



runlinc Intermediate Project 1: Set Fire Risk Limit (STEMSEL Version)

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Introduction

Problem

- How can we measure something, such as fire risk?
- How can we change the fire risk setting without reprogramming?

Background

You may have heard or known that in Australia bushfires are common during the summer period. What causes such fire is the dry environment and the heat produced by the sun rays (and also other factors such as lightning and human activities). In the summer period, days are longer and the sun rays are shine with more intensity. The increased intensity warms up any surfaces that are in contact with the sun rays as the surfaces absorb the energy. In a non-dry environment, water will absorb the excess heat from the sunlight and evaporate, thereby preventing a build-up of energy that causes a surface to start burning. However, in Australia, there is not enough rain to keep up with evaporation during the summer, which leads to an increased fire risk. This leads up to a situation where bushfires easily occur without notice. Therefore, it can be said, where the light intensity of a region is low, it is less likely for a fire to erupt, whereas the opposite can be said for an area with high light intensity.

Ideas

How can we measure the light intensity (level)? How can the microchip and runlinc tell the user if the level is high or low? Is a visual warning on a webpage enough, or would an additional method be advantageous? What kind of thresholds might be good? Is there any other information that might be good to display on our Webpage?

Plan

In this project, we will use light sensors (LDR) to measure the light intensity of a possible fire and a web input to change the light intensity risk.



Figure 1. Block Diagram of Inputs & Outputs of this project.

runlinc Background

Runlinc is a web page inside a Wi-Fi chip. The programming is done in the browser and sent to the chip over Wi-Fi. The runlinc web page inside the Wi-Fi chip will command the microchips to do sensing, control, data logging Internet of Things (IoT). It can predict and command.

Part A: Design the Circuit on runlinc

Note: Refer to runlinc Wi-Fi Setup Guide document to connect to runlinc

Use the left side of the runlinc web page to construct an input/output (I/O).

PORT	CONFIGURATION	NAME	STATUS
A3	DISABLED		
B4	DISABLED		
B6	DISABLED		
C0	DISABLED		
C1	DISABLED		
C2	DISABLED		
C3	DISABLED		
C4	DISABLED		
C5	DISABLED		
C6	DISABLED		
C7	ANALOG_IN	Light_Sensor	225

Network Status: Active

Figure 2. I/O configurations connections

For port C7; name it Light_Sensor and set it as ANALOG_IN.

In our circuit design, we will be using the light sensor. We happen to have this in our kits, so these can be used on our circuit design, as per the plan.

Part B: Build the Circuit

Use the runlinc I/O to connect the hardware. Remember that turning the screws clockwise will close the clamps and turning the screws anticlockwise will open them. All black wires should go in the negative (-) terminal, red wires go in the positive (+) terminal, and white wires go in the terminal we designated in the runlinc web page.

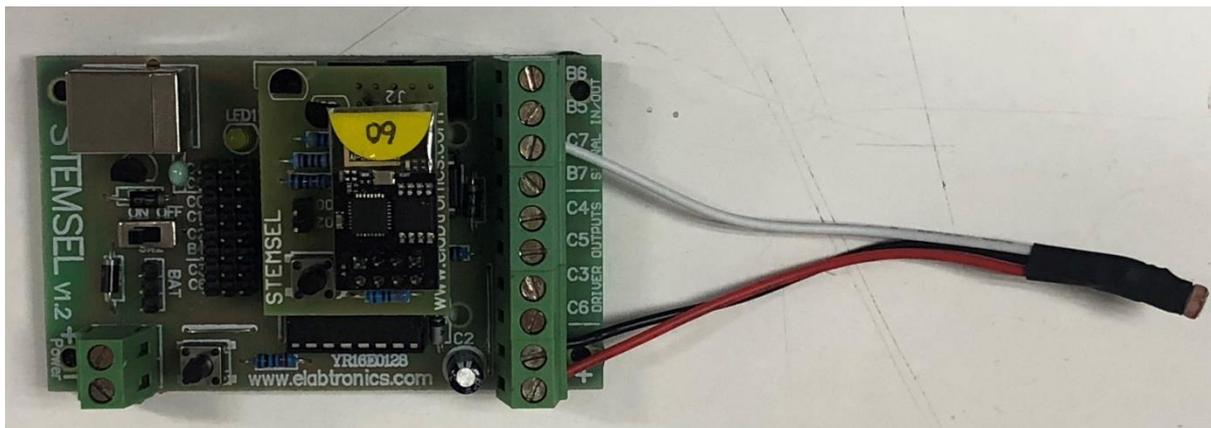


Figure 3 Circuit connection on the microcontroller

Wiring instructions

For the Light sensor, connect the white wire to C7, black wire to the negative port and red wire to the positive port.

Part C: Program the Circuit

HTML:

Before we program the logic into STEMSEL board, we will first set up an HTML page.

