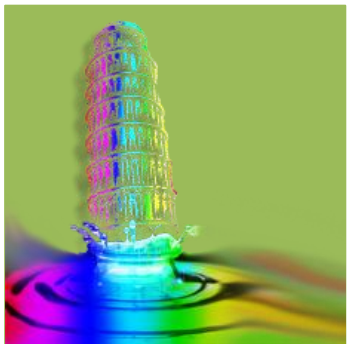
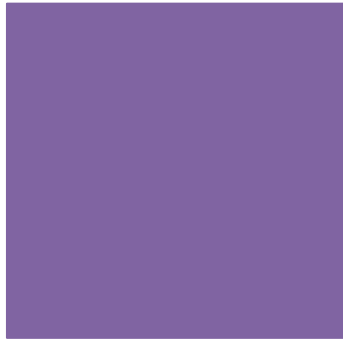


Anatomy of a 3D printing system



+ Main components of a 3D printer system



Software
(CAD/CAM)

Firmware
(Electronic)

Hardware

extruder

Case study

THE PRUSA I3 REWORK

+ Mechanical structure



Hardware

+ Mechanical structure

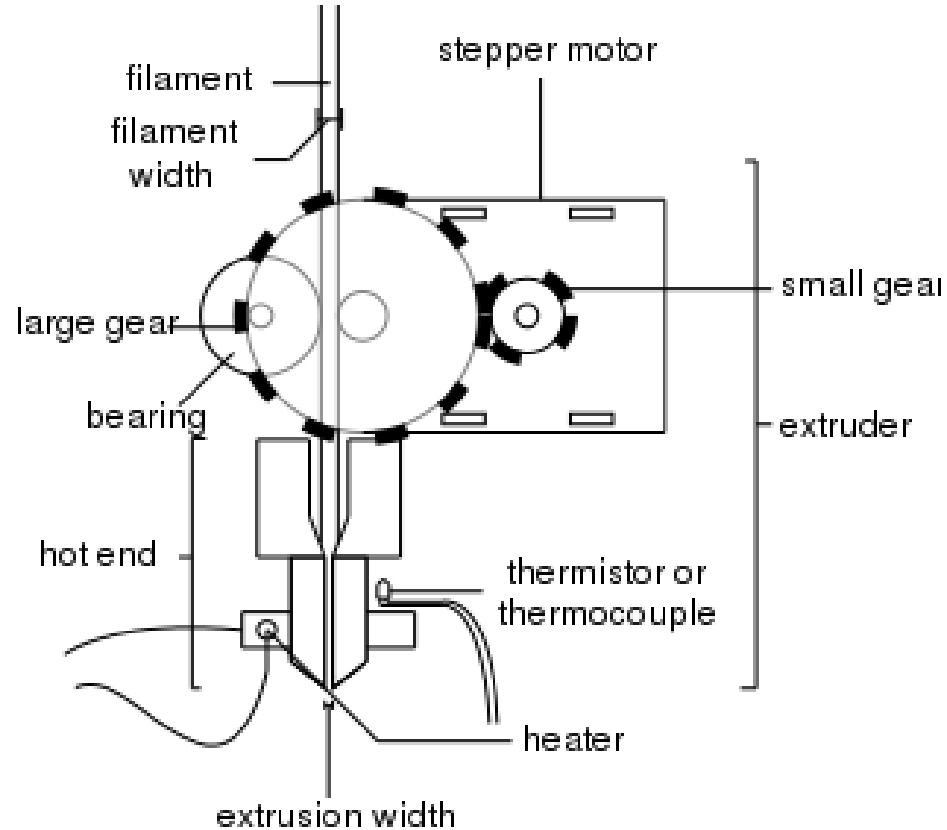
	Single Sheet Frame
Plastic Parts (exc Extruder)	26
Non Printed Parts	337 (approx)
Cost	\$300 – 1000
Controller Electronics	Almost all RepRap controller
Printing Size	200 x 200 x 200
Motors	5 x NEMA 17 Stepper
Frame Material	6 mm Aluminium (or Wood)
Frame Manufacture	Laser Cutter, CNC, Water Jet
Pro	Easy assembling
Con	Specialised tools

