Lab #2

CET4811 – Fall 2023

Arduino ↔ Webserver/Browser Communication

Introduction

Lab Purpose: Use serial port to connect to visualization tools

- Use Node.js Serial Port Module to make Arduino and Web Server/Browser (Node.js) work together
- This lab was updated from an online tutorial. Check back on this site for more instructions on getting Node.js to communicate with Arduino:
- http://www.barryvandam.com/node-js-communicating-with-arduino/#comment-4834
- https://youtu.be/m-3XvNQko4s
- Arduino compatible visualization tools
    - Processing – Java
        - Line Charts: https://forum.processing.org/two/discussion/3141#Item_3
    - Node.js – Javascript/JQuery
        - Line Charts: https://canvasjs.com/html5-javascript-line-chart/
    - OpenFramworks – C++
        - https://openframeworks.cc/documentation/graphics/ofPolyline/

Part I. Installation

1) Download the updated software files from blackboard after reading the setup below.

2) Install Node.js & NPM (Node Package Manager)
    a. see this installation setup for Windows systems: https://blog.teamtreehouse.com/install-node-js-npm-windows
    b. Install node version 18.16.0 (the latest as of May 2023)
        i. Go to https://nodejs.org/download/release/v18.16.0/
        ii. Download the x64.msi or x86.msi installation file and run it with 'Administrator privileges' on your computer
    c. Run the installer and accept the license agreement
    d. Verify Node.js is installed
        i. Open a command prompt (type 'cmd' on the search bar for Windows Users)
        ii. type 'node -v' (no quotes!) => this should give you the Node version number
        iii. now type 'npm -v' => this should give you the NPM version should be **version 9.6.6**
        iv. If both commands are working proceed to the next step

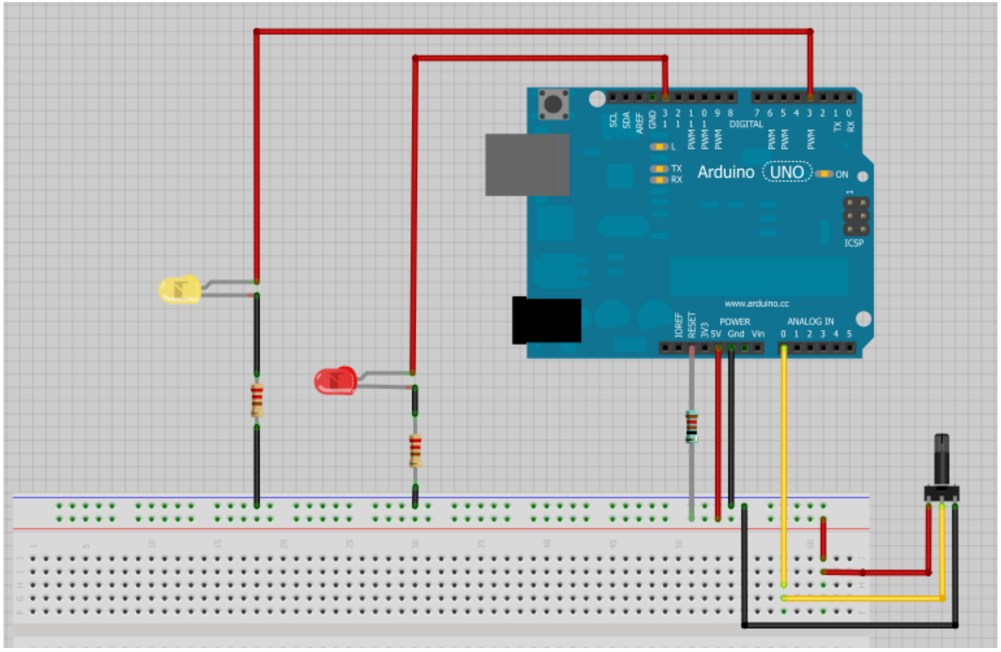
3) Add the appropriate modules in the code working directory:
    a. change directories inside the command prompt to the location of your files:
    b. for example: 'cd c:\Documents\NewDir\4811\Lab1'
4) Move the lab software tools from blackboard into this directory (unzip the blackboard files)
    a. this should make another directory SCOM4Class2
5) From the command prompt change directories into SCOM4Class2 and run the following commands
    a. 'cd SCOM4Class2'
    b. 'npm install socket.io'
    c. 'npm install -g express'

   d. ‘npm install serialport’   => this command may give you an error
   e. ‘npm install’ => this will load any other dependencies that I may have missed.

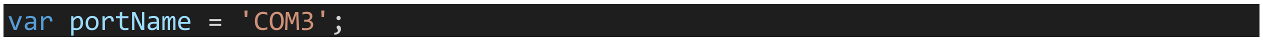
6) Node.js installation is complete!

