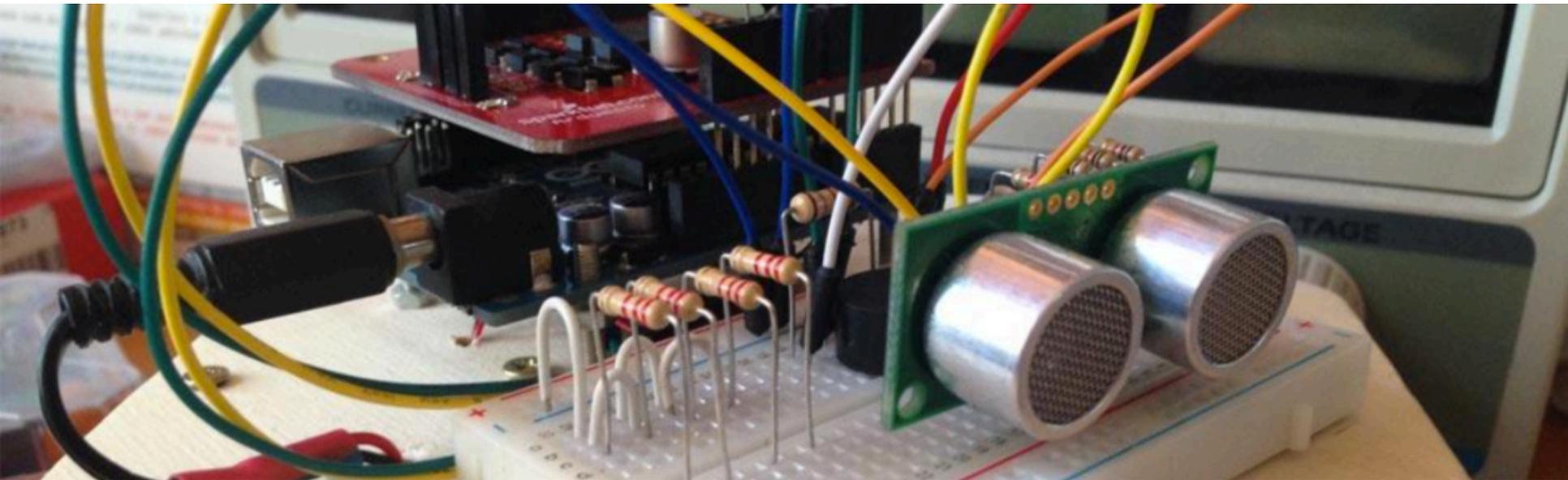


Electronic Prototyping

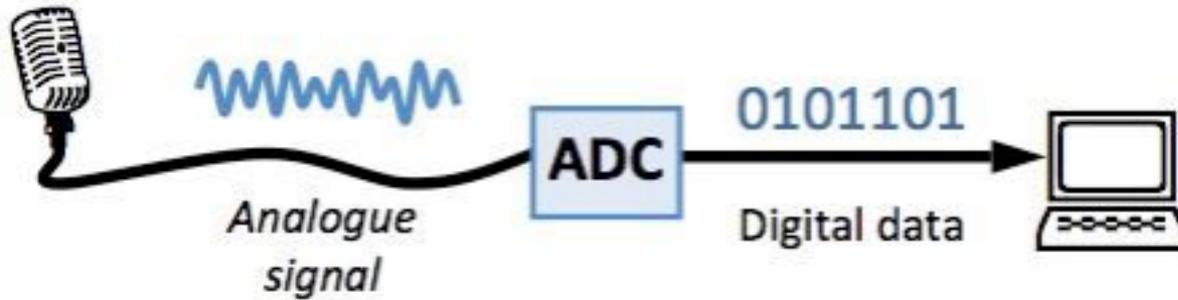
Analog to digital converter

Lesson 5

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Analog to digital converter



The Analog to Digital Conversion Process (1/2)

- Sounds are analog - they are made of waves that travel through matter. People hear sounds when these waves physically vibrate their eardrums.
- Since Computers are digital devices, they cannot understand these continuous pressure variable analog signals, so they communicate digitally, using electrical impulses that represent 0s and 1s (i.e., through Binary).

Binary Notations:

- One binary digit (0 or 1) is referred to as a bit, which is short for binary digit. One bit can only be used to represent 2 different values: 0 and 1.
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The Analog to Digital Conversion Process (2/2)

- To represent more than two values, we need to use multiple bits.
- Two bits combined can be used to represent 4 different values:
 - 00, 01, 10, and 11.
- Three bits can be used to represent 8 different values:
 - 000, 001, 010, 100, 011, 101, 110 & 111.
- In general, 'n' bits can be used to represent 2^n different values.

2^0	1
2^1	2
2^2	4
2^3	8
2^4	16
2^5	32
2^6	64
2^7	128
2^8	256
2^9	512
2^{10}	1024
2^{11}	2048
2^{12}	4096

Arduino Due ADC

- The **Due** has the following hardware capabilities:
 - Resolution is defaults to 10 bits (returns values between 0-1023)
 - 2 pins with 12-bit DAC (Digital-to-Analog Converter)
 - The Due boards have 12-bit ADC capabilities that can be accessed by changing the resolution to 12.
 - This will return values from `analogRead()` between 0 and 4095.
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Example 1: Potentiometer

- Simulation of analog sensor using a potentiometer



Open Example 1 in the share folder

Example 2: Millivolts value

- Simulation of analog sensor using a potentiometer and conversion in millivolts

Open Example 2 in the share folder

Exercise: Temperature sensor LM35

- Find the Datasheet
- Reading the temperature and print the value in:
 - Celsius
 - Fahrenheit
 - Kelvin

