

# Simple DIY Audio

Circuits that make weird,  
entertaining noises



# About me

I love music and electronics,  
but I don't know a lot in either one.

I just finished a BE in Electrical Engineering

I love the internet,  
and hence cats.



# Why this pres?

Learn some basic ideas about sound and producing sound for projects / music / fun.

Give you building blocks  
so that you can  
build monsters like these:



# What this pres is about

Some Lo-fi circuits:

1. Amplifiers (makes louder)
2. Synthesizers (makes noises)

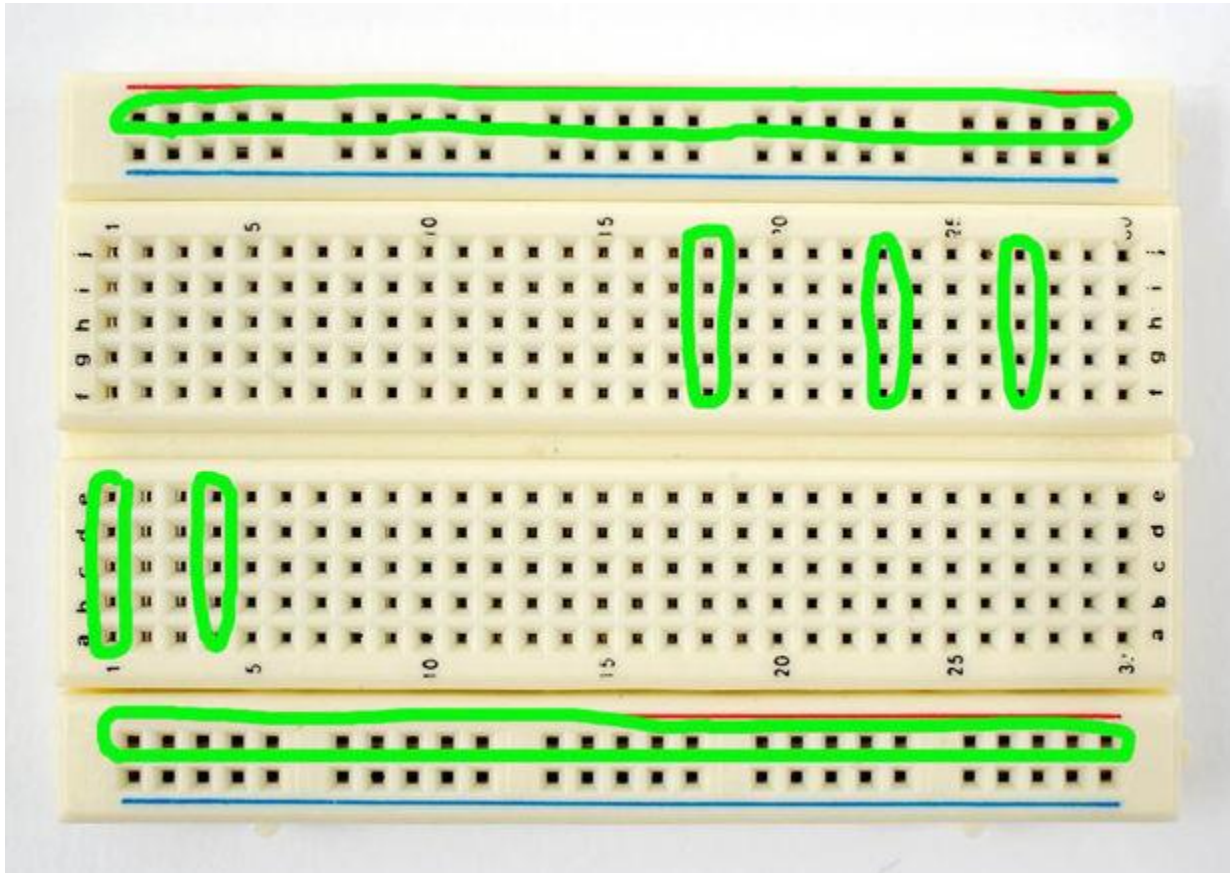
# Your friends in this journey

1. Breadboards
2. Speakers
3. Wires
4. Multimeter
5. Misc. small electronic components (resistors, capacitors, IC's, diodes, etc.)

(Optional, although very nice to have: )

