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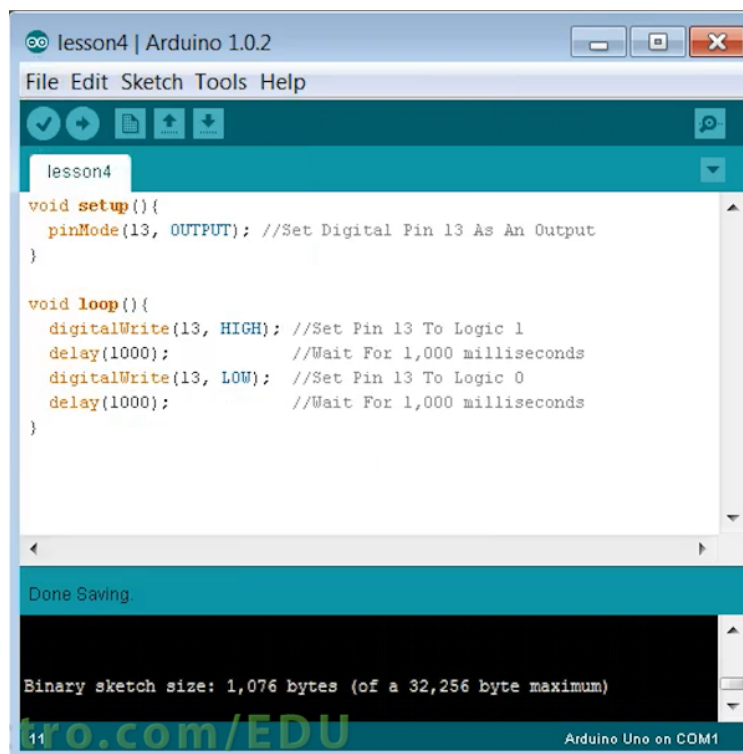
Introduction To Microcontrollers Electronics – Lesson 4: Timers and Timing

FORMULAS

The following formulas and information are meant to go with the online lesson found here:
http://www.pyroelectro.com/edu/microcontrollers/timers_timing/

EXAMPLE ARDUINO PROGRAM

In lesson 4 we explored the world of timers and timing functions that Arduino offers. In the first program we used the delay function to perform a seeming simple task of blinking an LED. The delay function paused the program for 1,000 milliseconds or 1 second.



```
lesson4 | Arduino 1.0.2
File Edit Sketch Tools Help
lesson4
void setup(){
  pinMode(13, OUTPUT); //Set Digital Pin 13 As An Output
}

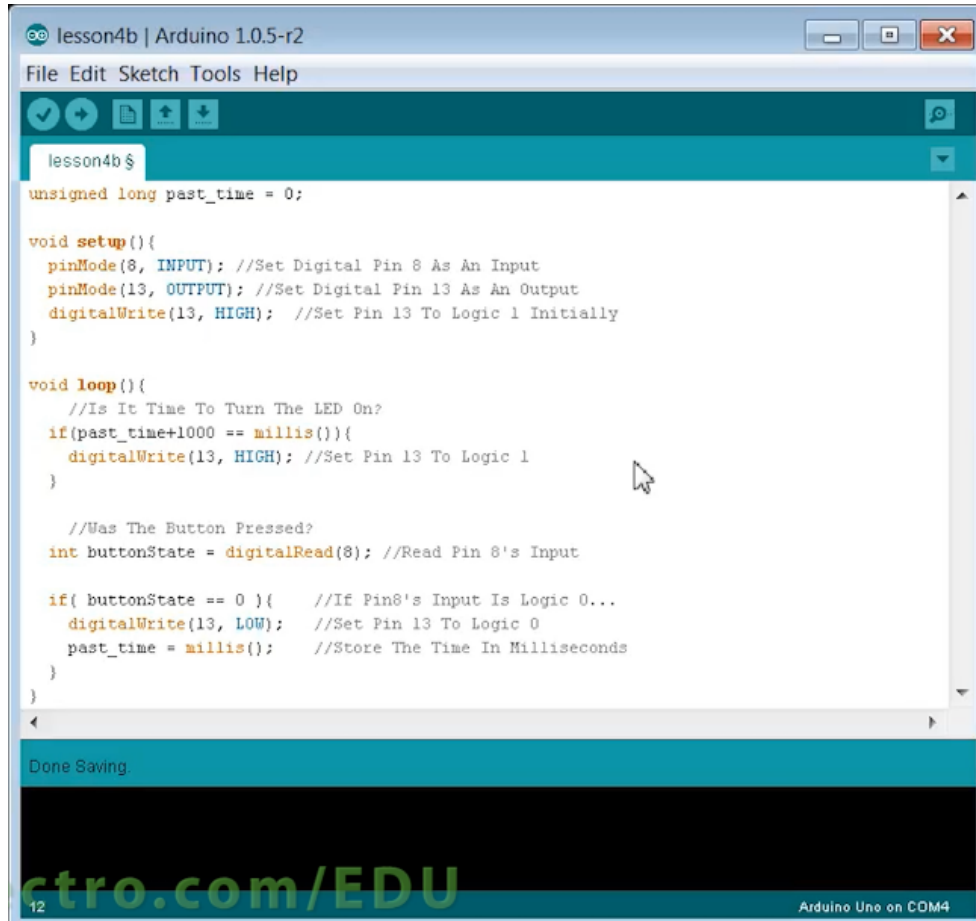
void loop(){
  digitalWrite(13, HIGH); //Set Pin 13 To Logic 1
  delay(1000);           //Wait For 1,000 milliseconds
  digitalWrite(13, LOW); //Set Pin 13 To Logic 0
  delay(1000);           //Wait For 1,000 milliseconds
}

Done Saving

Binary sketch size: 1,076 bytes (of a 32,256 byte maximum)
pyro.com/EDU Arduino Uno on COM1
```

After a successful demonstration, we then changed the 1,000 inside of the delay() function to a 250, which made the LED blink much faster since the program pauses were then only 250 milliseconds.

The second program that we built for lesson 4 looked at building a simple timer that turned an LED off for 1 second and then turned it back on.



```
lesson4b | Arduino 1.0.5-r2
File Edit Sketch Tools Help
lesson4b $
unsigned long past_time = 0;

void setup(){
  pinMode(8, INPUT); //Set Digital Pin 8 As An Input
  pinMode(13, OUTPUT); //Set Digital Pin 13 As An Output
  digitalWrite(13, HIGH); //Set Pin 13 To Logic 1 Initially
}

void loop(){
  //Is It Time To Turn The LED On?
  if(past_time+1000 == millis()){
    digitalWrite(13, HIGH); //Set Pin 13 To Logic 1
  }

  //Was The Button Pressed?
  int buttonState = digitalRead(8); //Read Pin 8's Input

  if( buttonState == 0 ){ //If Pin8's Input Is Logic 0...
    digitalWrite(13, LOW); //Set Pin 13 To Logic 0
    past_time = millis(); //Store The Time In Milliseconds
  }
}

Done Saving
pyroelectro.com/EDU
12 Arduino Uno on COM4
```

ADDITIONAL INFORMATION

If you have any questions about the formulas or information found in this document, please feel free to head on over to the forums and ask us some questions!

<http://www.pyroelectro.com/forums/viewforum.php?f=25>