

Activity 4: Programming Embedded Systems (Part 2)

Activity 4 : Programming Embedded Systems (Having Fun with Arduino)

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Part 2: Serial and PWM

What is the meaning of “Baud Rate”? What is the unit of the “Baud Rate”?

Bits per second, 115200

Try to control the LED from serial input. ‘1’ to turn on the LED, ‘0’ to turn off the LED.
(Change circuit without Button switch).

```
const int LED_PIN = 2;
const int BUTTON_PIN = 3;

int ledState = LOW;

void setup() {
    pinMode(LED_PIN, OUTPUT);
    pinMode(BUTTON_PIN, INPUT);

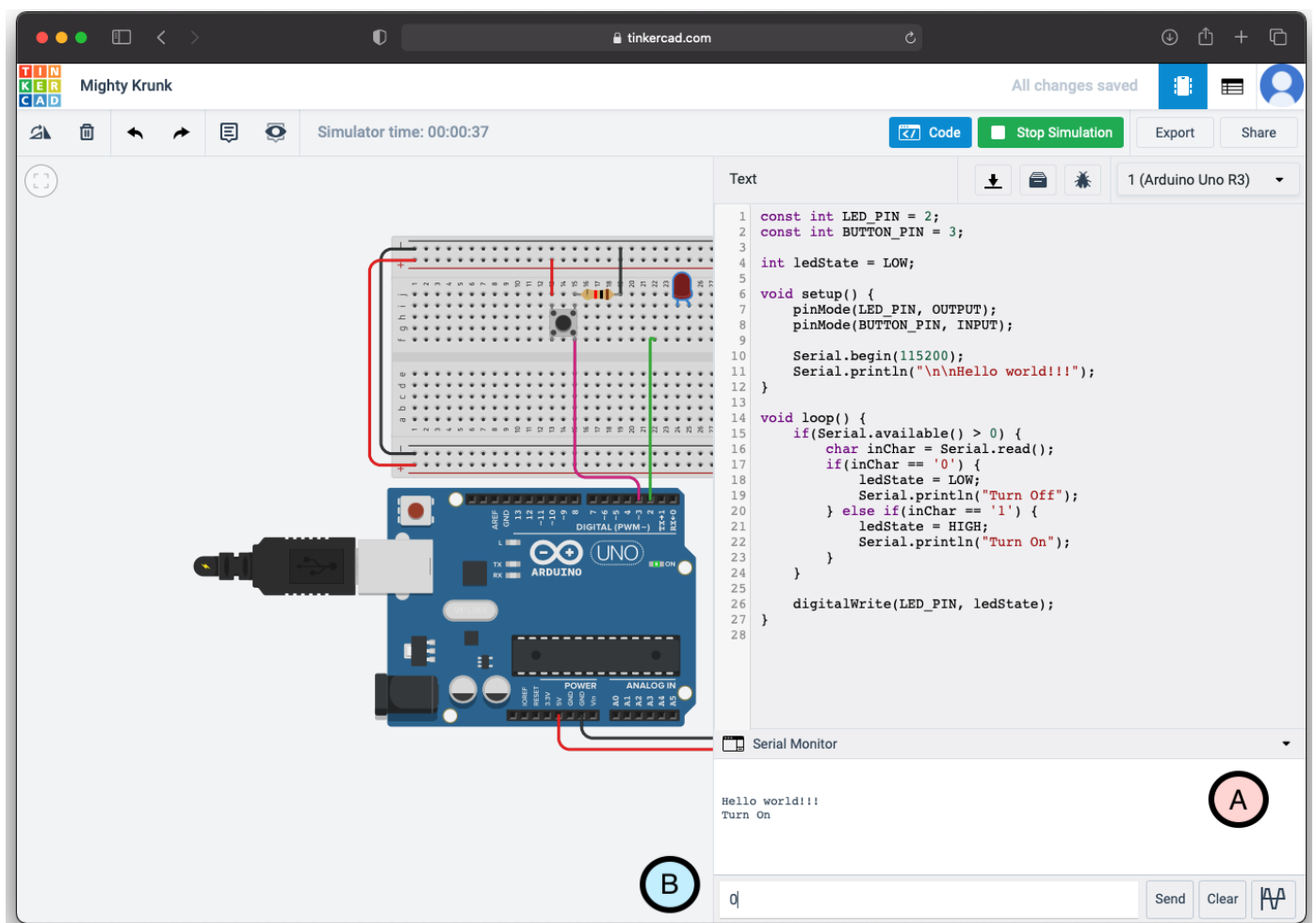
    Serial.begin(115200);
    Serial.println("\n\nHello world!!!");
}

void loop() {
    if(Serial.available() > 0) {
        char inChar = Serial.read();
        if(inChar == '0') {
            ledState = LOW;
        }
    }
}
```

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```
Serial.println("Turn Off");  
} else if(inChar == '1') {  
    ledState = HIGH;  
    Serial.println("Turn On");  
}  
  
digitalWrite(LED_PIN, ledState);  
}
```

Note that you can observe the serial output in the Serial Monitor (A) at the bottom of the Code pane. You can also enter input via Serial input (B).



What does “PWM” stand for?

Pulse Width Modulation

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Try to control LED level from 0 to 9 by the serial input. You can monitor the PWM graph via the oscilloscope.

```
const int LED_PIN = 2;
const int BUTTON_PIN = 3;

int dutyCount = 0;
int currentDuty = 0;

void setup() {
    pinMode(LED_PIN, OUTPUT);
    pinMode(BUTTON_PIN, INPUT);

    Serial.begin(115200);
    Serial.println("\n\nHello world!!!");
}

void loop() {
    if(Serial.available() > 0) {
        char inChar = Serial.read();
        int temp = inChar - '0';
        if(temp >= 0 && temp <= 9) {
            currentDuty = temp;
        }
    }

    if(dutyCount%10 < currentDuty) {
        digitalWrite(LED_PIN, HIGH);
    } else {
        digitalWrite(LED_PIN, LOW);
    }
}
```

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Write Arduino code to do the following task. Input one digit '0' to '9' as a serial input, dim the LED as that number loops. (1 loop dim set PWM from 0% -> 90% -> 0%) Put the code in the answer box. (The range of PWM is between 0 and 255. If the PWM is at 0 that mean the system is running at 0% and If the PWM is at 255 this mean that the system is running at 100%)

Example Video Clip: <https://youtu.be/oLsSGaJd38o>

```
const int LED_PIN = 2;
const int BUTTON_PIN = 3;

int dutyCount = 0;
int currentDuty = 0;

void setup() {
  pinMode(LED_PIN, OUTPUT);
  pinMode(BUTTON_PIN, INPUT);

  Serial.begin(115200);
  Serial.println("\n\nHello world!!!");
}

void loop() {
  // Read serial input
  if (Serial.available() > 0) {
    char inChar = Serial.read();
    int temp = inChar - '0';
    if (temp >= 0 && temp <= 9) {
      currentDuty = temp;
    }
  }

  // Update LED duty cycle
  if (dutyCount % 10 < currentDuty) {
    digitalWrite(LED_PIN, HIGH);
  } else {
    digitalWrite(LED_PIN, LOW);
  }

  // Increment duty cycle count
  dutyCount++;

  // Reset duty cycle count at end of cycle
  if (dutyCount == 10) {
    dutyCount = 0;
  }
}
```

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Once you finish, students must inform an instructor or a TA for inspection.

— THIS IS THE END OF PART 2 —