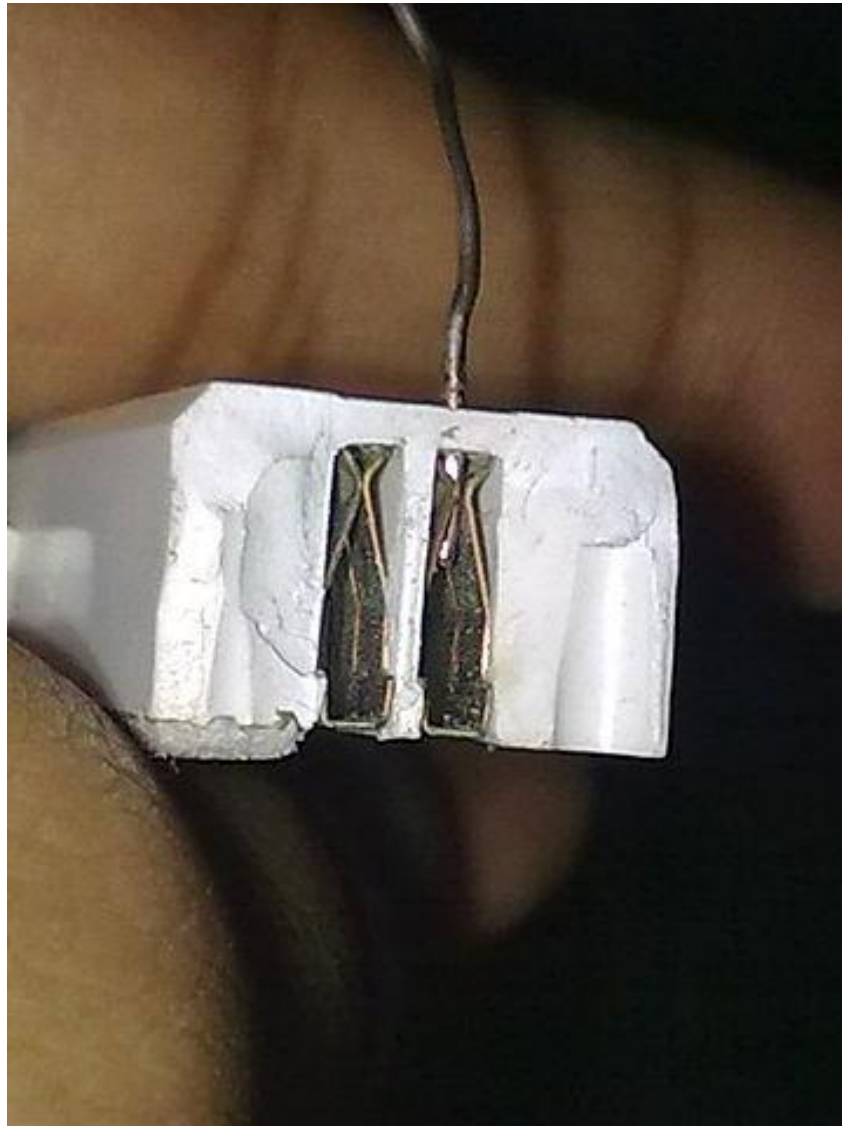
1. Oscilloscope
2. Soldering Iron + Solder + flux + etc.

# A note about breadboards



# Inside a breadboard?





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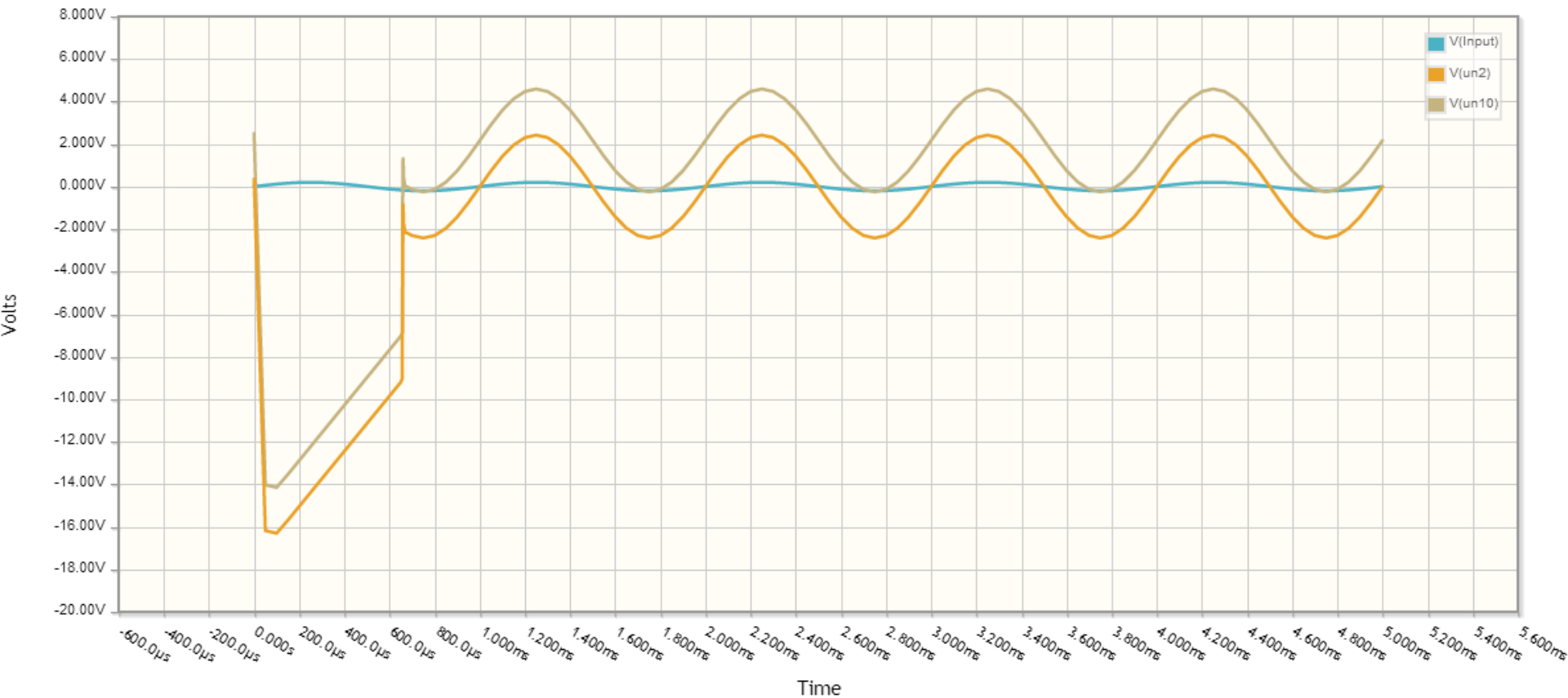
# Simple Amplifier

Demoo



# Amplifiers

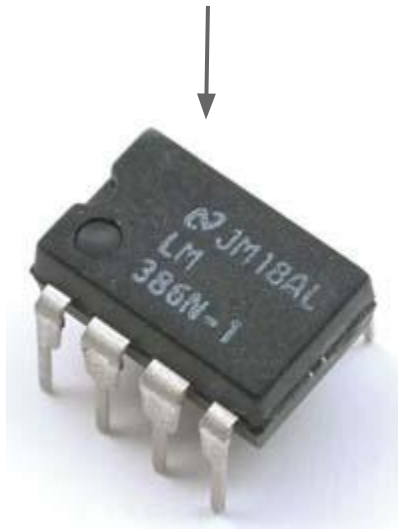
They amplify the voltage of your signal.



