Plant Incalescence Supervision System (PISS)

Emmett
Sebastian

01

Background

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- **Overview:** Use a keypad with an MSP430FR2355 to control the temperature of a plant. System information is printed to an LCD controlled by an MSP430FR2310. Heating/Cooling information is displayed on an LED bar. Heating/Cooling done with Peltier device. All microprocessors are networked with I2C.
- **Primary Goal:** Select mode to alter temperature of the plant. Set temperature averaging window to alter sensitivity. Display temperature (both ambient and plant), window size, heating/cooling, seconds active on LCD and LED bar. Control Peltier.
- **System Functionality:** Features keypad input, temperature sensing, LED bar output, LED status, LCD display, and mosfet control. Networked with I2C, programmed in C.
- **Purpose:** Aims to teach keypad, ADC, LED, I2C, LCD, and transistor interfacing for embedded systems. Provides experience with basic feedback control loops.

02

Development Process

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01 FLOWCHART

Both:
Designed main state machine
Tested new hardware

Emmett:
Built flowcharts for Main, I2C, ADC (LM19), LM92, and RTC

Sebastian:
Built flowcharts for LCD and LED bar

02 REUSED HARDWARE

Emmett:
Updated ADC for the new system

Sebastian:
Updated LED Bar and LCD for the new system

03 I2C

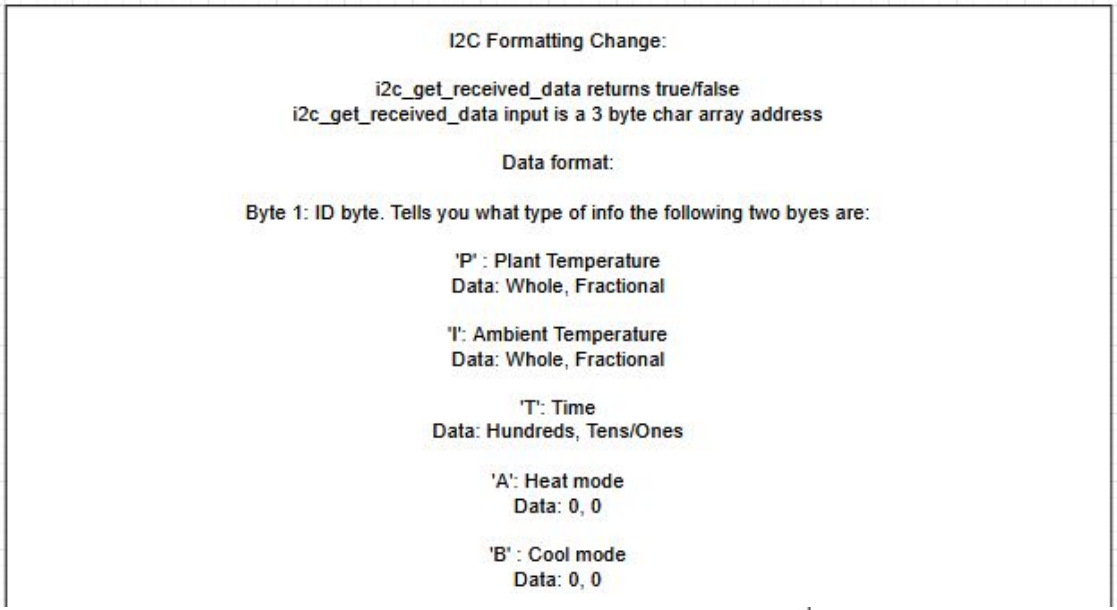
Emmett:
Rebuilt I2C code to improve reliability and fix addressing issues
Tied new modules into the I2C code

