Intro to Arduino and different types of Arduino boards

CSE 315

Peripherals & Interfacing

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What is Arduino

- Arduino board is an open-source platform used to make electronics projects.
- It consists of both a microcontroller and a part of the software or Integrated Development Environment (IDE) that runs on your PC.
- It is used to write & upload computer code to the physical board.
- The platform of an Arduino has become very famous with designers or students just starting out with electronics, and for an excellent cause.

Different types of Arduino Boards

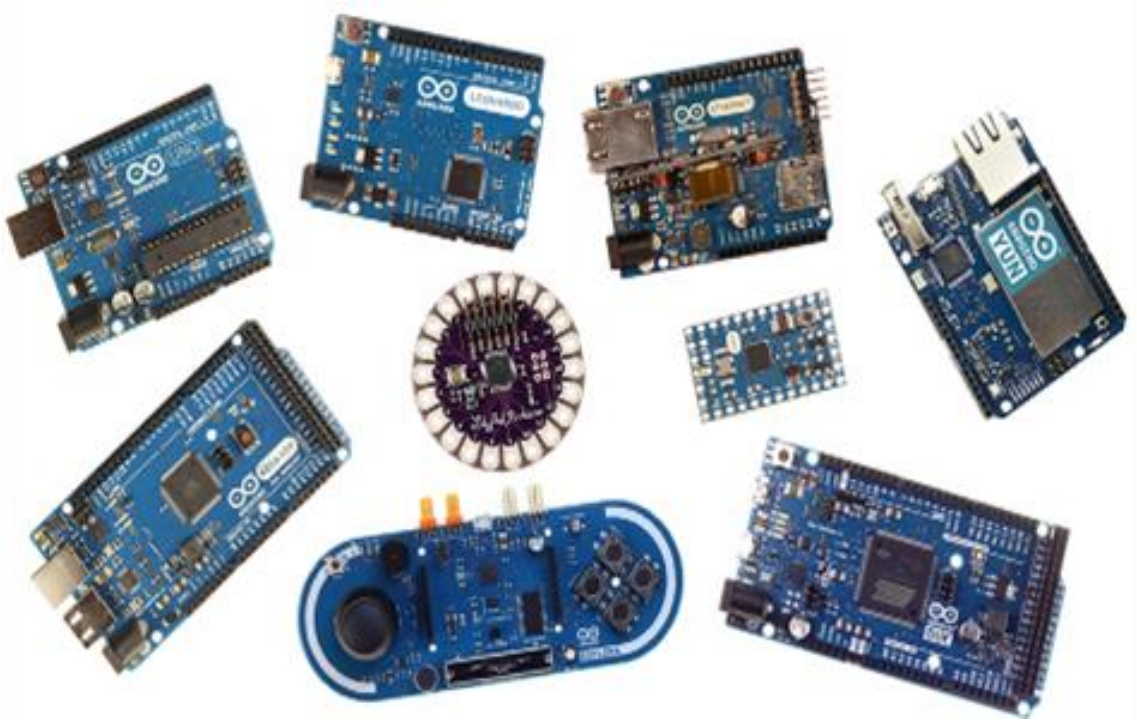


Fig 1. Different types of Arduino Boards.

Basic Features:

- The Arduino does not require a separate part of hardware.
- In order to program a new code onto the board you can just use a USB cable.
- The Arduino IDE uses a basic version of C++, making it simpler to learn the program.
- At last, Arduino board offers a typical form factor that breaks out the functions of the microcontroller into a more available package.

Why Arduino:

- Arduino board has been used for making different engineering projects and different applications.
- The Arduino software is very simple to use for beginners, yet flexible adequate for advanced users.
- It runs on windows, Linux and Mac.
- Teachers and students in the schools utilize it to design low cost scientific instruments to verify the principles of physics and chemistry.
- Arduino also makes simpler the working process of microcontroller.

