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Thermostat Embedded System

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**Project Review**

The thermostat system obtains the ideal temperature using buttons pressed by the user. The current temperature is read and compared to the ideal temperature. If the ideal temperature is higher than the current temperature, the thermostat indicates “heating” by turning on a LED light. The readings are gathered and sent to a server for data storage. To perform the operations, the embedded system requires multiple peripherals available within the system. The embedded system used the I2C, GPIO, and UART peripherals (Texas Instruments, 2017/2020a). The GPIO detects when buttons are pressed on the system to alter the ideal temperature. When the button is pressed, the GPIO performs the instructions located within the GPIO function, known as interrupts (Texas Instruments, 2017/2020a). The first button increased the ideal temperature. The second button decreases the ideal temperature. The message is sent back to the main function using the interrupt (Texas Instruments, 2017/2020a). The I2C peripheral is a microchip that senses the current room temperature per execution of each time cycle (Texas Instruments, 2017/2020a). The I2C reading is compared with the ideal temperature sent by the GPIO interrupt. When the ideal temperature is greater than the current reading, the GPIO sends a message to the system to turn on the LED light to indicate “heating” to the user. The UART peripherals processes the data indicating the ideal temperature, current temperature, heating status, and time since the device was restart (Texas Instruments, 2017/2020a). The UART peripherals transforms the data together into a specific format to send the data to the simulated server (Vahid et al., 2016).

Thermostat connects to the cloud using Wi-Fi. The embedded system has an wi-fi capabilities built into the embedded system using the microchip (Texas Instruments, 2017/2020a). No external devices are required to power on/off or use the wi-fi in the system (Texas Instruments, 2017/2020a). When enabled, the device connects to the TI cloud with the proper programming and authorization (Texas Instruments, 2017/2020b). The embedded system supports the SSL (secured socket layer) standards for data encryption and server verification (Texas Instruments, 2017/2020b). The data is transmitted between the cloud and the thermostat at designated timer intervals. The power socket connections to the cloud allowing users to control the thermostat using the peripherals and corresponding data (Texas Instruments, 2017/2020b).

The Flash and RAM within the embedded system are needed to support the code for the thermostat. Volatile memory is only accessible if the device is powered on. Data is erased when the device is turned off. The RAM is in microchip(s) connected to the CPU/MPU (microcontroller) and I/O ports (Delkin Industrial, 2018; Texas Instruments, 2017/2020a). Random Access Memory (RAM) uses volatile memory to read instructions generated by the CPU along with temporary data storage (Delkin Industrial, 2018). The instructions come from the boot process and coding created by developers (Delkin Industrial, 2018). Flash memory is a non-volatile memory used for long-term data storage. The flash uses non-volatile memory to store data even when the system is powered off. For proper data storage, all input/output requests from the system must be processed before the shutdown of the system (Delkin Industrial, 2018). The coding is necessary to perform the operations of data storage and input/output requests into the flash memory (Delkin Industrial, 2018). The coding sends instructions to flash drives to read, write and delete data stored in the embedded system (Delkin Industrial, 2018).

References

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