+ Mechanical structure

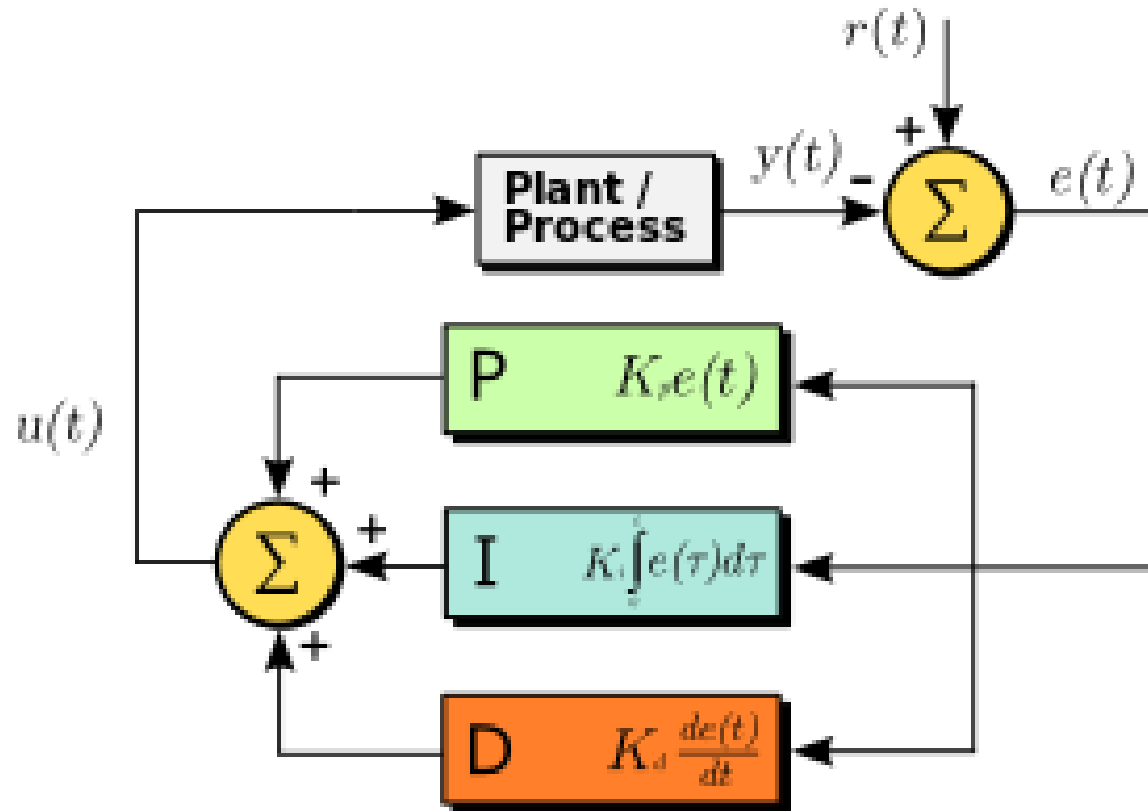
- 3D positioner
- Plastic parts + “vitamins”



+ Extruder



+ Temperature controller



+ HotPlate



Hardware

+ Electronics



- 1) Community based, tested and supported electronics
 - 4pi
 - Generation 7 Electronics
 - Melzi
 - RAMPS (RepRap Arduino Mega Pololu Shield)
 - Sanguinololu
 - SmoothieBoard
- 2) RAMPS derivatives
 - Megatronics
 - 3Drag controller
- 3) Commercial alternatives
 - R2C2 Electronics
 - Generation 6
 - Generation 4



Ramps

RepRap Arduino Mega Pololu Shield



ELECTRONICS INFO

Details

Name : RAMPS

Creator : johnnyr

Status : active

Description

Arduino MEGA based modular RepRap electronics.

