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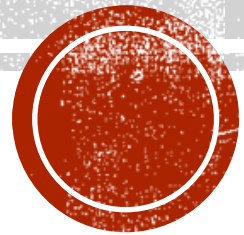
INTRODUCTION TO ARDUINO



ARDUINO

- Arduino is the go-to gear for artists, hobbyists, students, and anyone with a gadgetry dream.
- Arduino rose out of another formidable challenge: how to teach students to create electronics, fast.
- With Arduino, you can control almost everything around you be it simple LED or giant Robots.

ARDUINO - HISTORY

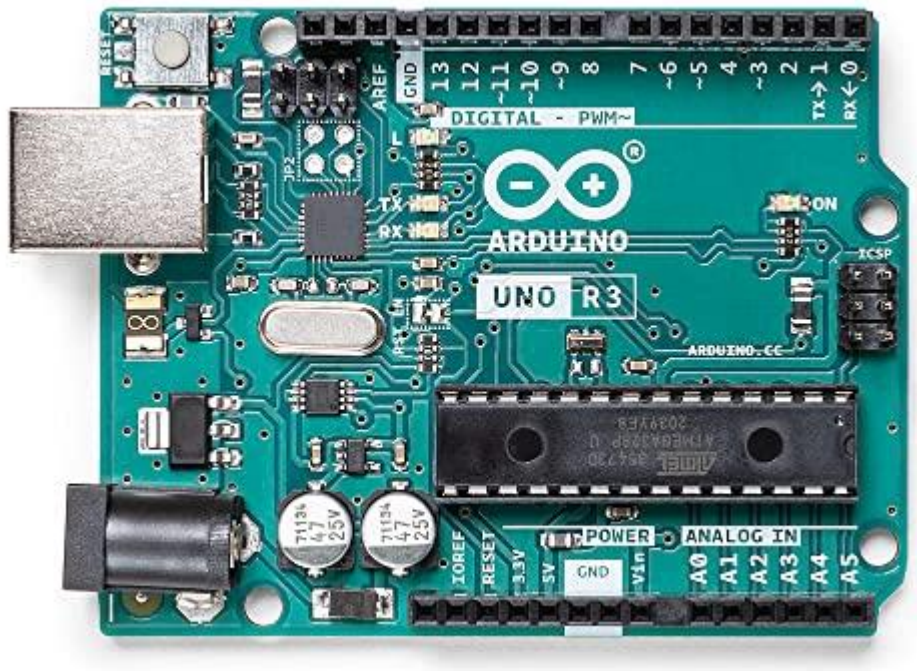
- The Arduino project began in 2005 as a tool for students at the Interaction Design Institute Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators.
- Open Source Hardware using ATMEL Processor(now owned by Microchip)
- Coding is accessible & transferrable → (C++, Processing, java)
- Main objective of this **Arduino was to make used friendly device for electronic project**

