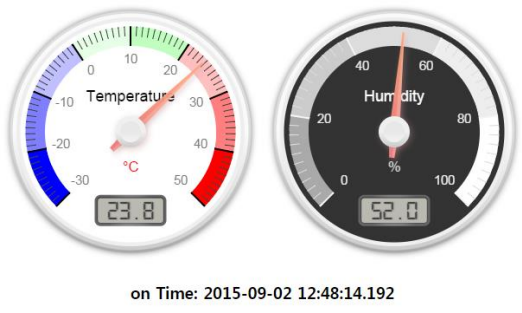
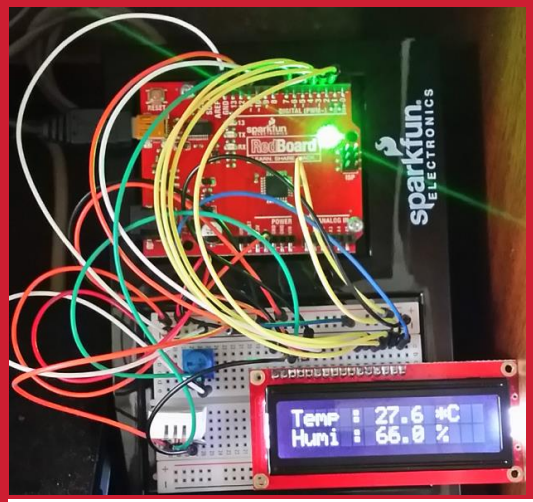
HW-SW-Connectivity

[wk14]

Arduino & NodeJS V



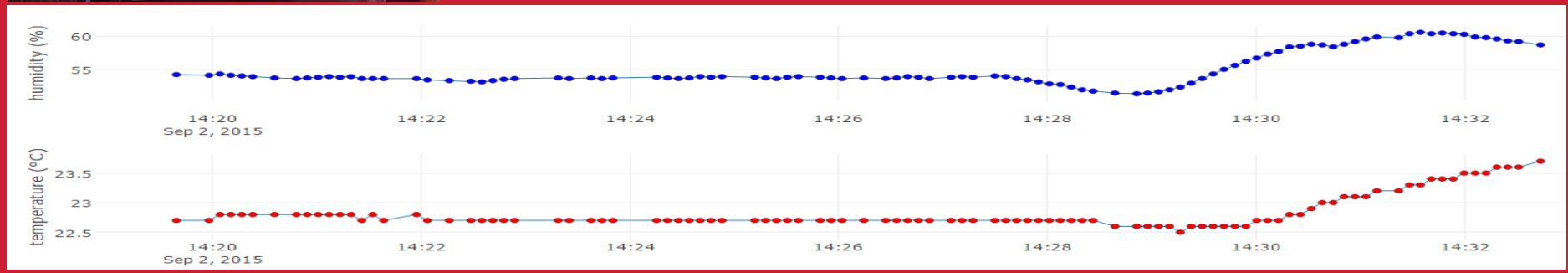


Basic HW and SW Integration using Arduino & Javascript

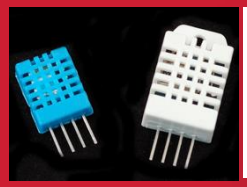
COMSI, INJE University

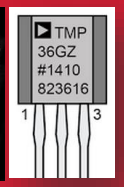
2nd semester, 2017

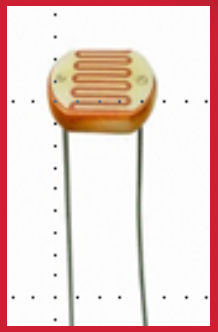
Email : yish@inje.ac.kr



[Practice]







- [wk13]
  - RT Data Visualization with node.js
  - Usage of gauge.js
  - Complete your real-time LUX charts
  - AAnn_Rpt10.zip

wk13 : Practice-10 : AAnn_Rpt10.zip

- **[Target of this week]**
  - Complete your plots of real-time streaming of luminosity (lux).
  - Design your own gauge and chart.
  - Save your outcomes and compress 3 figures

제출파일명 : **AAnn_Rpt10.zip**

- 압축할 파일들

① AAnn_DS_30timestamps.png

② AAnn_ldr_change.png

③ AAnn_ldr_gauge.png

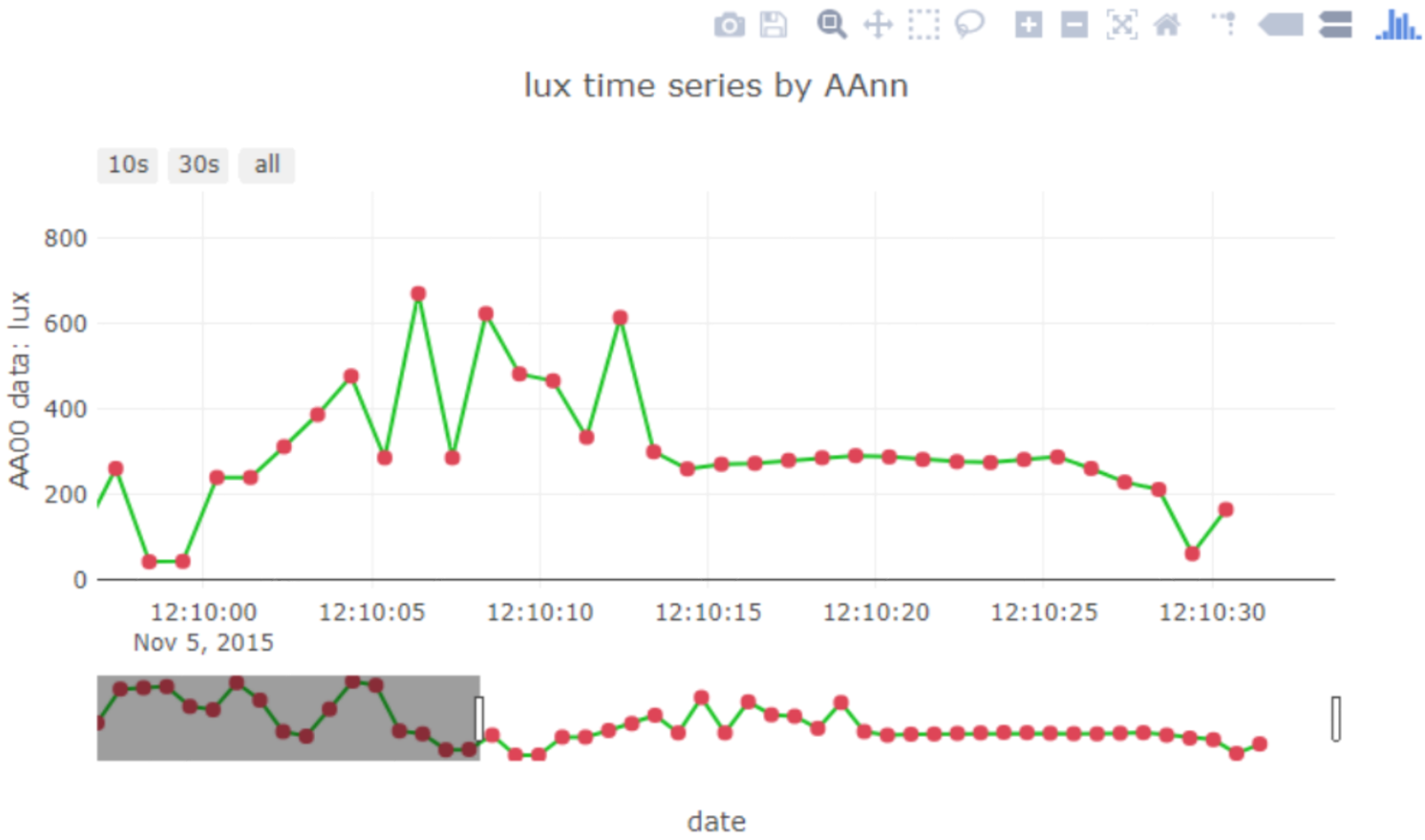
Email : chaos21c@gmail.com

results

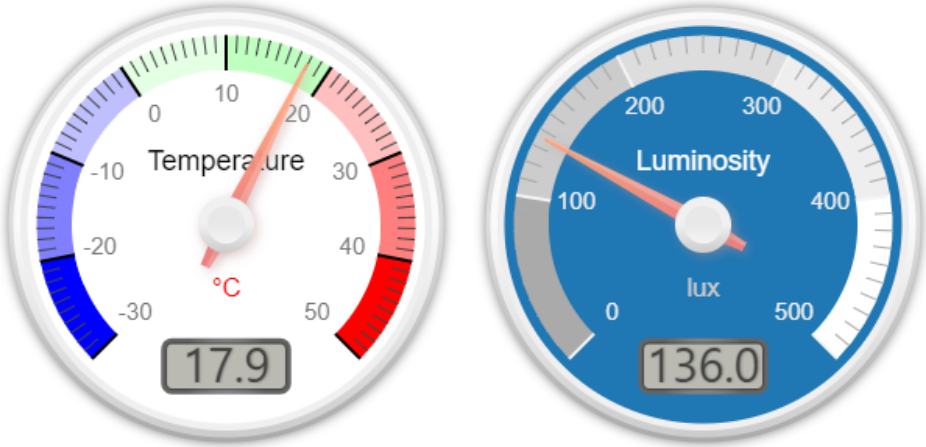
[DIY 2] Client html : client_ldr_gauge.html (change design of Gauge)

Data visualization : plotly.js

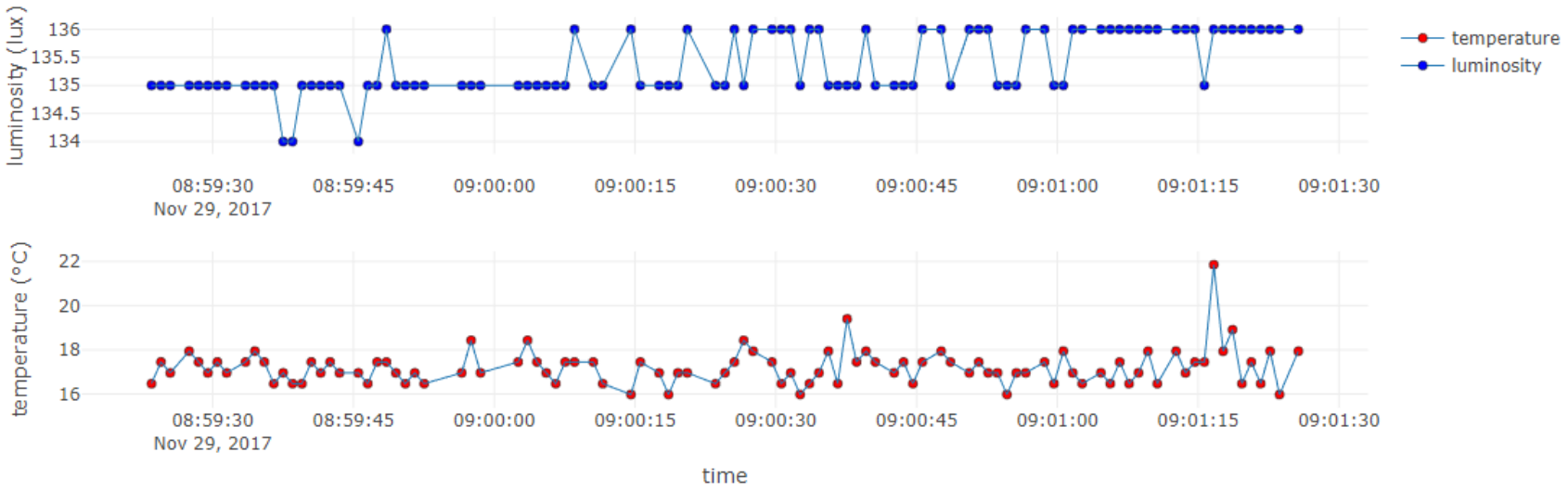
Time series by AAnn



Real-time Temperature(°C) and Luminosity(lux) from sensors



on Time: 2017-11-29 09:01:25.675



Arduino

ARDUINO Genuino

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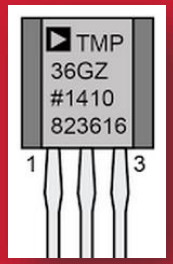
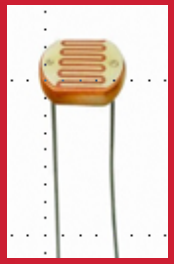
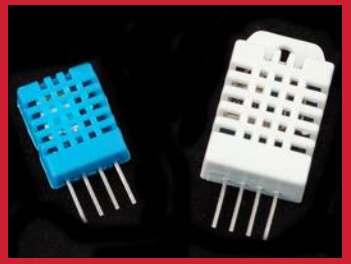
https://www.arduino.cc/