In a Nutshell:

- Inexpensive
- Cross-platform
- Simple, clear programming environment
- Open source and extensible software
- Open source and extensible hardware

Feature analogy of different boards:

Arduino Boards	Processor	Memory	Digital I/O	Analogue I/O
Arduino Uno	16Mhz ATmega328	2KB SRAM, 32KB flash	14	6 input, 0 output
Arduino Due	84MHz AT91SAM3X8E	96KB SRAM, 512KB flash	54	12 input, 2 output
Arduino Mega	16MHz ATmega2560	8KB SRAM, 256KB flash	54	16 input, 0 output
Arduino Leonardo	16MHz ATmega32u4	2.5KB SRAM, 32KB flash	20	12 input, 0 output

List of Arduino boards

- Arduino Uno (R3)
- LilyPad Arduino
- Red Board
- Arduino Mega (R3)
- Arduino Leonardo

Arduino Uno R3

- The Uno is a huge option for your initial Arduino.
- It consists of 14-digital I/O pins, where 6-pins can be used as PWM(pulse width modulation outputs).
- 6-analog inputs, a reset button, a power jack, a USB connection and more.
- It includes everything required to hold up the microcontroller.
- Simply attach it to a PC with the help of a USB cable and give the supply to get started with a AC-to-DC adapter or battery.

Arduino Uno(R3)

Fig 2. Arduino Uno basic hardware

Some projects based on Arduino UNO:

- Automatic Medicine Reminder Using Arduino
- Obstacle Avoiding Robot using Arduino and Ultrasonic Sensor
- Google Assistant Based Voice Controlled Home Automation using DIY Arduino Wi-Fi Shield
- Self balancing robot
- Line follower

Arduino Lilypad

- The Lily Pad Arduino board is a wearable e-textile technology .
- It expanded by Leah Buechley and considerately designed by “Leah and SparkFun”.
- Each board was imaginatively designed with huge connecting pads
- A smooth back to let them to be sewn into clothing using conductive thread.
- This Arduino also comprises of I/O, power, and also sensor boards which are built especially for e-textiles. These are even washable

Arduino Lilypad

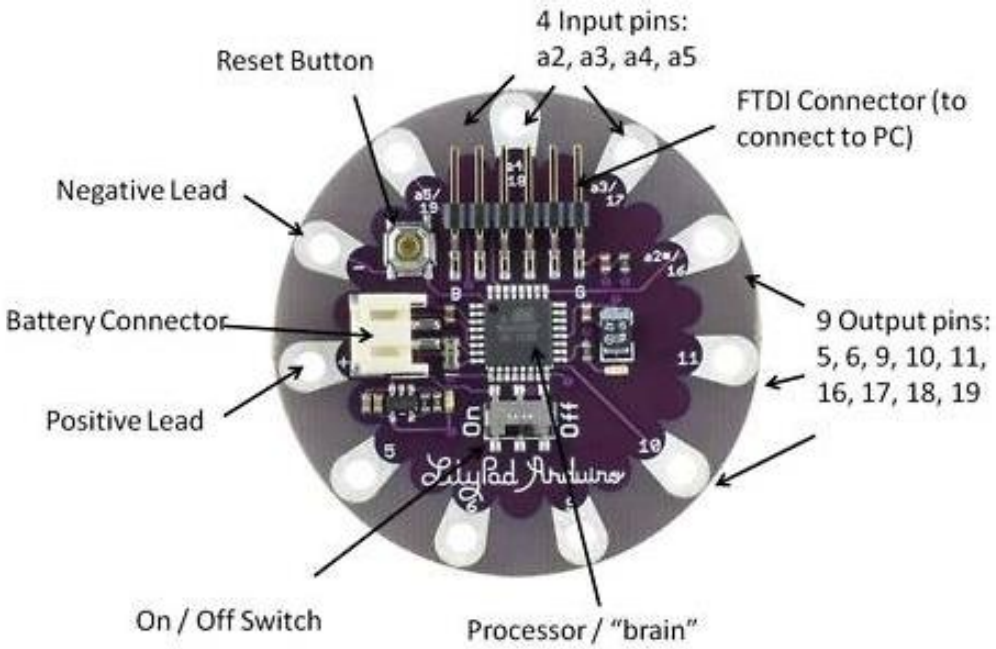
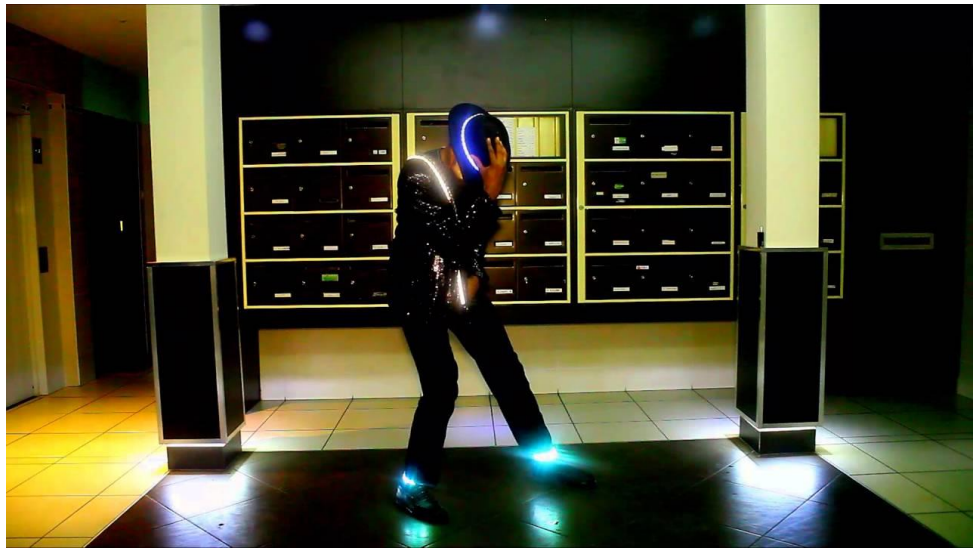