# Operating Principle

External Power Source

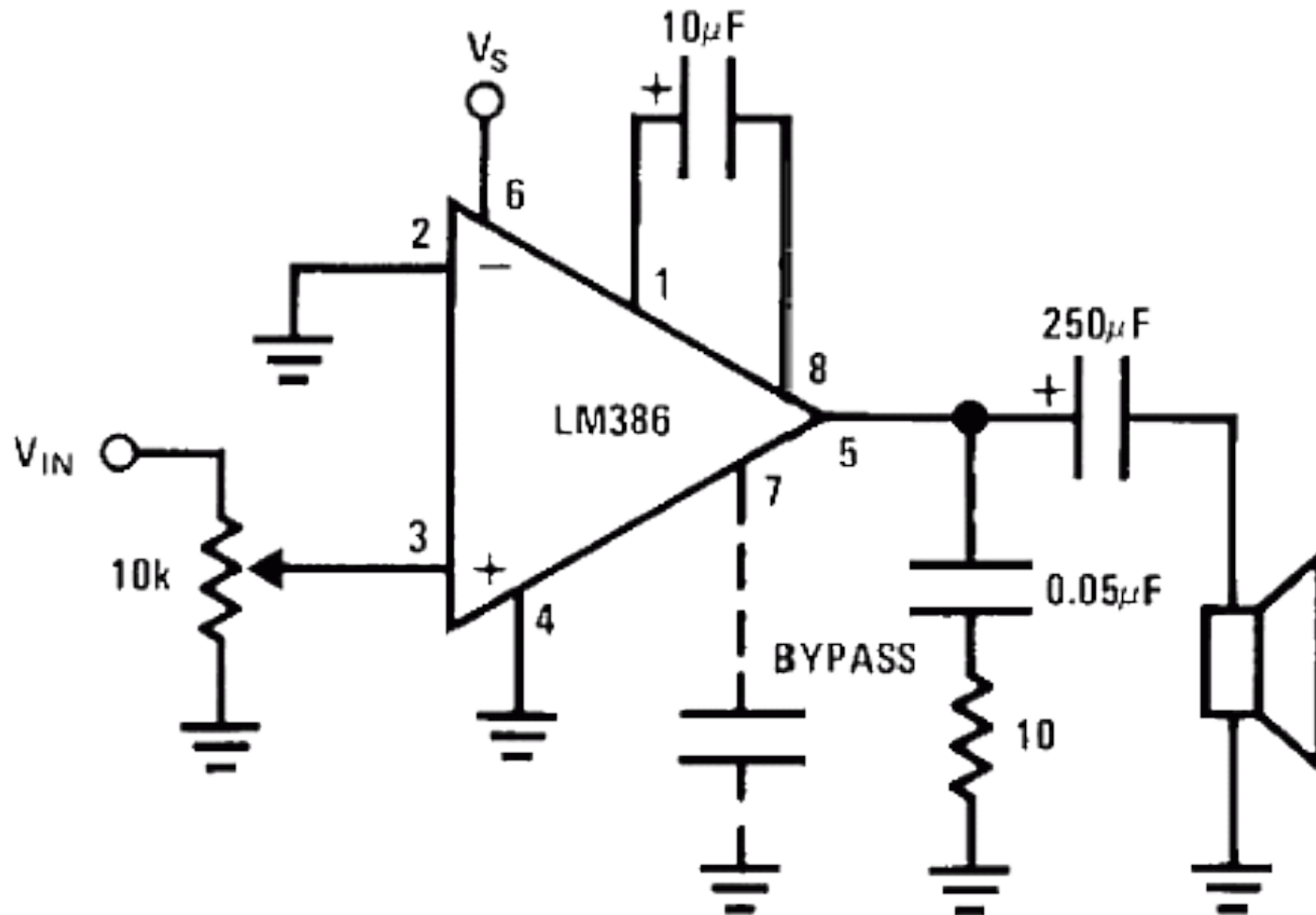
Input  
Voltage  
(weak)



Output  
Voltage  
(strong)