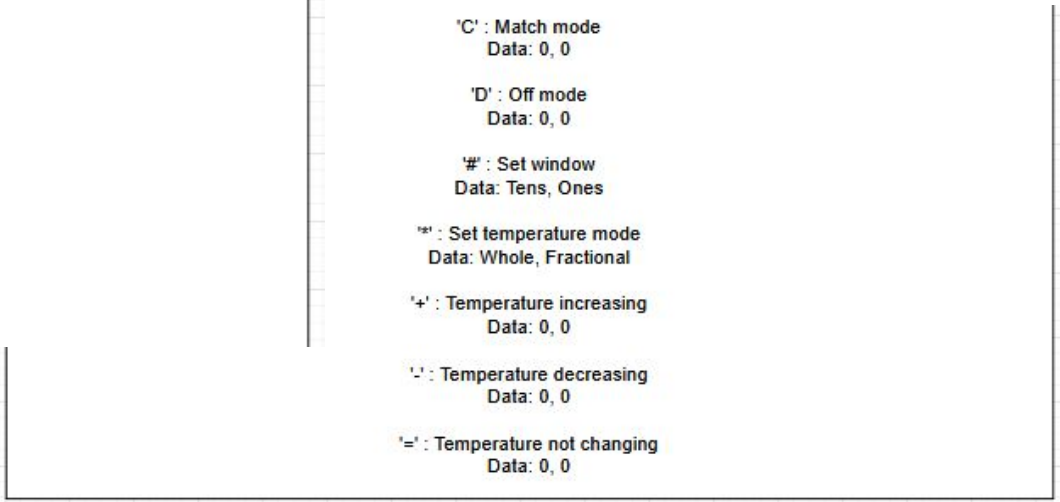
Requirement/specification	Points	Emmett	Sebastian
Introduction	1	X	
Circuit diagram	1	X	
System architecture diagram	1	X	X
High-level flowchart	1	X	X
Professional demo	2	X	X
Collect ambient temperature using the LM19	2	X	
Collect data every 0.5 s (proof required)	1	X	
Collect the plant's temperature using the LM92	6	X	
Collect data every 0.5 s (proof required)	1	X	
Collect the time spent in the present mode of operation using an I2C RTC	2	X	
Collect data every 1 s (proof required)	1	X	
Produce a moving average of the temperatures	5	X	
Regardless of the selected mode, the Peltier must be turned off after 5 minutes	2	X	X
The Peltier device can be turned off	2	X	X
The Peltier device can be configured to heat	2	X	X
The Peltier device can be configured to cool	2	X	X
The Peltier device can be configured to match the ambient temperature	2	X	X
LCD displays the mode of operation	2		X
Display the mode string in the upper-left corner	1		X
Display the ambient temperature	2		X
Refresh the temperature at least every 2 s	1		X
Display the temperature in the top-right corner	1		X
Display the temperature with a resolution of 0.1 C	1		X
Display the plant temperature	2		X
Refresh the temperature at least every 2 s	1		X
Display the temperature in the bottom-right corner	1		X
Display the temperature with a resolution of 0.1 C	1		X
Display the window size	2		X
Display the time spent in the current mode of operation	2		X
Refresh the time at least every 1 s	1		X
Display the seconds in the bottom row of the LCD	1		X
Display up to a 3-digit number	1		X
When the system is actively heating, the lights should fill to the right	2	X	X
When the system is actively cooling, the lights should fill to the left	2	X	X
When not actively heating or cooling, the lights should be off	2	X	X
Total	60	30	30

