

W10B: DE [Joystick and Arduino with LEDs] Arduino Variables Tutorial

Introduction

Programming languages have their own grammar called “syntax”. Programs written with the Arduino software are called Sketches. A **Sketch** (program written with **Arduino**) will contain: a title, **constants**, **variables**, `setup()` functions, and `loop()` functions.

If the syntax of a language is not followed, the program will not compile correctly. This means that no executable code will be produced. Fortunately, the **Arduino** integrated development environment (IDE) will provide error messages that will help you fix your “bad grammar”... called “syntax errors”. One of the most common syntax errors that students make is forgetting that lines of code need to end with a semicolon.

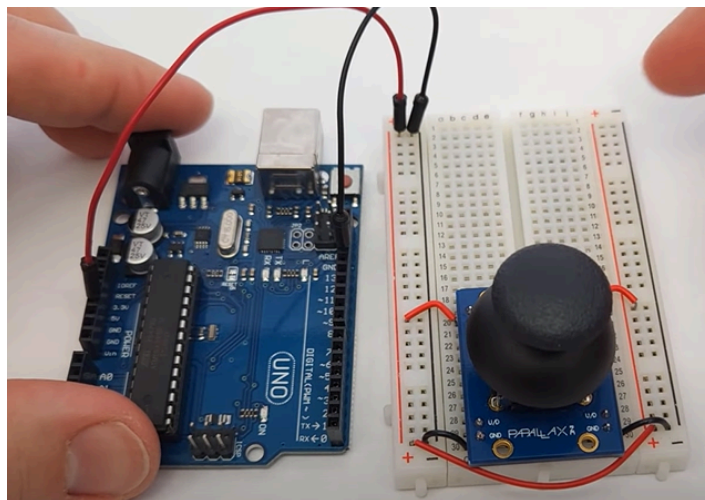
Equipment

- Computer with Arduino Software
- 2-axis JoyStick
- 4 LEDs -Multiple colors

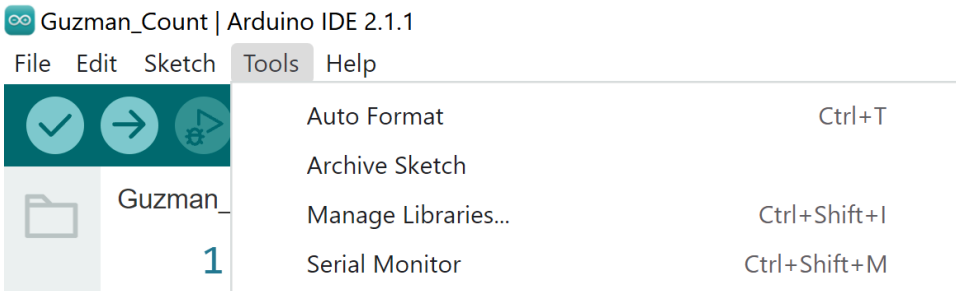
Procedure

Introduction: Create a “New Sketch” and enter the code:

```
joystick_read | Arduino IDE 2.0.4
File Edit Sketch Tools Help
Arduino Uno
joystick_read.ino
1 // define pins
2 const int LRpin = A0;
3 const int UDpin = A1;
4
5 // variables for analog readings
6 int LR;
7 int UD;
8
9 void setup() {
10 // put your setup code here, to run once:
11 // Initialize serial communication
12 Serial.begin(9600);
13 }
14
15 void loop() {
16 // put your main code here, to run repeatedly:
17 // read analog pins
18 LR = analogRead(LRpin);
19 UD = analogRead(UDpin);
20
21 // print values
22 Serial.print("LR: ");
23 Serial.print(LR);
24 Serial.print(" UD: ");
25 Serial.println(UD);
26 }
27
```



View the code using Serial Monitor located under the Tools tab:



1. Use the video provided to understand the use of variables using C++ Code. Use the Arduino to program the code and the reference guide: **REFERENCE VIDEO: How to Use a**

Joystick with Arduino (Lesson #13)

<https://www.youtube.com/watch?v=vo7SbVhW3pE&t=1s>

Use this code: <https://www.youtube.com/watch?v=vo7SbVhW3pE&t=1s>

What does the C++ code do? Did you define the variables on your Arduino?

The code reads inputs from the joystick and prints out their value in the serial monitor.

2. Using the code above. Display the numerical values shown by the program when the joystick is pushed down and the display of the values when the joystick moves up. Make sure to have your name on your Arduino Sketch Code to get credit for your screenshot. Make sure to comment your name into the code. If your code is too long make sure to attach a Google Document with your code.