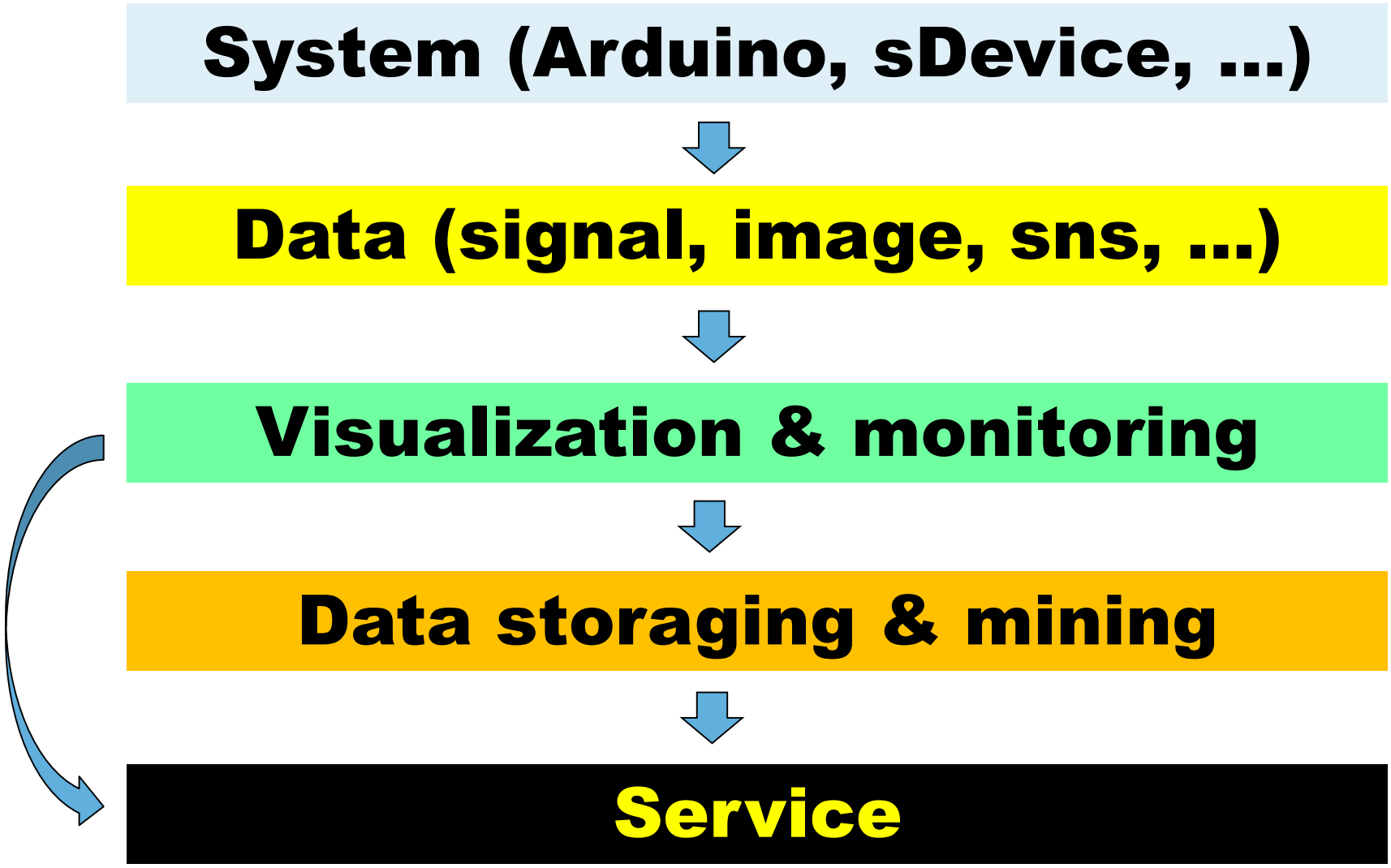
Arduino & Node.js







A6.1. Introduction to visualization



A6.1.8 Introduction to plot.ly

https://plot.ly/javascript/time-series/

https://plot.ly/javascript/streaming/

A6.1.10 Getting started: plotly.js

plotly.js CDN

You can also use the ultrafast plotly.js CDN link. This CDN is graciously provided by the incredible team at Fastly.

```
<head>
    <script src="https://cdn.plot.ly/plotly-latest.min.js"></script>
</head>
```

Else, if you want to get a specific version of plotly.js, say 1.2.0:

```
<head>
    <script src="https://cdn.plot.ly/plotly-1.2.0.min.js"></script>
</head>
```

<script src="https://cdn.plot.ly/plotly-latest.min.js"></script>

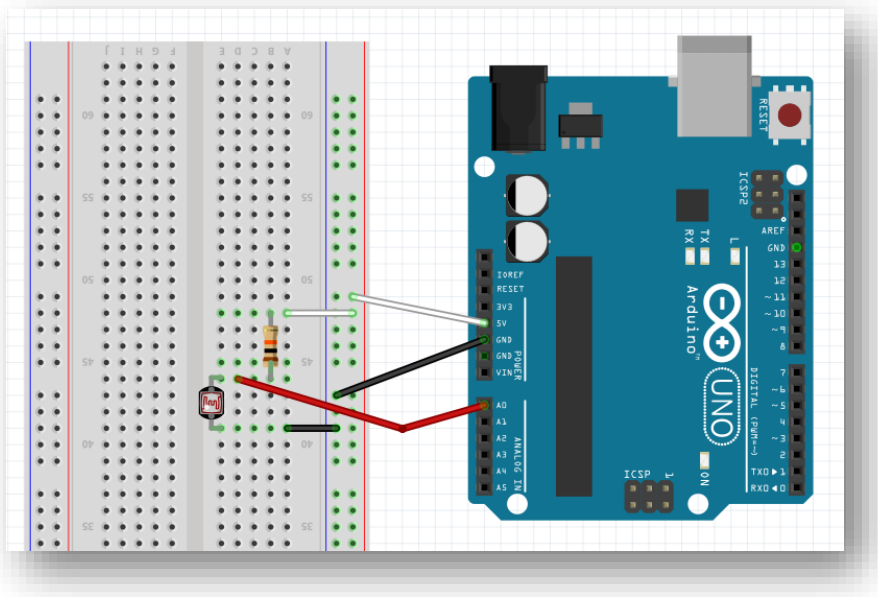
https://plot.ly/javascript/getting-started/

A6.3.9 plotly.js: Time series

[3] Time series : my lux data

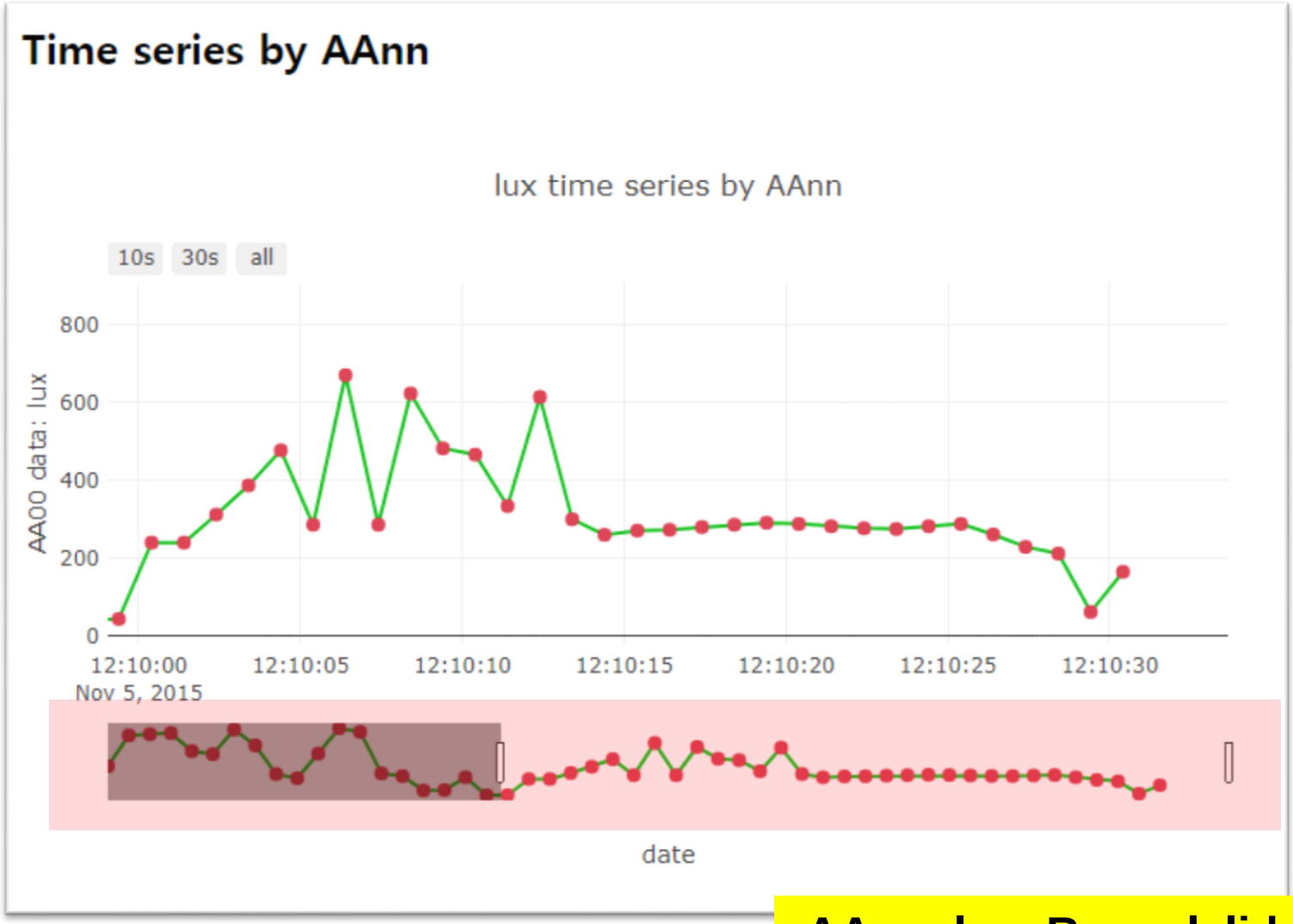
```
'2015-11-05 12:09:41.382',
'2015-11-05 12:09:42.380',
'2015-11-05 12:09:43.378',
'2015-11-05 12:09:44.377',
'2015-11-05 12:09:45.375',
'2015-11-05 12:09:46.389',
'2015-11-05 12:09:47.388',
'2015-11-05 12:09:48.386',
'2015-11-05 12:09:49.384',
'2015-11-05 12:09:50.383',
'2015-11-05 12:09:51.381',
'2015-11-05 12:09:52.380',
'2015-11-05 12:09:53.394',
'2015-11-05 12:09:54.392',
'2015-11-05 12:09:55.391',
'2015-11-05 12:09:56.389',
'2015-11-05 12:09:57.387',
'2015-11-05 12:09:58.386',
'2015-11-05 12:09:59.384',
'2015-11-05 12:10:00.398',
'2015-11-05 12:10:01.397',
```

Data :
date,value



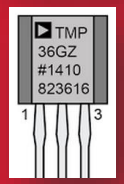
Project: Time series with Rangeslider

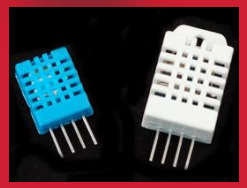
[Project-DIY] AAnn_lux_Rangelslider.html

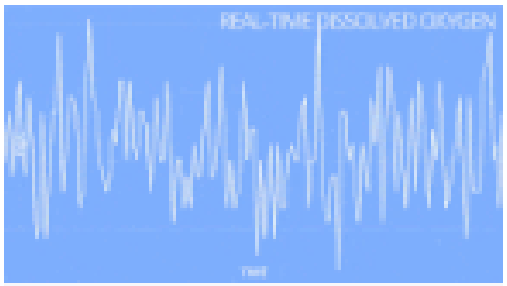


AAnn_lux_Rangelslider.html

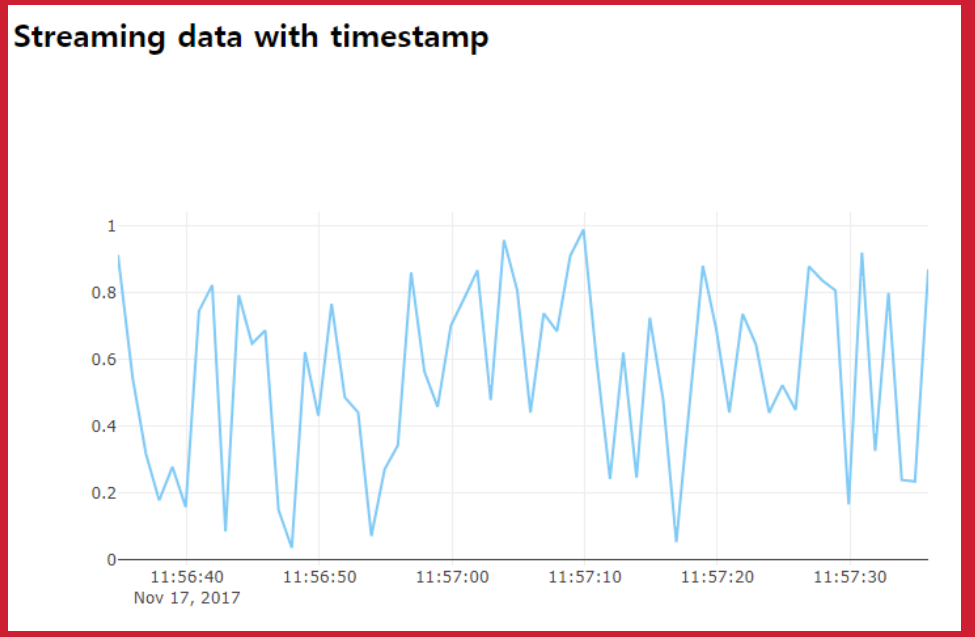
Data Streaming using ploy.ly







Streaming Charts



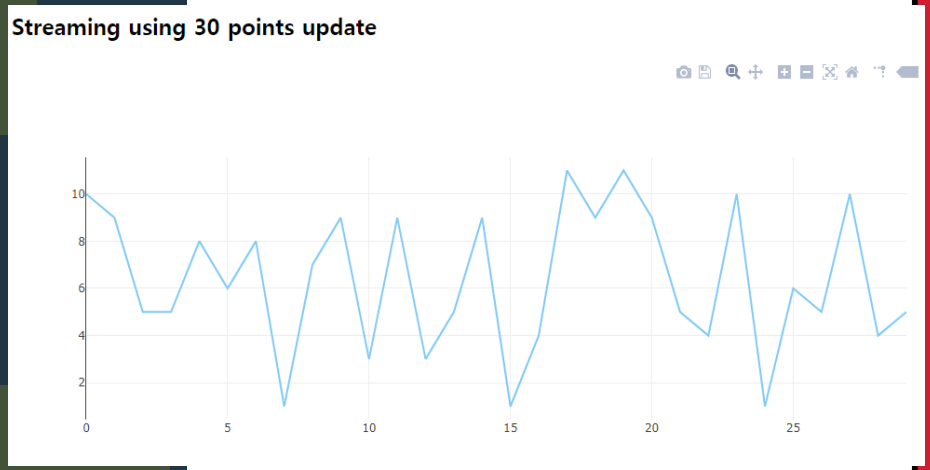
A6.4.7 plotly.js: Streaming data

[5] Streaming data using 30 points update

```
var arrayLength = 30
var newArray = []

for(var i = 0; i < arrayLength; i++) {
    var y = Math.round(Math.random()*10) + 1
    newArray[i] = y
}
```