Fig 3. Arduino Lilypad basic hardware

Some projects based on Arduino Lilypad:



Some projects based on Arduino Lilypad:

- Unicorn Horn With NeoPixel LEDs and Arduino Lilypad
- Arduino LilyPad Controlled NeoPixel Earrings
- Hertzian Armor

Arduino Redboard

- The RedBoard Arduino board can be programmed using a Mini-B USB cable using the Arduino IDE.
- It will work on Windows 8 without having to modify your security settings.
- It is more constant due to the USB or FTDI (Future Technology Device International) chip we used and also it is entirely flat on the back.
- Creating it is very simple to utilize in the project design.
- Just plug the board, select the menu option to choose an Arduino Redboard and you are ready to upload the program.
- You can control the RedBoard over USB cable using the barrel jack.

Arduino Redboard

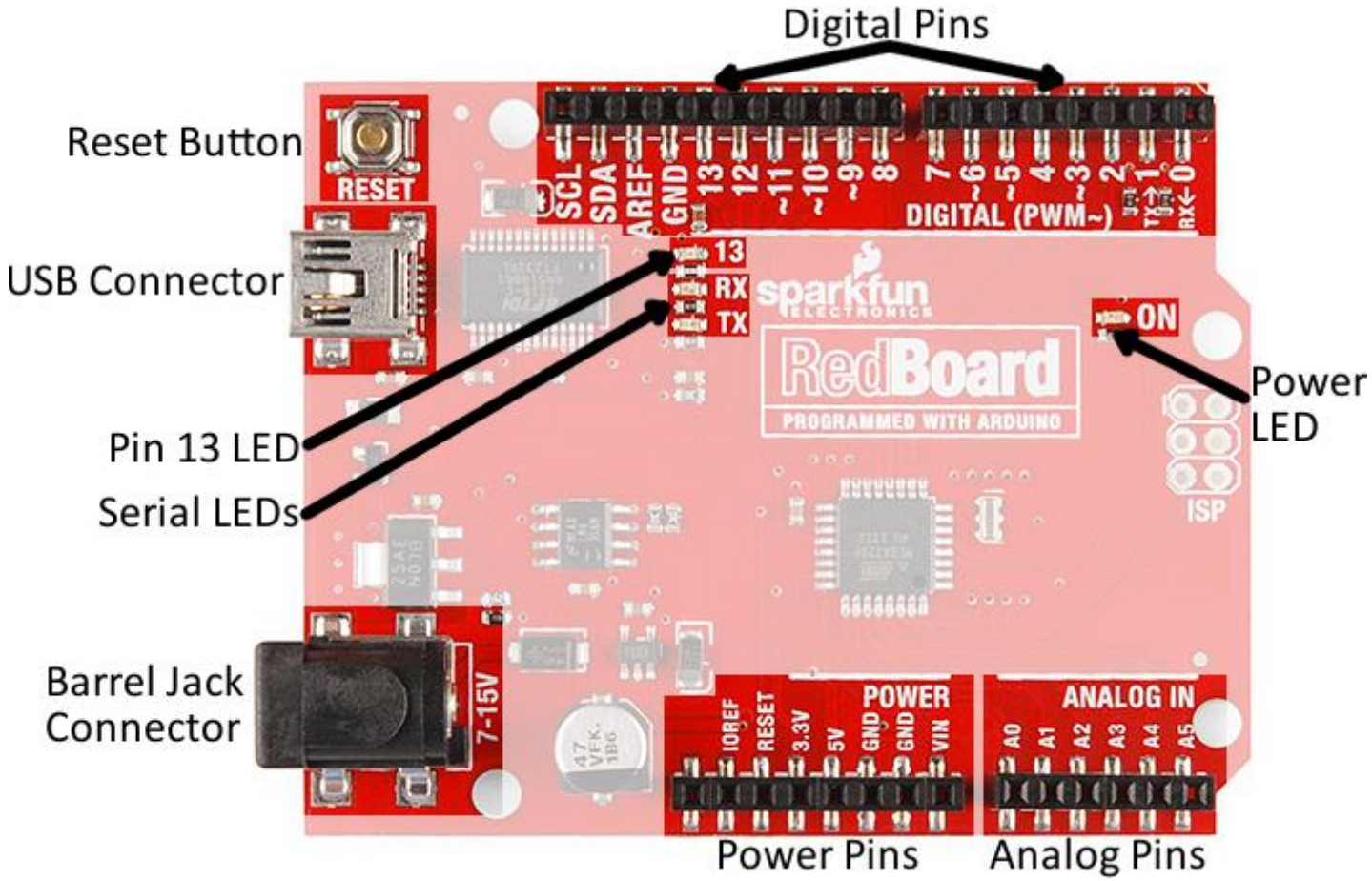


Fig 4. Arduino Redboard basic hardware

Some projects based on Arduino Redboard:

- DC MOTORS AND MOTOR DRIVERS
- Autonomous Driving Vehicle

Arduino Mega (R3)

- The Arduino Mega is similar to the UNO’s big brother.
- It includes lots of digital I/O pins (from that, 14-pins can be used as PWM o/ps).
- It includes 6-analog inputs, a reset button, a power jack, a USB connection and a reset button.
- It includes everything required to hold up the microcontroller.

Arduino Mega (R3)

- Simply attach it to a PC with the help of a USB cable.
- Give the supply to get started with a AC-to-DC adapter or battery.
- The huge number of pins make this Arduino board very helpful for designing the projects .
- It need a bunch of digital i/ps or o/ps like lots buttons.

Arduino Mega (R3)

