Introduction to Arduino

BeurdByteBuilders

https://cpge-bird.github.io

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Outline

1. What is Arduino?
2. Arduino Uno Performance
3. Arduino Pins Features
4. Basic C++ Syntax
5. Example: Blinking LED

What is Arduino?

Overview

- Arduino is an open-source platform used for building electronics projects.
- It includes a programmable microcontroller and several input/output pins.
- Ideal for beginners to learn coding and hardware interaction.

Arduino Uno Performance

Microcontroller

ATmega328P

Specifications

- **Flash Memory:** 32 KB (0.5 KB used by bootloader)
- **SRAM (RAM):** 2 KB
- **EEPROM:** 1 KB

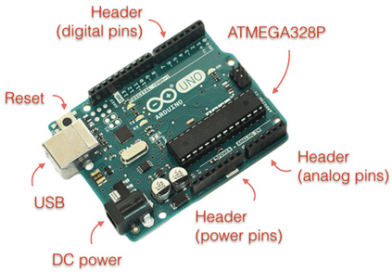
Performance

- **Clock Speed:** 16 MHz
- **Operating Voltage:** 5V
- **Digital I/O Pins:** 14 (6 PWM supported)
- **Analog Input Pins:** 6

Arduino Pin Types

Main Pin Types

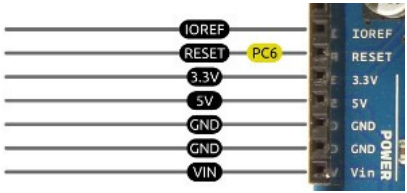
- **Digital Pins (0-13):** Used for digital input/output (HIGH or LOW).
- **Analog Pins (A0-A5):** Converts analog signals to digital values (0-1023).
- **PWM Pins:** Pins that support PWM for analog-like outputs (3, 5, 6, 9, 10, 11).
- **Power Pins:** Includes 5V, 3.3V, and GND for external component power.



Power and Reset Features

Power Options

- **5V Pin:** Supplies regulated 5V to components.
- **3.3V Pin:** Outputs 3.3V, ideal for low-power devices.
- **GND Pins:** Grounds connections to complete circuits.
- **VIN Pin:** Connects external power source (7-12V).



Reset Functionality

- **Reset Pin:** Resets the board and restarts code.

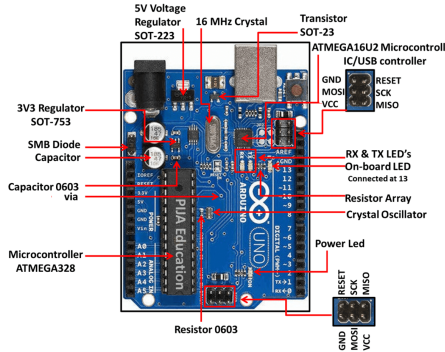
Special Features and Components

Additional Components

- **Onboard LED (Pin 13):** For basic tests.
- **ICSP Header:** Allows direct microcontroller programming.
- **TX/RX LEDs:** Indicates serial communication activity.
- **Voltage Regulator:** Provides stable voltage levels.
- **USB Connection:** For power and data transfer.

Debugging Tools

- **Reset Button:** Quickly restarts the board.
- **Serial Monitor (via USB):** For data output.



Basic C++ Syntax for Arduino

Core Structure

Setup and Loop:

- `setup()` – Runs once at the beginning to initialize settings.
- `loop()` – Repeats continuously for the main program.

Code Basics

- Comments: `// single-line` and `/* multi-line */`
- Functions and Variables: `int`, `digitalWrite()`, `pinMode()`

Data Types and Variables

Common Data Types

- `int`: Stores integers (e.g., `int counter = 0;`)
- `float`: Holds floating-point numbers (e.g., `float temperature = 23.5;`)
- `char`: Holds a single character (e.g., `char letter = 'A';`)
- `bool`: Stores a Boolean value (true or false)

Variable Modifiers and Example Code

Variable Modifiers

- `const`: Declares constants that cannot change (e.g., `const int ledPin = 13;`)
- `unsigned`: For positive-only integers, extending the range (e.g., `unsigned int score = 100;`)
- `volatile`: Indicates that the variable may change outside the program's scope (useful for interrupts)

Example Code

```
const int ledPin = 13;
int counter = 0;
float voltage = 5.0;
```

Example: Blinking an LED

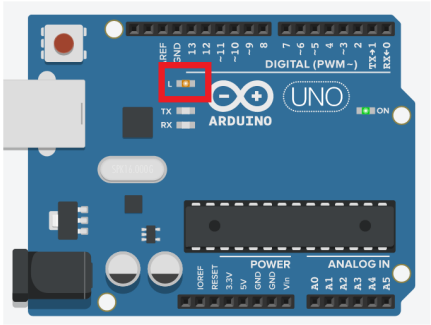
Objective

Connect an LED to pin 13 and make it blink every second.

Code Example:

sketch_oct17a.ino

```
1  // Beurd Byte Builders
2  void setup() {
3
4    pinMode(LED_BUILTIN, OUTPUT);
5  }
6
7  void loop() {
8    digitalWrite(LED_BUILTIN, HIGH);
9    delay(1000);
10   digitalWrite(LED_BUILTIN, LOW);
11   delay(100000);
12 }
13
```



Thank You for Your Attention!

Questions or Feedback?

Written with LaTeX

Your journey into Arduino has just begun!