Final Project: Thermostat

SNHU CS 350

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The thermostat prototype that I have created utilizes the UART peripheral through simulating data being sent to a server via the UART Terminal. It transmits the current temperature of the room in degrees Celsius, the set temperature, a binary state indicating heat on/off, and the number of seconds since the device was last reset. The GPIO peripheral is utilized by A display LED indicating that the data is being sent via two blinks after which it proceeds back to the LED state indicating if the heat is on or off. This is shown via the same LED being on if the set temperature is greater than or equal to the current temperature and off if the set temperature is lower than the current temperature. The SW2 switch on the TI board is the set temperature increase switch and the SW3 switch on the board is the set temperature decrease switch. Each switch will change the set temperature by 1 degree. The I2C peripheral is used to read the current temperature of the room. Testing of this temp reading has proven to be working through application of additional heat sources to check for a notable increase.

The code utilizes a task scheduler that will switch separate state machine to carry out the actions that are driven by the timer. The thermostat supports each of the peripherals required and has been simulated to indicate connection to the cloud via Wi-Fi. After analyzing other boards, I find the TI board to be one of the better options as it is inexpensive, provides all the peripherals needed and contains enough Flash and RAM to support the code to drive the thermostat. Other options such as the ARDUINO UNO Wi-Fi do not contain the GPIO peripheral and have more than necessary amounts of RAM and Flash. The TI board contains 256KB of RAM and 1MB of executable Flash. In the future, for implementation of the Cloud connection via Wi-Fi this can be achieved by converting the data that is being transmitted to the terminal into a txt file to be sent over Wi-Fi. The current data is being displayed via terminal as <AA,BB,S,CCCC>. AA = ASCII decimal value of room temperature (00 - 99) degrees Celsius. BB = ASCII decimal value of set-point temperature (00-99) degrees Celsius. S = '0' if heat is off, '1' if heat is on. CCCC = decimal count of seconds since board has been reset.

As for the task scheduler its duty is to check three separate tasks to be performed based on time passed. If 200ms passes the button function will be called to check if the button has been flagged as to indicate a recent press which will then increase or decrease the set temp by 1 depending on which button was pressed. If 500ms passes the temp function is called to check the temperature and change the LED state based on the current temperature. The LED function is then called to make the change of the LED to indicate if heat is on or off. If 1 second passes, then the upload function is called to display the temperature readings and the LED function is called to indicate the upload to server occurring. The number of seconds is incremented in the if statement as well to increase time passed being displayed to the terminal.

References:

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