Rogan Page

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CS-350

7-1 Project

Technical and Operational Documentation for Task Scheduler

Overview

The task scheduler is a critical component of the smart thermostat system. It ensures periodic and timely execution of tasks such as reading the temperature, updating the LED status, handling button presses, and simulating data transmission via UART.

Task Scheduler Algorithm

Initialization:

Timer Setup: Configure a timer to trigger interrupts at regular intervals.

Task Registration: Register tasks that need periodic execution.

Start Scheduler: Enable the timer to start the scheduling process.

Timer Interrupt Service Routine (ISR):

Task Execution: Execute registered tasks in a predefined order.

Task Management: Handle task execution times and rescheduling.

Inputs and Outputs

Inputs:

Timer interrupt signals.

Sensor data from TMP006 via I2C.

Button presses via GPIO interrupts.

Outputs:

Updated LED status via GPIO.

Temperature data transmitted via UART.

Expected Results

Accurate Temperature Reading: Periodically read and process temperature data.

Responsive User Input: Detect and respond to button presses to adjust set temperature.

Timely Data Transmission: Simulate sending temperature data to a server via UART.

LED Status Update: Reflect heating status accurately via the LED.

Supporting Peripherals

Temperature Sensor (TMP006 via I2C):

Initialization and reading routines ensure accurate temperature measurement.

LED (via GPIO):

GPIO initialization and control functions indicate heating status.

Buttons (via GPIO Interrupts):

Button presses adjust the set temperature through interrupt-driven handlers.

UART:

UART initialization and data transmission simulate server communication.

Hardware Architectures Comparison

Texas Instruments (TI CC3220SF)

* Peripherals: Supports I2C, GPIO, UART, and integrated Wi-Fi.
* Flash and RAM: 1MB Flash, 256KB RAM.
* Wi-Fi: Built-in Wi-Fi for cloud connectivity.

Recommendation: Best for ease of development, security, and integration.

Microchip (ATWINC1510)

* Peripherals: Supports I2C, GPIO, UART, and advanced Wi-Fi.
* Flash and RAM: Requires external Flash, 128KB RAM.
* Wi-Fi: Advanced Wi-Fi capabilities for robust cloud connectivity.

Recommendation: Good for Wi-Fi performance but requires external Flash.

Freescale (NXP Kinetis KW41Z)

* Peripherals: Supports I2C, GPIO, UART, needs external Wi-Fi module.
* Flash and RAM: 512KB Flash, 128KB RAM.
* Wi-Fi: External module needed for Wi-Fi, increasing complexity.

Recommendation: Suitable for flexible peripheral support, but less preferred due to external Wi-Fi requirement.

Conclusion

The TI CC3220SF is recommended for the final product due to its integrated Wi-Fi, ample memory, and overall ease of development, meeting SysTec’s business requirements for a reliable and scalable smart thermostat solution.