# LM386 amplifier circuit



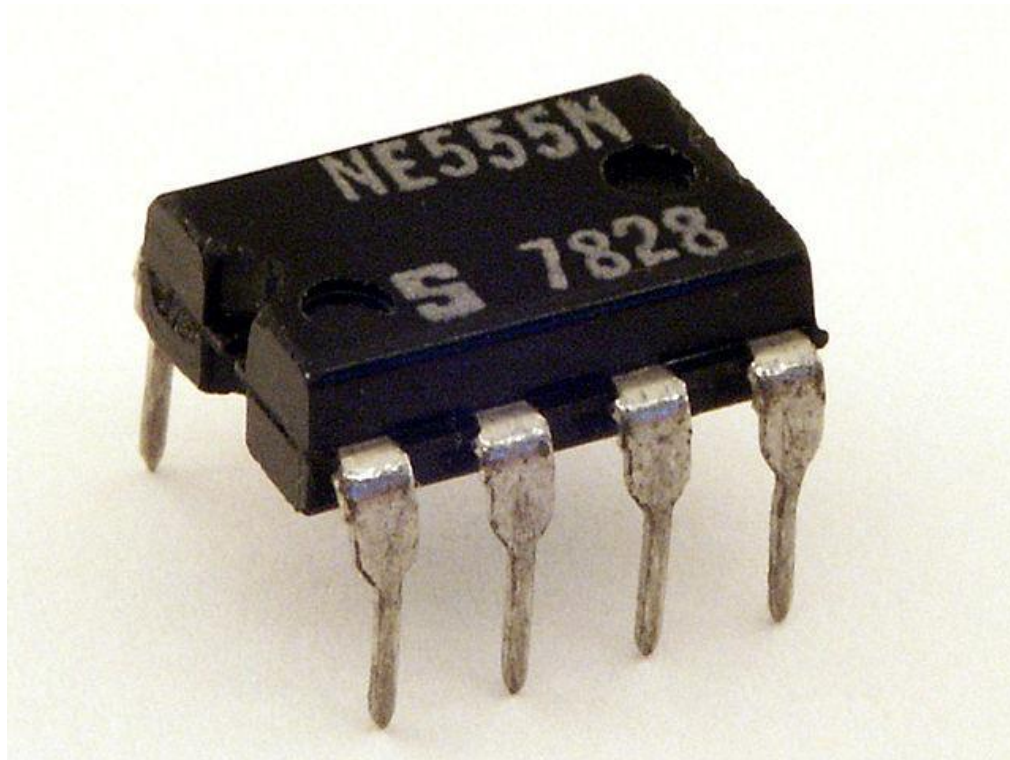
# Atari Punk Console

Demo



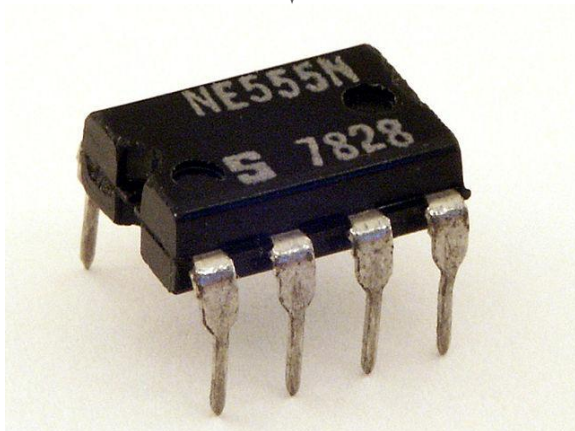
# 555

It can be used as a timer, oscillator or a pulse generator.

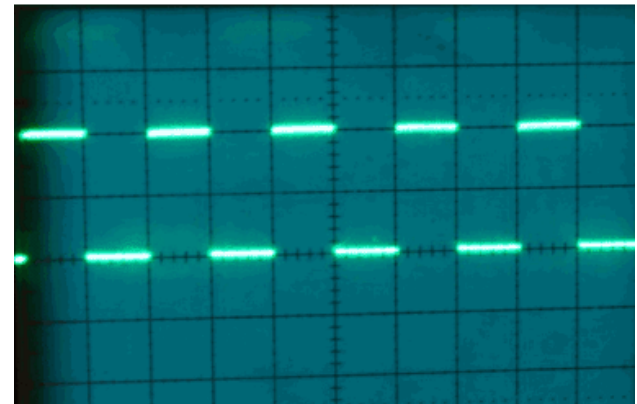


# The basic idea

External voltage source - input



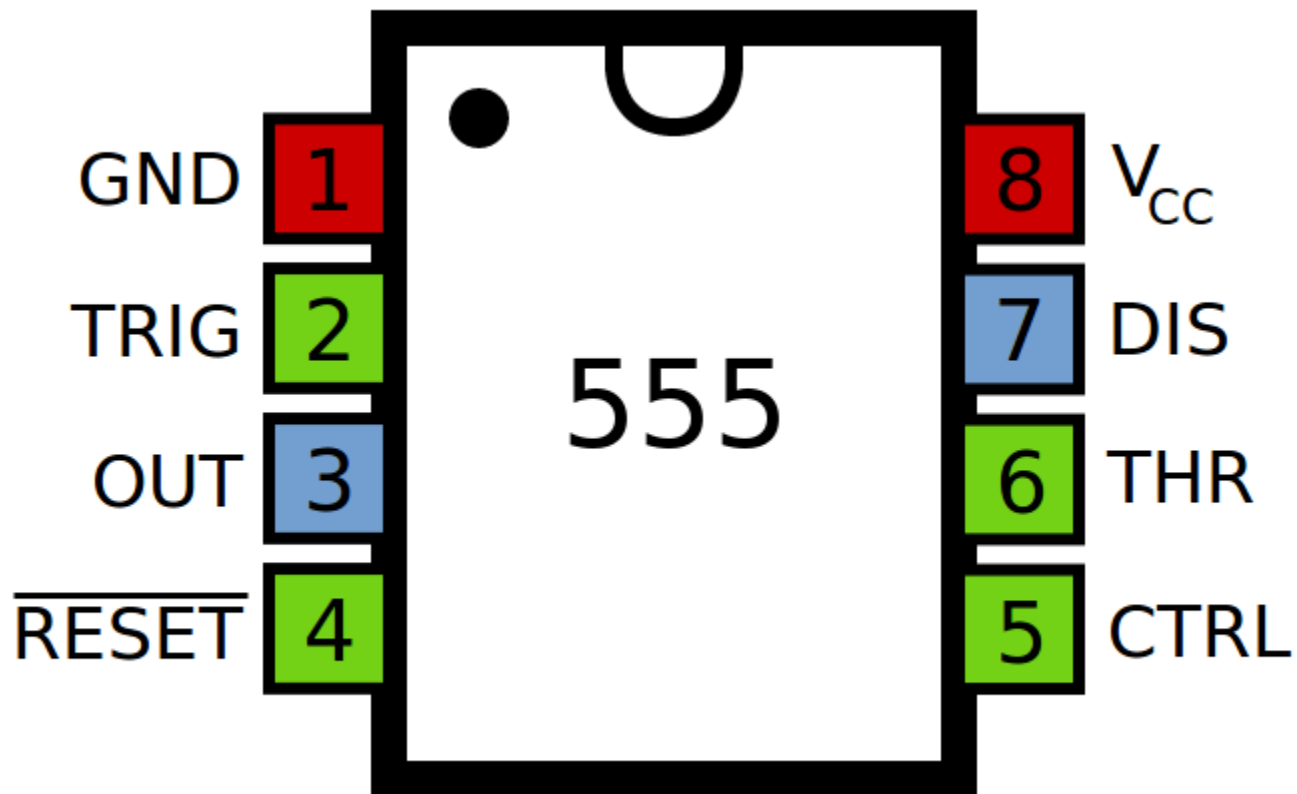
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Square wave  
- output