Attach your C++ text code below. To earn full credit make sure your code has comments. Describe what the code does.

```
const int joystickLR = A0; // Joystick left/right on analog pin A0
const int joystickUD = A1; // Joystick up/down on analog pin A1

const int leftLED = 3; // Left LED on PWM pin 3
const int downLED = 5; // Down LED on PWM pin 5
```

```
const int upLED = 6;      // Up LED on PWM pin 6
const int rightLED = 9;   // Right LED on PWM pin 10

int horizontalValue = 0;  // Variable to store horizontal joystick value
int verticalValue = 0;    // Variable to store vertical joystick value

// Joystick center position (approximately 512 for most joysticks)
const int centerPosition = 512;

void setup() {
    // Initialize serial communication for debugging
    Serial.begin(9600);
}

void loop() {
    // Read joystick values
    horizontalValue = analogRead(joystickLR);
    verticalValue = analogRead(joystickUD);

    // Print joystick values for debugging
    Serial.print("Horizontal: ");
    Serial.print(horizontalValue);
    Serial.print(" | Vertical: ");
    Serial.println(verticalValue);

    // Small delay for stability
    delay(50);
}
```

3. Use the YouTube tutorial to program the Joystick and four LEDs to indicate the direction of

the joystick movement. Make sure to get four different LED colors. Make sure to use resistors for each LED; remember to use resistors greater than 220 ohms.

Insert the C++ Code below and the comments to each of the parts of the code. Naming conventions must be followed. For Example "cat" is the same as blink_LED.

```
const int joystickLR = A0; // Joystick left/right on analog pin A0
const int joystickUD = A1; // Joystick up/down on analog pin A1

const int leftLED = 3;    // Left LED on PWM pin 3
const int downLED = 5;    // Down LED on PWM pin 5
const int upLED = 6;      // Up LED on PWM pin 6
const int rightLED = 9;   // Right LED on PWM pin 10

int horizontalValue = 0;  // Variable to store horizontal joystick value
int verticalValue = 0;    // Variable to store vertical joystick value

// Variables to store calculated LED brightness
int rightBrightness = 0;
int leftBrightness = 0;
int upBrightness = 0;
int downBrightness = 0;

// Joystick center position (approximately 512 for most joysticks)
const int centerPosition = 512;

void setup() {
  // Set LED pins as outputs
  pinMode(leftLED, OUTPUT);
  pinMode(rightLED, OUTPUT);
  pinMode(upLED, OUTPUT);
  pinMode(downLED, OUTPUT);

  // Initialize serial communication for debugging
  Serial.begin(9600);
}
```

```
void loop() {
  // Read joystick values
  horizontalValue = analogRead(joystickLR);
  verticalValue = analogRead(joystickUD);

  // Print joystick values for debugging
  Serial.print("Horizontal: ");
  Serial.print(horizontalValue);
  Serial.print(" | Vertical: ");
  Serial.println(verticalValue);

  // Calculate LED brightness for horizontal axis
  if (horizontalValue > centerPosition) {
    // Joystick moved right
    rightBrightness = map(horizontalValue, centerPosition, 1023, 0, 255);
    leftBrightness = 0;
  } else {
    // Joystick moved left
    leftBrightness = map(horizontalValue, 0, centerPosition, 255, 0);
    rightBrightness = 0;
  }

  // Calculate LED brightness for vertical axis
  if (verticalValue > centerPosition) {
    // Joystick moved up
    upBrightness = map(verticalValue, centerPosition, 1023, 0, 255);
    downBrightness = 0;
  } else {
    // Joystick moved down
    downBrightness = map(verticalValue, 0, centerPosition, 255, 0);
    upBrightness = 0;
  }

  // Set LED brightness using PWM
  analogWrite(leftLED, leftBrightness);
}
```

```
analogWrite(rightLED, rightBrightness);  
analogWrite(upLED, upBrightness);  
analogWrite(downLED, downBrightness);  
  
// Small delay for stability  
delay(50);  
}
```

E-Portfolio video with updated code.

E-Portfolio Published link with video file. Upload the file to your Google Drive to upload on your Portfolio. YouTube Videos preferred.

<https://sites.google.com/riversideunified.org/matthewjeide/notes/w10b-de-joystick-and-arduino-with-leds-arduino-variables-tutorial>

Conclusion

Answer in complete sentences each of the questions below.

1. How does step 3 compare to step 1 and 2. What changes did you make and why?

I had to introduce LEDs into the equation, and they had to specifically correlate to directions of the joystick. The LEDs and their coding had a lot more code compared to just printing out the input from the joystick to the serial monitor.