

Arduino Blink Without Delay: Two LEDs, Two Rates

Mokxi · one-page lesson plan

OBJECTIVE

`delay()` stops everything. Use `millis()` instead and run two LEDs at different rates at once. Both the blocking and the working version run on this page.

WHAT YOU NEED

Arduino Uno R3, Resistor (2), LED (2)

STEPS

- What `delay()` actually does — On the real chip, and in Mokxi's model of it, ``delay()`` is not a busy loop spinning the CPU for the sake of i...
- The state-machine shape — The fix is to stop waiting and start asking the time.
- Two timers at once — The Uno's built-in ``tworates`` program is the circuit above, running as shown: two independent jobs, two inter...
- What you would try with `delay()`, and why it stops scaling — It is possible to make two lamps alternate with nothing but ``delay()``, and the Uno's built-in ``twoleds`` progr...

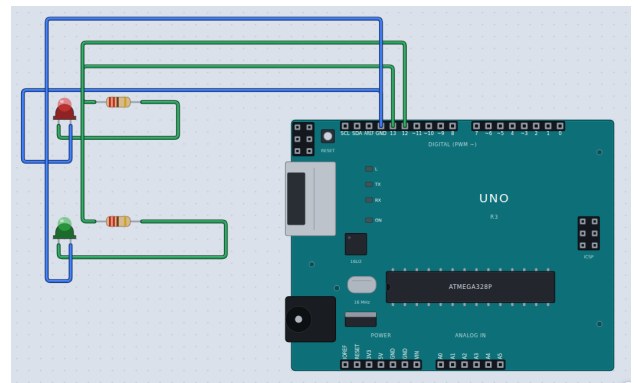
FIRMWARE/EXAMPLES/TWORATES (THE EXACT PROGRAM RUNNING ABOVE)

```
const int RED_PIN = 13;
const int GREEN_PIN = 12;
const unsigned long RED_MS = 250;
const unsigned long GREEN_MS = 400;
```

```
unsigned long lastRed = 0;
unsigned long lastGreen = 0;
bool redOn = false;
bool greenOn = false;
```

```
void loop() {
  unsigned long now = millis();
```

THE CIRCUIT



ASSESSMENT IDEA

Have the student add a third LED at its own rate to the `millis()` sketch, then explain in writing why the same change cannot be made in the `delay()`-only version.

<https://mokxi.com/learn/arduino-blink-without-delay>