## 555 - contd.





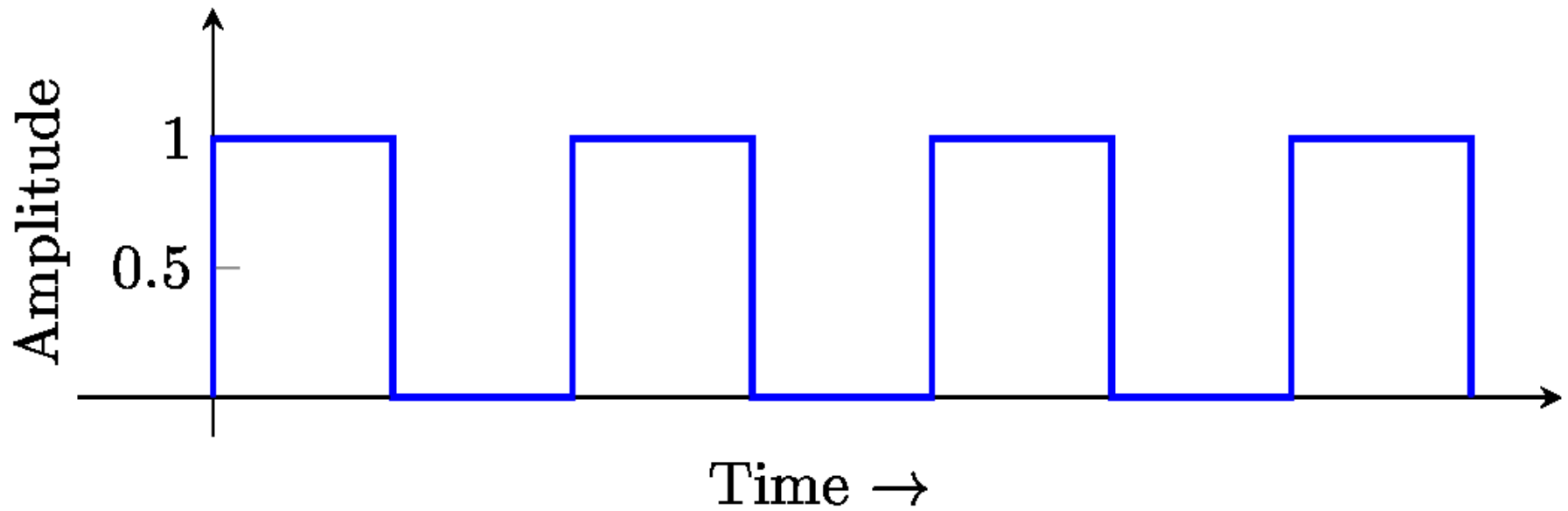
# Atari Punk Console - Details

It uses **two** 555 chips.

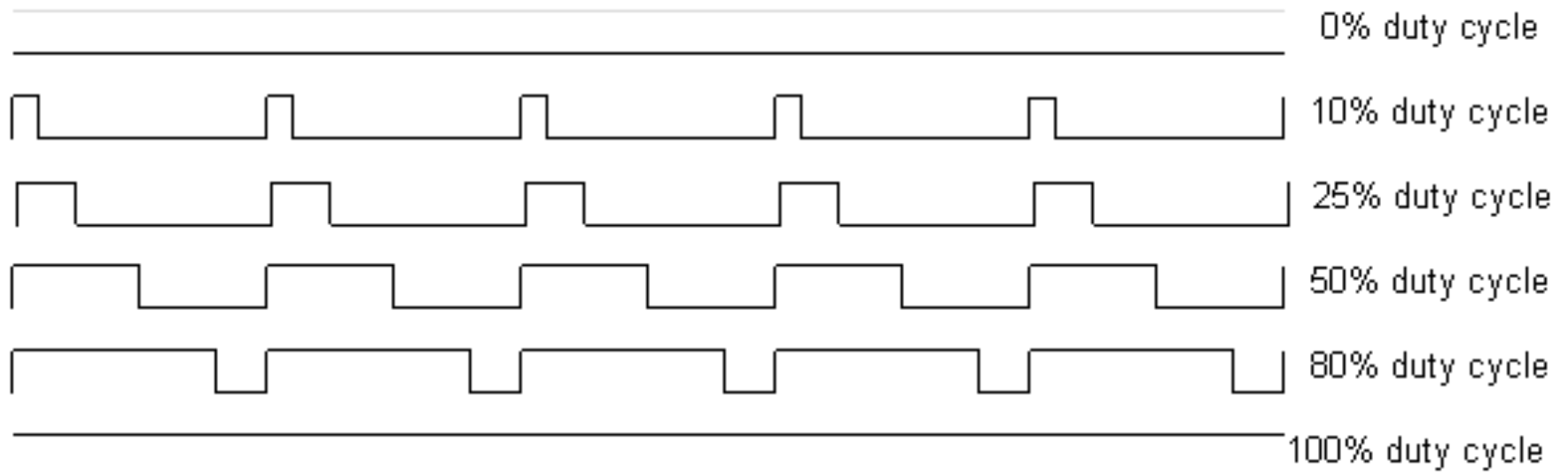
1. One is used as an square wave oscillator and hence can be used to change the frequency
2. The other is used as a 'monostable' oscillator, and is used to vary the 'width' of the square wave

