

Week 09:
Serial Communication ,
Node.JS and Arduino

Make your projects talk!

Download Files

<http://lovepawena.com/CCLab/week09-examples.zip>

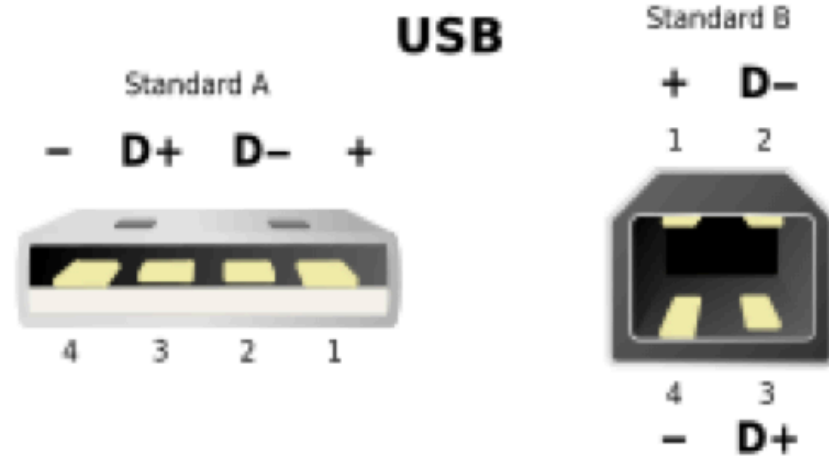
Serial? What?

- a standard for **communicating electronically**
- the “**process of sending data one bit at a time, sequentially, over a communication or computer bus**”

Serial communication

- a way for **machines** to **speak** to each other
- USB stands for **Universal Serial Bus**
- in Processing we had a **console** to `println()` data
- in Arduino we can **`println()`** over a serial connection to our computers or other devices

USB (Universal Serial Bus)



- an industry standard for **wired communication between computers and peripheral devices** (keyboard, mouse, smartphone, arduinos)

Other serials

- Bluetooth Connections



- RS-232 

- SPI (Serial Peripheral Interface)

- I²C (Inter-Integrated Circuit) aka 2-wire



- Ethernet (IEEE 1394)



- FireWire



- MIDI



Cool, so?

- SO, we can specifically tell **Arduino** to **send** out bytes of **serial data** through a USB connection to our computer
- we can also tell **Arduino** to **listen** for bytes or **serial data** coming from our computer

And?

- AND, we can tell **Node to listen** for Arduino's bytes of **data** coming through the USB pipeline
- we can also **send** messages **from Node** to your Arduino

It's a party!!

Testing communication/Arduino

```
int led = 13;

void setup() {
  //activate serial port on 9600 baud rate and LED on pin 13
  pinMode( led, OUTPUT);
  Serial.begin( 9600);
}

void loop() {
  //write HIGH on pin 13 and then send a message "LEAD is HIGH" to
serial port
  digitalWrite( led, HIGH);
  Serial.write(" LEAD is HIGH");
  delay( 1000);
  //write LOW on pin 13 and then send a message "LEAD is LOW" to
serial port
  digitalWrite( led, LOW);
  Serial.write(" LEAD is LOW");
}
```

FILE:_01_arduino_node

Open terminal!

