Arduino and the Blinking LED
A Classical Sketch

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1. Introduction to Arduino

Arduino is an open-source electronics prototyping platform based on easy-to-use hardware and software. It allows users ranging from novices to experts to create interactive electronic projects. At the heart of Arduino is a microcontroller—a small computer on a single integrated circuit. The Arduino ecosystem includes various models such as the Uno, Mega, Nano, and Leonardo. Each has a unique number of pins and capabilities but shares a common programming structure.

2. Why Blinking an LED is the First Step

The Blinking LED sketch is typically the first project for beginners because:

- It introduces the core concepts of microcontroller programming.
- It requires minimal hardware: an Arduino board and an LED.
- It demonstrates the basic syntax and structure of Arduino sketches.
- It builds confidence by producing a visible and tangible result.

3. Hardware Requirements

- Arduino Uno (or compatible board)
- USB cable to connect to a computer
- 1 LED (Light Emitting Diode)
- 1 Resistor (220)
- Breadboard and jumper wires

4. Circuit Setup

Connect the components as follows:

- The long leg (anode) of the LED goes to digital pin 13 via a resistor.
- The short leg (cathode) goes to the ground (GND).

Many Arduino boards already have an internal LED connected to pin 13, so external hardware is optional for this sketch.

5. Structure of an Arduino Sketch

Every Arduino program, also known as a *sketch*, consists of two main functions:

- `setup()` is run once when the program starts. It's used to initialize settings.
- `loop()` runs repeatedly after `setup()`. This is where the main logic resides.

6. The Blinking LED Sketch

```
void setup() {
  pinMode(13, OUTPUT); // Set digital pin 13 as output
}

void loop() {
  digitalWrite(13, HIGH); // Turn the LED on
  delay(1000);            // Wait for 1 second
  digitalWrite(13, LOW);  // Turn the LED off
  delay(1000);            // Wait for 1 second
}
```

Listing 1: Blinking LED Sketch

7. Detailed Explanation

pinMode()

This function configures the specified pin to behave as either an input or an output. Here, we set pin 13 as an output:

```
pinMode(13, OUTPUT);
```

digitalWrite()

Sends a HIGH or LOW signal to a digital pin:

```
digitalWrite(13, HIGH); // LED turns on
```

delay()

Pauses the program for the amount of time (in milliseconds) specified as a parameter:

```
delay(1000); // Wait for 1 second
```

8. Common Variations

You can experiment by:

- Changing the delay to make the LED blink faster or slower.
- Using a different digital pin and adjusting `pinMode` and `digitalWrite` accordingly.
- Adding another LED and alternating blinks.

9. Conclusion

The Blinking LED is more than just a flashing light. It is a rite of passage into the world of physical computing. Understanding it lays the foundation for more advanced projects involving sensors, actuators, and even wireless communication.