# Square Wave

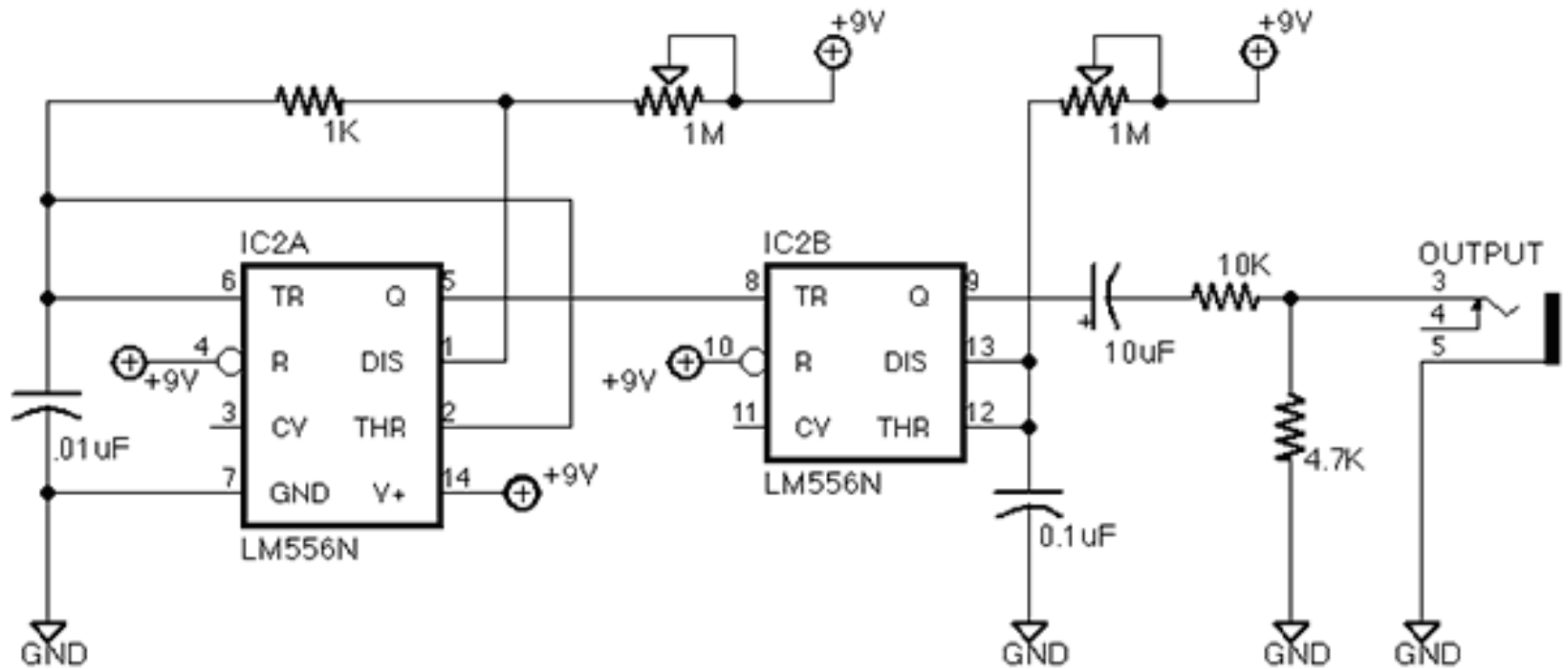
Square wave



# A square wave's 'width': **Duty Cycle**



# Circuit Diagram



# The 40106 IC

The Inverting Hex Schmitt-Trigger is a circuit that does two things:

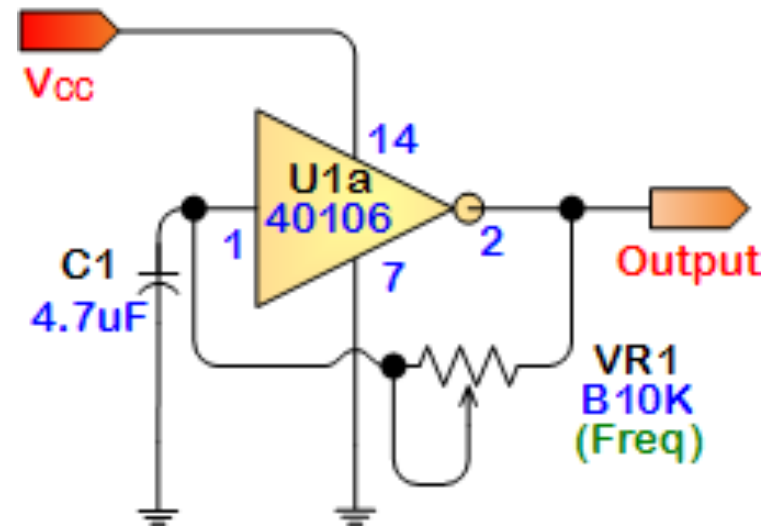
1. Output goes **low** when input is **high**
2. Output goes **high** when input is **low**