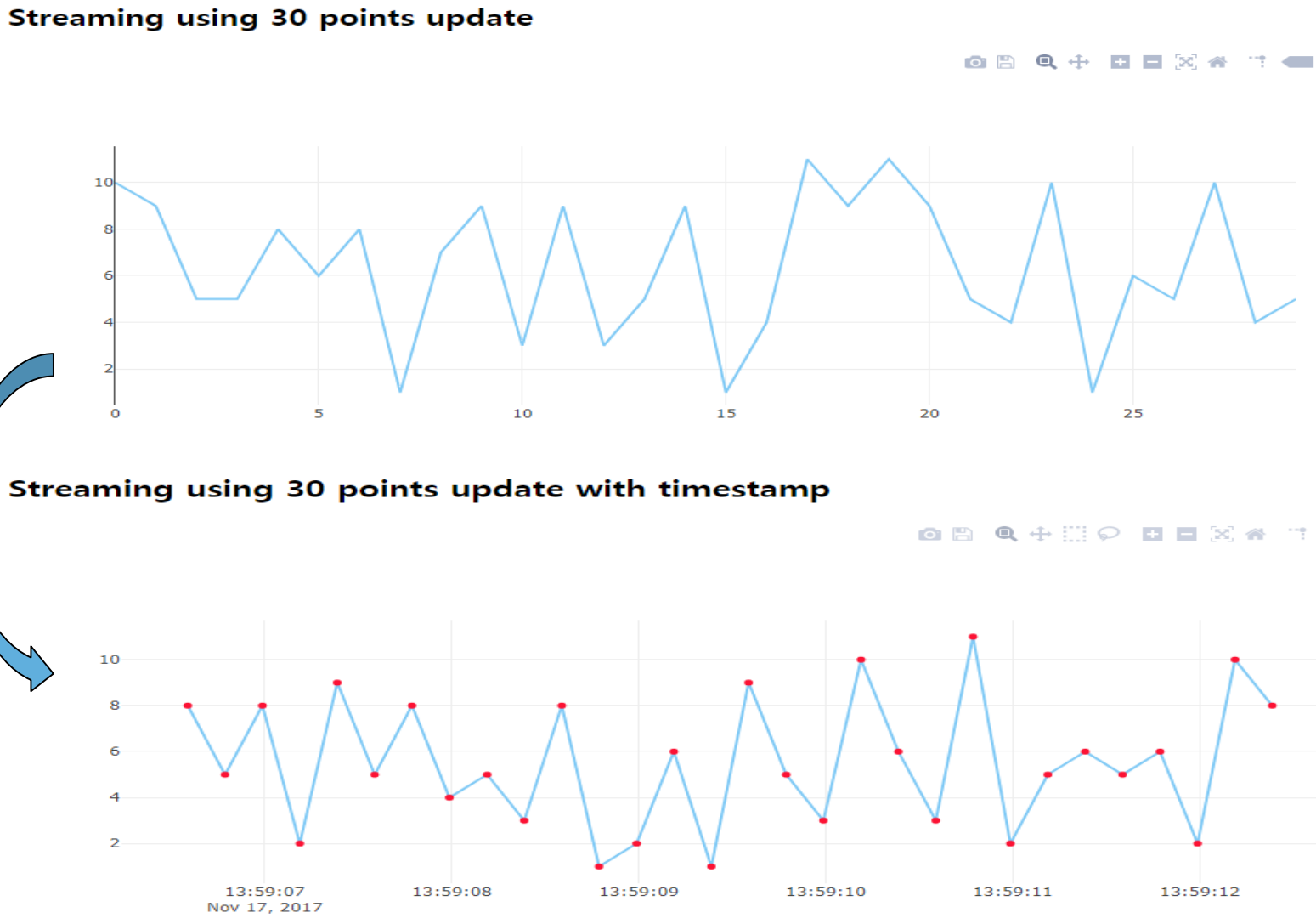
```
Plotly.plot('graph', [{
    y: newArray,
    mode: 'lines',
    line: {color: '#80CAF6'}
}]);
```

```
var cnt = 0;
var interval = setInterval(function() {

    var y = Math.round(Math.random()*10) + 1
    newArray = newArray.concat(y)  // add new data
    newArray.splice(0, 1)  // remove the oldest data

    var data_update = {
        y: [newArray]
    };

    Plotly.update('graph', data_update)
    //cnt++;
    if(cnt === 100) clearInterval(interval);
}, 1000);
```



A6.4.8 plotly.js: Streaming data

[DIY] Streaming time series using 30 points update



AAnn_DS_30timestamps.png 로 캡처 저장.

A6.4.9 plotly.js: Streaming data

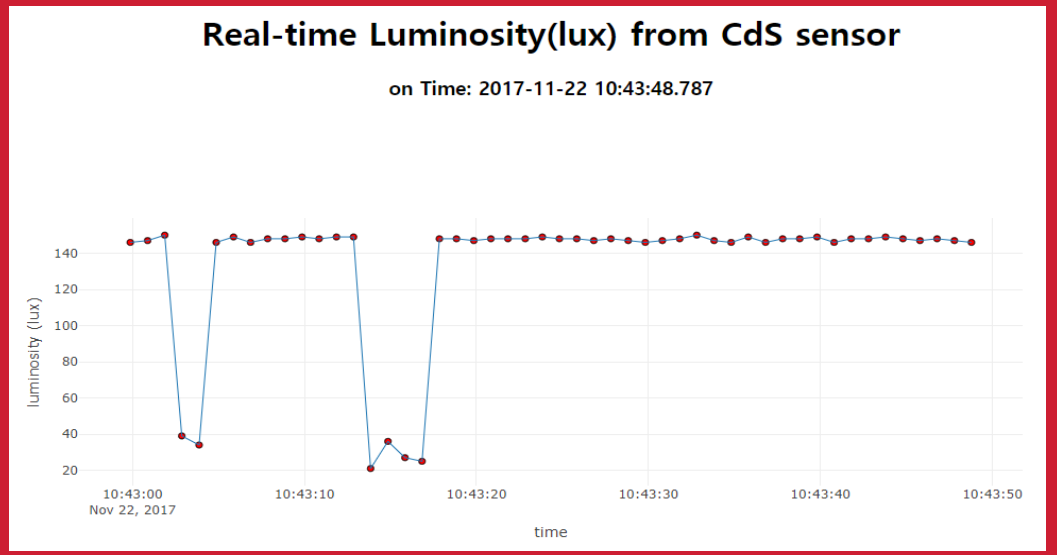
[DIY-hint] Streaming time series using 30 points update

```
<script>
    var arrayLength = 30
    var newArray = []
    var timeArray = []

    // initial 30 data
    for(var i = 0; i < arrayLength; i++) {
        var y = Math.round(Math.random()*10) + 1
        var time = new Date();
        newArray[i] = y
        timeArray[i] = time
    }

    var data = [{
        x: timeArray,
        y: newArray,
        mode: 'lines+markers',
        line: {color: '#80CAF6'},
        marker: {color: '#FC1234'}
    }]


    Plotly.plot('graph', data);
```

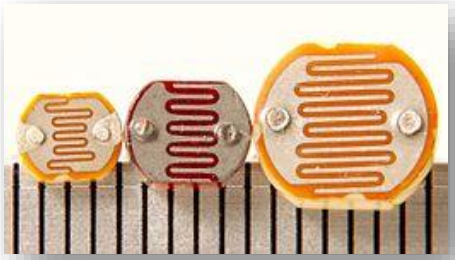
Arduino sensor data

RT visualization using ploy.ly

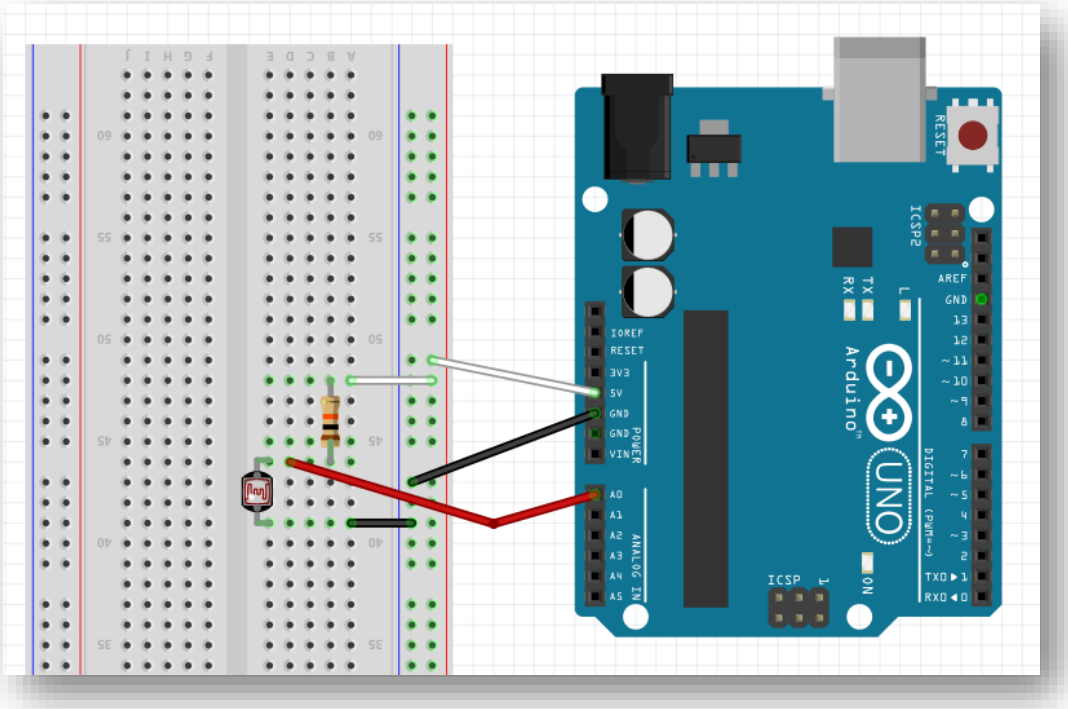
```
AA00,2017-11-22 10:43:11.859,149
AA00,2017-11-22 10:43:12.851,149
AA00,2017-11-22 10:43:13.845,21
AA00,2017-11-22 10:43:14.854,36
AA00,2017-11-22 10:43:15.844,27
AA00,2017-11-22 10:43:16.837,25
AA00,2017-11-22 10:43:17.846,148
AA00,2017-11-22 10:43:18.839,148
AA00,2017-11-22 10:43:19.847,147
```



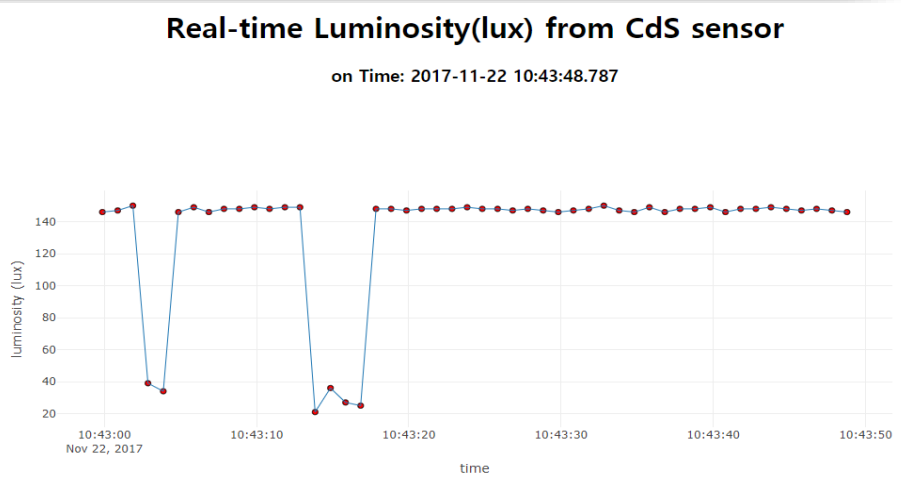
Luminosity sensor [Photocell LDR]