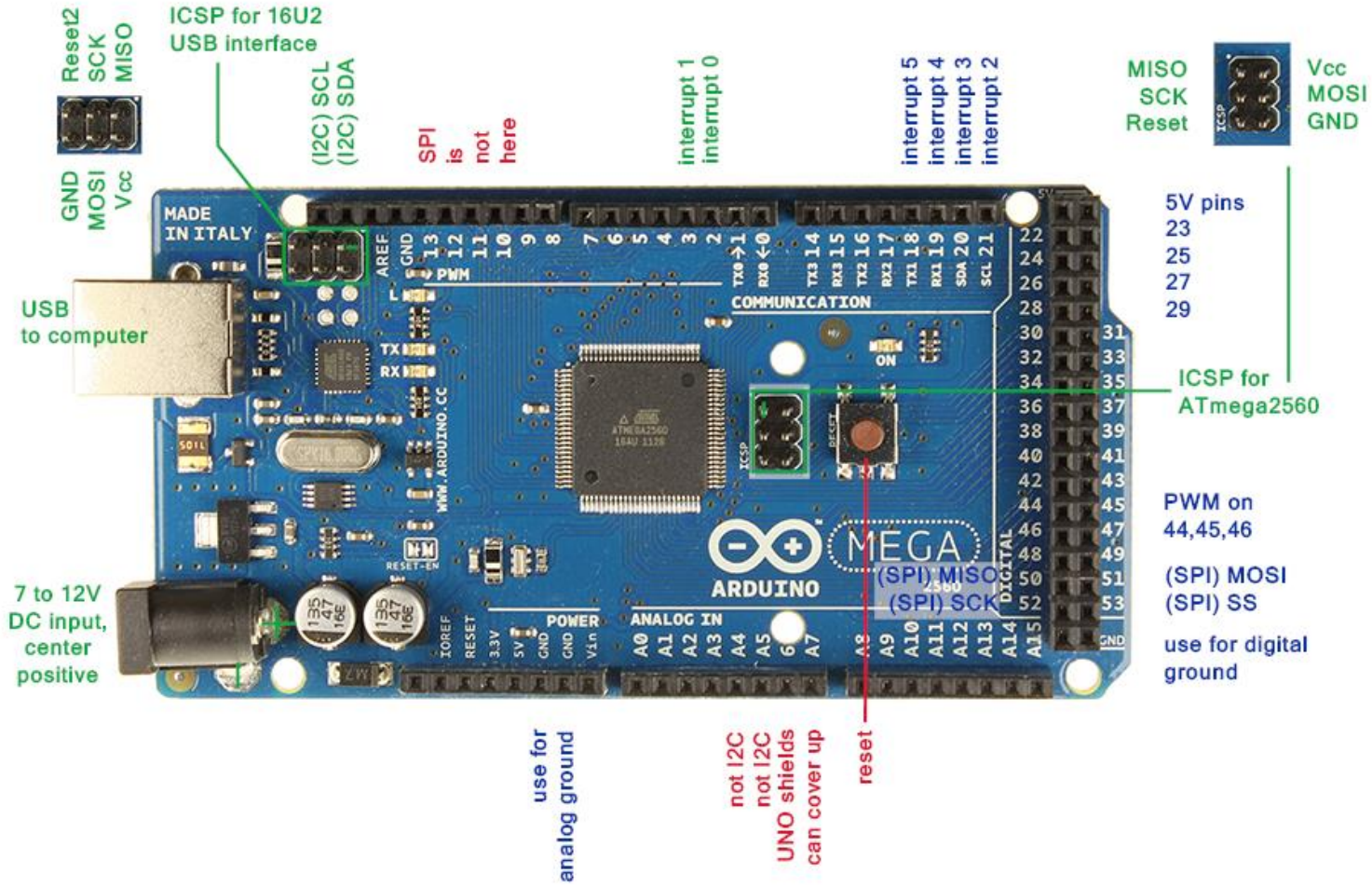


Fig 5. Arduino Mega (R3) basic hardware

Some projects based on Arduino Mega:

- Arduino Serial Communication
- Arduino Solar Tracker
- Arduino RFID Reader
- Frequency Counter Using Arduino

Arduino Leonardo:

- The first developed board of an Arduino series is the Leonardo board.
- This board uses one microcontroller along with the USB.
- It can be very simple and cheap also.
- This board handles USB directly.
- The program libraries are obtainable which let the Arduino board to follow a keyboard of the computer, mouse, etc.

Arduino Leonardo:

