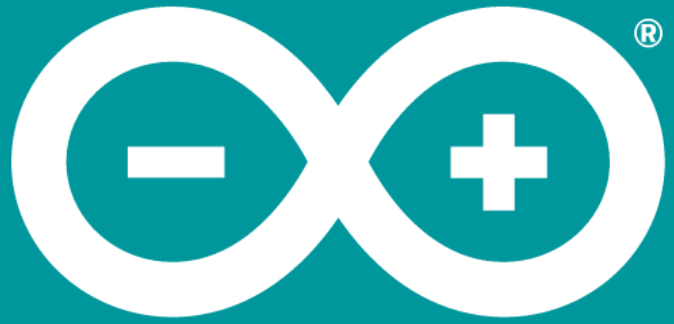


Let’s Arduino!

Part I – Intro to the world of electronic hardware

Hands up! You are surrounded by ..... Hardware device 🤦

Smart Hardware

Macbook Pro

Smartisan M1

Tesla Model S

Huawei Watch

Raventech H1

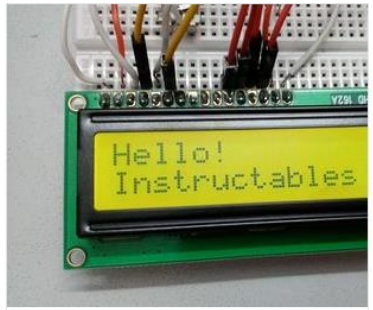
DJI MAVIC Pro

Google Glass

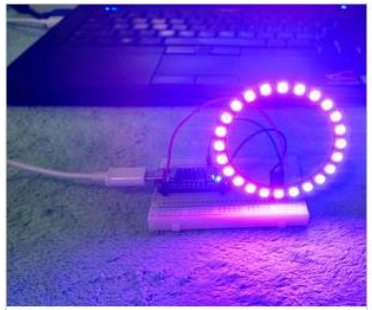
DIY Smart Devices

Smart Segregator/Dustbin
by D art of science
15 978

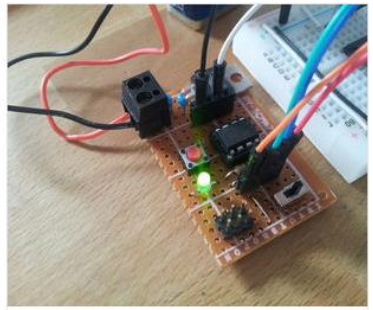
Arduino Random Music Generator
by adithyashok
33 1.9K



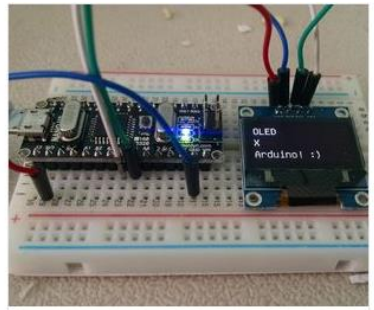
LCD Interfacing using Arduino Uno
by You_know_me
66 2.9K



NeoPixel 24 Ring With Arduino
by JTronix
35 1.8K



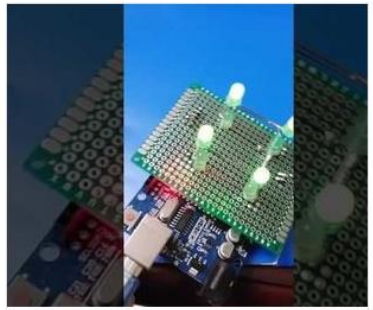
ATtiny Dev Board / Tinyduino
by Raffy611
63 4.0K



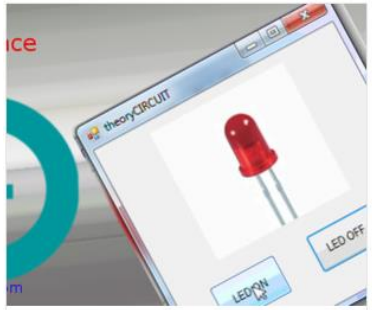
128x64 OLED display with Arduino
by JTronix
45 2.2K

