



University of Alexandria, Faculty of Engineering  
Department of Computer and Systems Engineering

CSE233 Computer Organization  
Arduino Lab 6: Debugger

prepared by:

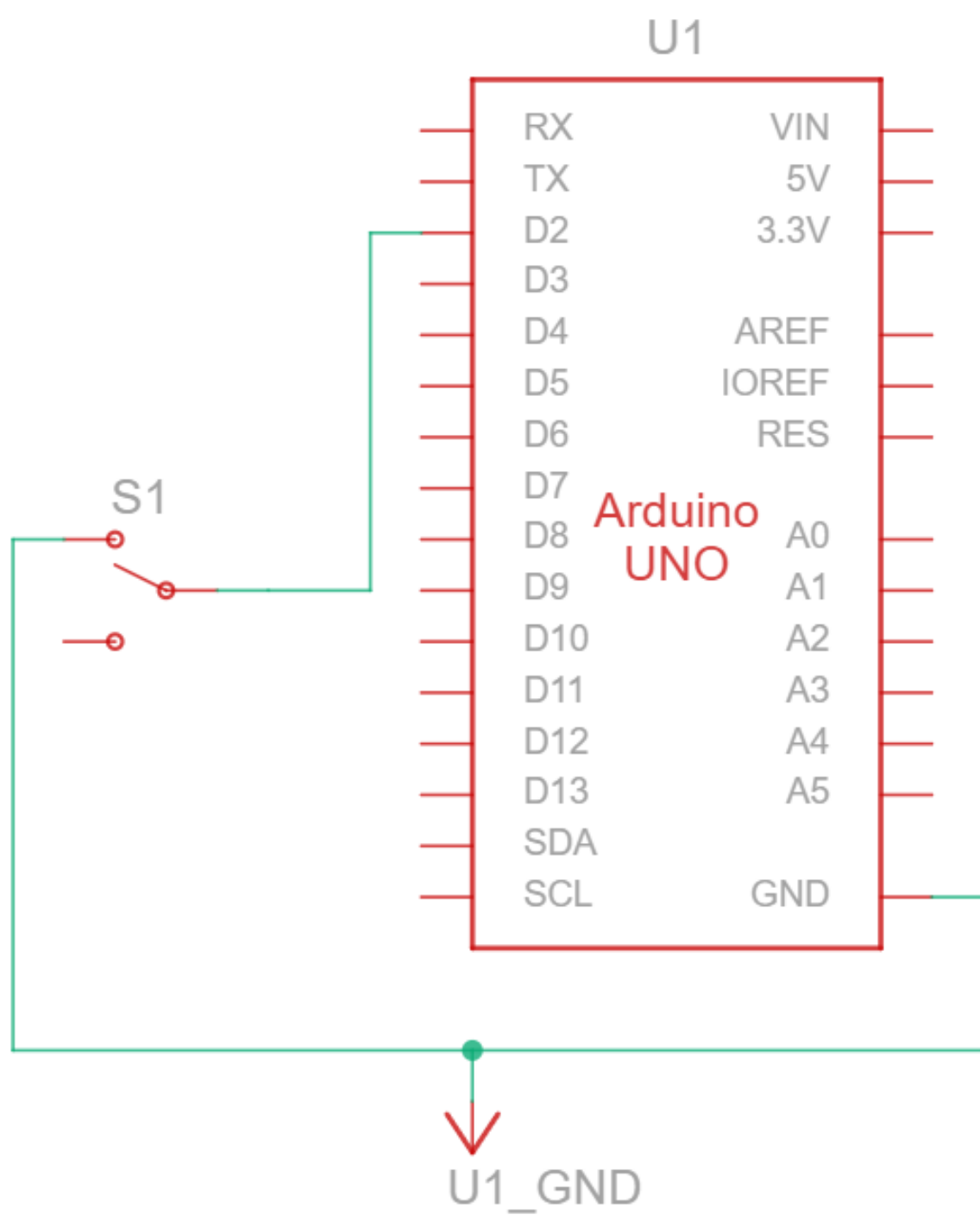
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## The Documentation

First, we declared global variables including the button pin, LED state, and a counter variable. We implemented a debounce function to eliminate button bounce noise by reading the button state multiple times with delays. In the setup function, we initialized serial communication at 115200 baud rate, configured the button pin as INPUT\_PULLUP, and set the built-in LED as output. In the loop function, we continuously check the button state using the debounce function, and when a button press is detected (state change), we toggle the LED state and print it to the serial monitor. The counter variable `x` is incremented in each loop iteration, which serves as a breakpoint target for debugging using Virtual Micro debugger.