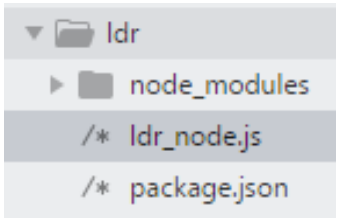
CdS




```
AA00,2017-11-22 10:43:11.859,149
AA00,2017-11-22 10:43:12.851,149
AA00,2017-11-22 10:43:13.845,21
AA00,2017-11-22 10:43:14.854,36
AA00,2017-11-22 10:43:15.844,27
AA00,2017-11-22 10:43:16.837,25
AA00,2017-11-22 10:43:17.846,148
AA00,2017-11-22 10:43:18.839,148
AA00,2017-11-22 10:43:19.847,147
```



A5.2.4 Luminosity sensor [Photocell LDR]

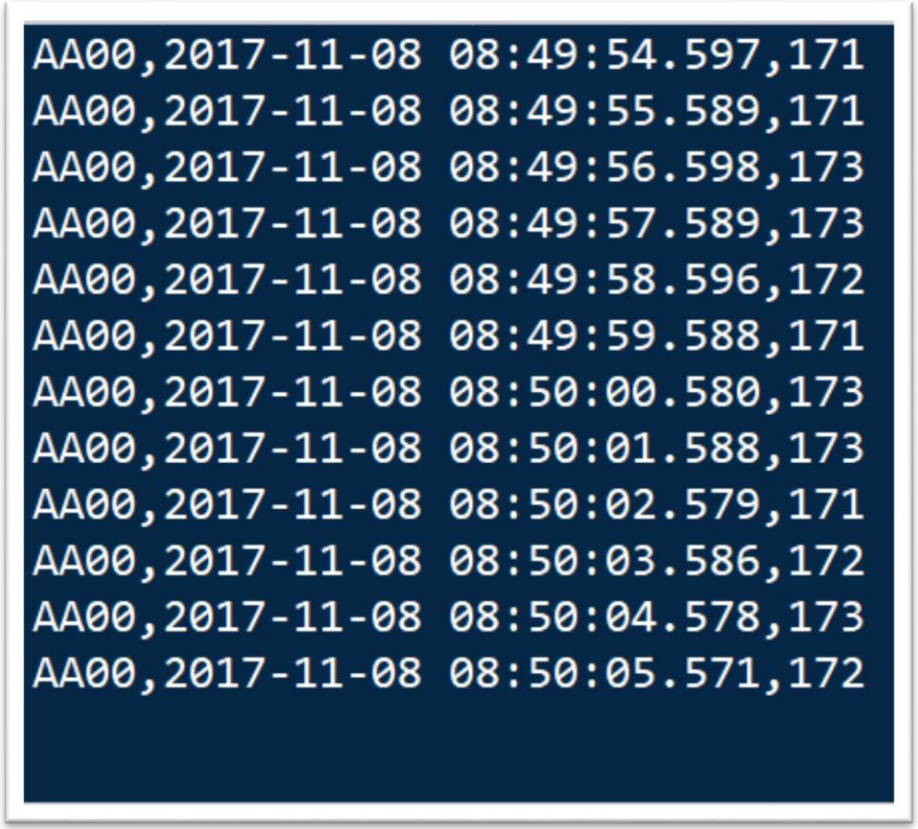


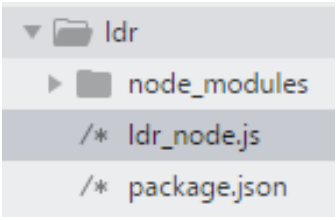
Save tmp36_node.js as ldr_node.js

```
var dStr = '';
var tdata = [];

sp.on('data', function (data) { // call back when data is received
    // raw data only
        //console.log(data);
        dStr = getDateString();
        tdata[0] = dStr;  // date
        tdata[1] = data;  // data
        console.log("AA00," + tdata);
        io.sockets.emit('message', tdata);  // send data to all clients
});

// helper function to get a nicely formatted date string
function getDateString() {
    var time = new Date().getTime();
    // 32400000 is (GMT+9 Korea, GimHae)
    // for your timezone just multiply +/-GMT by 3600000
    var datestr = new Date(time +32400000).
    toISOString().replace(/T/, ' ').replace(/Z/, '');
    return datestr;
}
```

A5.2.5 Luminosity sensor [Photocell LDR]

Run ldr_node.js (^B)






```
io.sockets.emit('message', tdata);  // send data to all clients
```

A6.5.1 RT sensor-data streaming in Arduino

[1] Client html : client_ldr.html (using socket.io.js)

```
<!DOCTYPE html>
<head>
  <meta charset="utf-8">
  <title>plotly.js Example: Real time signals from sensors</title>

  <script src="https://cdn.plot.ly/plotly-latest.min.js"></script>
  <script type="text/javascript" src="https://cdnjs.cloudflare.com/ajax/libs/
  socket.io/1.3.6/socket.io.js"></script>
  <style>body{padding:0;margin:30;background:#fff}</style>
</head>
```

A6.5.2 RT sensor-data streaming in Arduino

[2] Client html : client_ldr.html (global variables)

```
<body>  <!-- style="width:100%;height:100%"> -->
<!-- Plotly chart will be drawn inside this DIV -->
<h1 align="center"> Real-time Luminosity(lux) from CdS sensor </h1>

<h3 align="center"> on Time: <span id="time"> </span> </h3>

<div id="myDiv"></div> <!-- graph here! -->

<hr>

  <script>
  /* JAVASCRIPT CODE GOES HERE */
    var streamPlot = document.getElementById('myDiv');
    var ctime = document.getElementById('time');

    var xArray = [], // time of data arrival
        xTrack = [], // value of CdS sensor 1 : lux
        numPts = 50, // number of data points in x-axis
        dtda = [],  // 1 x 2 array : [date, lux] from CdS
        preX = -1,  // check change in data
        initFlag = true;
```

A6.5.3 RT sensor-data streaming in Arduino

[3] Client html : client_ldr.html (socket connection & handling message)

```
var socket = io.connect('http://localhost:3000'); // port = 3000
socket.on('connect', function () {
    socket.on('message', function (msg) {
        // initial plot
        if(msg[0]!='' && initFlag){
            dtda[0]=msg[0];
            dtda[1]=parseFloat(msg[1]);  // Lux
            init();  // start streaming
            initFlag=false;
        }
        console.log(msg[0]);
        console.log(parseFloat(msg[1]));
        // Convert value to integer
        dtda[0]=msg[0];
        dtda[1] = parseFloat(msg[1]); // integer

        // when new data is coming, keep on streaming data
        ctime.innerHTML = dtda[0];
        nextPt();
    });
});
```

[4] Client html : client_ldr.html (init() & nextPt())

```
function init() {  // initial screen ()
    // starting point : first data (lux)
    for ( i = 0; i < numPts; i++) {
        xArray.push(dtda[0]);  // date
        xTrack.push(dtda[1]);  // CdS sensor (lux)
    }

    Plotly.plot(streamPlot, data, layout);
}

function nextPt() {

    xArray.shift();
    xArray.push(dtda[0]);

    xTrack.shift();
    xTrack.push(dtda[1]);  // CdS sensor: lux

    Plotly.redraw(streamPlot);
}
```

[5] Client html : client_ldr.html (data & layout)

```
// data
var data = [{
    x : xArray,
    y : xTrack,
    name : 'luminosity',
    mode: "markers+lines",
    line: {
        color: "#1f77b4",
        width: 1
     },
    marker: {
        color: "rgb(255, 0, 0)",
        size: 6,
        line: {
          color: "black",
          width: 0.5
        }
     }
}];
```

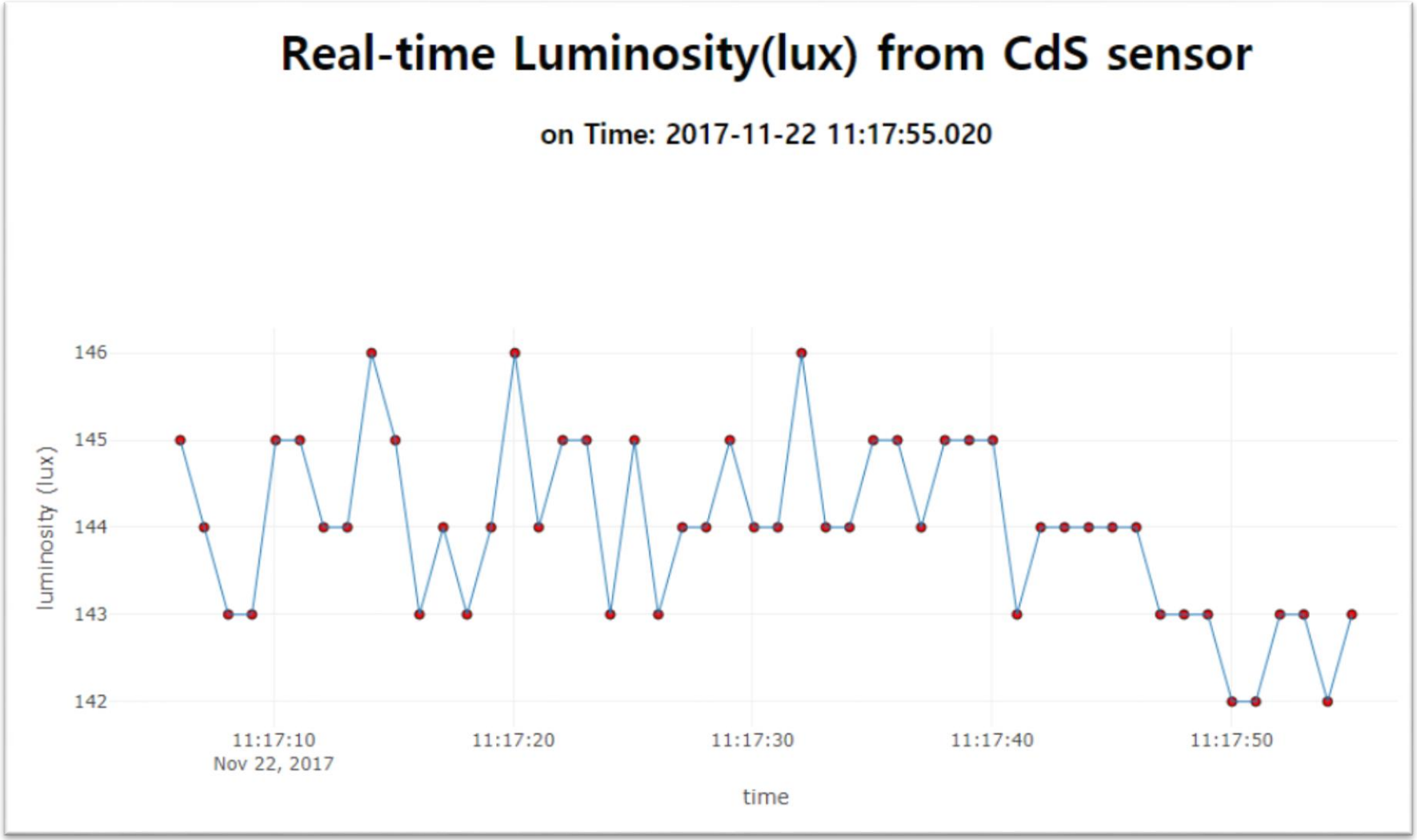
```
// Layout
var layout = {
    xaxis : {
        title : 'time',
        domain : [0, 1]
    },
    yaxis : {
        title : 'luminosity (lux)',
        domain : [0, 1],
        range : [0, 500]
    }
};
```

domain: [0,1] → x 또는 y 축을 100% 사용

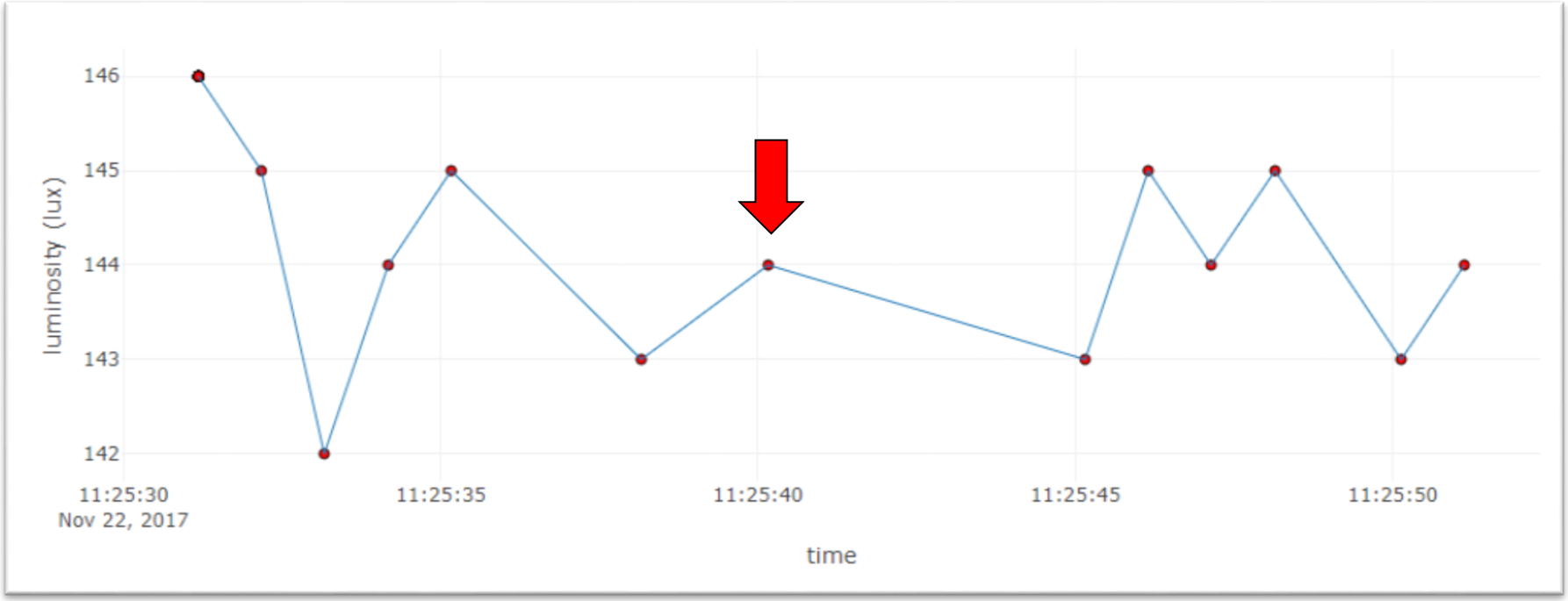
range: [0,500] → y 축의 범위를 0~500 설정

A6.5.6 RT sensor-data streaming in Arduino

[6] Client html : client_ldr.html (real time monitoring of the luminosity)