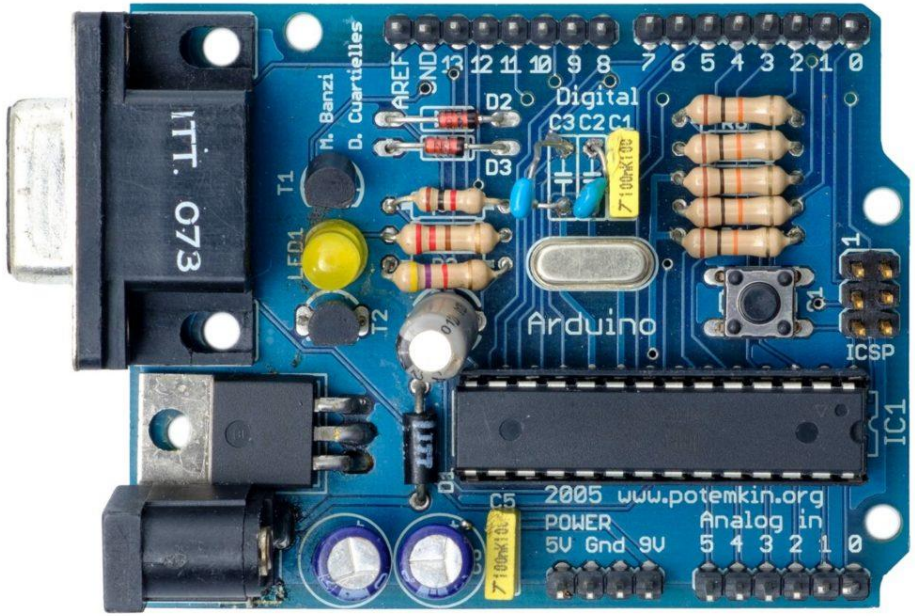
ARDUINO - HISTORY

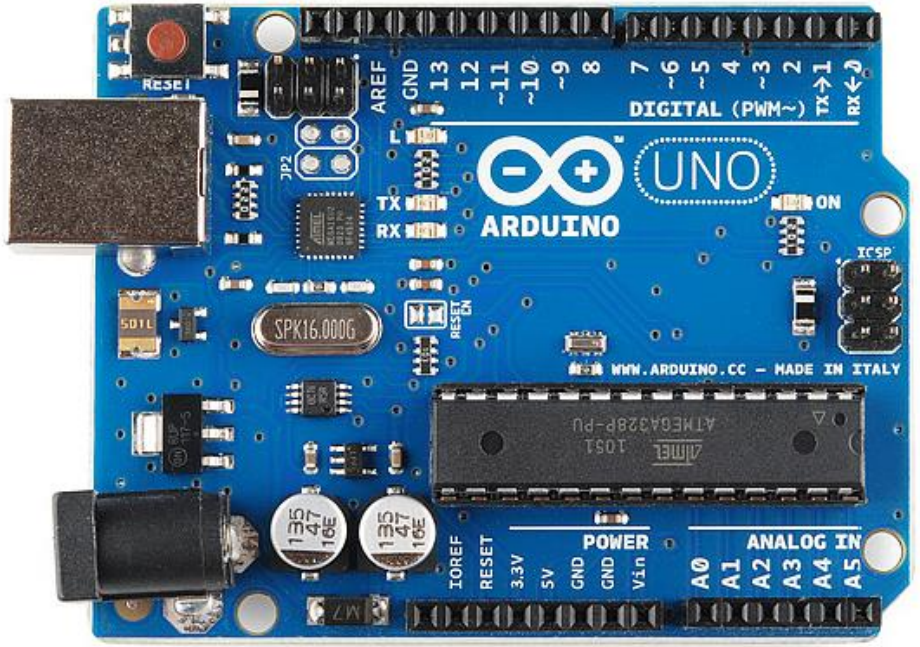
- First Arduino was created by five friends.
- "Massimo Banzi" & "David Cuartielles" at the Interaction Design Institute,Italy.
- "David Mellis" developed the Arduino software, which was based on Wiring. "Gianluca Martino" and "Tom Igoe" joined the project, and the five are known as the original founders of Arduino.

ARDUINO

- Basically Arduino is Microcontroller.
- Microcontroller is microprocessor with memory, RAM and some other peripheral connected with it.