Type: `npm install serialport` to install serialport

Type: `ls /dev/tty.*` to check serialport

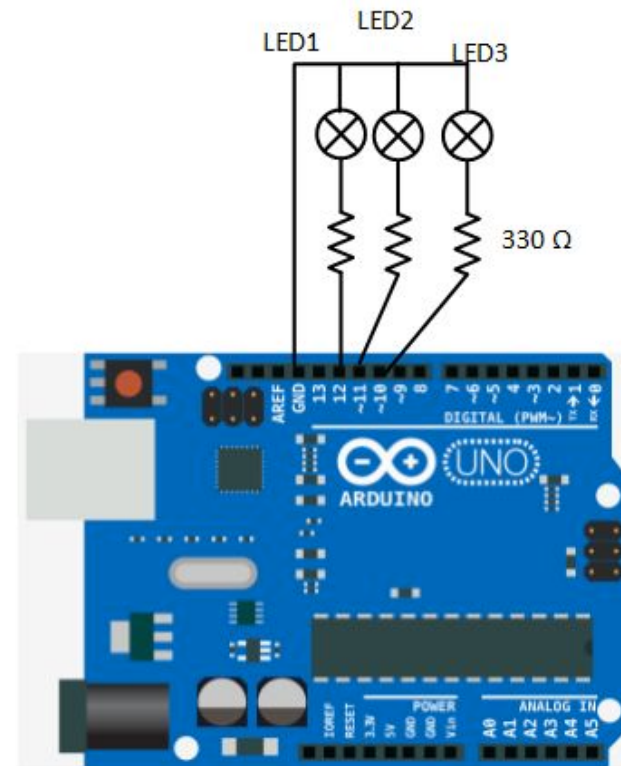
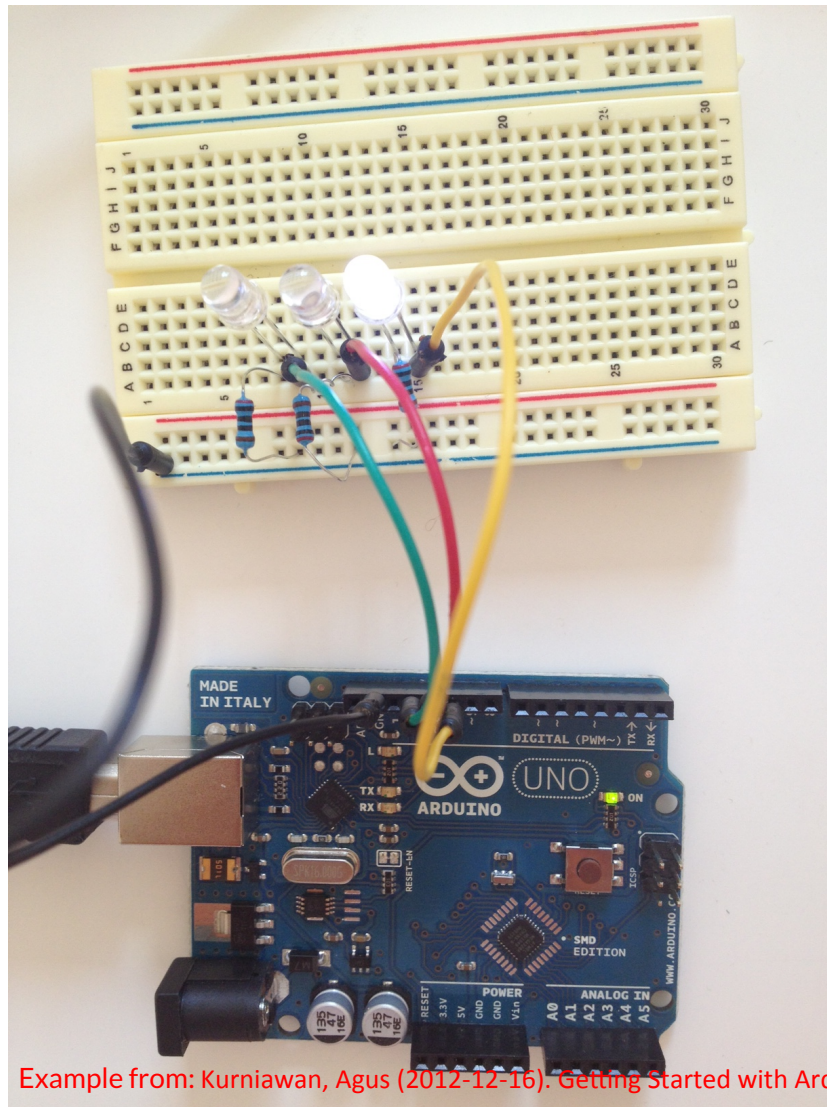
Testing communication/Node

```
var serialport = require("serialport");
var SerialPort = serialport.SerialPort;

var myserial = new SerialPort ("/dev/tty.usbmodemfd121",{
  //initialize serial port with baud rate 9600
  baudrate: 9600,
  //attach message parser for serial port with "\n"
  parser: serialport.parsers.readline("\n")
});

//listen for incoming messages from serial port, can use on('data')
myserial.on('data', function (data){
  var str = new String(data);
  if(str!='')
    console.log(data);
});
```