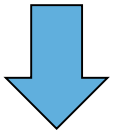
[DIY 1.] Client html : client_ldr_change.html (detecting change)



입력되는 lux 값이 변하는 경우에만 그래프를 그림.
실시간 모니터링에서 이상 감지 기능이 필요함.
밝기 값 변화의 문턱값을 설정해서 이상 감지 기능 구현

[DIY 1. hint] Client html : client_ldr_change.html (detecting change)

```
// when new data is coming, keep on streaming data
ctime.innerHTML = dtda[0];
nextPt();
```

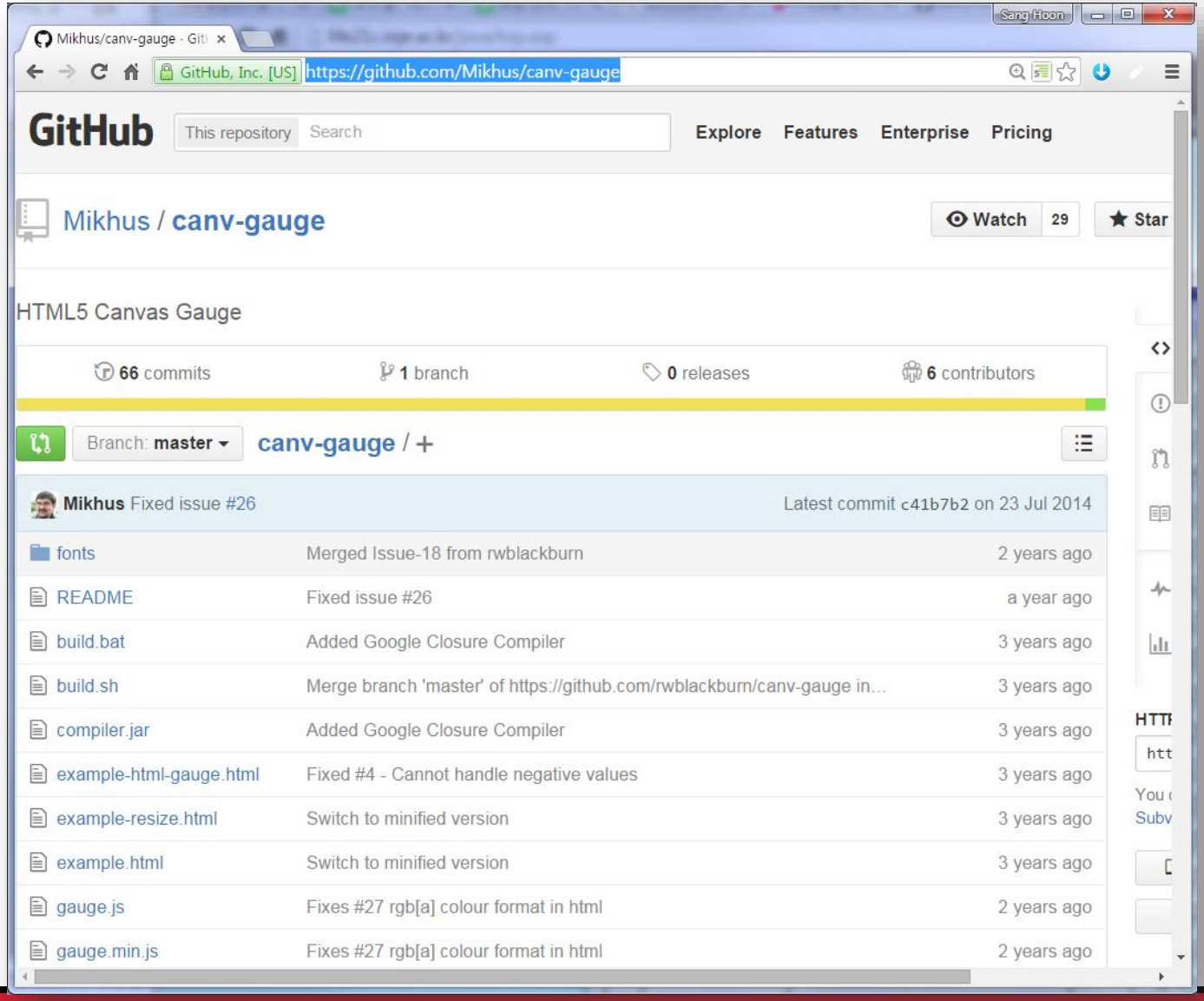


```
// when new data is coming, keep on streaming data
// Only when the value of lux is different from the previous one,
// the screen is redrawed.
if (dtda[1] != preX) {  // any change?
    preX = dtda[1];

    ctime.innerHTML = dtda[0];
    nextPt();
}
```

측정되는 주변광의 밝기가 일정 시간 유지되다가 변하는
그래프를 캡처하여 AAnn_ldr_change.png 로 저장

Canvas Gauge

[1] Canvas gauge javascript library : gauge.js



[DIY 2] Client html : client_ldr_gauge.html (add Gauge)

```
<script src="https://cdn.plot.ly/plotly-latest.min.js"></script>
<script type="text/javascript" src="https://cdnjs.cloudflare.com/ajax/libs/
socket.io/1.3.6/socket.io.js"></script>

<script src="gauge.min.js"></script>
```

```
<body>  <!-- style="width:100%;height:100%"> -->
<!-- Plotly chart will be drawn inside this DIV -->
<h1 align="center"> Real-time Luminosity(lux) from CdS sensor by AAnn</h1>
<!-- Lux gauge -->
<div align="center">
    <canvas id="gauge"> </canvas>
</div>

<h3 align="center"> on  Change time: <span id="time"> </span> </h3>
```

[DIY 2] Client html : client_ldr_gauge.html (add Gauge)

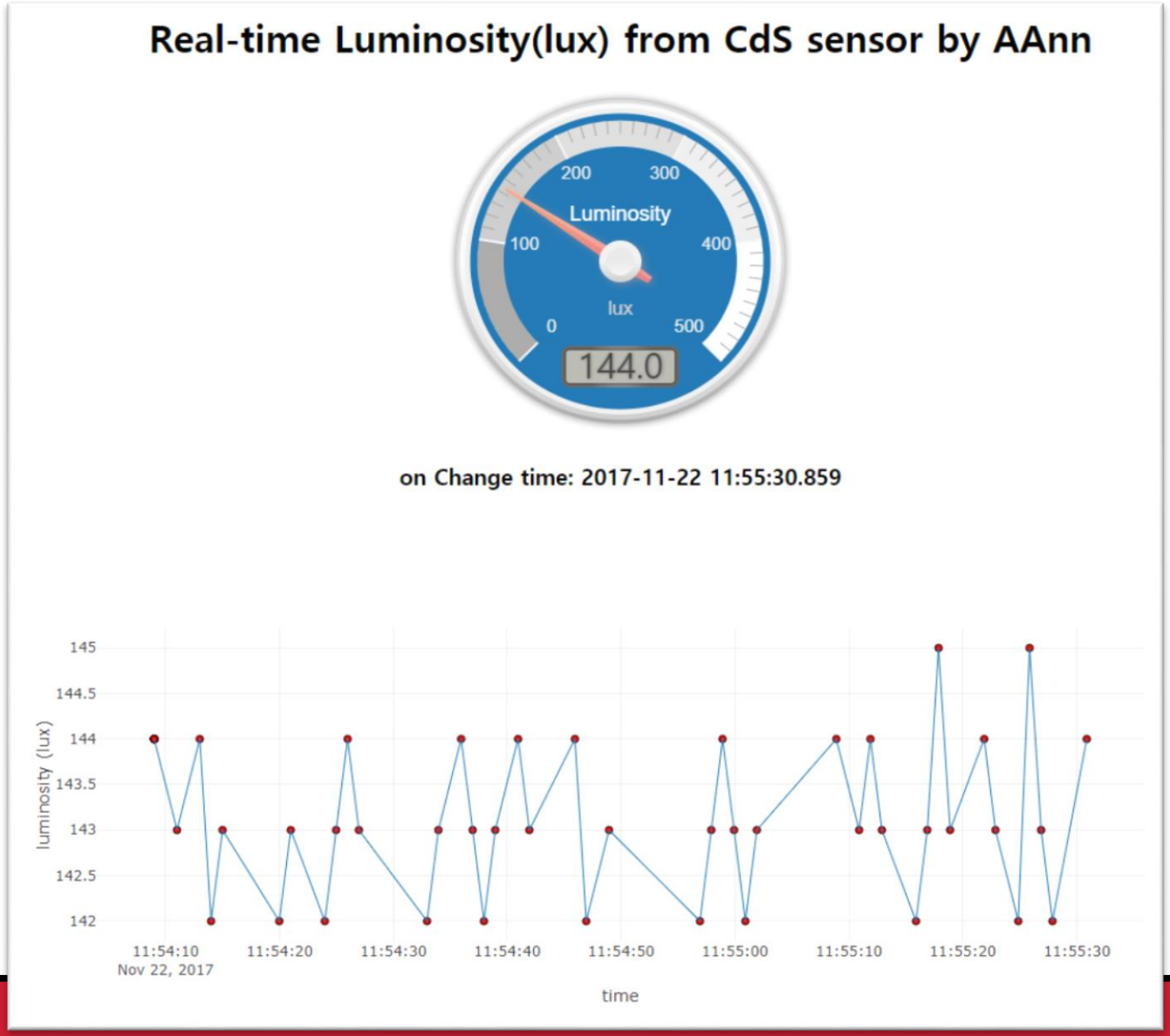
```
// when new data is coming, keep on streaming data
// Only when the value of lux is different from the previous one,
// the screen is redrawed.
if (dtda[1] != preX) {  // any change?
    preX = dtda[1];

    gauge_lux.setValue(dtda[1]);  // lux gauge

    ctime.innerHTML = dtda[0];
    nextPt();
}
```

[DIY 2] Client html : client_ldr_gauge.html (design of Gauge)

```
var gauge_lux = new Gauge({
    renderTo     : 'gauge',
    width        : 300,
    height       : 300,
    glow         : true,
    units        : 'lux',
    valueFormat  : { int : 3, dec : 1 },
    title        : "Luminosity",
    minValue     : 0,
    maxValue     : 500,  // new
    majorTicks   : ['0','100','200','300','400','500'],
    minorTicks   : 10,
    strokeTicks  : false,
    highlights   : [
        { from : 0,   to : 100, color : '#aaa' },
        { from : 100, to : 200, color : '#ccc' },
        { from : 200, to : 300, color : '#ddd' },
        { from : 300, to : 400, color : '#eee' },
        { from : 400, to : 500, color : '#fff' }
    ],
    colors       : {
        plate      : '#1f77b4',
        majorTicks : '#f5f5f5',
        minorTicks : '#aaa',
        title      : '#fff',
        units      : '#ccc',
        numbers    : '#eee',
        needle     : { start : 'rgba(240, 128, 128, 1)', end : 'rgba(255, 160,
            122, .9)' }
    }
});

gauge_lux.draw();
```

[DIY 2] Client html : client_ldr_gauge.html (change design of Gauge)

변경된 디자인으로 된 그래프를 캡처하여 AAnn_ldr_gauge.png 로 저장



[DIY]

RT LDR lux monitoring using plot.ly data streaming

A6.5.3 RT sensor-data streaming in Arduino

[3] Client html : client_ldr.html (socket connection & handling message)

```
var socket = io.connect('http://localhost:3000'); // port = 3000
socket.on('connect', function () {
    socket.on('message', function (msg) {
        // initial plot
        if(msg[0]!='' && initFlag){
            dtda[0]=msg[0];
            dtda[1]=parseFloat(msg[1]);  // Lux
            init();  // start streaming
            initFlag=false;
        }
        console.log(msg[0]);
        console.log(parseFloat(msg[1]));
        // Convert value to integer
        dtda[0]=msg[0];
        dtda[1] = parseFloat(msg[1]); // integer

        // when new data is coming, keep on streaming data
        ctime.innerHTML = dtda[0];
        nextPt();
    });
});
```

[4] Client html : client_ldr.html (init() & nextPt())

```
function init() {  // initial screen ()
    // starting point : first data (lux)
    for ( i = 0; i < numPts; i++) {
        xArray.push(dtda[0]);  // date
        xTrack.push(dtda[1]);  // CdS sensor (lux)
    }

    Plotly.plot(streamPlot, data, layout);
}

function nextPt() {

    xArray.shift();
    xArray.push(dtda[0]);

    xTrack.shift();
    xTrack.push(dtda[1]);  // CdS sensor: lux

    Plotly.redraw(streamPlot);
}
```

