



runlinc Beginners Project 3: Fridge Alarm (STEMSEL Version)

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Introduction

Problem

Fridges only work when the door is closed. We need to create an alarm that will tell us if the fridge door has been left open. This can be done by using runlinc.

Background

Fridges have become essential in our daily lives. By keeping our food cold, we can keep our food fresh for a longer period. Previously it was necessary either buy perishable groceries every day or to preserve them in a time-consuming way. The invention of the cooling box was useful, but it still required large blocks of ice to be bought periodically to keep the food cold as there was no electricity. Now we can buy food and keep it fresh in the fridge for days. Refrigerators also keep pests like mice and cockroaches away from our food which prevents disease. However, if the fridge door is left open, the fridge can't keep working, and the pests could contaminate our food!

This project constructs an alarm that sounds when the fridge door has been left open. It uses the STEMSEL controller board, Wi-Fi runlinc chip, a Light Dependent Resistor (LDR), a yellow LED and web buzzer tone generator. When the fridge door is opened, the LDR senses the light in the fridge and activates a web buzzer tone generator, and a LED as a “door open” alarm.

Ideas

How can the microchip tell if the fridge door is open? What are the differences between when the door is open and when it is closed? Do we want the alarm to activate as soon as the door is opened, or should we have a delay? How can the alarm let us know that the door is open?

Plan

Two things might change when the door is open: the light level and the temperature. In our kits, we have light sensors (LDRs). We can use a light sensor to check if the door is open. When the alarm turns on, we will activate a buzzer sound.

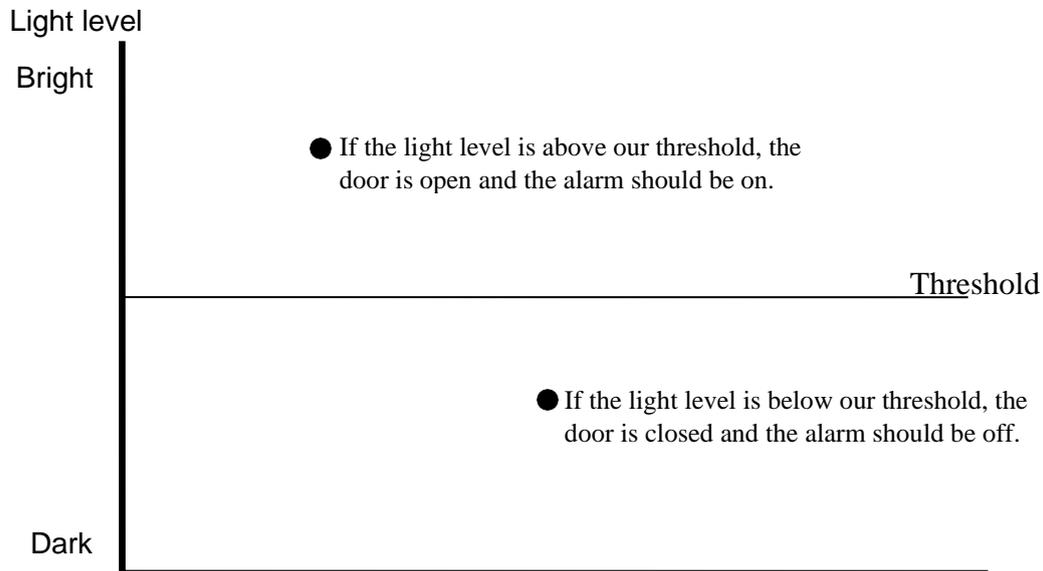


Figure 1: Light Level for a light sensor

Temperature will work in the same way; if it is above the threshold, the alarm should be on; otherwise, the alarm should be off. The microchip should continuously check the light and temperature levels, then activate the alarm if either of them gets too high.

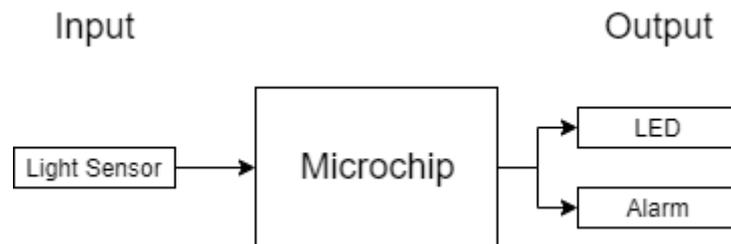


Figure 2: Block diagram of Microchip outputs

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). Ports C4, C5, C3 and C6 are output ports. Ports B6, B5, C7 and B7 are input ports.

Set the C7 port as ANALOG_IN and name it Lightsensor.

Also, set the C5 port as DIGITAL_OUT and name it templed.