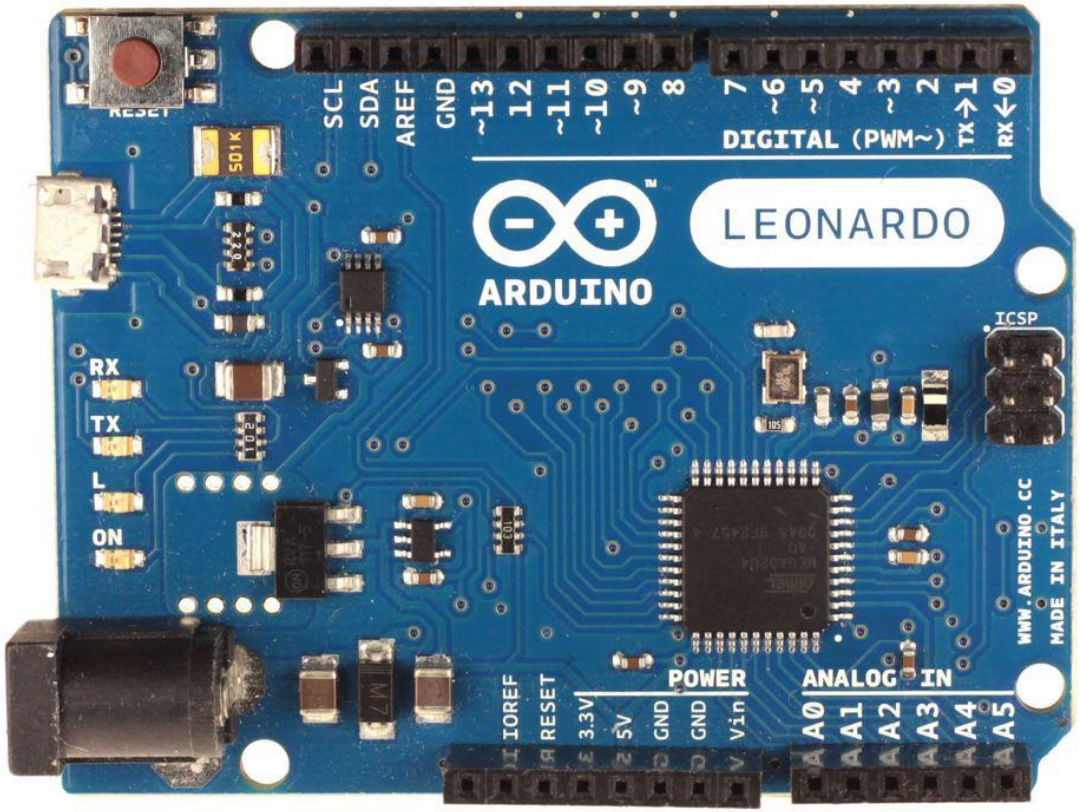


Fig 6. Arduino Leonardo basic hardware

Some projects based on Arduino leonardo:

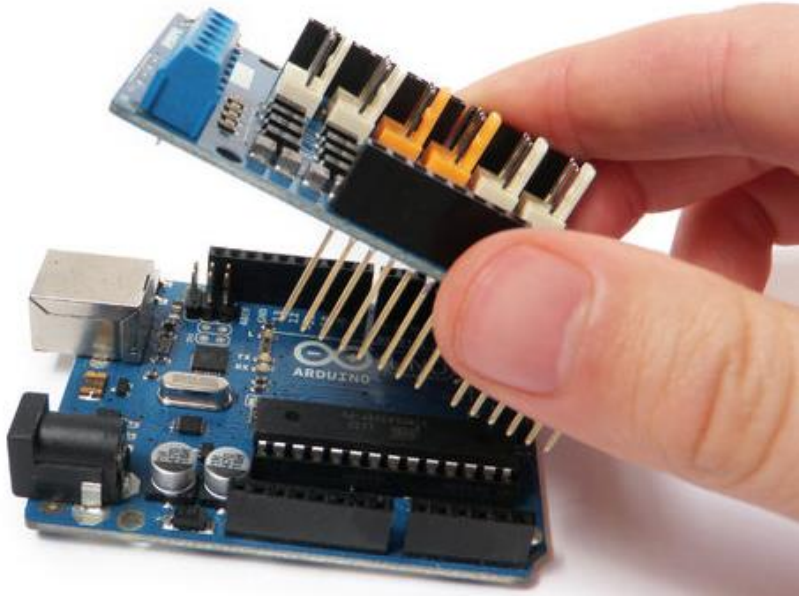
- Humanoid Arm
- Arduino PC Monitor
- Autonomous Navigation and 2D Mapping
- Arduino PowerPoint Pointer
- Rangefinder for Garage Parking with Arduino

Arduino Shields:

- Arduino shields are pre built circuit boards used to connect to a number of Arduino boards.
- These shields fit on the top of the Arduino compatible boards
- It provide an additional capabilities like connecting to the following:
  - Internet
  - Motor controlling
  - Providing wireless communication
  - LCD screen controlling

Arduino Shields:

- Shields are useful to extend the capacity of your Arduino.