Controlling LEDs from Node through Arduino



```

//define led pins
int led1 = 12;
int led2 = 11;
int led3 = 10;

//initialize pinmode with OUTPUT mode and activate the serial port with baudrate
void setup() {
  pinMode(led1, OUTPUT);
  pinMode(led2, OUTPUT);
  pinMode(led3, OUTPUT);
  Serial.begin(9600);
}

//wait for incoming data from the serial port
//if incoming data has value "1", turn on LED1 and so forth

void loop() {
  if (Serial.available() > 0) {
    char inputData = Serial.read();
    if(inputData=='1'){
      digitalWrite(led1, HIGH);
      digitalWrite(led2, LOW);
      digitalWrite(led3, LOW);
    }
    if(inputData=='2'){
      digitalWrite(led1, LOW);
      digitalWrite(led2, HIGH);
    }
  }
}

```

LED controller/ Arduino

FILE:_02_led_blink

02-led-blink.js

```
1 //activate serial port module
2 var serialport = require("serialport");
3 var SerialPort = serialport.SerialPort;
4
5 //set led=1 as initial command
6 var led = 1;
7 // change serial port of Arduino
8 var myserial = new SerialPort("/dev/tty.usbmc
9     baudrate: 9600
10 });
11
12 //open event from serial port module
13 myserial.on('open', function(){
14     //timer set at 2000
15     setInterval(testLedController, 2000);
16 });
17
18 function testLedController(){
19     console.log('send command for led=' + led
20     //write data into serial port
21     myserial.write(led.toString());
22     //increase value of led
23     led++;
24     //if value is more than 3, set value back
25     if(led>3)
26         led = 1;
27 }
28
29 //catches errors from serial port
30 myserial.on('error', function (err) {
31     console.log('Error = ' + err);
32 }
```