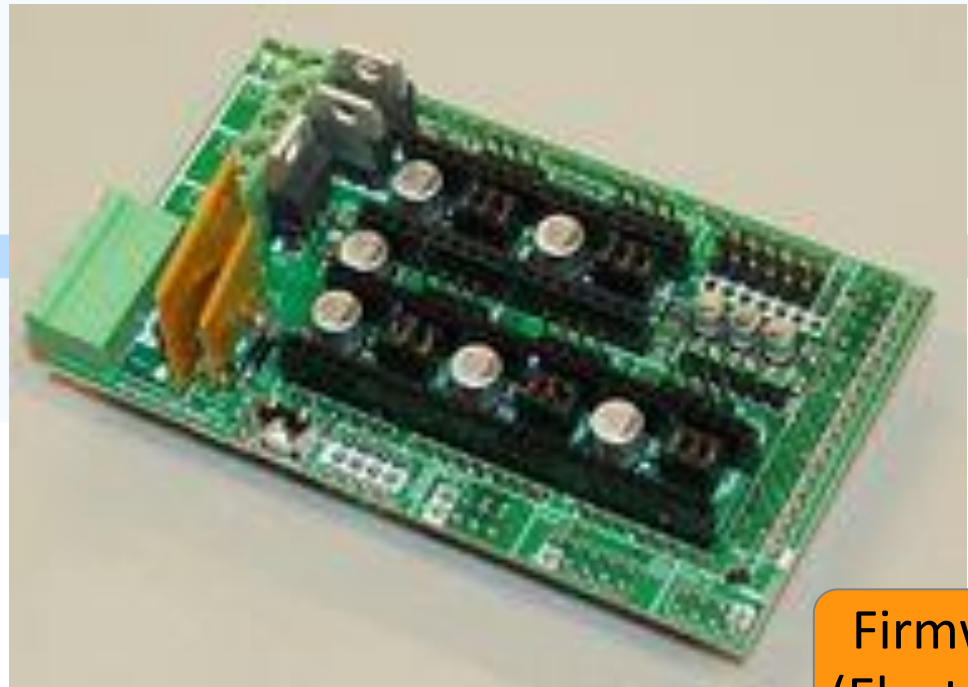
RAMPS is the most often used RepRap electronics in 2012. It shares circuitry concepts (stepper driver, thermistor, heater MOSFETs, etc.) with many other electronics.

Features

- License=[GPL](#)
- Built on stable Arduino Mega base
- Modular - easier to troubleshoot
- ATmega based
- up to 1/16 microstepping
- etch resist prepared up to v1.3, v1.4 is optimized for smd