Bot Laser Gallery Game
by justbennett
21 956

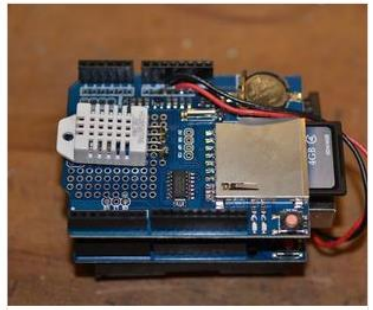
Ball
by bas-
13 2.3K



A Simple LED Cube 2X2X2
by braulio777
3 802



Visual Basic Arduino Interface
by theorycircuit
92 4.5K



Temperature, Humidity and Dewpoint Data Logger
by Ajyhooda
67 2.3K

Interfacing 20x4 LCD to Arduino using only 3 pins
by Rajkumar2506
40 1.6K

From http://www.instructables.com/

Hardware Devices

- Why are they smart, interesting, and useful ?
- They have a good “brain” and “knowledge”.
- Brain:
  - Micro-Controller (MCU) – For embedded system.
  - CPU – For normal computing.
  - GPU – For graphic and parallel computing.
- Knowledge:
  - Algorithm
  - Machine learning...

Hardware Devices

- They also have sensors (like “eyes”, “ears”) and peripherals (like “arms”, “mouth”).
- Sensors:
  - Light, color, pressure, motion…
  - Image, voice…
  - Other information
- Peripherals:
  - Communications
  - Display
  - Motors