03

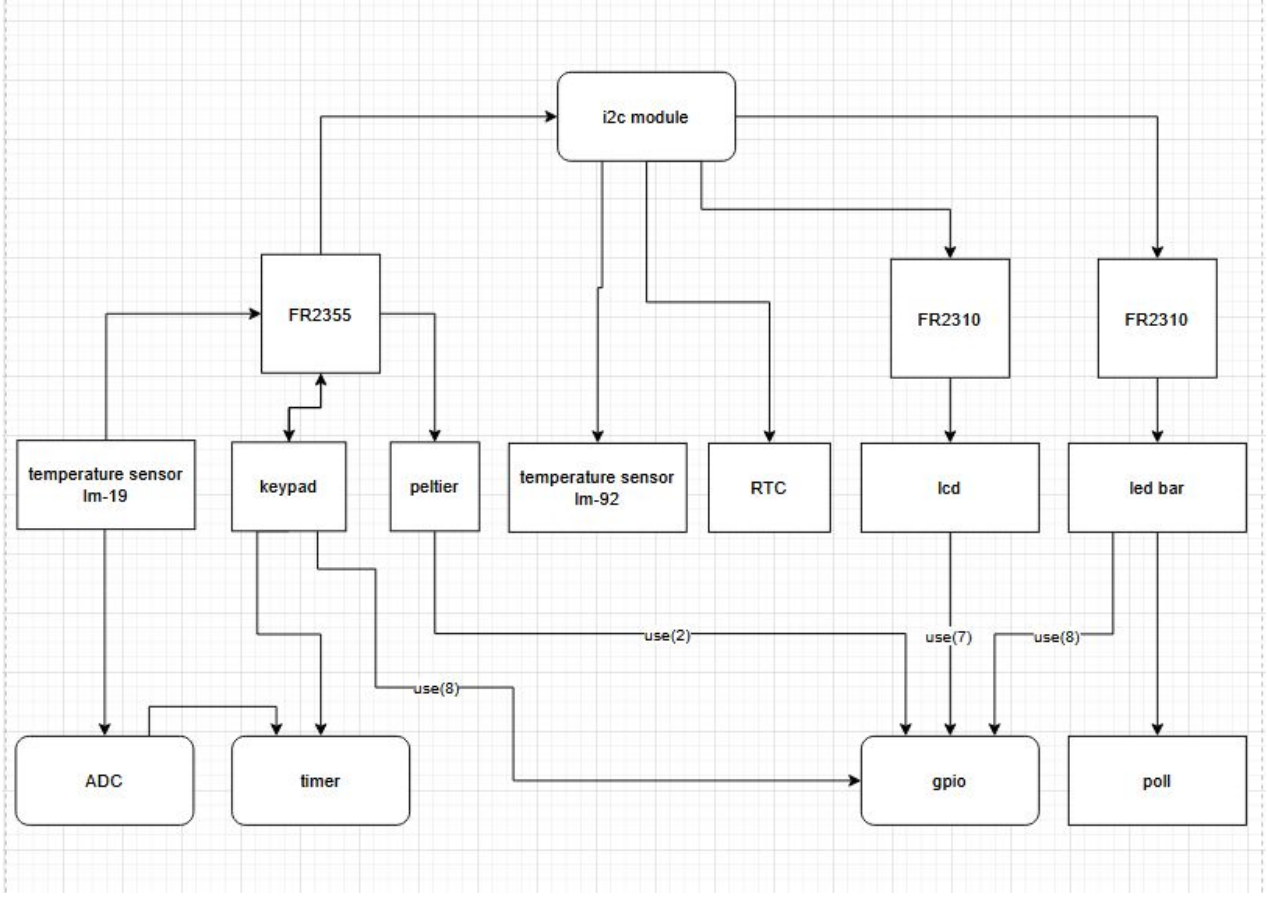
Development Documentation

System Transmission Design (STD)