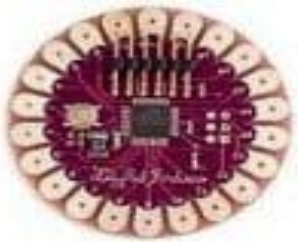






DIFFERENT TYPES OF ARDUINO

Arduino Uno



Arduino LilyPad

Arduino Mega 2560

Arduino Leonardo

Arduino Mega ADK

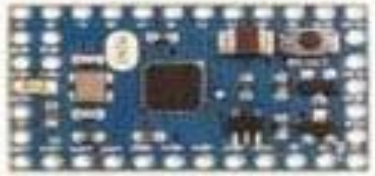
Arduino Ethernet

Arduino Pro

Arduino Nano

Arduino BT

Arduino Pro Mini



Arduino Mini

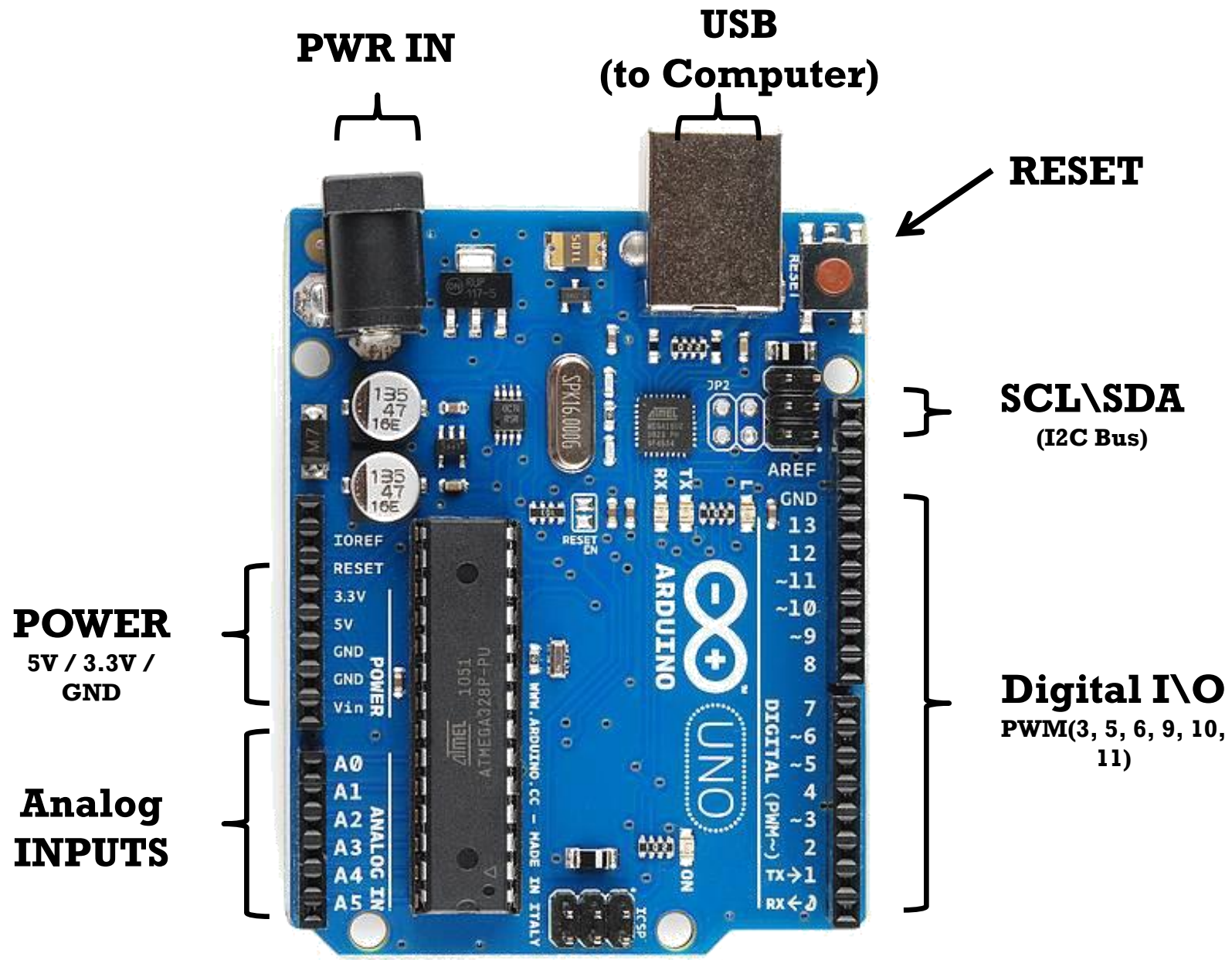
Arduino Fio

DIFFERENT TYPES OF ARDUINO

Board name	Year	Microcontroller	Board name	Year	Microcontroller
Diecimila	2007	ATmega168V	Mega 2560	2010	ATmega2560
LilyPad	2007	ATmega168V/ATmega328V	Uno	2010	ATmega328P
Nano	2008	ATmega328/ATmega168	Ethernet	2011	ATmega328
Mini	2008	ATmega168	Mega ADK	2011	ATmega2560
Mini Pro	2008	ATmega328	Leonardo	2012	ATmega32U4
Duemilanove	2008	ATmega168/ATmega328	Esplora	2012	ATmega32U4
Mega	2009	ATmega1280	Micro	2012	ATmega32U4
Fio	2010	ATmega328P	Yún	2013	ATmega32U4 + Linino

ARDUINO UNO

- What does it have?
  - 14 Digital In/Out pins (6 can be used as PWM) (0-13)
  - 6 Analog Inputs (A0, A1, A2, A3, A4, A5)
  - A USB Connection
  - A Power Jack
  - Reset Button
  - On-board LED
  - SCL/SDA pins (Serial Clock/ Serial Data pins)
- In short, it contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