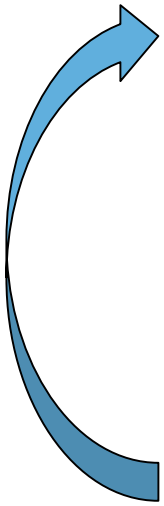
A6.5.14 RT sensor-data streaming in Arduino

[6] Client html : client_ldr_gauge_update.html (using plotly streaming without nextPt())

```
// function nextPt() {

//      xArray.shift();
//      xArray.push(dtda[0]);

//      xTrack.shift();
//      xTrack.push(dtda[1]);   // CdS

//      Plotly.redraw(streamPlot);
// }
```

```
var socket = io.connect('http://localhost:3000'); // port = 3000
socket.on('connect', function () {
    socket.on('message', function (msg) {
        // initial plot
        if(msg[0]!='' && initFlag){
            dtda[0]=msg[0];
            dtda[1]=parseFloat(msg[1]);  // lux
            init();  // start streaming
            initFlag=false;
        }
        console.log(msg[0]);
        console.log(parseFloat(msg[1]));
        // Convert value to number
        dtda[0]=msg[0];
        dtda[1] = parseFloat(msg[1]); // number
        // // when new data is coming, keep on streaming data
        // if (dtda[1] != preX) {  // any change?
        //      preX = dtda[1];

        //      gauge_lux.setValue(dtda[1]);  // lux gauge

        //      ctime.innerHTML = dtda[0];
        //      nextPt();
        // }
        // when new data is coming, keep on streaming data
        ctime.innerHTML = dtda[0];
        gauge_lux.setValue(dtda[1]);  // lux gauge
        //nextPt();
        xArray = xArray.concat(dtda[0])
        xArray.splice(0, 1)  // remove the oldest data
        xTrack = xTrack.concat(dtda[1])
        xTrack.splice(0, 1)  // remove the oldest data

        var update = {
            x:  [xArray],
            y:  [xTrack]
        }

        Plotly.update(streamPlot, update);
    });
});
```

[6] Client html : client_ldr_gauge_update.html
(using plotly streaming without nextPt())

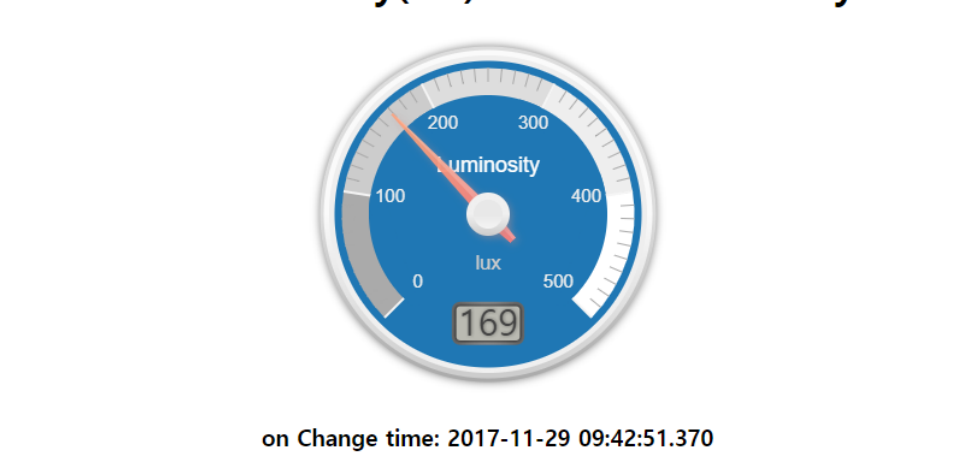


```
//nextPt();
xArray = xArray.concat(dtda[0])
xArray.splice(0, 1)  // remove the oldest data
xTrack = xTrack.concat(dtda[1])
xTrack.splice(0, 1)  // remove the oldest data

var update = {
    x:  [xArray],
    y:  [xTrack]
}

Plotly.update(streamPlot, update);
```

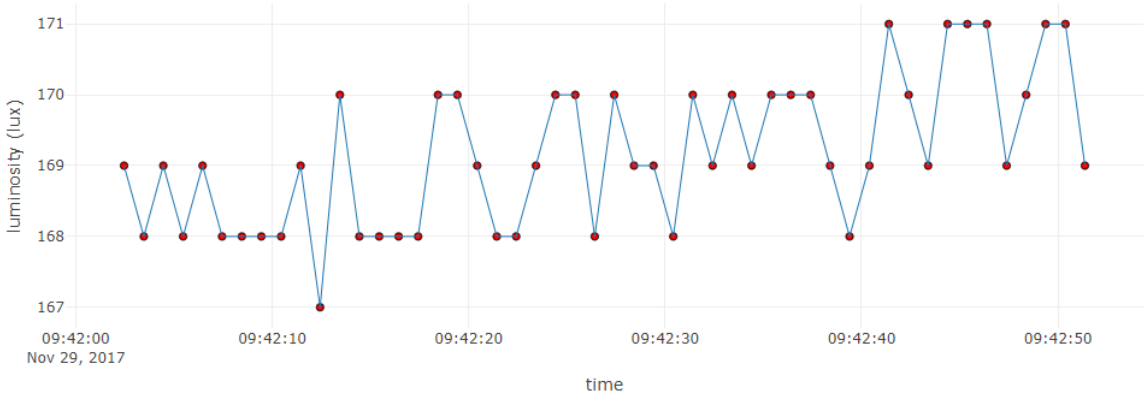
```
// function nextPt() {

//     xArray.shift();
//     xArray.push(dtda[0]);

//     xTrack.shift();
//     xTrack.push(dtda[1]);  // CdS

//     Plotly.redraw(streamPlot);
// }
```

A6.5.16 RT sensor-data streaming in Arduino

[6] Client html : client_ldr_gauge_update.html
(using plotly streaming without nextPt())



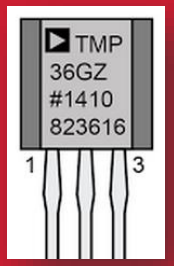

```
// when new data is coming, keep on streaming data
ctime.innerHTML = dtda[0];
gauge_lux.setValue(dtda[1]);  // lux gauge
//nextPt();
xArray = xArray.concat(dtda[0])
xArray.splice(0, 1)  // remove the oldest data
xTrack = xTrack.concat(dtda[1])
xTrack.splice(0, 1)  // remove the oldest data

var update = {
    x:  [xArray],
    y:  [xTrack]
}

Plotly.update(streamPlot, update);
```



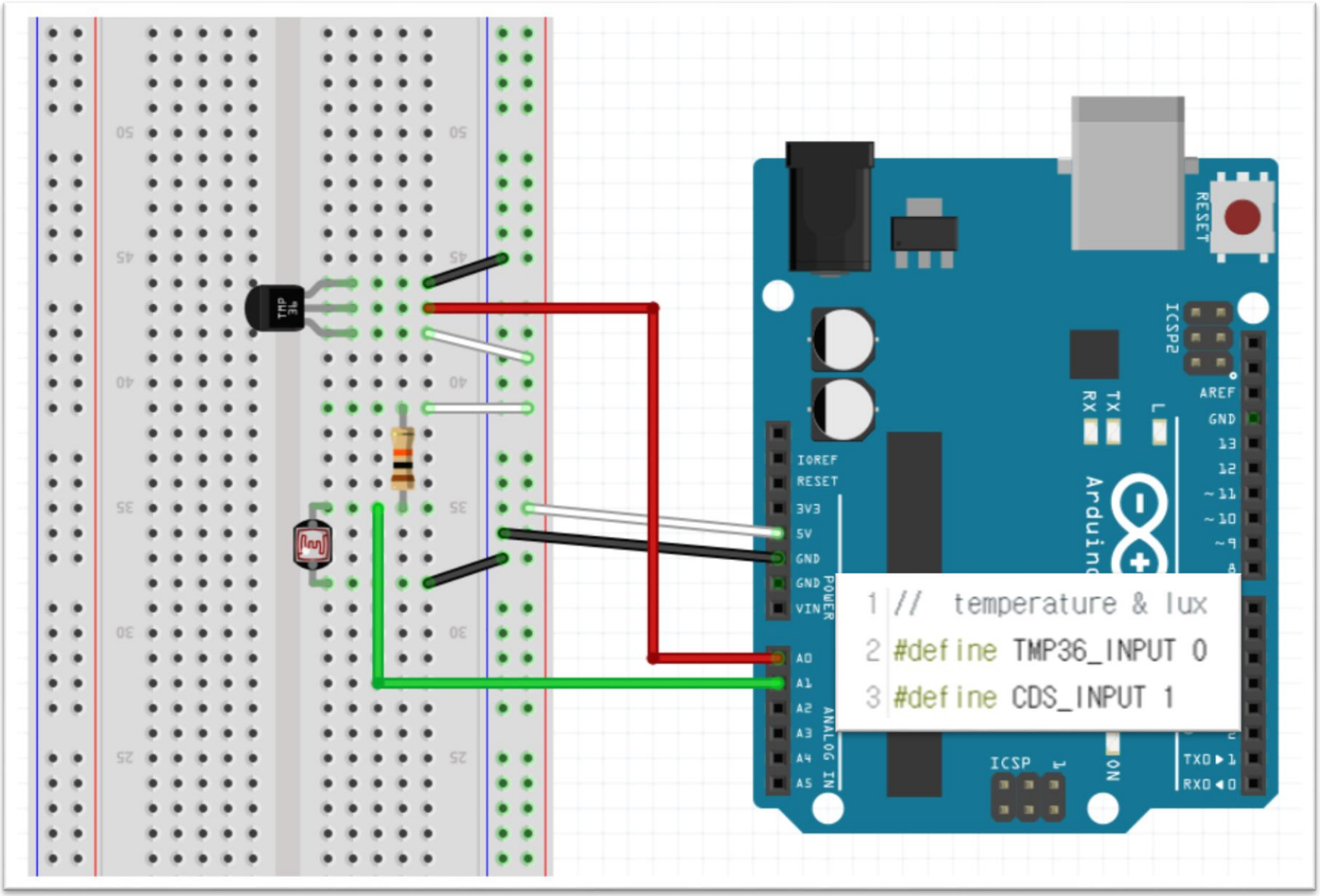
Arduino & Node.js

Multi-sensors

TMP36 + CdS



A6.6 TMP36 + CdS : circuit



A6.6.1 TMP36 + CdS + Node.js

[1] Arduino code: AAnn_TMP36_CdS.ino

AAnn_TMP36_CdS

```
1  //  temperature & lux
2  #define TMP36_INPUT 0
3  #define CDS_INPUT 1
4
5  void setup() {
6    Serial.begin(9600);
7  }
8  void loop() {
9    // Temperature from TMP36
10   int temp_value = analogRead(TMP36_INPUT);
11   // converting that reading to voltage
12   float voltage = temp_value * 5.0 * 1000;  // in mV
13   voltage /= 1023.0;
14   float tempC = (voltage - 500) / 10 ;
15
16   // Lux from CdS (LDR)
17   int cds_value = analogRead(CDS_INPUT);
18   int lux = int(luminosity(cds_value));
19   Serial.print("AAnn,");
20   Serial.print(tempC);
21   Serial.print(",");
22   Serial.println(lux);
23
24   delay(1000);
25 }
```

COM4

```
AAnn,11.09,156
AAnn,12.07,154
AAnn,12.07,154
AAnn,11.58,155
AAnn,11.09,67
AAnn,10.61,74
AAnn,10.61,82
AAnn,11.58,159
AAnn,12.56,163
```

```
27 //Voltage to LuxLux
28 double luminosity (int RawADC0){
29   double Vout=RawADC0*0.0048828125;
30   int lux=(2500/Vout-500)/10;
31   // lux = 500 / Rldr, Vout = Rldr*
32   return lux;
33 }
```

A6.6.2 TMP36 + CdS + Node.js

[2.1] NodeJS code: tmp36_ldr_node.js (← ldr_node.js)

```
1  // tmp36_ldr_node.js
2
3  var serialport = require('serialport');
4  var portName = 'COM4';  // check your COM port!!
5  var port     =    process.env.PORT || 3000;
6
7  var io = require('socket.io').listen(port);
8
9  // serial port object
10 var sp = new serialport(portName,{
11       baudRate: 9600,    // 9600  38400
12       dataBits: 8,
13       parity: 'none',
14       stopBits: 1,
15       flowControl: false,
16       parser: serialport.parsers.readline('\r\n')
17 });
```

A6.6.3 TMP36 + CdS + Node.js

[2.2] NodeJS code: tmp36_ldr_node.js → Parsing data

```
19  var readData = '';  // this stores the buffer
20  var temp ='';
21  var lux ='';
22  var mdata =[]; // this array stores date and data from multiple sensors
23  var firstcommaidx = 0;
24
25  sp.on('data', function (data) { // call back when data is received
26      readData = data.toString(); // append data to buffer
27      firstcommaidx = readData.indexOf(','); // string.indexOf(searchvalue,start)
28      //console.log(data);
29
30      // parsing data into signals
31      if (readData.lastIndexOf(',') > firstcommaidx && firstcommaidx > 0) {
32          temp = readData.substring(firstcommaidx + 1, readData.lastIndexOf(','));
33          lux = readData.substring(readData.indexOf(',', firstcommaidx+1) + 1);
34          //console.log(firstcolonidx + "," + readData.indexOf(':', firstcolonidx+1))
35          readData = '';
36
37          dStr = getDateString();
38          mdata[0]=dStr;  // Date
39          mdata[1]=temp;  // temperature data
40          mdata[2]=lux;  // humidity data
41          console.log(mdata);
42          io.sockets.emit('message', mdata);  // send data to all clients
43
44      } else {  // error
45          console.log(readData);
46      }
47
48  });
```