Part II. Work with Node.js & Arduino

7) Important files to understand/edit
   a. Arduino Sketch file: YourBaseDirectory/ _ Arduino/ArduinoNodeJS/ArduinoNodeJS.ino
   b. Node webserver & SCOM server file: /bin/www
   c. Main webpage: YourBaseDirectory /public/index.ejs
      i. Overwrite the YourBaseDirectory/public/index.ejs file
         1. Delete the /public/index.ejs file
         2. Copy and rename the /public/SCOM_index.ejs to /public/index.ejs
   d. Main javascript file to communicate between browser & Arduino via SCOM port: YourBaseDirectory /public/javascripts/arduinoData.js
8) Build your Circuit!
   a. make sure to properly connect your RESET pin!



9) Start the Arduino software FIRST!
   a. run Arduino code in the Arduino directory with your favorite Arduino IDE
   b. connect your Arduino board to your computer and send the Arduino code to the board
   c. Arduino has to have write control permission of the SCOM (serial com) port 1ST otherwise it will NOT run simultaneously with Node
10) Edit the COM port in your webserver
   a. edit the /bin/www file
   b. change the portName variable to the appropriate COM port

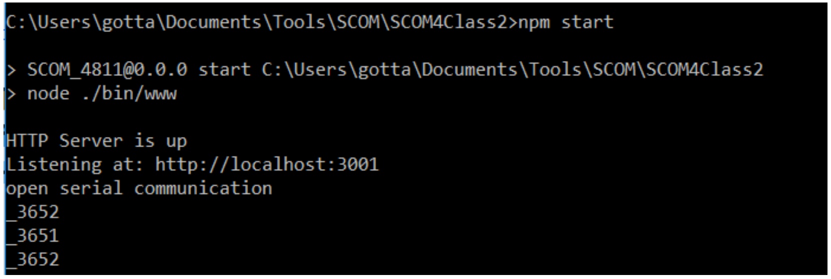


```
var portName = 'COM3';
```

11) Start the Node webserver

a. to run the webserver that will load the browser page run this command from your code working directory:

b. ‘npm start’



```
C:\Users\gotta\Documents\Tools\SCOM\SCOM4Class2>npm start

> SCOM_4811@0.0.0 start C:\Users\gotta\Documents\Tools\SCOM\SCOM4Class2
> node ./bin/www

HTTP Server is up
Listening at: http://localhost:3001
open serial communication
_3652
_3651
_3652
```

c. If you want to STOP the node server just type Ctl-C from the command prompt to interrupt the program.

12) You should now be able to view the webpage at: http://localhost:3001

13) Make a short video or show me in class of your system interacting with the browser
   a. Show the potentiometer readings update the browser
   b. Show the LED values turned on digitally
   c. Show the LED values can be activated with a dimmer switch using analogwrite()

14) Edit #sandbox section of Webpage using javascript based on SCOM input & user interaction
   a. To see where the sandbox tag is open /public/index.ejs
   b. add javascript code inside the /public/javascript/arduinoData.js to edit the sandbox tag
   c. Write your name, the potmeter value, and a date stamp everytime you Toggle the button
   d. Turn the background color of the #sandbox section to GREEN if potmeter > 600, and RED if potmeter is < 600;
   e. If the slider is at it’s max value, make an “alert” call that says: “WARNING: Slider is at MAXIMUM value”

Part III. Questions

15) Looking at the Serial output from the command line and reading the comments in /public/javascripts/arduinoData.js -> function parseSerialData()
   a. What are the parts of the format string for the serial output (value) sent by the Arduino Sketch?

16) Open the Arduino Sketch file / _ Arduino/ArduinoNodeJS/ArduinoNodeJS.ino and find where the data is being sent to the serial port.
   a. What is the ‘index’ value used that is sent along with the data?
   b. How can you change this index value to another number between 0-9 (write the code line)

17) Most Node.js webservers default to run on http port 3xxx. Change the Node.js webserver to a different port in the 3000s. (ie. 3023)
   a. inside /bin/www, look at where httpServer is created. Edit the port number
   b. Stop the Node webserver (Ctl-c from the command line)
   c. Re-run the Node webserver and check in the browser that it is running on the new port
   d. screenshot your browser address line with the updated port value

Bonus
try adding the a Canvas.js chart to the #sandbox section of your webpage:
https://canvasjs.com/html5-javascript-line-chart/
https://webdesign.tutsplus.com/tutorials/how-to-create-a-simple-line-chart-with-chartjs--cms-28129
https://canvasjs.com/docs/charts/basics-of-creating-html5-chart/
https://canvasjs.com/docs/charts/basics-of-creating-html5-chart/updating-chart-options/
https://canvasjs.com/javascript-charts/dynamic-live-line-chart/