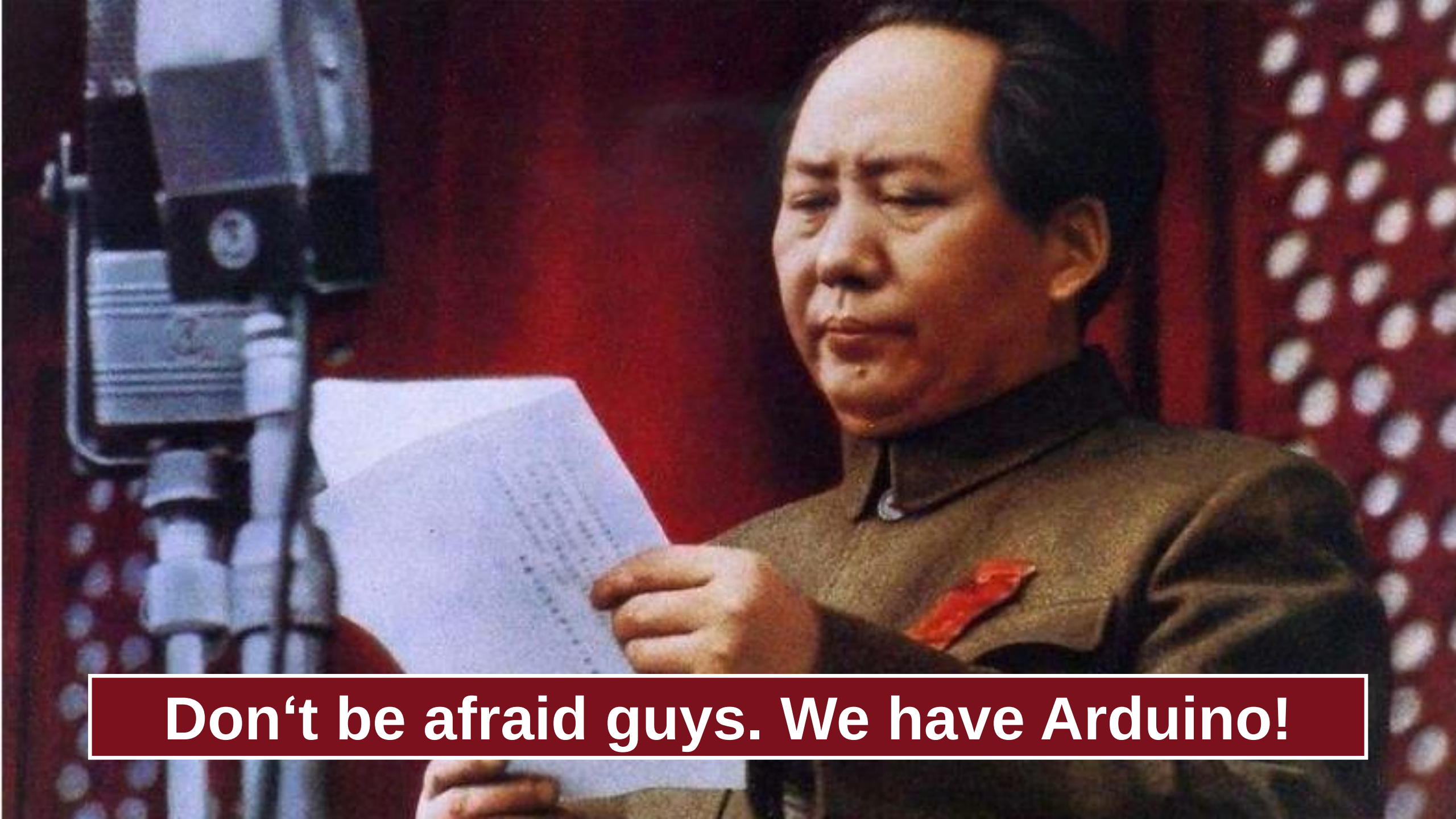
Let’s start from MCU

- MCU is a micro-computer.
- Include:
  - Processor & controller (As a CPU for computer)
  - RAM & ROM (As memory and hard disk)
  - I/O interface (As USB / PCI)
- Features
  - Low power, low price and low performance
    (<10mW) (<USD 10) (<100MHz)
  - Normally for control purposes
- Well-known manufactures:
  - ST, TI, Altmel, Intel, AD, NXP etc.

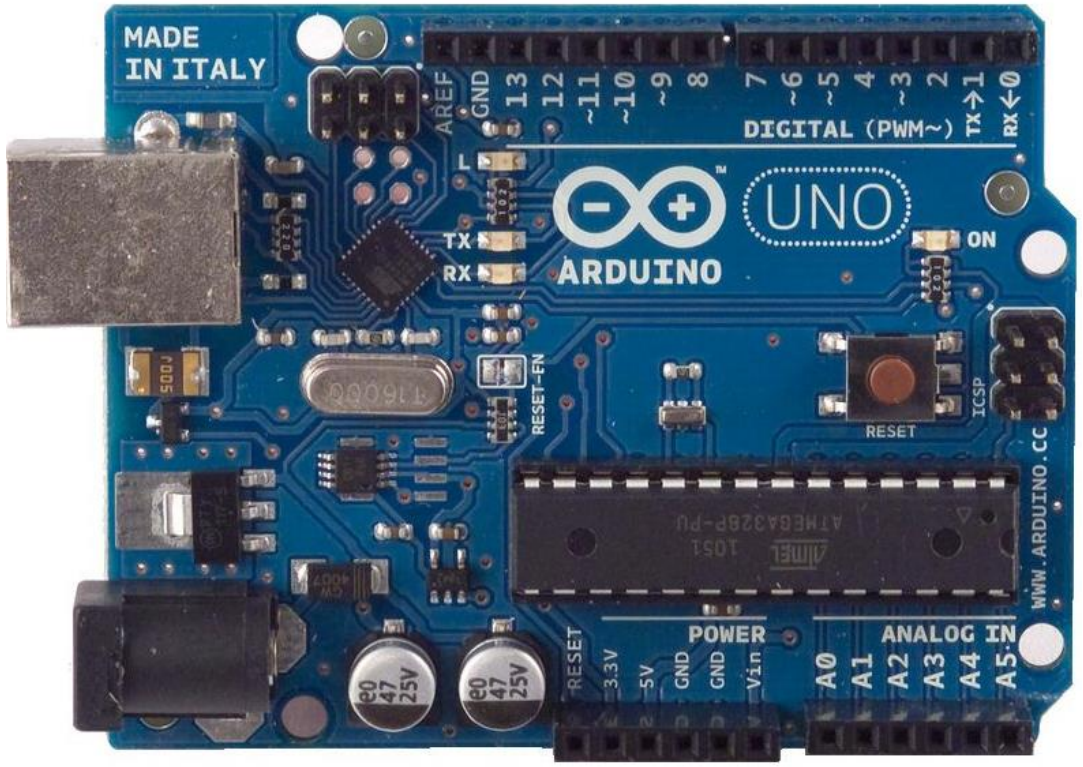
We found the new world!