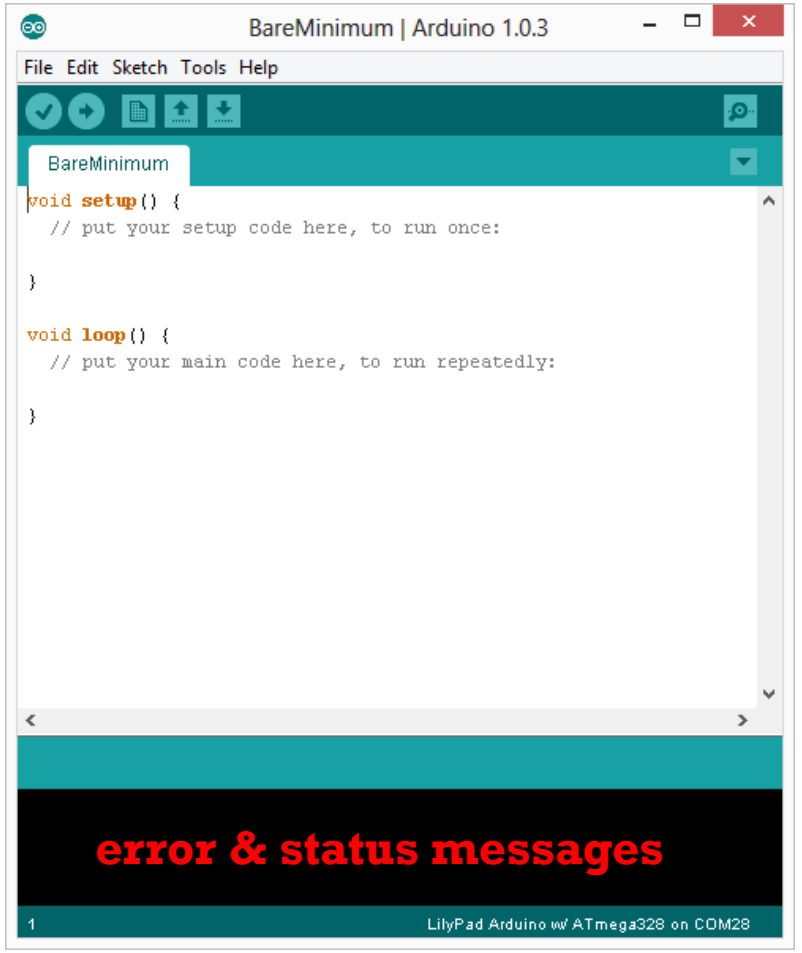

PWR IN
USB
(to Computer)
RESET
SCL\SDA
(I2C Bus)
POWER
5V / 3.3V /
GND
Analog
INPUTS
Digital I\O
PWM(3, 5, 6, 9, 10,
11)
IOREF
RESET
3.3V
5V
GND
GND
Vin
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM~)
ARDUINO
UNO
ATMEGA328P-PU
WWW.ARDUINO.CC – MADE IN ITALY
ICSP
ON
RESET EN
JP2
SPX16.000G

HOW TO CODE IN ARDUINO

- You need to download Arduino IDE (Integrated Development Environment).
- Arduino IDE is available for all Mac, Windows.and Linux.

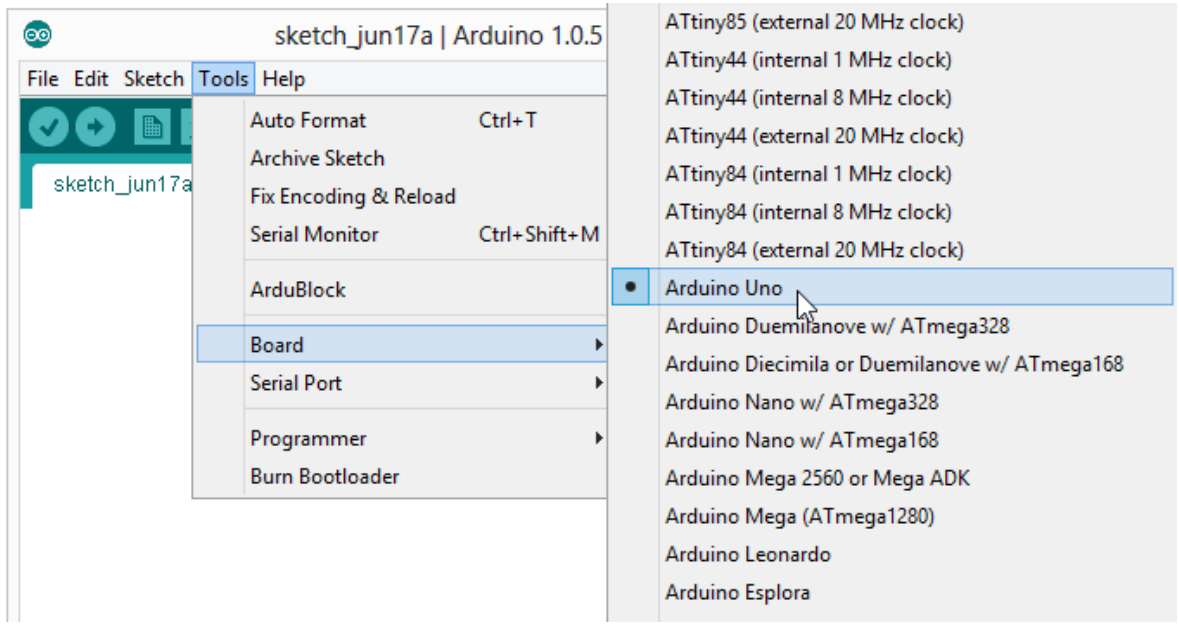
HOW TO CODE IN ARDUINO

- Once you have downloaded and installed/extracted the folder, you can directly run Arduino.exe, which will take you to its IDE.
- The IDE will look like the shown screenshot.