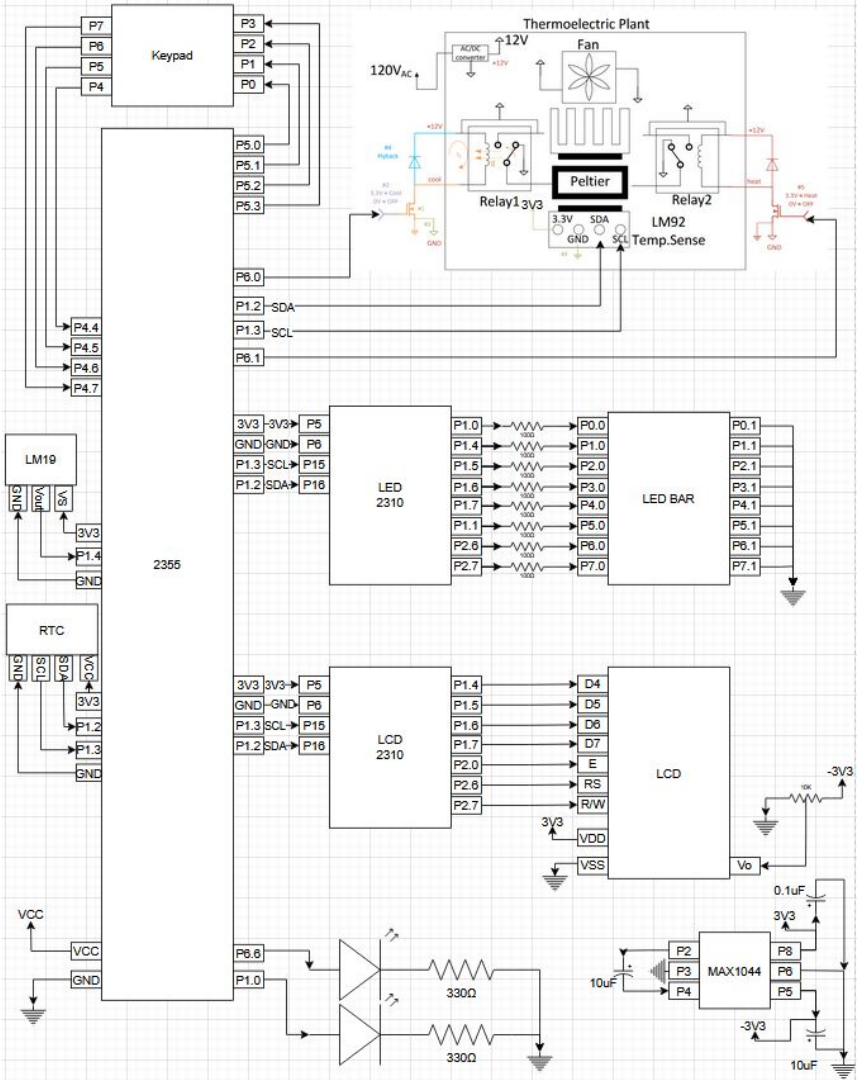




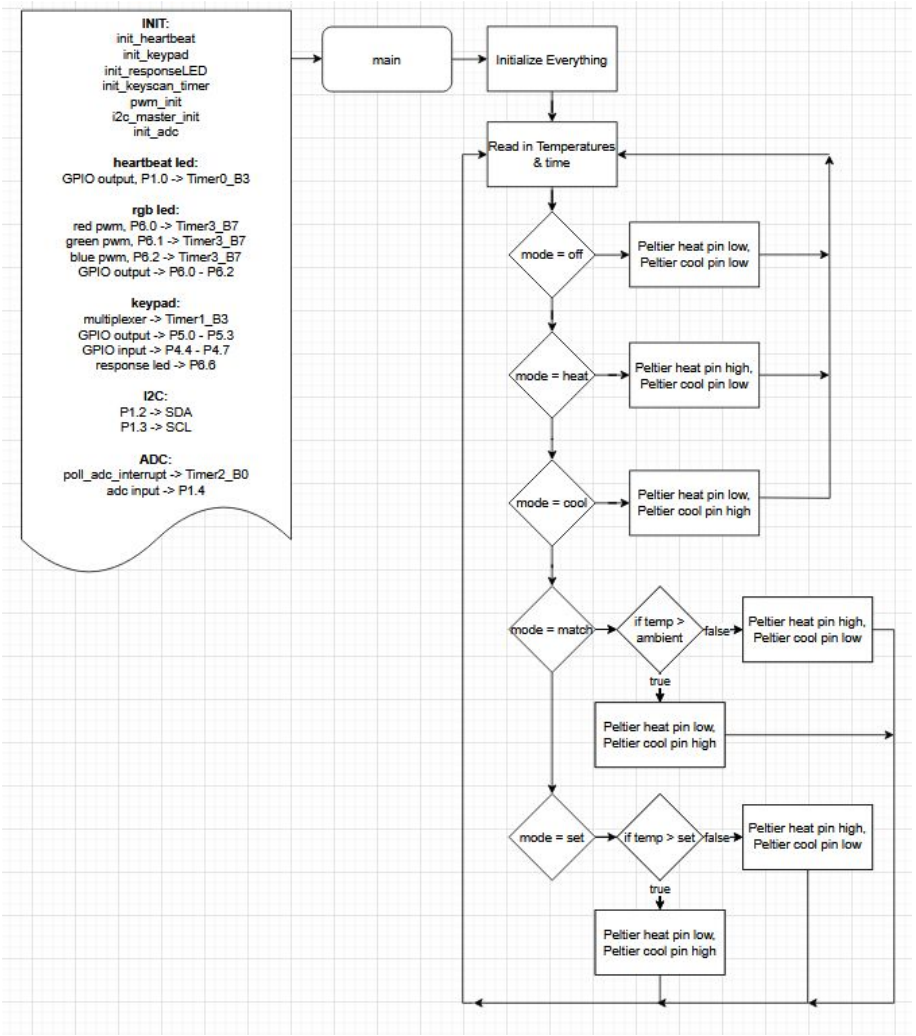
Software Architecture



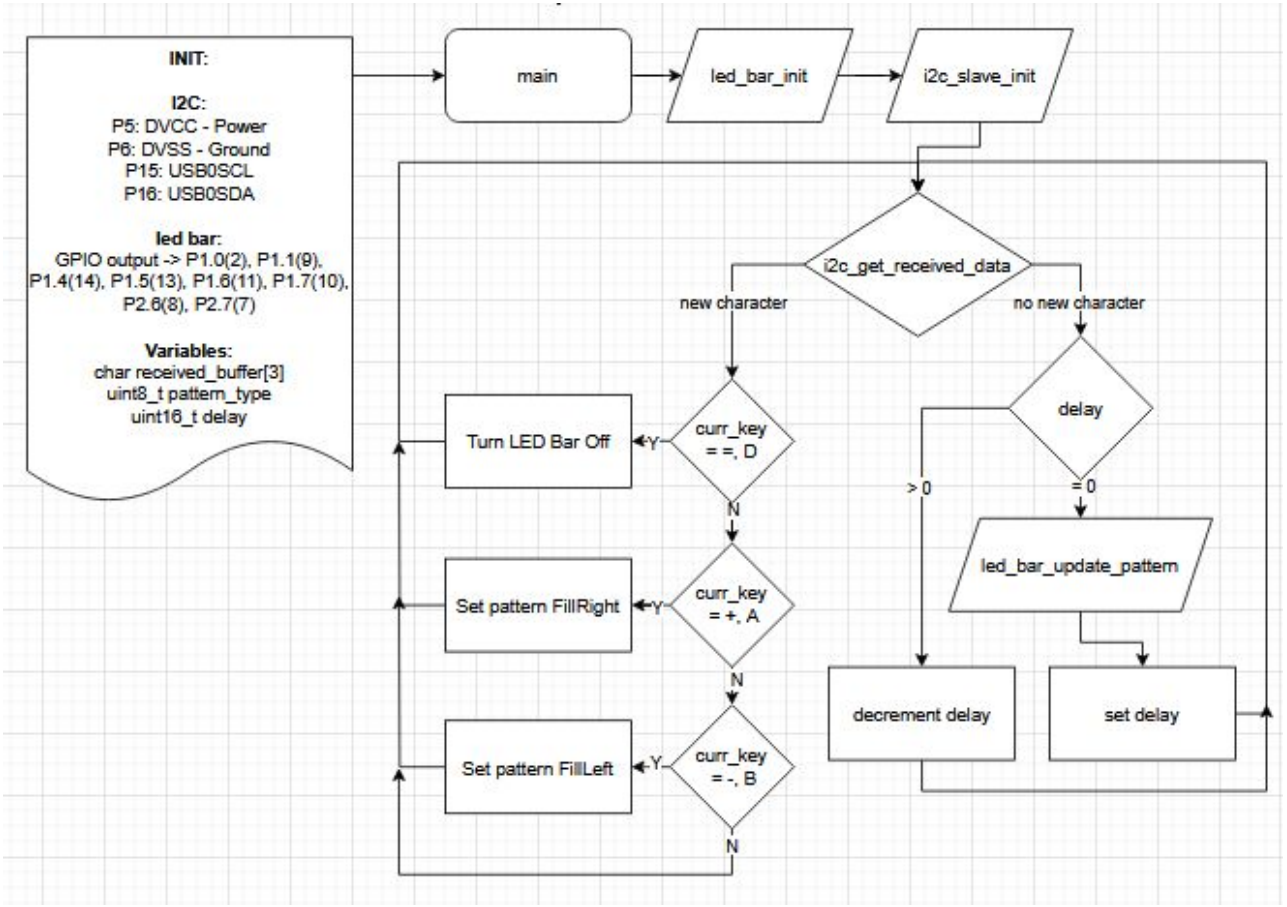
Circuit Diagram



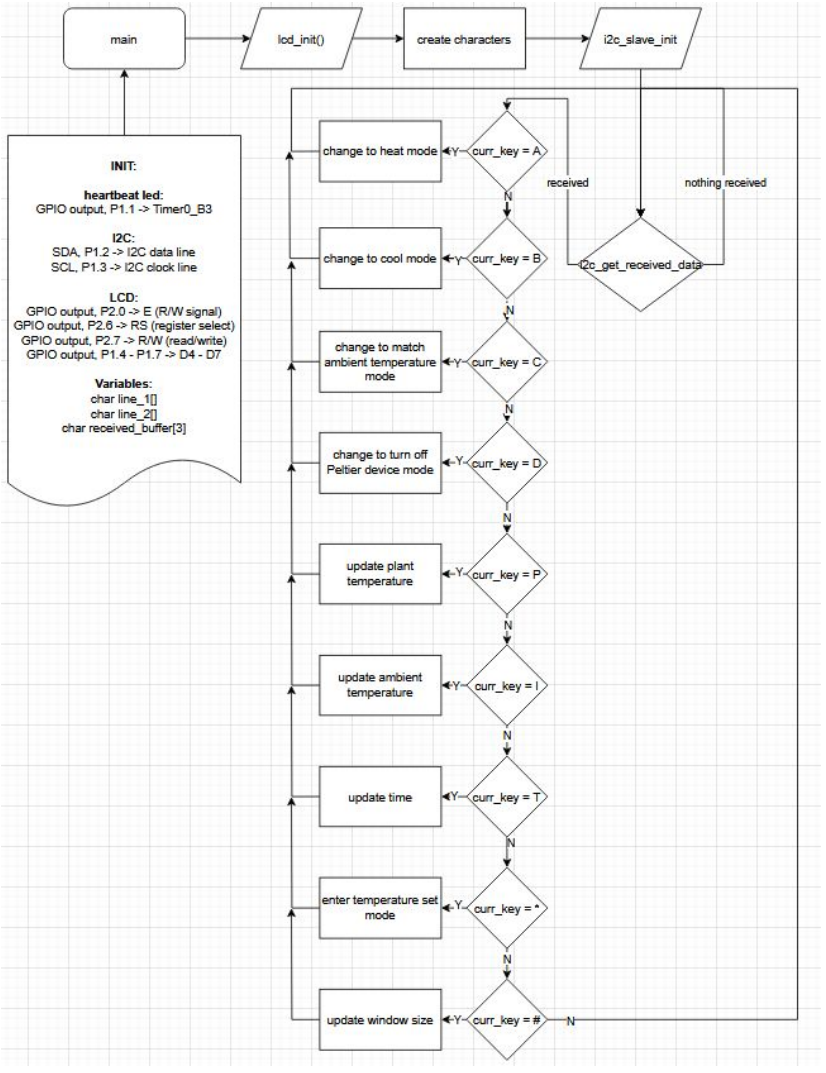
Controller Main Flowchart



LED BAR Main Flowchart



LCD Main Flowchart



04

Demo

05

Extra Credit

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- (+1) The user can select the window size using the keypad
- (+0) The Peltier device can be configured to match a temperature entered using the keypad (Don't think we've done this yet)
- (+1) Display a custom character for the ambient temperature
- (+1) Display a custom character for the plant temperature

TOTAL: +6

THANK YOU

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