In our circuit design, we will be using a yellow LED and light-dependent resistor. We happen to have these in our kits, so these can be used on our circuit design, as per the plan. Buzzer won't be used because it can't communicate. Instead, a tone generator from the web browser is used

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File

Save

Board

Run Code

Stop Code

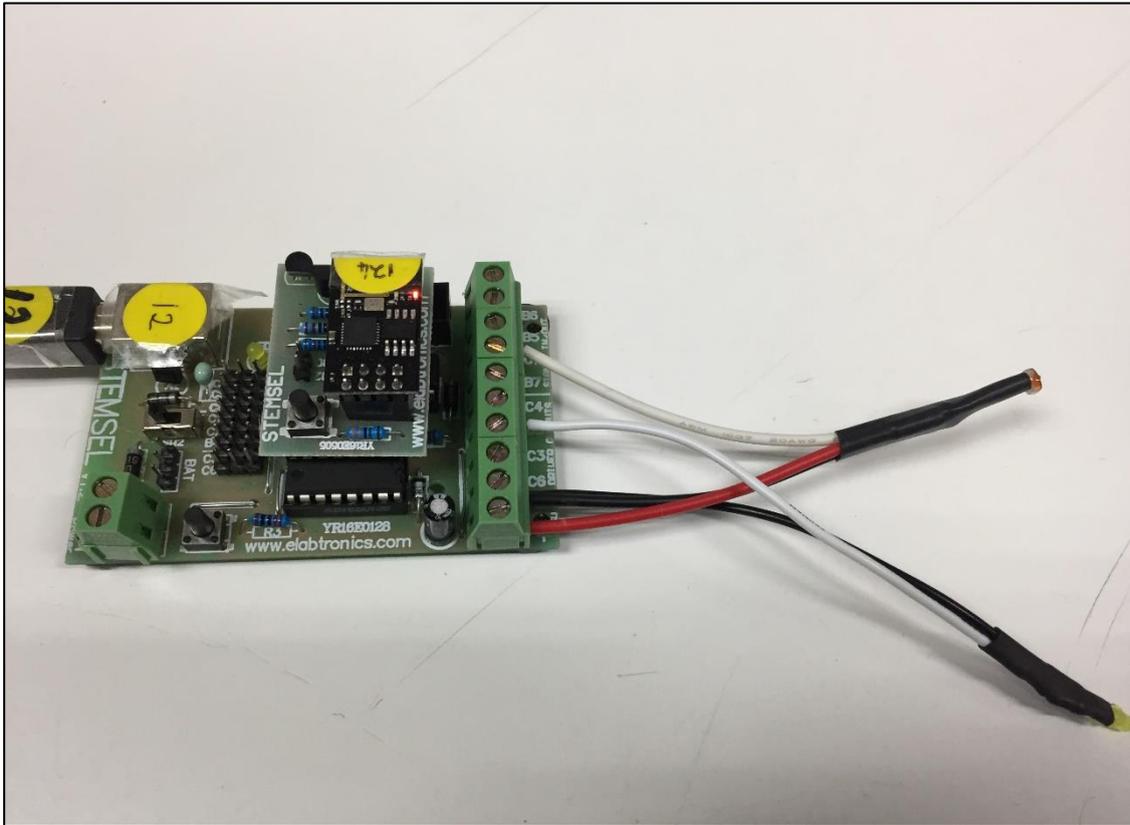
Board IP: http://192.168.1.60

STEMSEL
⌵

PORT	CONFIGURATION	NAME	STATUS
A3	DISABLED ⌵	<input type="text"/>	
B4	DISABLED ⌵	<input type="text"/>	
B6	DISABLED ⌵	<input type="text"/>	
C0	DISABLED ⌵	<input type="text"/>	
C1	DISABLED ⌵	<input type="text"/>	
C2	DISABLED ⌵	<input type="text"/>	
C3	DISABLED ⌵	<input type="text"/>	
C4	DISABLED ⌵	<input type="text"/>	
C5	DIGITAL_OUT ⌵	templed	OFF
C6	DISABLED ⌵	<input type="text"/>	
C7	ANALOG_IN ⌵	Lightsensor	14

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 port.



Wiring instructions

- 1) Connect yellow LED white wire to port C5 and black wire to the negative terminal (-)
- 2) Connect light-dependent resistor white wire to port C7, red wire to the positive terminal (+) and black wire to the negative terminal (-)

Part C: Program the Circuit

Use the blocks on the right side of the runlinc webpage to program the functions of the fridge alarm. Use the HTML to add contents, CSS to add style in your favour and JavaScript to program the microchip. For this case, JavaScript Loop is needed to program it to act as an alarm. Type the following code.

JavaScript Loop

```
Result = analogIn(Lightsensor);
if(Result < 153 ){
    turnOff ( templed );
}else{
    let audioCtx = new AudioContext();
    let oscillator = audioCtx.createOscillator();
    oscillator.frequency.value = 4440;
    oscillator.connect(audioCtx.destination);
    oscillator.start();
    oscillator.stop(audioCtx.currentTime + 3);
    turnOn ( templed);
}
```

If the light sensor input is above 153, the fridge alarm will turn on.

If light sensor input is below 153, the fridge alarm will turn off.

We can then modify the fridge alarm program so that the alarm is activated after the fridge door has been opened for more than five seconds. The time delay of five seconds should only occur when the door is opened and not any other time in the program.

We will edit the }else{ section to:

```
...
}else{
    await mSec( 5000 );
    Result = analogIn(Lightsensor);
    if(Result >= 153 ){
        let audioCtx = new AudioContext();
        let oscillator = audioCtx.createOscillator();
        oscillator.frequency.value = 4440;
        oscillator.connect(audioCtx.destination);
        oscillator.start();
        oscillator.stop(audioCtx.currentTime + 3);
        turnOn ( templed);
    }
}
```

Summary

The electric fridge is a highly useful device, but it must be used properly, otherwise we waste electricity and run the risk of illness from spoiled food. Our fridge alarm will warn us if the fridge is left open too long and also if the temperature gets too high in the fridge.