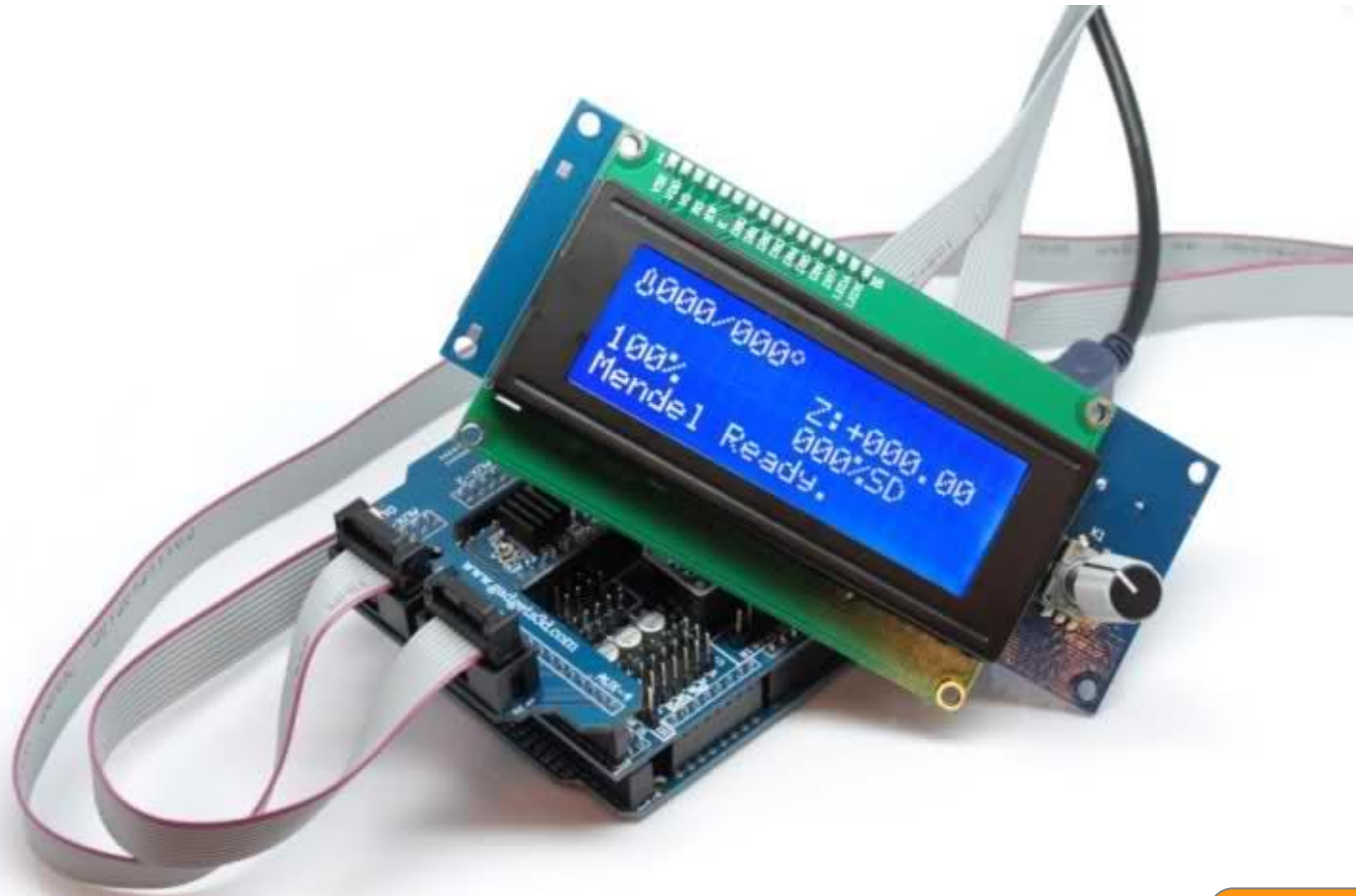
Compatible Firmware

- [Marlin](#)
- [Sprinter](#)
- [Teacup](#)



Firmware
(Electronic)

+ RAMPS GADGETS3D Shield with Panel

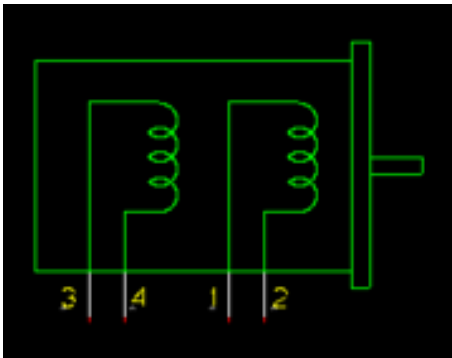


Firmware
(Electronic)

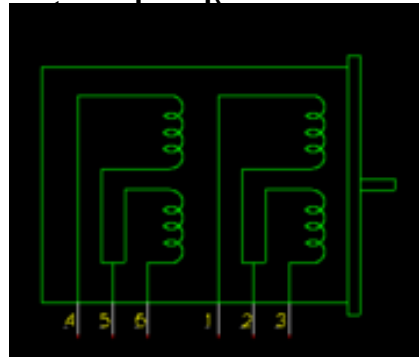
+ Stepper Motors



Stepper motor
(NEMA)