However...

- Thousands of types and models of MCU !
- C language !
- Complex development environment !
- Hundreds of registers need to setup !
- Unfriendly development board !
- ……
- Each item can stop you step to the HARDWARD WORLD !


Don‘t be afraid guys. We have Arduino!

Your First MCU board – Arduino



Arduino UNO

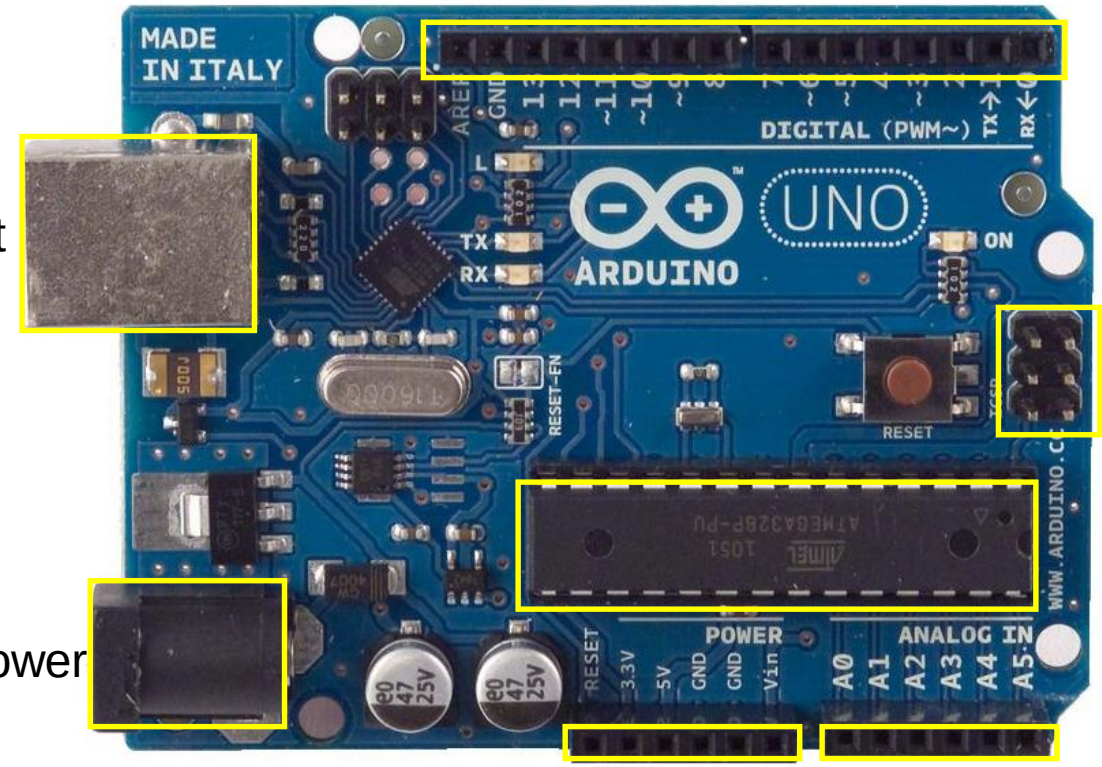
Card size
Well-designed
Rich resources
Easy to expand
For all the beginners!

