Final Project – Thermostat Report

CS-350-R4869 Emerging Sys Arch & Tech

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SysTec’s business requirements and technical specifications for the prototype were to be able to read the ambient room temperature, indicate whether the heater is on or off, be capable of increasing or decreasing the set temperature, and simulate the data being sent from the board to a server. The TI CC3220S has an onboard TMP006 temperature sensor that can read the ambient room temperature. By initializing the I2C peripheral driver using the command initI2C(), I was able to access the TMP006 temperature sensor and pull the ambient room temperature (in Celcius) with the readTemp() function.

To indicate whether the heater is on or off, the prototype utilizes the onboard LED GPIO\_LED\_0. By initializing the GPIO peripheral with the GPIO\_init() command, I can turn on and off the light. To adhere to SysTec’s business requirements and technical specifications, GPIO\_LED\_0 turns on to indicate the heater is on and the heater should only turn on if the ambient room temperature is less than the setpoint of the thermostat. The GPIO peripherals include the two general purpose buttons on either side of the board. After installing the button callbacks and enabling the interruptions, I was able to set the buttons to increase and decrease the established setpoint of the thermostat by one whenever their respective button is pressed.

Calling the initUART() function, initializes the UART peripheral. Using the UART, the board can transmit and receive data. I was able to highlight the thermostat’s data transmissions using the UART of the prototype by displaying specific data in a customized layout to the screen. This would be a simulation of the data frame that would be sent to a server over the network.

The prototype demonstrates how the thermostat would connect to the cloud via Wi-Fi. Just as the UART displayed the thermostat information to the screen, the thermostat would use its UART to contact the cloud API via Wi-Fi. In the instance of the CC3220S board, it was connected to my computer through USB. Within CCS, I was able to adjust the baud rate and serial configurations to have the board run the code and output to my monitor. This would be alter to connect to the cloud via Wi-Fi. Luckily, TI, Microchip, and Freescale all have

Wi-Fi enabled options as more companies incorporate the IoT. Still, according to Sheryl Miles, TI’s SimpleLink CC33xx Wi-Fi 6 implements highly reliable, secure, and efficient Wi-Fi connections at an affordable price for applications (2023). The CC33xx products can also attach to artificial intelligence (AI) capable processors.

The CC3220S has 256KB of on-chip SRAM and 1024KB of on-chip flash memory according to the Texas Instruments CC3220 SimpleLink Wi-Fi and Internet of Things Technical Reference Manual (2023). This is plenty of memory for the prototype because the data types used were limited and chosen based on their appropriateness to conserve memory and improve execution speed. Similarly, Microchip and Freescale produce microcontrollers that offer Flash and RAM capacities that are comparable but vary in performance and pricing. Because of my experience so far with TI and their CC3220S, I would consider sticking with them. We know that board support the code developed for the thermostat and that it what is important. If we were to venture to a different manufacturer, it is possible we will have to manipulate the code to support the peripherals used for their product.

References

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