Bipolar



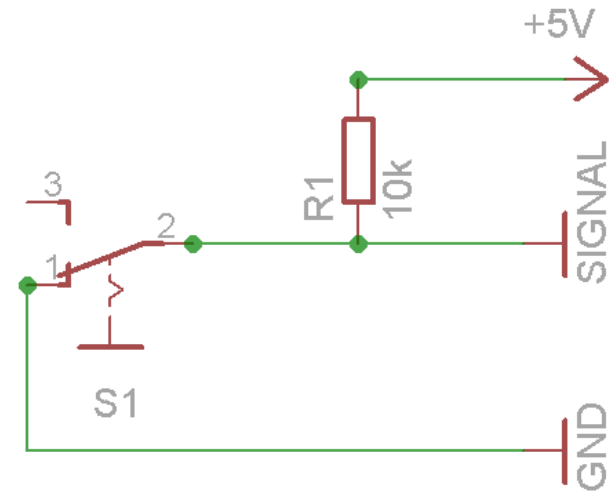
Unipolar



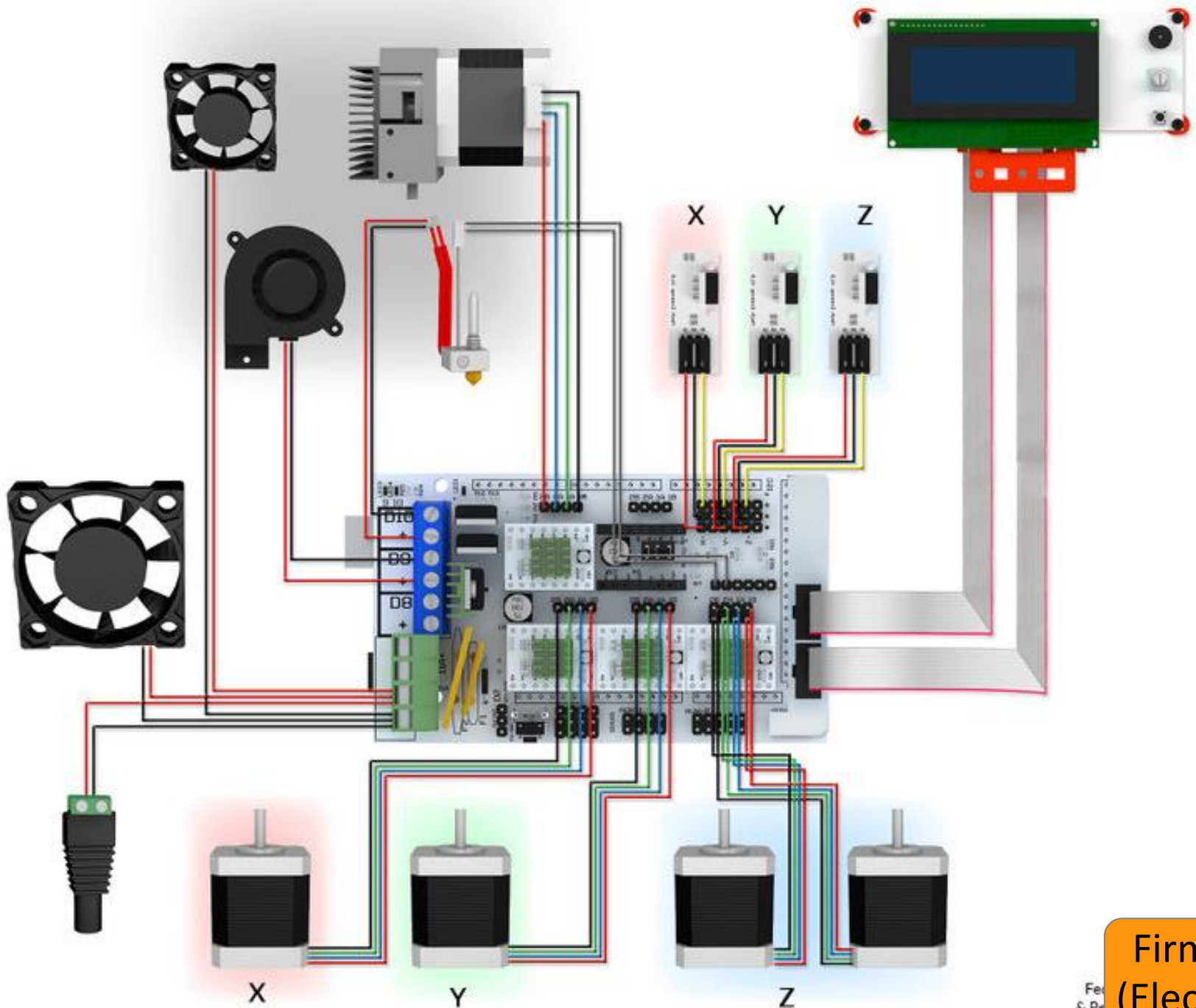
Pololu stepper driver

Firmware
(Electronic)

+ Mechanical Endstops



Firmware