1. Set up the text of the page and place it in the centre:

```
<div style="text-align:center">
</div>
```

2. Within the <div></div> tags we will setup headings and body texts with respective unique IDs:

```
<h3>Fire Risk Dashboard powered by runlinc</h3>
<td>Current Light Intensity Now:</td>
<font id="Intensity">Loading...</font> Light Intensity out of 5 Light Intensity
<br>
Analysis: <font id="Message"></font>
<br>
<br>
Set Fire Risk Limit Setting:
<br>
<br>
Current Low Risk Limit is <font id="FRlimit">Loading...</font> Light Intensity.
```

3. Then between “Set Fire Risk Limit Setting:” and “Current Low Risk Limit...” we will add a slider that will help us to easily change the limit of the fire risk:

```
<input type="range" id="limit" min="0" max="5" step="0.1" value="2">
```

The final code should be typed into the HTML block:

```
<div style="text-align:center">
<h3>Fire Risk Dashboard powered by runlinc</h3>
<td>Current Light Intensity Now:</td>
<font id="Intensity">Loading...</font> Light Intensity out of 5 Light Intensity
<br>
Analysis: <font id="Message"></font>
<br>
<br>
Set Fire Risk Limit Setting:
<br>
<input type="range" id="limit" min="0" max="5" step="0.1" value="2">
<br>
Current Low Risk Limit is <font id="FRlimit">Loading...</font> Light Intensity.
</div>
```

This will set up our webpage to receive the Information from the Light_Sensor.

Javascript Loop:

Then we will program the code into STEMSEL board using the Javascript Loop.

1. We will first need to have the board measure the light intensity from the light sensor, followed by converting the light intensity into a number within the range of 0 to 5.

```
sense_num = analogIn( Light_Sensor );
sense_num = sense_num / 51;
sense_num = sense_num.toFixed(1);
```

2. We will then need to retrieve the intensity that we have set on the HTML page using the HTML slider feature.

```
document.getElementById("Intensity").innerHTML = sense_num;
Limit = document.getElementById("limit").value;
document.getElementById("FRlimit").innerHTML = Limit;
```

3. Using the limit from step 3 we can then compare whether the risk is low or high.

```
if(sense_num < Limit)
  document.getElementById("Message").innerHTML = "Fire Risk is LOW";
else
  document.getElementById("Message").innerHTML = "Fire Risk is HIGH";
```

The final code for the Javascript Loop block:

```
sense_num = analogIn( Light_Sensor );
sense_num = sense_num / 51;
sense_num = sense_num.toFixed(1);
document.getElementById("Intensity").innerHTML = sense_num;
Limit = document.getElementById("limit").value;
document.getElementById("FRlimit").innerHTML = Limit;

if(sense_num < Limit)
  document.getElementById("Message").innerHTML = "Fire Risk is LOW";
else
  document.getElementById("Message").innerHTML = "Fire Risk is HIGH";
```

Expected Result:

Fire Risk Dashboard powered by runlinc

Current Light Intensity Now: 2.9 Light Intensity out of 5 Light Intensity
 Analysis: Fire Risk is HIGH

Fire Risk Limit Setting:



Current Low Risk Limit is 2 Light Intensity.

Figure 4. Expected Webpage Result.

runlinc v1.0

File

Board

Board IP: 192.168.137.82

STEMSEL

PORT	CONFIGURATION	NAME	STATUS
A3	DISABLED		
B4	DIGITAL_OUT		OFF
B6	DIGITAL_OUT		OFF
C0	DIGITAL_OUT		OFF
C1	DIGITAL_OUT		OFF
C2	DIGITAL_OUT		OFF
C3	DIGITAL_OUT		OFF
C4	DIGITAL_OUT		OFF
C5	DIGITAL_OUT		OFF
C6	DIGITAL_OUT		OFF
C7	ANALOG_IN	Light_Sensor	125

Network Status: Active

CSS

HTML

```

                    <div style="text-align:center">
                    <h3>Fire Risk Dashboard powered by runlinc</h3>
                    <td>Current Light Intensity Now:</td>
                    <font id="Intensity">Loading...</font> Light Intensity out of 5 Light Intensity
                    <br>
                    Analysis: <font id="Message"></font>
                    <br>
                    Fire Risk Limit Setting:
                    <br>
                    <input type="range" id="limit" min="0" max="5" step="0.1" value="2">
                    <br>
                    Current Low Risk Limit is <font id="FRlimit">Loading...</font> Light Intensity.
                    </div>
                
```

JavaScript

JavaScript Loop

```

                    sense_num = analogIn( Light_Sensor );
                    sense_num = sense_num / 51;
                    sense_num = sense_num.toFixed(1);
                    document.getElementById("Intensity").innerHTML = sense_num;
                    Limit = document.getElementById("limit").value;
                    document.getElementById("FRlimit").innerHTML = Limit;

                    if(sense_num < Limit)
                    document.getElementById("Message").innerHTML = "Fire Risk is LOW";
                    else
                    document.getElementById("Message").innerHTML = "Fire Risk is HIGH";
                
```

Figure 5. Expected runlinc Result

Summary

What we did today is a form of application that can help us measure the fire risk around us and this case is a way to find out whether the light level is causing a fire risk. But this is not so simple as we just did. It should be noted that we are surrounded by many things that are flammable although they are in a damp environment. The world is a very unpredictable place. By learning how we can measure the level of risk, we can prioritise and control as many parameters as we can by learning what can be done to lower the risks that will be detrimental to our very being.