## The Schematic Diagram



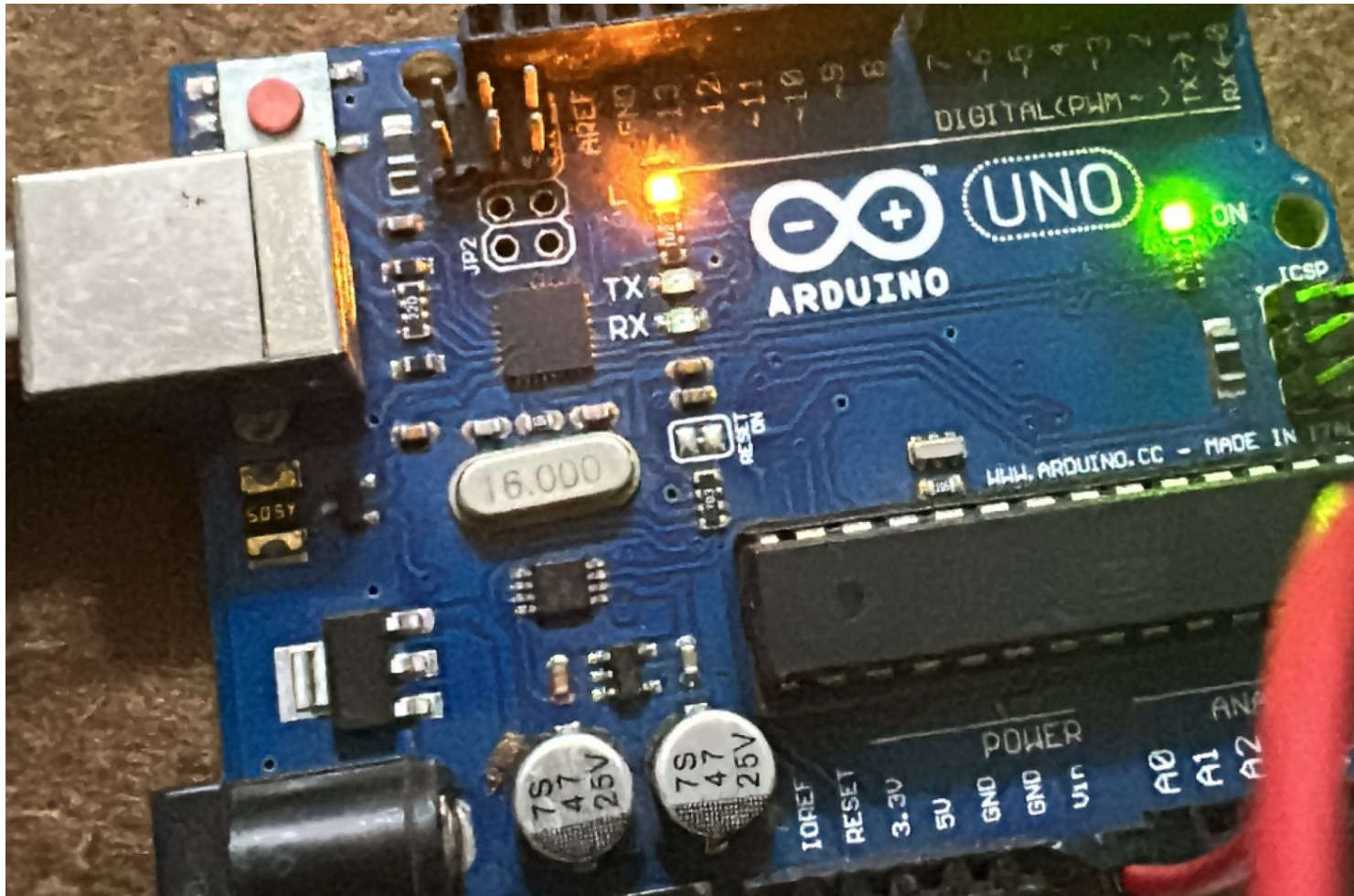
## LED State Screenshots

### LED OFF State

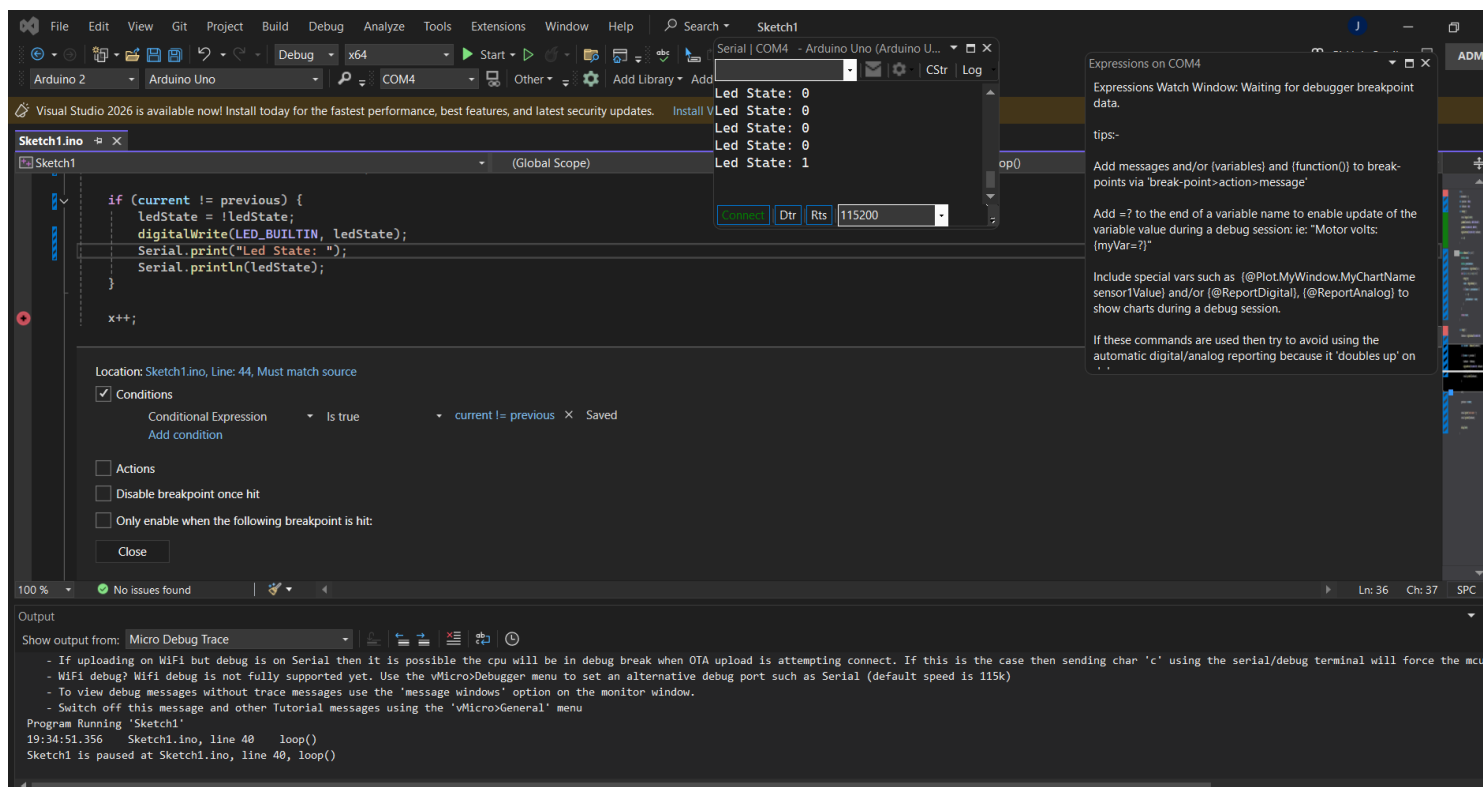




## LED ON State



# Debugger Breakpoint



## The Arduino Code

```
1 // Lab 6: Debugger with Latch Button and LED
2
3 // Global Variables
4 int x;
5 int buttonPin = 2;
6 bool previous = HIGH;
7 bool ledState = LOW;
8
9 void setup() {
10     Serial.begin(115200);
11     pinMode(buttonPin, INPUT_PULLUP);
12     pinMode(LED_BUILTIN, OUTPUT);
13     digitalWrite(LED_BUILTIN, ledState);
14     x = 20;
15 }
16
17 // Debounce function to eliminate button noise
18 boolean debounce(int pin) {
19     boolean state;
20     boolean previousState;
21     previousState = digitalRead(pin);
22     for (int i = 0; i < 10; i++) {
23         delay(10);
24         state = digitalRead(pin);
```

```

25         if (state != previousState) {
26             i = 0;
27             previousState = state;
28         }
29     }
30     return state;
31 }
32
33 void loop() {
34     ledState = digitalRead(LED_BUILTIN);
35     bool current = debounce(buttonPin);
36
37     // Check if button state changed
38     if (current != previous) {
39         ledState = !ledState;
40         digitalWrite(LED_BUILTIN, ledState);
41         Serial.print("Led State: ");
42         Serial.println(ledState);
43     }
44
45     x++; // Breakpoint line for debugging
46     previous = current;
47
48     Serial.print("Led State: ");
49     Serial.println(ledState);
50     delay(1000);
51 }
52

```

## Challenges Faced

- **Button Debouncing:** Implementing proper debouncing logic to handle mechanical button noise and ensure reliable state detection.
- **Virtual Micro Setup:** Configuring and setting up the Virtual Micro debugger environment for the first time.
- **Breakpoint Configuration:** Setting conditional breakpoints based on button state changes in the debugging environment.
- **Serial Monitor Synchronization:** Ensuring proper timing between serial output and LED state changes during debugging.

## References

- Virtual Micro installation and setup guide

- Virtual Micro debugging examples session
- Arduino official documentation for `digitalRead()` and `digitalWrite()`
- Button debouncing techniques from Arduino community