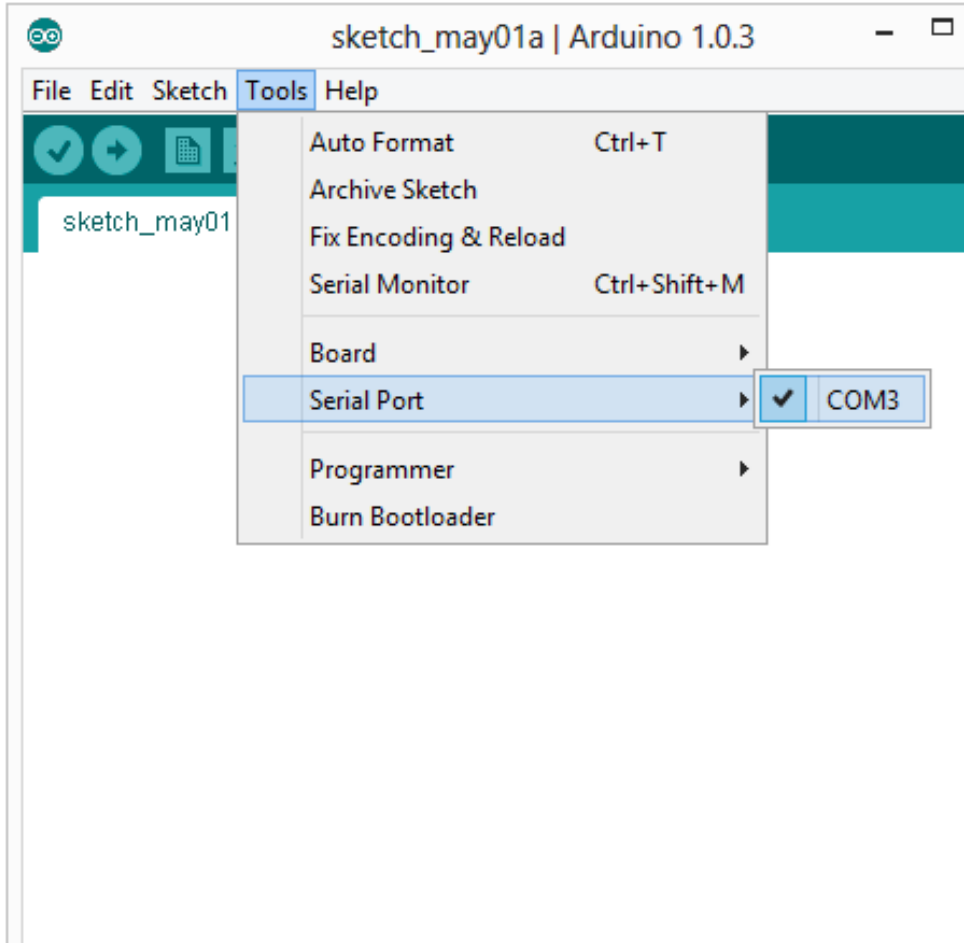
PROGRAM YOUR ARDUINO

- Before you start programming, double check that correct board is selected under Tools → Board.
- Now, you can start playing with Arduino.



PROGRAM YOUR ARDUINO

- The Arduino Uno can be programmed with the Arduino software. Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board).
- All the peripheral connected with Computers are using Serial Port.
- You can check port for Arduino Uno in Device Manger.