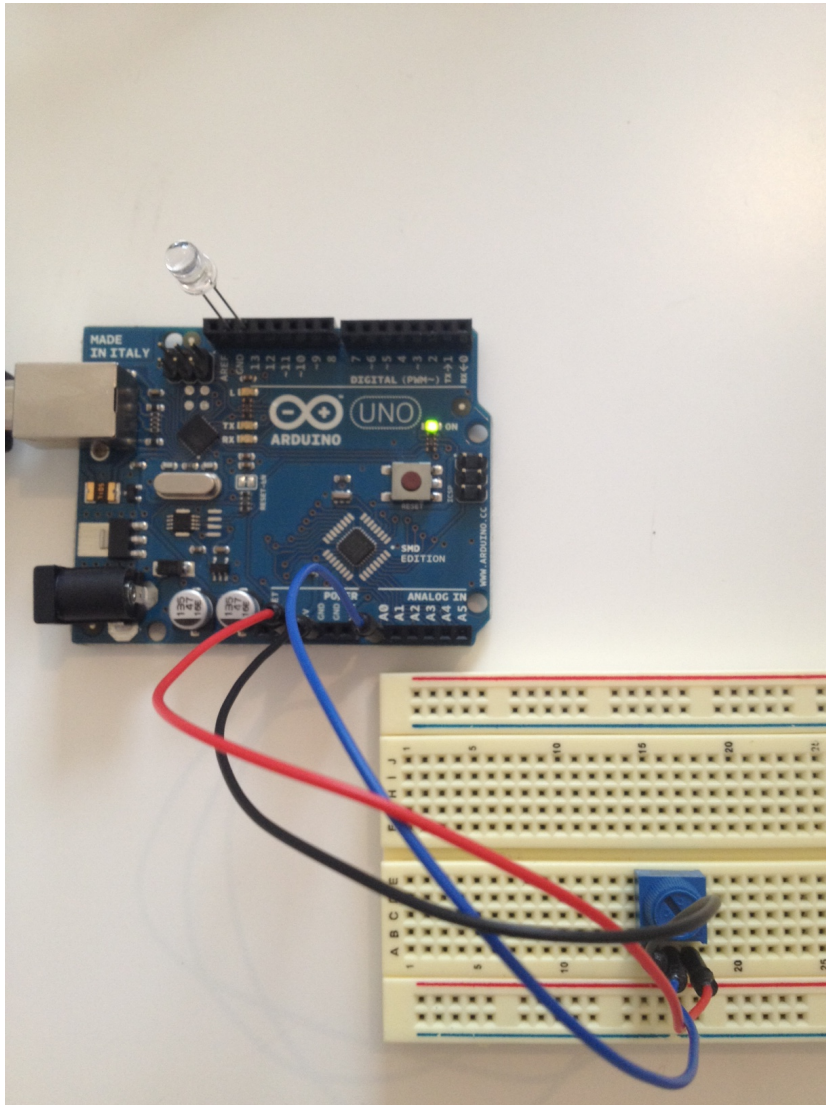
LED controller/ Node

FILE:02-led-blink.js

Fancy example

LED in GND and 13

Potentiometer connects to 5V, GND and A0



```
const int outputPin = 13;
int potPin = 0;
int sensorVal = 0;
int prevVal = 0;
String inputString = "";

void setup()
{
  pinMode(outputPin, OUTPUT);
  Serial.begin(9600);
}

void loop()
{
  //pot
  sensorVal = analogRead(potPin);
  if(prevVal != sensorVal) {
    Serial.print('B');
    Serial.print(sensorVal);
    Serial.print('E');
    prevVal = sensorVal;
  }
  delay(100);

  // arduino reads Serial
  if (Serial.available() > 0) {
    int incomingByte = Serial.read();
  }
}
```

Done uploading.

Binary sketch size: 4,512 bytes (of a 32,256 byte maximum)

Fancy example

FILE: _03_app

03-app.js

```
1 // old stuff
2 var connect = require('connect'),
3     fs = require('fs'),
4     util = require('util'),
5     io = require('socket.io').listen(9001), // WS
6     port = 9000, // HTTP port
7
8     // new stuff
9     // define a class
10    SerialPort = require("serialport").SerialPort,
11    // ls /dev/tty.*
12    sPort="/dev/tty.usbmodemfd121",
13    //sPort = "/dev/tty.usbserial-AM01PK24",
14    // create an instance (object)
15    arduino = new SerialPort(sPort, {
16        baudrate: 9600
17    });
18
19 // create web server using connect
20 connect.createServer(
21     connect.static(__dirname + '/public') // two
22     underscores
23 ).listen(port);
24 util.log('the server is running on port: ' + port)
25 ;
26
27 // init socket.io
28 io.set('log level', 1);
29 io.sockets.on('connection', function(socket) {
30     util.log('Ooooooh, someone just poked me :));
31     socket.on('led', function(data) {
```

Fancy example

FILE:03-app.js



HOMWORK!

Homework

- 1. CATCH UP ON YOUR HOMEWORK!**
2. Control something with Node through Arduino
 1. Post a video to the blog
 2. Post code and references to the blog
 3. Draw the schematic or use Fritzing and post
- 3. Midterm DUE: 11/05**

Midterm assignment

Make a game, toy, data visualization, **something creative** that

a) uses at least two things that we covered in JavaScript (i.e. canvas, API, Node, etc.)

or...

b) uses serial communication to connect to Arduino

DUE: 11/05/13

References

<http://fritzing.org/>

<http://arduino.cc/en/Tutorial/HomePage>

<http://www.instructables.com/index>

Kurniawan, Agus (2012-12-16). Getting Started with Arduino and Node.js