We can use resistors and capacitors to 'force' the input to go high and low

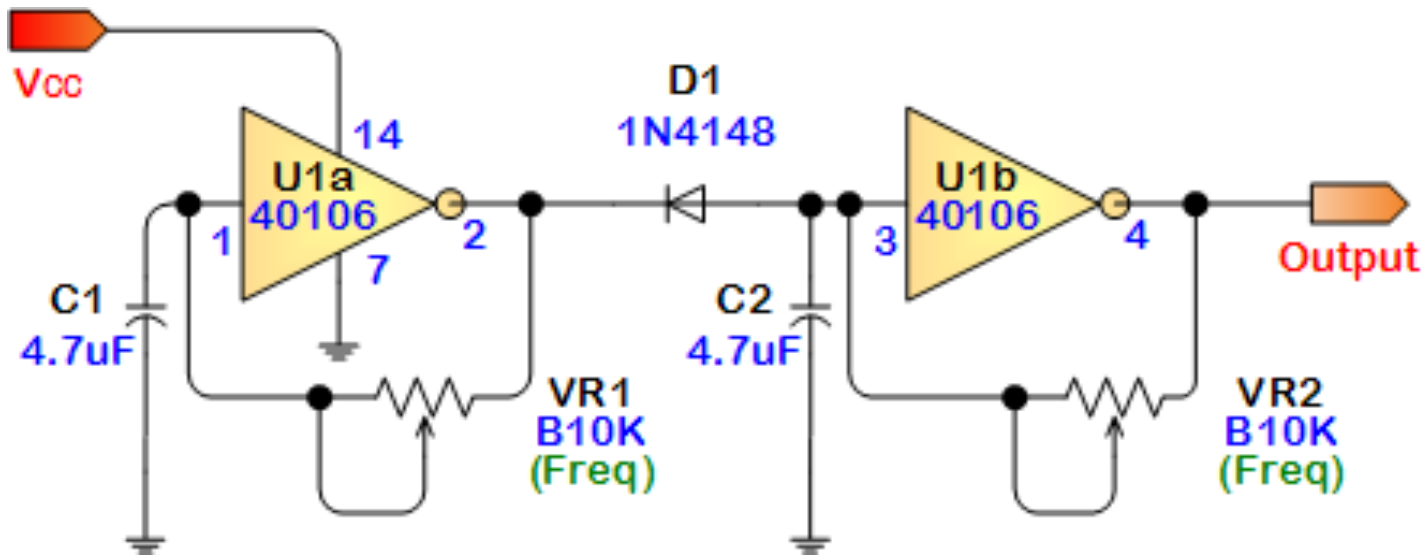
- Thus we can obtain a square wave output.

# A simple 40106 Synth

The 4.7uF Capacitor & The 10k Pot place the output signal's frequency in the audible range.