INPUT VS OUTPUT

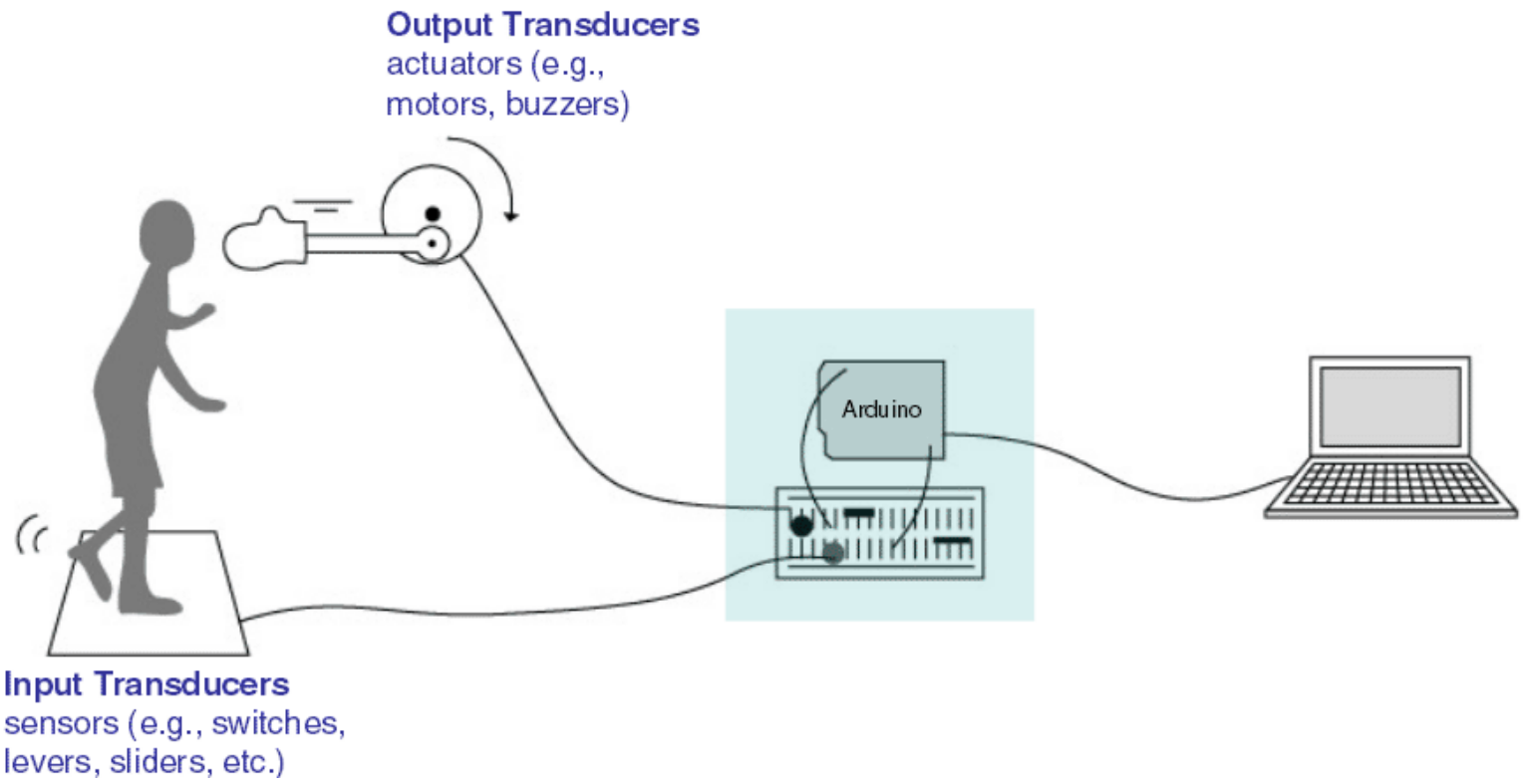


Image from *Theory and Practice of Tangible User Interfaces* at UC Berkley

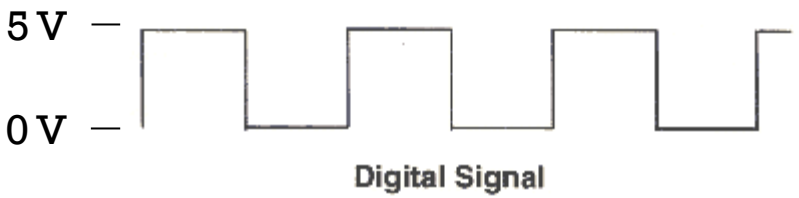
6 MAJOR CONCEPTS

- digitalWrite(pin,value)
- analogWrite(pin_no,value)
- digitalRead(pin)
- analogRead(pin)
- If (statements) / Boolean
- Serial Communication
- pinMode(pin_no,INPUT/OUTPUT)

ANALOG VS DIGITAL

- Microcontrollers are **digital** devices – ON or OFF. Also called – discrete.

- **Analog** signals are anything that can be a full range of values.



Digital Signal

Analog Signal

ANALOG VS DIGITAL

- Analog Sensors

Sensors	Variables
Mic	soundVolume
Photoresistor	lightLevel
Potentiometer	dialPosition
Temp Sensor	temperature
Flex Sensor	bend
Accelerometer	tilt/acceleration

- Digital Sensors
  - Digital sensors are more straight forward than Analog.
  - No matter what the sensor there are only two settings: On and Off

- Example, Push button, Switch

SERIAL COMMUNICATION

- "Serial" because data is broken into bits, each sent one after another in a single wire.
- Compiling turns your program into binary data (ones and zeros)
- Uploading sends the bits through USB cable to the Arduino
- The two LEDs near the USB connector blink when data is transmitted.
  - RX blinks when the Arduino is receiving data.
  - TX blinks when the Arduino is transmitting data

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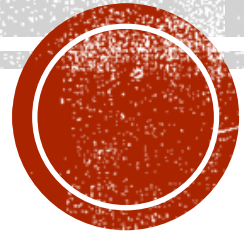
LET'S START CODING