Features

- Open-source electronics platform based
- Easy-to-use hardware and software
- Arduino boards are able to:
  - Read inputs - light on a sensor, a finger on a button, or a Twitter message.
  - Send an output - activating a motor, turning on an LED, publishing something online.
  - You can tell your board what to do by sending a set of instructions to the microcontroller on the board.
- Over the years Arduino has been the brain of thousands of projects

From Italy

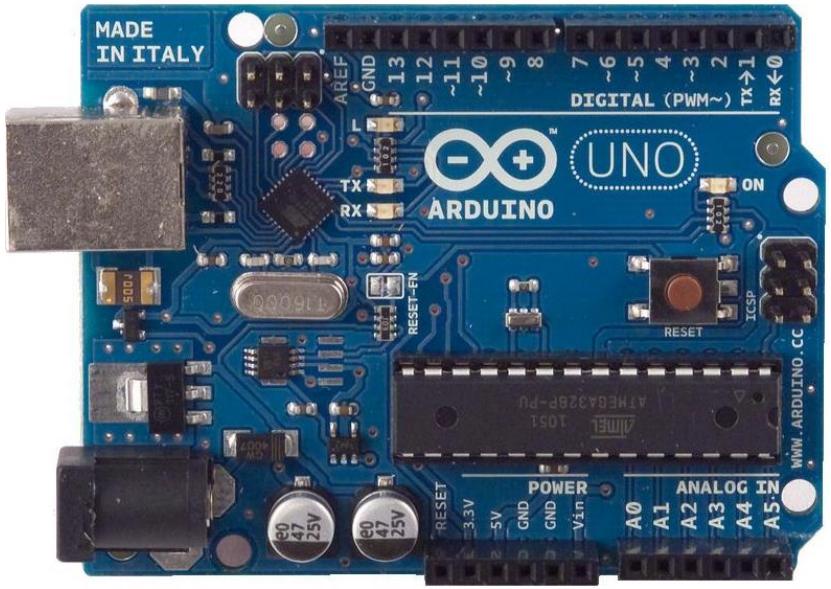
Arduino UNO - Resource

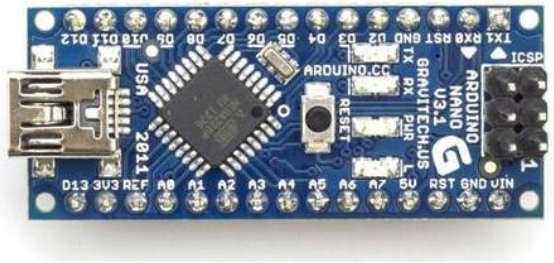


Arduino UNO - Resource

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Arduino Nano – Small UNO





Example projects

Security Access Using RFID Reader

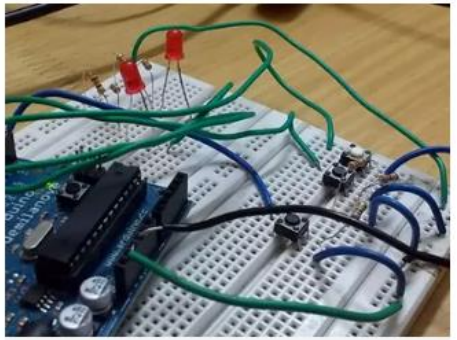
by Aritro Mukherjee

49,145 VIEWS 15 COMMENTS 74 RESPECTS

Arduino Kitchen Timer

Project tutorial by Team I and myself

21,401 VIEWS 15 COMMENTS 33 RESPECTS



Measure your reaction time

Project tutorial by Jayraj Desai

14,856 VIEWS 2 COMMENTS 14 RESPECTS

