Arduino Programming Structure

Arduino programming follows a simple structure with two main functions:

- Setup()
- Loop()

These functions are part of every Arduino program.

1.The setup() Function

Purpose: This function runs once at the beginning when the Arduino is powered on or reset.

What goes here?:

You initialize settings, pin modes, and setup serial communication.

This is the starting point of the program.

Example of setup():

```
 Void setup() {
 // Initialize serial communication at 9600 baud rate
 Serial.begin(9600);
 // Set pin 13 as an OUTPUT pin
 pinMode(13, OUTPUT);

}
```

2. The loop() Function

Purpose: This function runs repeatedly in a loop as long as the Arduino is powered.

What goes here?:

You write the actions that need to happen over and over again.

This part controls what your Arduino does continuously.

Example of loop():

```
 Void loop() {
 // Turn the LED on pin 13 on
 digitalWrite(13, HIGH);
 // Wait for 1 second (1000 milliseconds)
 Delay(1000);
 // Turn the LED off
 digitalWrite(13, LOW);
 // Wait for 1 second
 Delay(1000);
}
```

3. Variables and Constants

- **Variables**: You can store data values that change, like numbers, states, or sensor readings.
    - Example: `int temperature;`
- **Constants**: Used for fixed values that don't change, such as pin numbers.
    - Example: `const int ledPin = 13;`

4. Functions

Sometimes, you may want to repeat certain actions. So, you can define **functions** to organize the code and make it reusable.

Example:

```
void blinkLED() {
  digitalWrite(13, HIGH);
  delay(1000);
  digitalWrite(13, LOW);
  delay(1000);
}
```

5. Common Arduino Functions

- **pinMode(pin, mode)**: Defines whether a pin is INPUT or OUTPUT.
  - Example: `pinMode(13, OUTPUT);`
- **digitalWrite(pin, value)**: Sets the pin to either HIGH or LOW (ON or OFF).
  - Example: `digitalWrite(13, HIGH);`
- **digitalRead(pin)**: Reads the state (HIGH or LOW) of a digital input pin.
  - Example: `int buttonState = digitalRead(2);`
- **delay(milliseconds)**: Pauses the program for the specified amount of time.
  - Example: `delay(1000);` (Waits 1 second)
- **analogRead(pin)**: Reads the value from an analog pin (0 to 1023).
  - Example: `int sensorValue = analogRead(A0);`
- **analogWrite(pin, value)**: Writes an analog value (PWM signal) to a pin (0-255).
  - Example: `analogWrite(9, 128);` (50% brightness for LED)

6. Comments

Adding **comments** helps explain the code, so others (or yourself) can understand what it does.

- **Single-line comment**:
  `// This is a single-line comment`
- **Multi-line comment**:
  `/* This is a multi-line comment */`