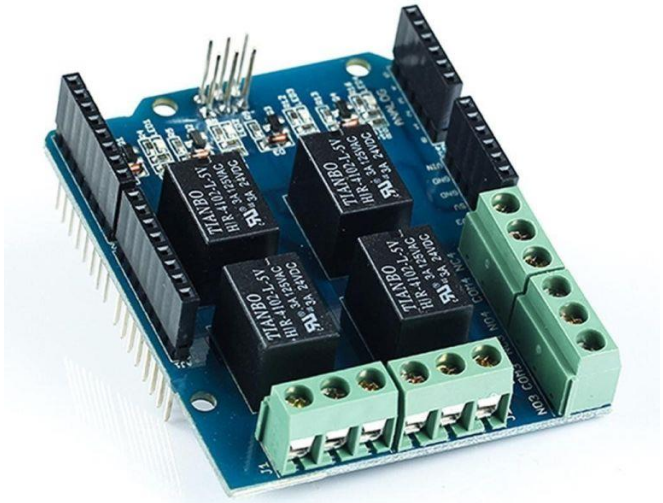
Different types of Shields:

- **1. Ethernet Shield**

The Ethernet Shield allows you to connect your Arduino to the internet. You just have to plug the shield onto the Arduino board and then, connect it to your network.

- **2. Relay Shield**

The Relay Shield is a module with 4 mechanical relays that provides you an easy way to control high voltage.



- **3. ProtoShield**

The ProtoShield is a prototyping Shield that makes it easy to prototype. It allows for easy connections between the breadboard and the Arduino.

- **4. Motor Shield**

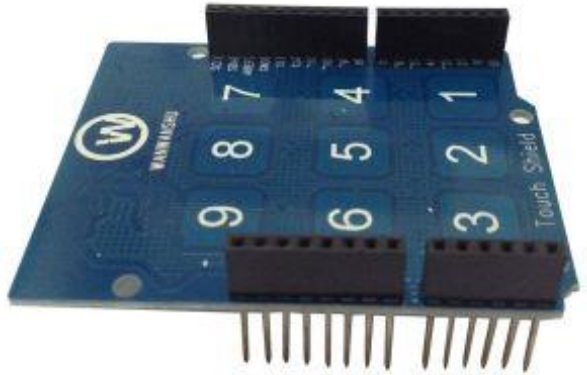
This Shield allows an easy control of motor direction and speed. It makes it easy to incorporate a motor into any of your projects.

- **5. LCD Shield**

This Shield makes it easy to use a 16×2 Character LCD. With this, it is possible to control a 16×2 Character LCD, up to 3 backlight pins and 5 keypad pins using only the two I2C pins on the Arduino.

- **6. Capacitive Touchpad Shield**

The Touchpad Shield allows you to build simple capacitive touch interfaces.



- **7. Smoke Detector Shield**

This Shield can detect concentrations of combustible gas in the air and read it as an analogue value. Useful to make a smoke detector system.

- **8. 64-Button Shield**

With this Shield you can connect up to 64 buttons to your Arduino. Some cool projects with this shield include musical instruments, cool computer interfaces, etc.

- **9. Joystick Shield Kit**

The joystick Shield provides simple analog inputs and four separate buttons and one button under the joystick itself.

- **10. GSM/GPRS Shield**

The GSM/GPRS Shield allows you to connect your Arduino to GSM/GPRS cell phone network. It allows you to dial a phone number or send a text message to a friend via easy to use AT commands.

- 11. **GPS Logger Shield**
- 12. **Wireless SD Shield**
- 13. **cc300 Wi-Fi Shield**
- 14. **HC-05 Bluetooth Shield**
- 15. **MP3 Player Shield**

You must know at least twenty-twenty five Arduino shields with it functionalities.

Thank you