Arduino PWM Fade: analogWrite, Pins and the Curve

Mokxi · one-page lesson plan

OBJECTIVE

See analogWrite() breathe an LED with real 490 Hz hardware PWM on timer 1, which pins actually support it, and why the brightness curve is not straight.

WHAT YOU NEED

Arduino Uno R3, Resistor, LED

STEPS

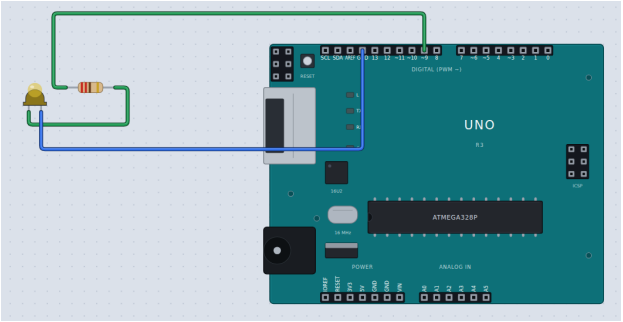
• Which pins support analogWrite — Only six pins on the Uno can do this: 3, 5, 6, 9, 10 and 11, marked with a tilde on the board's own silkscree…
• The code — The sketch below only ever changes one thing, `analogWrite(LED_PIN, breath[step])`, thirty times a second, st…
• Why 8 bits — `analogWrite()` takes a value from 0 to 255, eight bits, on every pin it supports, even the ones sitting on t…
• The brightness curve — Human brightness perception is closer to logarithmic than linear: doubling the actual light output does not l…

FIRMWARE/EXAMPLES/FADE (THE EXACT PROGRAM RUNNING ABOVE)

```
const int LED_PIN = 9;
const int STEPS = 64;
const int MS_PER_STEP = 30;

const uint8_t breath[STEPS] = {
    0,   1,   2,   5,  10,  15,  21,  28,
   37,  46,  56,  66,  77,  89, 101, 113,
  125, 137, 149, 161, 173, 184, 194, 204,
  213, 222, 229, 235, 240, 245, 248, 249,
  250, 249, 248, 245, 240, 235, 229, 222,
  213, 204, 194, 184, 173, 161, 149, 137,
  125, 113, 101,  89,  77,  66,  56,  46,
```

THE CIRCUIT



ASSESSMENT IDEA

Have the student change the fade sketch to a straight linear ramp of analogWrite() values and explain in writing why it still looks like it rushes the top end.

https://mokxi.com/learn/arduino-pwm-fade