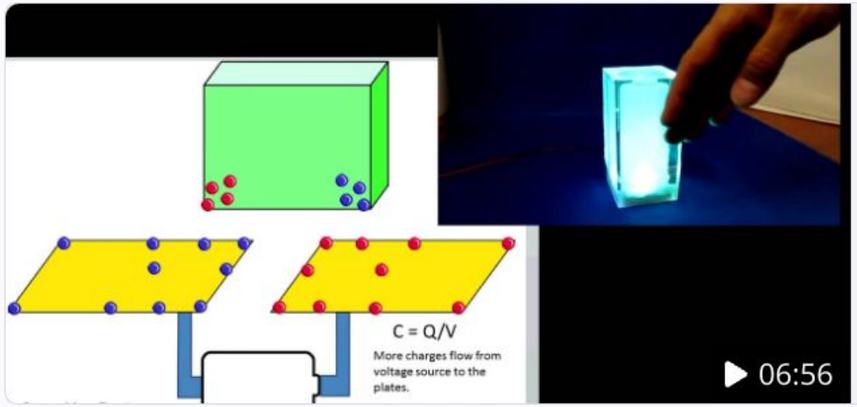
Detects changes in electrical capacitance.

2 **Applications**

Touchscreens, proximity sensors, and more.

3 **Sensitivity**

Affected by sensor size and design.

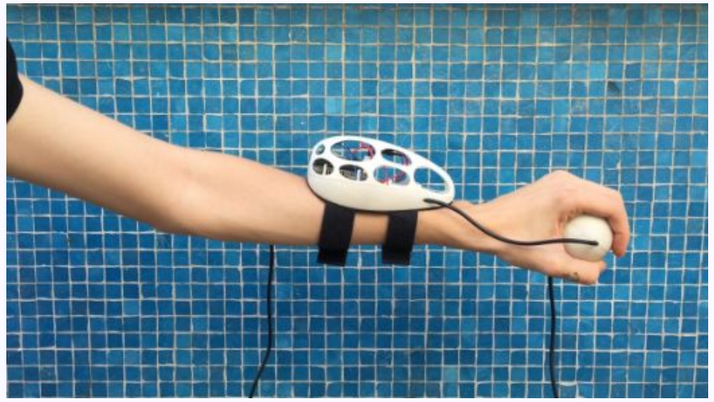


YouTube

Capacitive sensor, Theory, application and design

This video explains the physics behind the surface capacitive sensors, with numerical results supporting the theory. A video for the projected capacitive senso...

Brainstorm
sketch
A/a



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