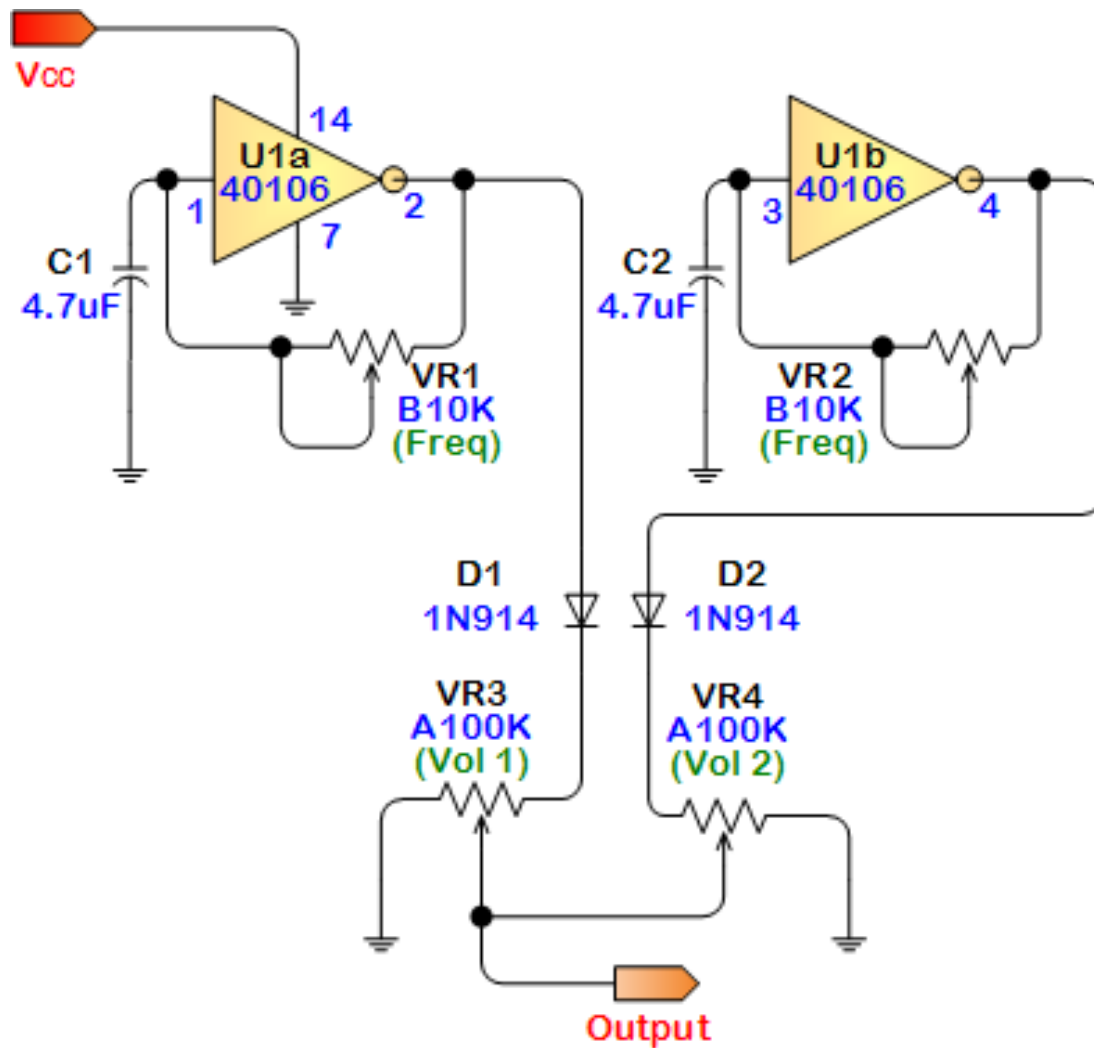


# Dual oscillator



The output of Oscillator 1 is fed into the input of Oscillator 2

# 'mixing' two oscillators



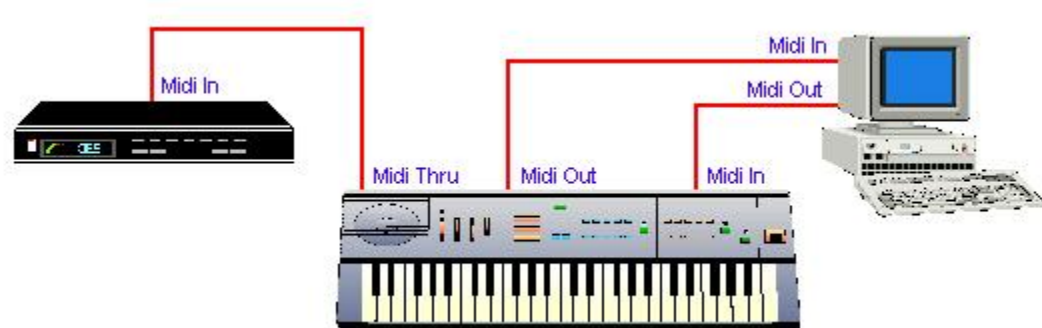


# An intro to the digital

## MIDI -

A standard 'language' electronic instruments 'talk' to each other with.

But now, instruments and computers too!



# The alphabet of this language

Channel	Instrument	Velocity
[0 - 15]	[0 - 127]	[0 - 127]

Eg:    0                      60                      64 [Middle C(piano)]

—————→  
time

# **Your computer's secret**

The Microsoft GS Wavetable SW Synth -

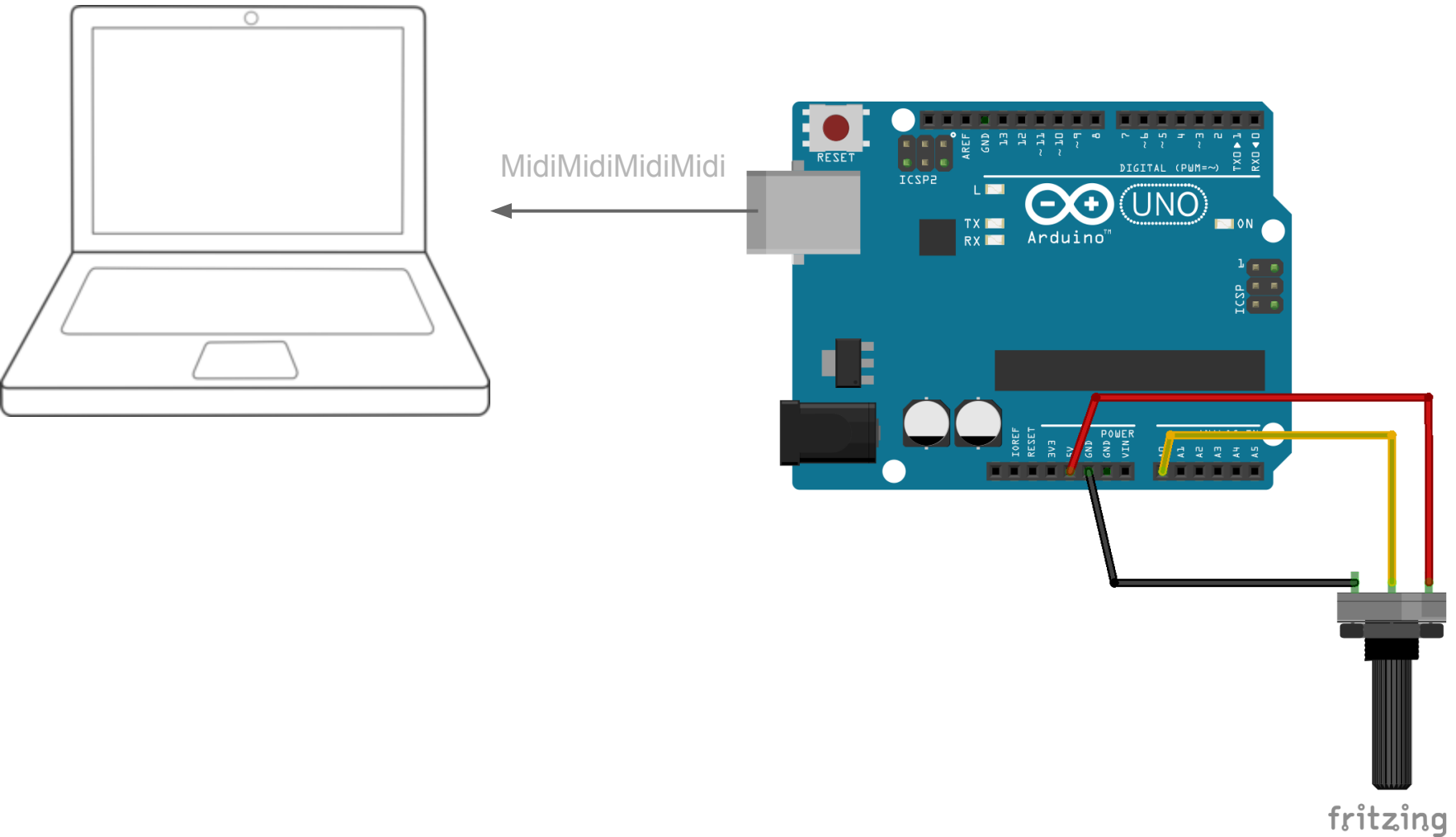
A set of sounds with all the notes on many instruments - 128 of them!

# One way to tap into your computer's synth

You will need:

- Arduino board
- Some sort of input device  
(that can be used with the Arduino)
- A computer

# Circuit



# The Arduino Program

- Read Pot value
- Convert Pot value(0-1024) to note value(0-127)
- Assemble the MIDI note
- Send MIDI note via USB cable to the computer

# Further hackz

1. Use buttons instead of potentiometers
2. Try to make a sine/triangle/sawtooth-wave generator instead of a square wave generator
3. Arduino - Use other wacky input sensors (Accelerometers, air-meter, etc)