

What is Arduino?

Arduino is a software as well as hardware platform that helps in making electronic projects. It is an open source platform and has a variety of controllers and microprocessors. There are various types of Arduino boards used for various purposes.

The Arduino is a single circuit board, which consists of different interfaces or parts. The board consists of the set of digital and analog pins that are used to connect various devices and components, which we want to use for the functioning of the electronic devices.

Most of the Arduino consists of 14 digital I/O pins.

The analog pins in Arduino are mostly useful for fine-grained control. The pins in the Arduino board are arranged in a specific pattern. The other devices on the Arduino board are USB port, small components (voltage regulator or oscillator), microcontroller, power connector, etc.

Features

The features of Arduino are listed below:

- Arduino programming is a simplified version of C++, which makes the learning process easy.
- The Arduino IDE is used to control the functions of boards. It further sends the set of specifications to the microcontroller.
- Arduino does not need an extra board or piece to load new code.
- Arduino can read analog and digital input signals.
- The hardware and software platform is easy to use and implement.

History

The project began in the Interaction Design Institute in Ivrea, Italy. Under the supervision of Casey Reas and Massimo Banzi, the Hernando Bar in 2003 created the **Wiring** (a development platform). It was considered as the master thesis project at IDII. The Wiring platform includes the PCB (Printed Circuit Board). The PCB is operated with the **ATmega168 Microcontroller**.

The ATmega168 Microcontroller was an IDE. It was based on the library and processing functions, which are used to easily program the microcontroller.

In 2005, Massimo Banzi, David Cuartielles, David Mellis, and another IDII student supported the ATmega168 to the Wiring platform. They further named the project as Arduino.

The project of Arduino was started in 2005 for students in Ivrea, Italy. It aimed to provide an easy and low-cost method for hobbyists and professionals to interact with the environment using the actuators and the sensors. The beginner devices were simple motion detectors, robots, and thermostats.

In mid-2011, the estimated production of Arduino commercially was 300,000. In 2013, the Arduino boards in use were about 700,000.

Around April 2017, Massimo Banzi introduced the foundation of Arduino as the "new beginning for Arduino". In July 2017, Musto continued to pull many Open Source licenses and the code from the websites of the Arduino. In October 2017, Arduino introduced its collaboration with the ARM Holdings. The Arduino continues to work with architectures and technology vendors.

Microcontroller

The most essential part of the Arduino is the Microcontroller, which is shown below:



- Microcontroller is small and low power computer. Most of the microcontrollers have a RAM (Random Access Memory), CPU (Central Processing Unit), and a memory storage like other computer systems.
- It has very small memory of 2KB (two Kilobytes). Due to less memory, some microcontrollers are capable of running only one program at a time.
- It is a single chip that includes memory, Input/Output (I/O) peripherals, and a processor.

- The GPIO (General Purpose Input Output) pins present on the chip help us to control other electronics or circuitry from the program.

Electronic devices around Us

We have many electronic devices around us. Most of the appliance consists of the microcontroller for its functioning. Let's discuss some of the examples.

- Microcontroller present in Microwave Oven accepts the user input and controls the magnetron that generates microwave rays to cook the food and displays the output timer.
- Modern cars also contain dozens of microcontrollers working in tandem (one after another) to control functions like lighting, radio interface, etc.

Projects

Let's consider a simple project of LED blink.

We need a software to install our sketch or code to the Arduino board. The LED will blink after the successful uploading of code. The software is called as Arduino IDE (Integrated Development Environment).

There are various projects created with the help of the Arduino. Some of the projects are listed below:

- Home Automation System using IOT (Internet of Things).
- Solar Power water trash collector.
- Fire Detector, etc.

Some projects require a list of components. So, for easy convenience and hands-on projects, the Arduino kits are available easily in market.

Arduino Kits

We can easily start with our electronics projects using the complete kit. It also helps us to create hands-on and engaging projects.

Some of the popular Arduino kits are listed below:

- Arduino Starter kit
- Robot Linking UNO kit for learning
- Arduino UNO 3 Ultimate starter kit
- UNO Super starter kit
- Mega 2560 Starter Kit

Arduino IDE

The IDE makes the traditional projects even easier and simpler. The USB cable is used to load the program or sketch on the specific Arduino board.

The IDE application is suitable for **Windows**, Mac OS X, and **Linux**. It supports the programming language **C** and **C++**. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software.

Many other companies including Sparkfun Electronics, also make their own boards that are compatible with **Arduino IDE**.

Arduino Boards

There are variety of Arduino board used for different purposes. The board varies in I/O pins, size, etc. The various components present on the **Arduino boards** are Microcontroller, Digital Input/Output pins, USB Interface and Connector, Analog Pins, Reset Button, Power button, LED's, Crystal Oscillator, and Voltage Regulator. Some components may differ depending on the type of board.

Let's discuss some of the popular Arduino boards.

- Arduino UNO
- Arduino Nano
- Arduino Mega
- Arduino Due
- Arduino Bluetooth

Shields

- Shields are defined as the hardware device that can be mounted over the board to increase the capabilities of the projects.
- The shield is shown below:



- The shield together with Arduino can make the projects even smarter and simpler. For example, Ethernet shields are used to connect the Arduino board to the Internet.
- The shields can be easily attached and detached from the Arduino board. It does not require any complex wiring.

Prerequisite

The requirement to learn Arduino is the basic knowledge of **C** and **C++** programming language. A basic understanding of **circuits**, **Microcontrollers**, and **Electronics** is also essential.

Audience

The Arduino is intended for use by students, engineers, and hobbyists. The basic knowledge of electronic components and programming is required before beginning with the Arduino Tutorials.