Smoke Detection using MQ-2 Gas Sensor

by Aritro Mukherjee

34,001 VIEWS 4 COMMENTS 36 RESPECTS

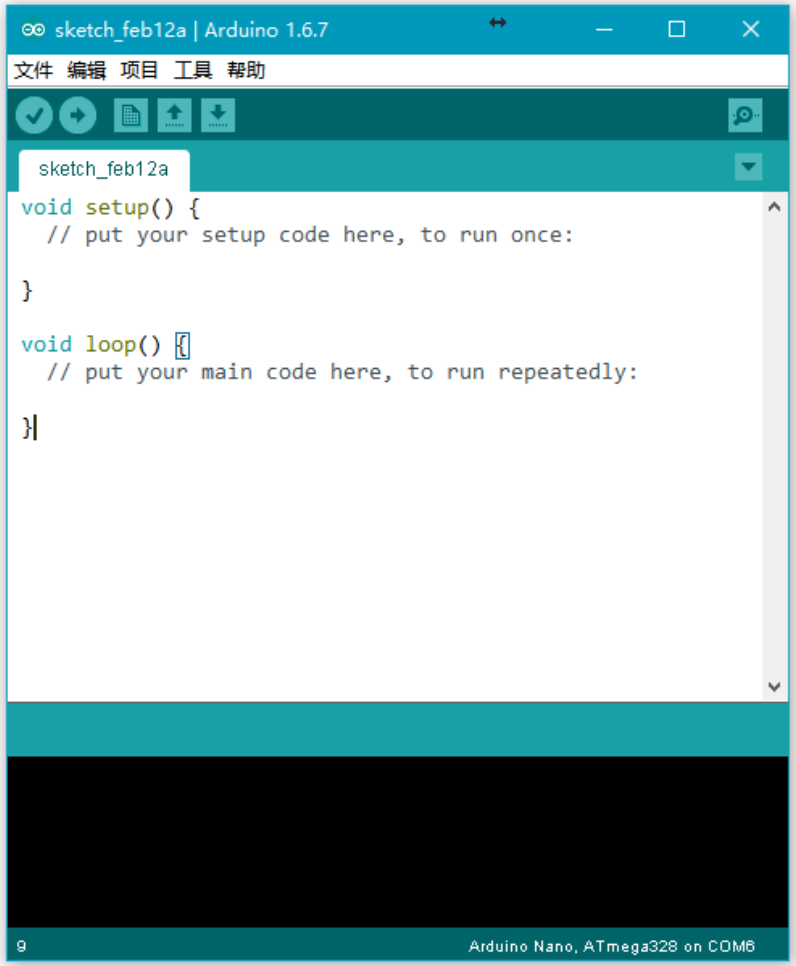
Find more: https://create.arduino.cc/projecthub/products/arduino-uno-genuino-uno

Arduino Hardware Family

Goto www.Arduino.cc

ENTRY LEVEL	UNO, LEONARDO, 101, ROBOT, ESPLORA, MICRO, NANO, MINI, MKR2UNO ADAPTER, STARTER KIT, BASIC KIT, LCD SCREEN
ENHANCED FEATURES	MEGA, ZERO, DUE, MEGA ADK, PRO, M0, M0 PRO, MKRZERO, PRO MINI, MOTOR SHIELD, USB HOST SHIELD, PROTO SHIELD, MKR PROTO SHIELD, MKR PROTO LARGE SHIELD, 4 RELAYS SHIELD, MEGA PROTO SHIELD, MKR SD PROTO SHIELD, ISP, USB2SERIAL MICRO, USB2SERIAL CONVERTER
INTERNET OF THINGS	YÚN, ETHERNET, TIAN, INDUSTRIAL 101, LEONARDO ETH, MKR1000, YUN MINI, WIFI SHIELD, WIFI 101 SHIELD, YÚN SHIELD, WIRELESS SD SHIELD, WIRELESS PROTO SHIELD, ETHERNET SHIELD V2, GSM SHIELD V2, MKR1000 BUNDLE
EDUCATION	CTC 101
WEARABLE	GEMMA, LILYPAD ARDUINO USB, LILYPAD ARDUINO MAIN BOARD, LILYPAD ARDUINO SIMPLE, LILYPAD ARDUINO SIMPLE SNAP