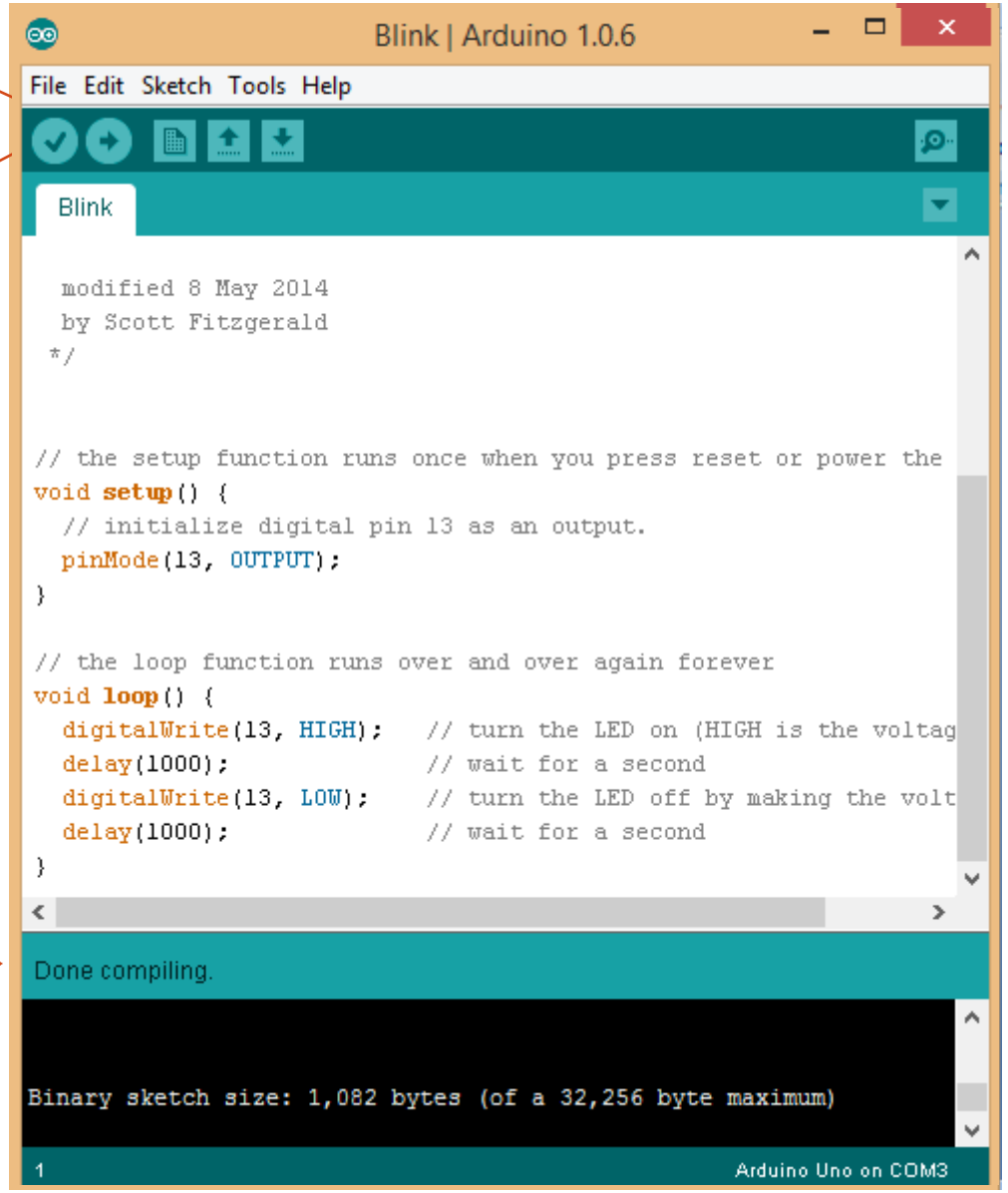


PROJECT #1 LED BLINK

- digitalWrite()