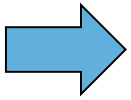
A6.6.4 TMP36 + CdS + Node.js

[3] Result: Parsed streaming data

COM4

```
AAnn,12.07,150
AAnn,12.56,152
AAnn,12.07,150
AAnn,11.09,150
AAnn,12.07,150
AAnn,12.07,150
AAnn,12.07,143
AAnn,11.09,150
AAnn,10.61,151
AAnn,10.61,42
AAnn,10.61,150
AAnn,11.09,152
AAnn,10.61,152
AAnn,10.61,152
```

☑ 자동 스크롤



NodeJS

```
D:\Portable\NodeJSPortable\Data>cd aa00

D:\Portable\NodeJSPortable\Data\aa00>cd ldr

D:\Portable\NodeJSPortable\Data\aa00\ldr>node tmp36_ldr_node
[ '2017-11-29 10:05:45.264', '12.56', '153' ]
[ '2017-11-29 10:05:46.255', '11.09', '153' ]
[ '2017-11-29 10:05:47.247', '13.05', '153' ]
[ '2017-11-29 10:05:48.257', '12.07', '152' ]
[ '2017-11-29 10:05:49.248', '12.07', '152' ]
[ '2017-11-29 10:05:50.256', '12.07', '153' ]
[ '2017-11-29 10:05:51.250', '12.56', '153' ]
[ '2017-11-29 10:05:52.241', '12.07', '151' ]
[ '2017-11-29 10:05:53.249', '12.56', '152' ]
[ '2017-11-29 10:05:54.241', '11.58', '153' ]
[ '2017-11-29 10:05:55.250', '11.09', '153' ]
[ '2017-11-29 10:05:56.243', '12.56', '153' ]
[ '2017-11-29 10:05:57.234', '11.09', '153' ]
[ '2017-11-29 10:05:58.243', '10.61', '153' ]
[ '2017-11-29 10:05:59.234', '11.58', '152' ]
[ '2017-11-29 10:06:00.244', '12.07', '153' ]
[ '2017-11-29 10:06:01.235', '10.61', '153' ]
[ '2017-11-29 10:06:02.227', '11.09', '153' ]
[ '2017-11-29 10:06:03.236', '12.56', '153' ]
[ '2017-11-29 10:06:04.227', '12.07', '152' ]
[ '2017-11-29 10:06:05.237', '12.07', '153' ]
[ '2017-11-29 10:06:06.228', '10.61', '153' ]
```

Save as AAnn_tmp36_ldr_data.png

A6.6.5 TMP36 + CdS + Node.js

[4.1] WEB client: client_tmp36_ldr.html

```
<!DOCTYPE html>
<head>
  <meta charset="utf-8">
  <title>plotly-basic.js Example: Real time signals from sensors</title>
  <script src="https://cdn.plot.ly/plotly-latest.min.js"></script>
  <script type="text/javascript" src="https://cdnjs.cloudflare.com/ajax/libs/
  socket.io/1.3.6/socket.io.js"></script>
  <script src="gauge.min.js"></script>
  <style>body{padding:0;margin:30;background:#fff}</style>
</head>

<body>  <!-- style="width:100%;height:100%"> -->
<!-- Plotly chart will be drawn inside this DIV -->
<h1 align="center"> Real-time Temperature(°C) and Luminosity(lux) from sensors </h1>
    <!-- 1st gauge -->
    <div align="center">
    <canvas id="gauge1"> </canvas>
    <!-- 2nd gauge -->
    <canvas id="gauge2"> </canvas>
    </div>
    <!-- <div id="console"> </div> -->
<h3 align="center"> on Time: <span id="time"> </span> </h3>
<div id="myDiv"></div>
<hr>
```

A6.6.6 TMP36 + CdS + Node.js

[4.2] WEB client: client_tmp36_ldr.html

```
25  <script>
26  /* JAVASCRIPT CODE GOES HERE */
27    var streamPlot = document.getElementById('myDiv');
28    var ctime = document.getElementById('time');
29
30    var xArray = [], // time of data arrival
31        xTrack = [], // value of sensor 1 : temperature
32        yTrack = [], // value of sensor 2 : luminosity
33        numPts = 50, // number of data points in x-axis
34        dtda = [],  // 1 x 3 array : [date, data1, data2] from sensors
35        preX = -1,
36        preY = -1,
37        initFlag = true;
38
```

A6.6.7 TMP36 + CdS + Node.js

[4.3] WEB client: client_tmp36_ldr.html

```
39      var socket = io.connect('http://localhost:3000'); // port = 3000
40      socket.on('connect', function () {
41          socket.on('message', function (msg) {
42              // initial plot
43              if(msg[0]!='' && initFlag){
44                  dtda[0]=msg[0];
45                  dtda[1]=parseFloat(msg[1]);  // temperature
46                  dtda[2]=parseFloat(msg[2]); // luminosity
47                  init();
48                  initFlag=false;
49              }
50              // console.log(msg[0]);
51              // console.log(parseFloat(msg[1]) + ', ' + parseFloat(msg[2]));
52              // Convert value to integer
53              dtda[0]=msg[0];
54              dtda[1] = parseFloat(msg[1]);
55              dtda[2] = parseFloat(msg[2]);
56
57              // Only when any of temperature or luminosity is different from the
                previous one, the screen is redrawed.
58              if (dtda[1] != preX || dtda[2] != preY) {  // any change?
59                  preX = dtda[1];
60                  preY = dtda[2];
61
62                  gauge_temp.setValue(dtda[1]);
63                  gauge_lux.setValue(dtda[2]);
64                  ctime.innerHTML = dtda[0];
65                  nextPt();
66              }
67          });
68      });
```

A6.6.8 TMP36 + CdS + Node.js

[4.4] WEB client: client_tmp36_ldr.html

```
70      function init() {  // initial screen ()
71          // starting point : first data (temp, humi)
72          for ( i = 0; i < numPts; i++) {
73              xArray.push(dtda[0]);  // date
74              xTrack.push(dtda[1]);  // sensor 1 (temp)
75              yTrack.push(dtda[2]);  // sensor 2 (lux)
76          }
77
78          Plotly.plot(streamPlot, data, layout);
79      }
80
81      function nextPt() {
82
83          xArray.shift();
84          xArray.push(dtda[0]);
85
86          xTrack.shift();
87          xTrack.push(dtda[1]);  // sensor 1:temp
88          yTrack.shift();
89          yTrack.push(dtda[2]);  // sensor 2:lux
90
91          Plotly.redraw(streamPlot);
92      }
```

A6.6.9 TMP36 + CdS + Node.js

[4.5] WEB client: client_tmp36_ldr.html → data & layout

```
// data
var data = [{
    x : xArray,
    y : xTrack,
    name : 'temperature',
    mode: "markers+lines",  // "lines+markers"
    line: {
        color: "#1f77b4",
        width: 1
     },
    marker: {
        color: "rgb(255, 0, 0)",
        size: 6,
        line: {
          color: "black",
          width: 0.5
        }
     }
}, {
    x : xArray,
    y : yTrack,
    name : 'luminosity',
    xaxis: 'x2',
    yaxis : 'y2',
    mode: "markers+lines",  // "lines+markers"
    line: {
        color: "#1f77b4",
        width: 1
     },
    marker: {
        color: "rgb(0, 0, 255)",
        size: 6,
        line: {
          color: "black",
          width: 0.5
        }
     }
}];
```

```
var layout = {
    xaxis : {
        title : 'time',
        domain : [0, 1]
    },
    yaxis : {
        title : 'temperature (°C)',
        domain : [0, 0.4],
        range : [-30, 50]
    },
    xaxis2 : {
        title : '',
        domain : [0, 1],
        position : 0.6
    },
    yaxis2 : {
        title : 'luminosity (lux)',
        domain : [0.65, 1],
        range : [0, 500]
    }
};
```

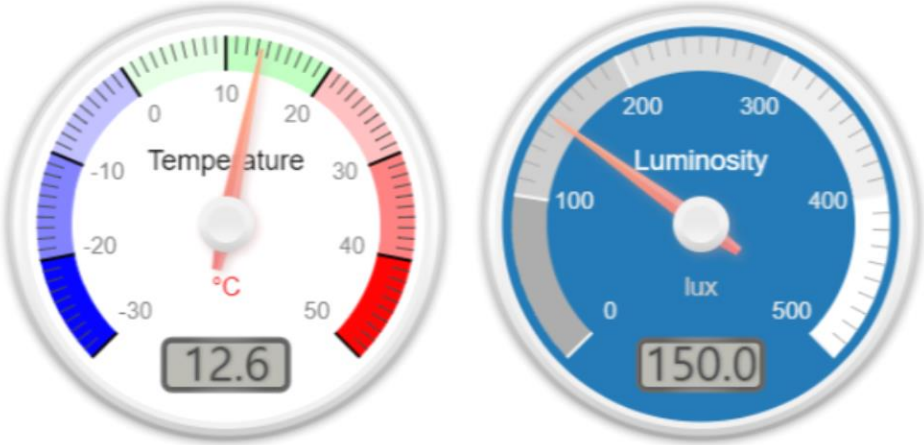
A6.6.10 TMP36 + CdS + Node.js

[4.6] WEB client: client_tmp36_ldr.html → gauges

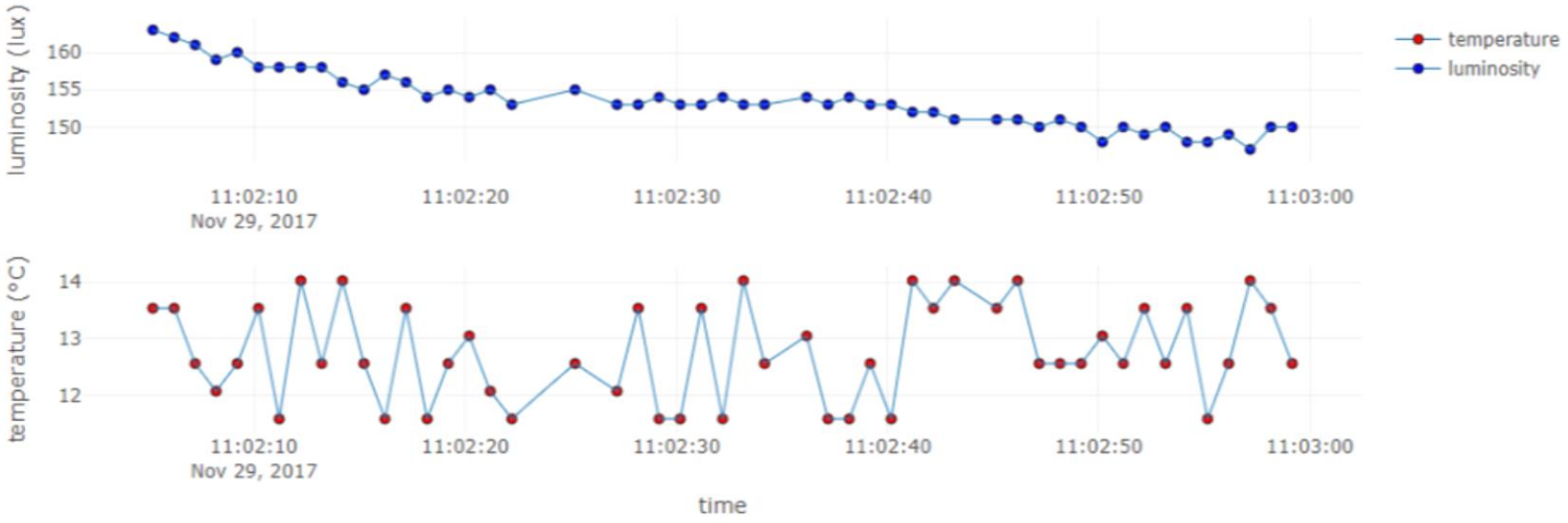
```
// gauge configuration
var gauge_temp = new Gauge({
    renderTo    : 'gauge1',
    width       : 300,
    height      : 300,
    glow        : true,
    units       : '°C',
    valueFormat : { int : 2, dec : 1 },
    title       : "Temperature",
    minValue    : -30,
    maxValue    : 50,
    majorTicks  : ['-30','-20','-10','0','10','20','30','40','50'],
    minorTicks  : 10,
    strokeTicks : false,
    highlights  : [
        { from : -30,   to : -20, color : 'rgba(0, 0, 255, 1)' },
        { from : -20,   to : -10, color : 'rgba(0, 0, 255, .5)' },
        { from : -10, to : 0, color : 'rgba(0, 0, 255, .25)' },
        { from : 0,   to : 10, color : 'rgba(0, 255, 0, .1)' },
        { from : 10, to : 20, color : 'rgba(0, 255, 0, .25)' },
        { from : 20, to : 30, color : 'rgba(255, 0,  0, .25)' },
        { from : 30, to : 40, color : 'rgba(255, 0,  0, .5)' },
        { from : 40, to : 50, color : 'rgba(255, 0,  0, 1)' }
    ],
    colors      : {
        plate      : '#fff',
        majorTicks : '#000',
        minorTicks : '#444',
        title      : '#000',
        units      : '#f00',
        numbers    : '#777',
        needle     : { start : 'rgba(240, 128, 128, 1)', end : 'rgba(255, 160,
            122, .9)' }
    }
});

gauge_temp.draw();
```

```
var gauge_lux = new Gauge({
    renderTo    : 'gauge2',
    width       : 300,
    height      : 300,
    glow        : true,
    units       : 'lux',
    valueFormat : { int : 2, dec : 1 },
    title       : "Luminosity",
    minValue    : 0,
    maxValue    : 500,
    majorTicks  : ['0','100','200','300','400','500'],
    minorTicks  : 10,
    strokeTicks : false,
    highlights  : [
        { from : 0,   to : 100, color : '#aaa' },
        { from : 100, to : 200, color : '#ccc' },
        { from : 200, to : 300, color : '#ddd' },
        { from : 300, to : 400, color : '#eee' },
        { from : 400, to : 500, color : '#fff' }
    ],
    colors      : {
        plate      : '#1f77b4',
        majorTicks : '#f5f5f5',
        minorTicks : '#aaa',
        title      : '#fff',
        units      : '#ccc',
        numbers    : '#eee',
        needle     : { start : 'rgba(240, 128, 128, 1)', end : 'rgba(255, 160,
            122, .9)' }
    }
});

gauge_lux.draw();
```