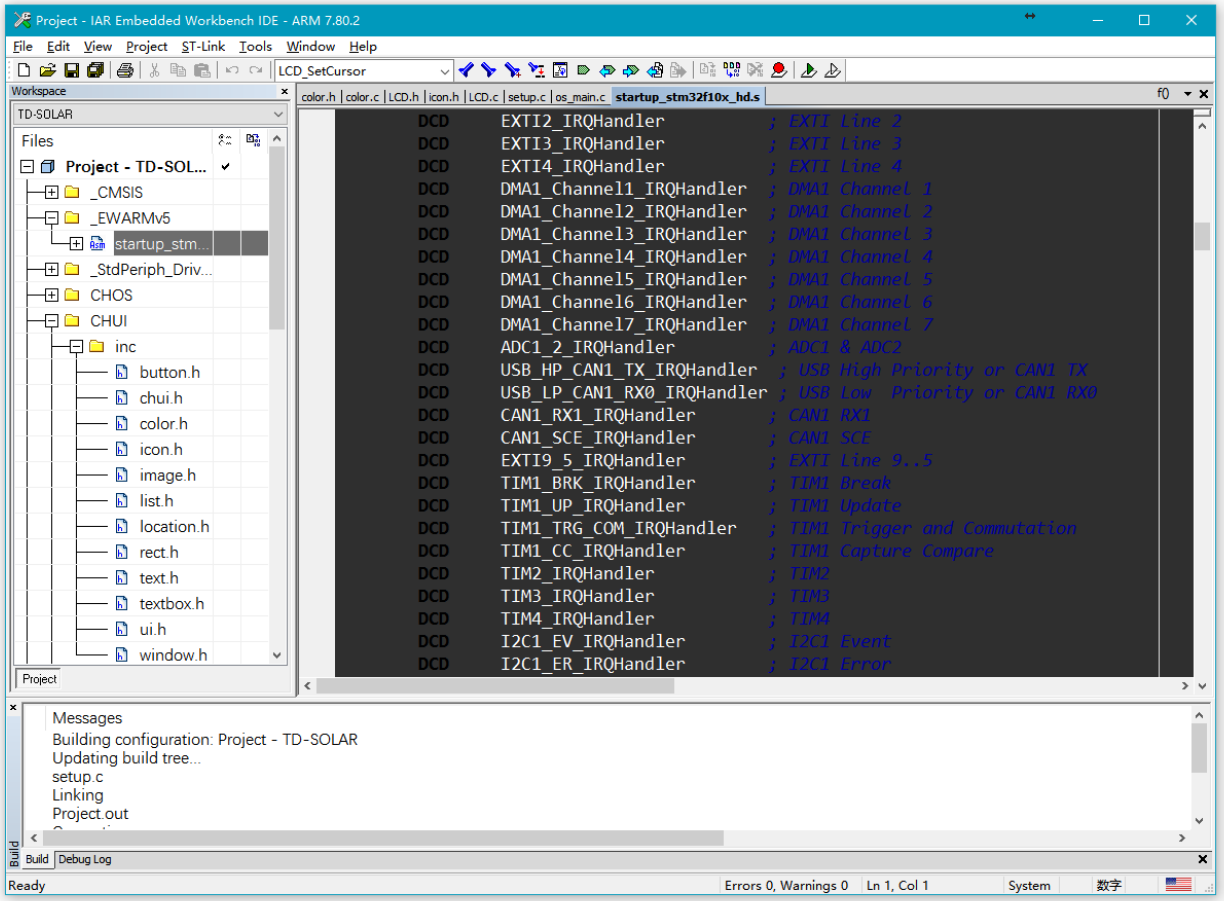
Very Easy Arduino IDE



- Concise interface
- Simplified C/C++ language*
- Integrated Serial Terminal
- Many examples inside
- Many libs inside
- Easy to share your codes and ideas
- 10 min to start !
- Open source software (FREE)

*Arduino programming language (based on Wiring)