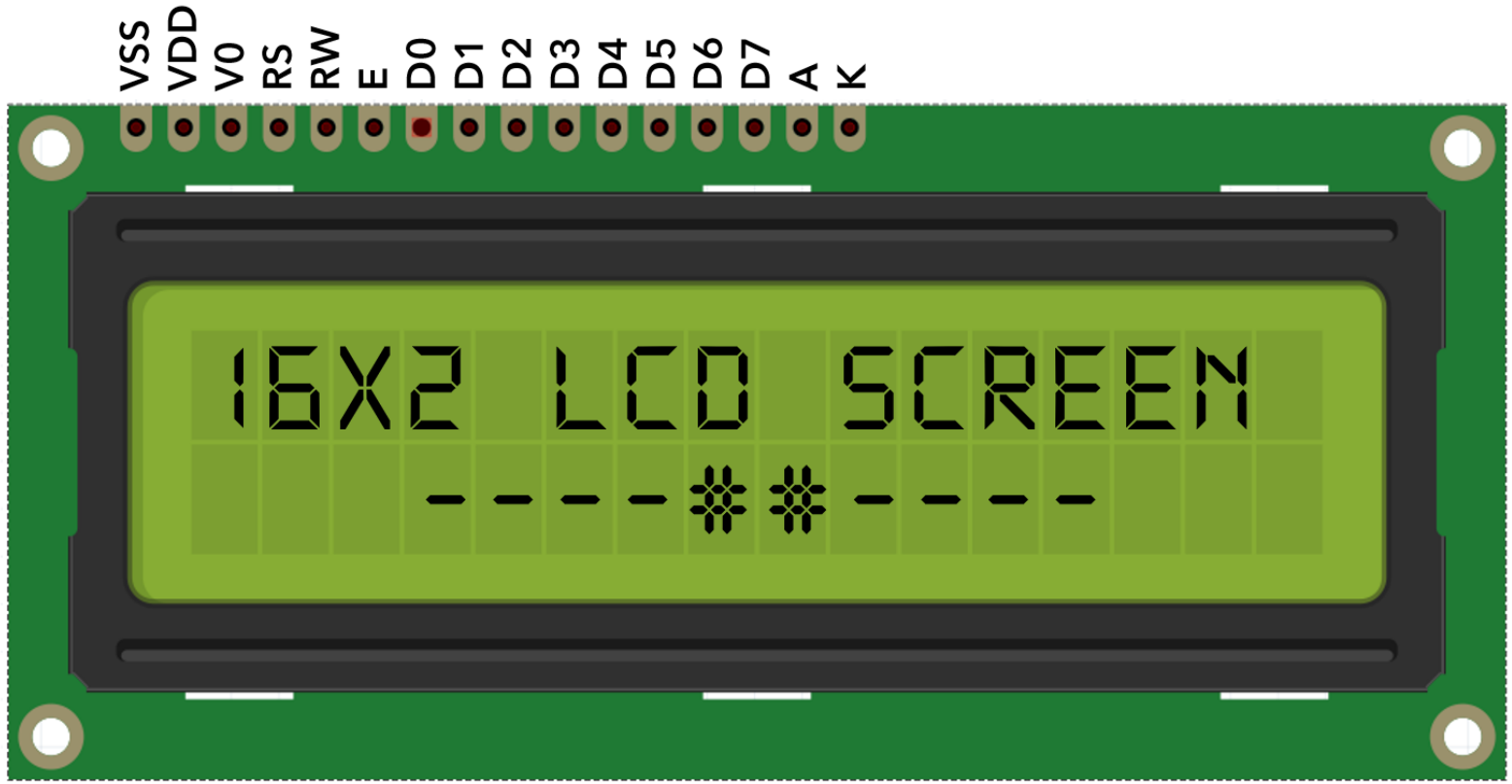
Upload

Compile



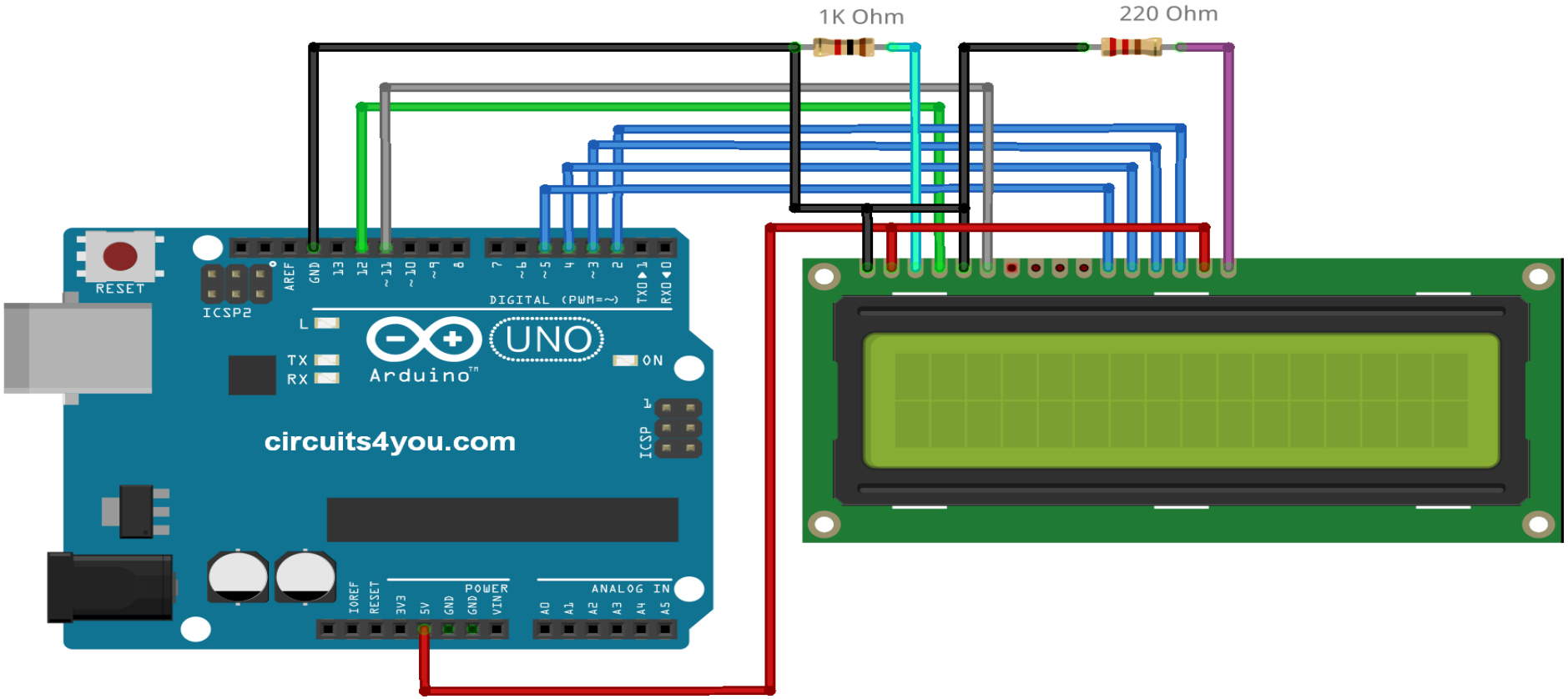
Status Message

PROJECT #2 LCD INTERFACING



No	Symbol	Function
1	VSS	Ground
2	VDD	5V +
3	V0	Contrast
4	RS	Register
5	RW	Read/Write
6	E	Enable
7	D0	Data bus
8	D1	Data bus
9	D2	Data bus
10	D3	Data bus
11	D4	Data bus
12	D5	Data bus
13	D6	Data bus
14	D7	Data bus
15	A	Anode (5V+)
16	K	Cathode (GND)

PROJECT #2 LCD INTERFACING



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THANK YOU