(Electronic)



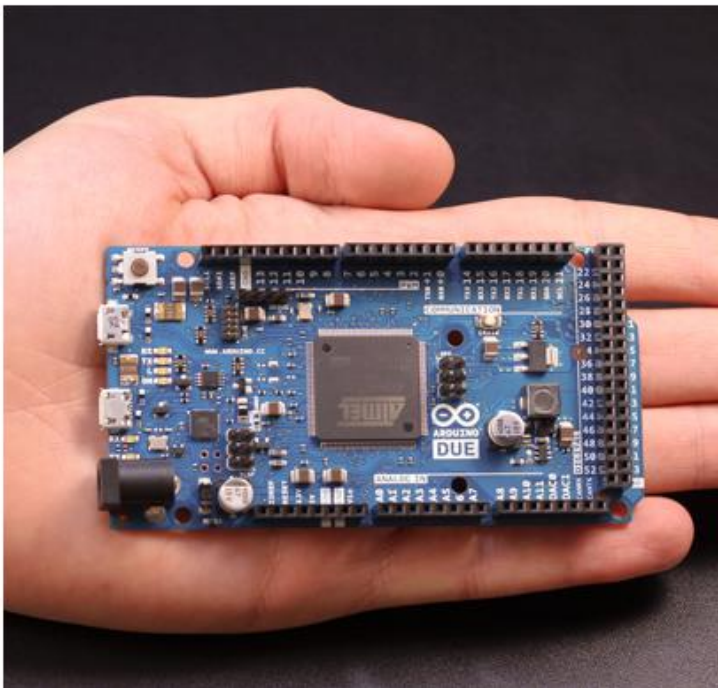
Firmware
(Electronic)

Fer
& Pe

+ Arduino



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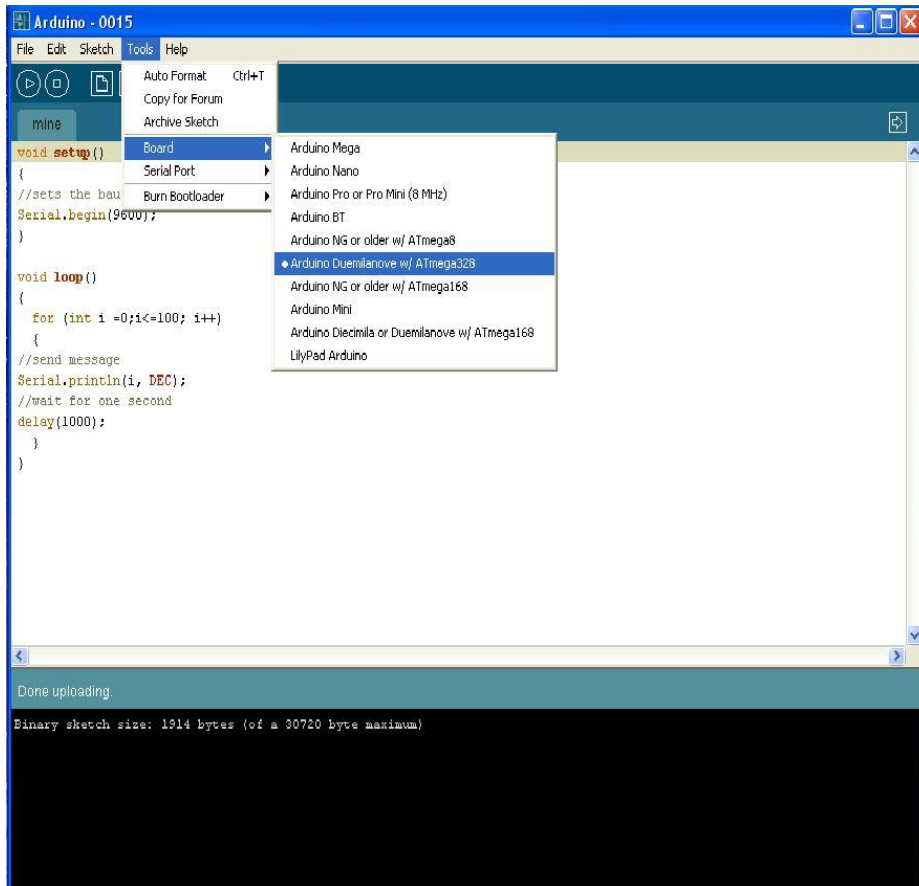


Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the [Arduino programming language](#) (based on [Wiring](#)) and the [Arduino development environment](#) (based on [Processing](#)). Arduino projects can be stand-alone or they can communicate with software running on a computer (e.g. [Flash](#), [Processing](#), [MaxMSP](#)).

Firmware
(Electronic)

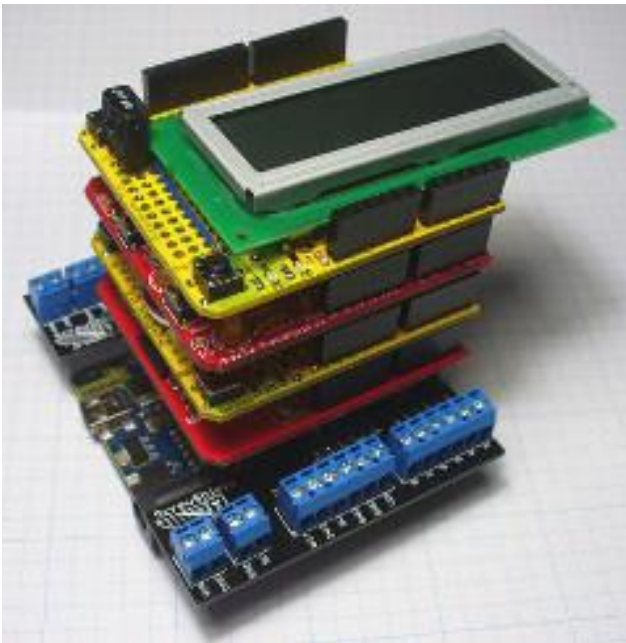
+ Arduino



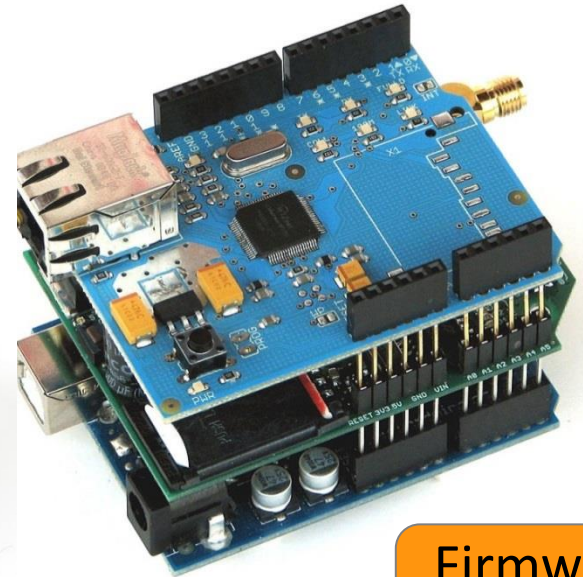
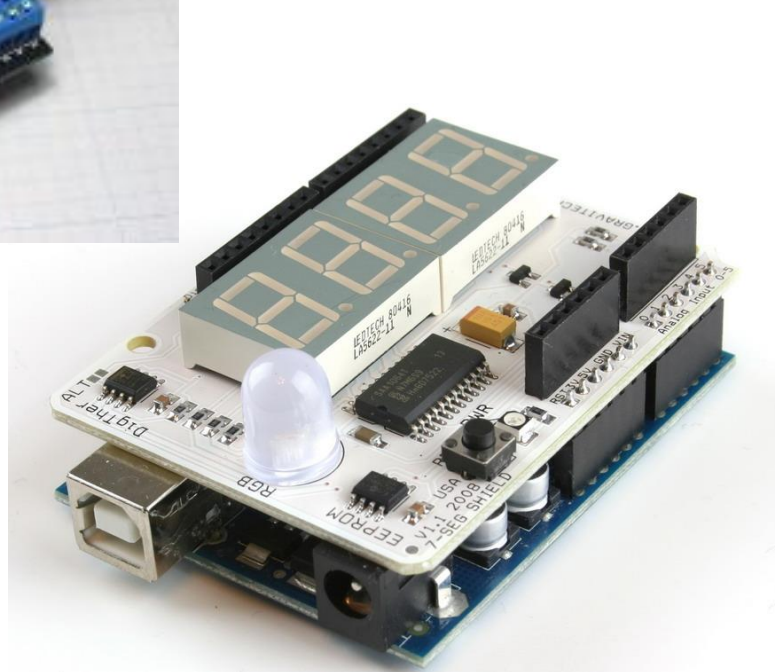
- IDE (Integrated Development Environment)
- The Arduino development environment contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.
- Software written using Arduino are called sketches.

Firmware
(Electronic)

+ Arduino



Shields are boards that can be plugged on top of the Arduino PCB extending its capabilities. The different shields follow the same philosophy as the original toolkit: they are easy to mount, and cheap to produce.



Firmware
(Electronic)

+ Arduino UNO