Real-time Temperature(°C) and Luminosity(lux) from sensors



on Time: 2017-11-29 11:02:59.163



[DIY]

Real-time

TMP36 & CdS monitoring

using plot.ly

→ Data streaming

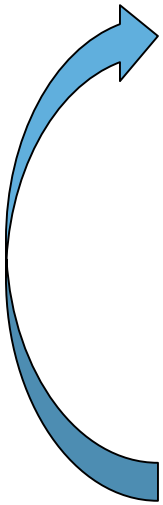
[5.1] WEB client: client_tmp36_ldr_update.html (using plotly streaming without nextPt())

Comment function nextPt()

```
// function nextPt() {

//      xArray.shift();
//      xArray.push(dtda[0]);

//      xTrack.shift();
//      xTrack.push(dtda[1]);  // sensor 1:temp
//      yTrack.shift();
//      yTrack.push(dtda[2]);  // sensor 2:lux

//      Plotly.redraw(streamPlot);
// }
```

[5.2] WEB client: client_tmp36_ldr_update.html (using plotly streaming without nextPt())

```
//nextPt();
xArray = xArray.concat(dtda[0])
xArray.splice(0, 1)  // remove the oldest data
xTrack = xTrack.concat(dtda[1])
xTrack.splice(0, 1)  // remove the oldest data

var update = {
    x:  [xArray],
    y:  [xTrack]
}

Plotly.update(streamPlot, update);
```

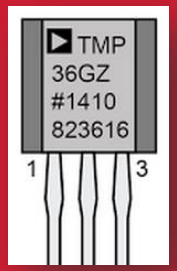


Complete this part of the code.

```
// function nextPt() {

//     xArray.shift();
//     xArray.push(dtda[0]);

//     xTrack.shift();
//     xTrack.push(dtda[1]);  // sensor 1:temp
//     yTrack.shift();
//     yTrack.push(dtda[2]);  // sensor 2:lux

//     Plotly.redraw(streamPlot);
// }
```

Save the complete code as AAnn_update.html

[Practice]



- [wk14]
  - RT Data Visualization with node.js
  - TMP38 + CdS sensors
  - Complete your real-time charts
  - AAnn_Rpt11.zip

wk14 : Practice-11 : AAnn_Rpt11.zip

- [Target of this week]
  - Complete your plots of real-time streaming of TMP36 & CdS
  - Design your own gauge and chart.
  - Save your outcomes and compress them.

제출파일명 : **AAnn_Rpt11.zip**

- 압축할 파일들

  ① AAnn_tmp36_ldr_data.png

  ② AAnn_update.html

Email : chaos21c@gmail.com

[Tip] Using WEB browser in SB text3

[Tool] Sublime Text – 현재 작업 중인 파일을 웹브라우저로 열기

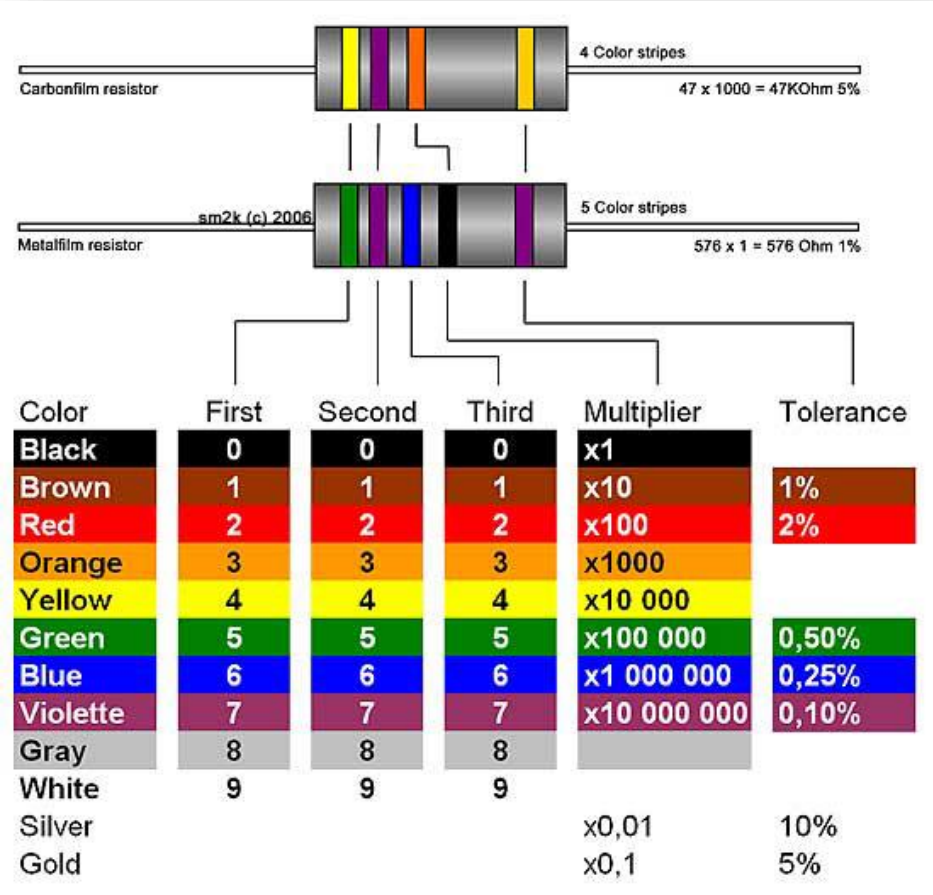
1. Tool -> New Plugin을 실행 한 후 아래 내용으로 덮어 씌운 후 **'open_browser'**으로 저장한다**.**

```
import sublime, sublime_plugin
import webbrowser

class OpenBrowserCommand(sublime_plugin.TextCommand):
    def run(self,edit):
        url = self.view.file_name()
        webbrowser.open_new(url)
```

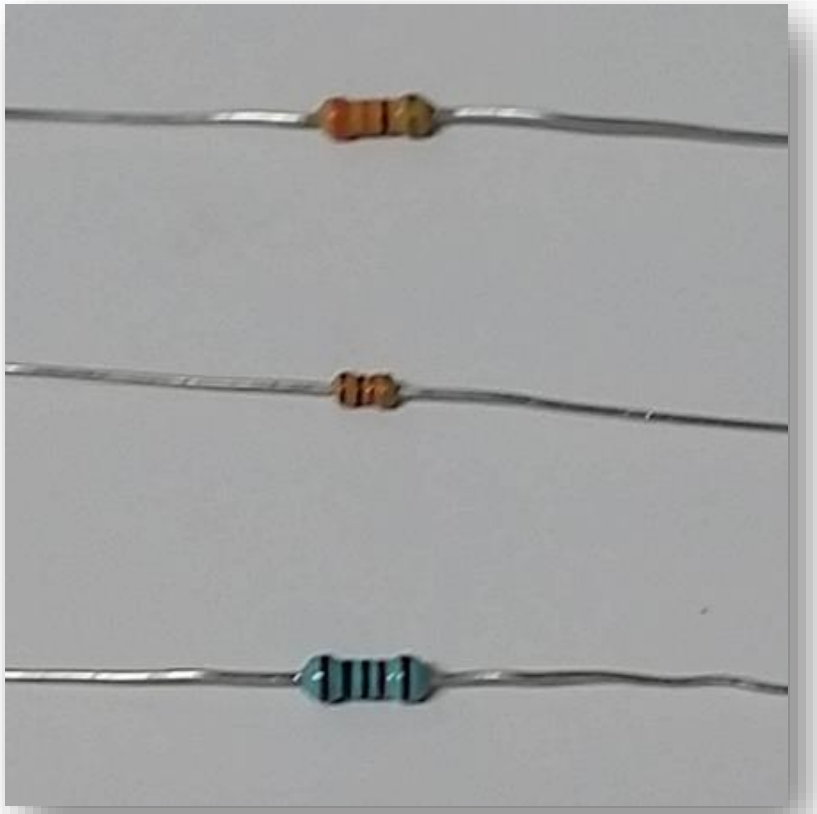
2. Preferences -> Key Bindings - User로 이동한 후 단축키를 할당한다**.**

```
{ "keys": ["f10"], "command": "open_browser" }
```

[참고 : 저항 값 읽기]



Color	First	Second	Third	Multiplier	Tolerance
Black	0	0	0	x1	
Brown	1	1	1	x10	1%
Red	2	2	2	x100	2%
Orange	3	3	3	x1000	
Yellow	4	4	4	x10 000	
Green	5	5	5	x100 000	0,50%
Blue	6	6	6	x1 000 000	0,25%
Violette	7	7	7	x10 000 000	0,10%
Gray	8	8	8		
White	9	9	9		
Silver				x0,01	10%
Gold				x0,1	5%



Lecture materials

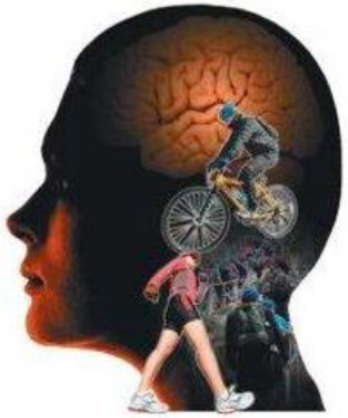
References & good sites

- ✓ http://www.nodejs.org/ko Node.js
- ✓ http://www.arduino.cc Arduino Homepage
- ✓ http://www.w3schools.com By w3schools
- ✓ http://www.github.com GitHub
- ✓ http://www.google.com Googling

Github.com/Redwoods

GitHub, Inc. [US] | https://github.com Redwoods (Redwoods Yi) · GitHub

Features Business Explore Marketplace Pricing Search GitHub Sign in or Sign up



Redwoods Yi

Redwoods

Block or report user

GimHae, Republic of Korea

Overview Repositories 5 Stars 2 Followers 0 Following 0

Pinned repositories

dht22-iot-project

Iot project to monitor data streaming from DHT22 wired at Arduino.

HTML

Lec

All lectures by Redwoods in Inje University

arduino-nodejs-plotly-streaming

This repo introduces a simple and efficient way to plot the streaming data from Arduino with Easy Pulse ppg sensor or DHT11 sensor.

HTML

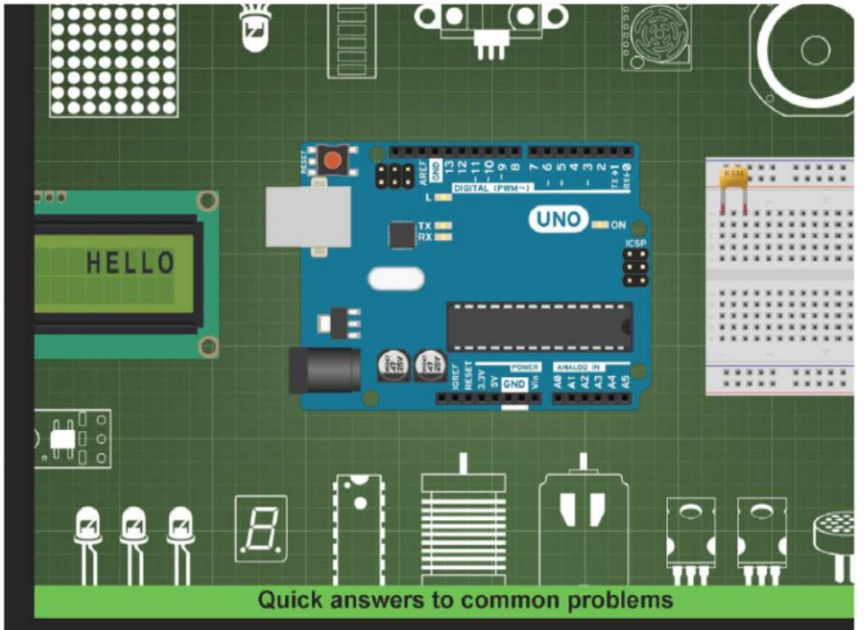
hw-coding

Resource for lecture of Hardware Programming (2017, Inje university)

Arduino

References


Community Experience Distilled
Arduino Essentials
Enter the world of Arduino and its peripherals and start creating interesting projects
Francis Perea
[PACKT]
PUBLISHING


HELLO
UNO
Quick answers to common problems
Arduino Development Cookbook
Over 50 hands-on recipes to quickly build and understand Arduino projects, from the simplest to the most extraordinary
Cornel Amariei
[PACKT] open source
PUBLISHING