Other IDE

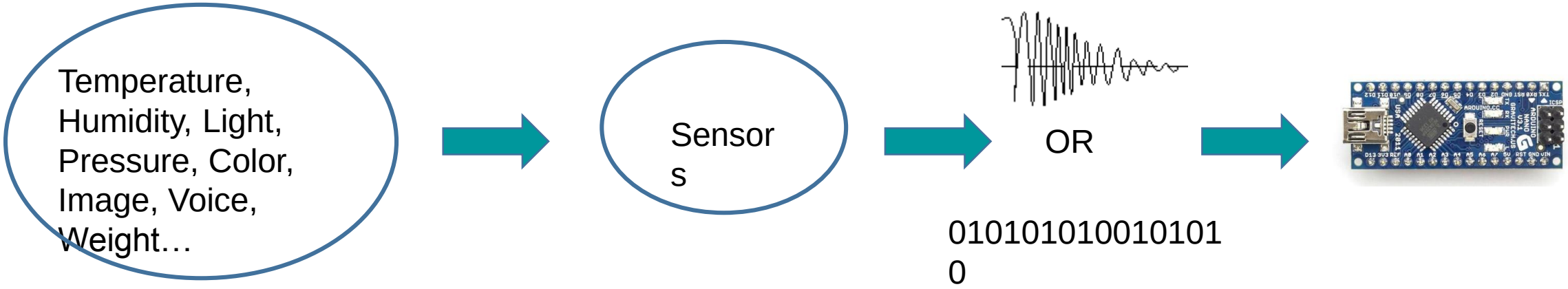


IAR

- COMPLICATED!
- 10 hours to start...
- USD 8000 for one user
- Much more professional

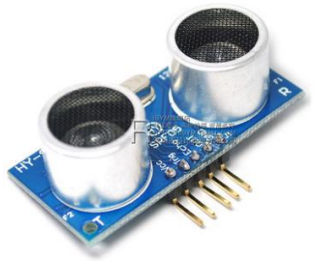
Sensors

- Sensors can transfer physical information to digital/analog value, which can be obtained by MCU.

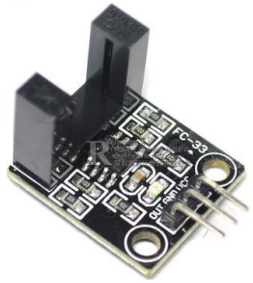


Sensors - Operation

- The MCU read data from sensors by different types of interfaces:
  - Digital serial communication (SPI, UART, IIC)
  - Digital parallel communication
  - Analogy sampling (ADC)
- Don’t be afraid. One line code in Arduino can help you play sensors.
  - Eg. `analogRead(0)` will get the voltage from analog pin#0
- In the following part, more details of sensor will be presented.

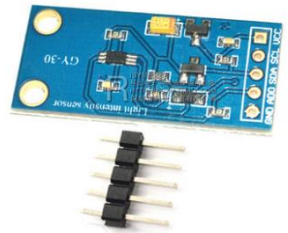


Ultrasonic Distance

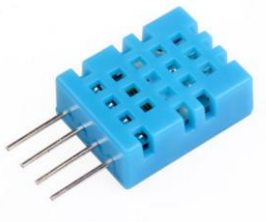


IR Distance

IR Human



Luminance



Temperature & Humidity

Peripherals

- Peripherals are generally used to display, control or communicate.
- Display:
  - LED, digital tube, LED matrix
  - Mono LCD, Colorful LCD …
- Control:
  - Motors, stepper motors, servo motors (with drivers)
  - Mechanical arm …
- Communication:
  - RS232, RS485, CAN Bus …
  - Bluetooth, WiFi, GSM, GPRS …

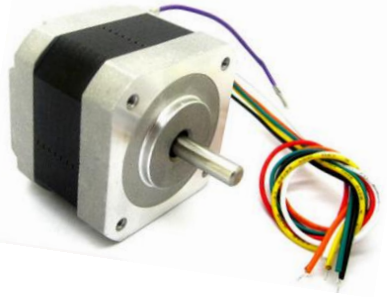
Peripherals - Operation

- Similar to sensors, MCU also operate peripherals by interfaces:
  - Digital signal, SPI, IIC, UART…

Bluetooth

LCD

Digital Tube



Motor

WiFi

Next Part: Start to play Arduino Nano

- Arduino IDE installation;
- Communication driver setup;
- Hello world on Arduino: Blink one LED;
- Serial communication with computer.


We design.
we
We are connected.
we dream big.
we have "hard fun."
we try and try again.
WE ASK QUESTIONS.
We create.
are
We think deep.
We invent.
MAKERS
We collaborate.
we make mistakes.
interesting

Reference

- https://www.arduino.cc/
- http://www.treee.com.cn/?id=os:tep:list
- http://www.slideshare.net/xxahmedsakrxx/introduction-to-arduino-16634116