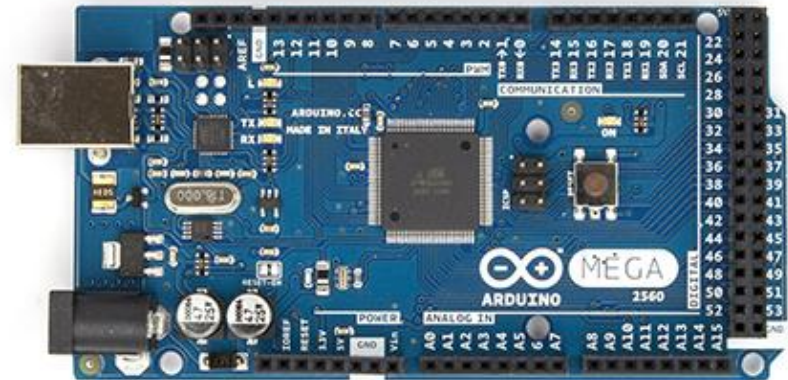
- The Arduino Uno is a microcontroller board based on the ATmega328.
 - 14 digital input/output pins
 - 6 PWM outputs (8 bit resolution)
 - 6 analog inputs (10 bit resolution)
 - 32 KB Flash Memory (of which 0.5 KB used by bootloader)
 - 2 KB SRAM
 - 1 KB EEPROM
 - 16 MHz ceramic resonator
 - USB connection - ICSP header
 - Power jack - reset button
- 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.



Firmware
(Electronic)

+ Arduino Mega

- The Arduino MEGA is a microcontroller board based on the ATmega2560.
 - 54 digital input/output pins
 - 15 PWM outputs (8 bit resolution)
 - 16 analog inputs (10 bit resolution)
 - 256 KB Flash Memory (of which 8 KB used by bootloader)
 - 8 KB SRAM
 - 4 KB EEPROM
 - 16 MHz ceramic resonator
 - USB connection - ICSP header
 - Power jack - reset button



+ Firmwares

- List of firmwares
 1. Sprinter
 2. Teacup
 3. sjfw
 4. Marlin
 5. Sailfish
 6. Makerbot
 7. Grbl
 8. Repetier-Firmware