Module 13

Quiz: Timers

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Q1 Timer_A

a) What determines the resolution of the periodic interrupt?

b) What determines the maximum period for a Timer_A period interrupt?

c) What determines the minimum period for a Timer_A period interrupt?

Q2 Timer_A

Explain how you could use two timers to make a very slow periodic interrupt (once an hour). This is a hardware solution, meaning the ISR runs exactly once an hour. You are allowed to use MSP432 pins.

Q3 Timer_A

Write a C program that maintains the time in hours, minutes and seconds using Timer A2 interrupts. Basically update these three global variables. Assume some other software initializes them to the correct time. Assume the bus clock is 48 MHz and SMCLK is 12 MHz.

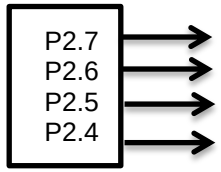
```
uint8_t Hour;     // 0 to 23
uint8_t Minute;   // 0 to 59
uint8_t Second; // 0 to 59
```

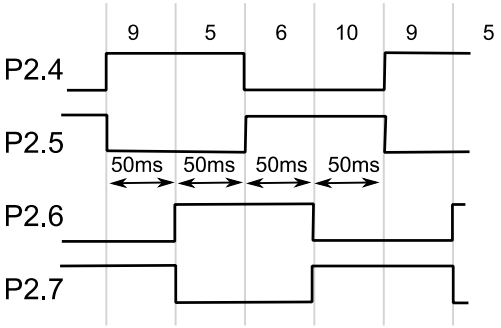
Q4 PWM

How does one choose the period with which run a PWM control of a motor? In particular, for what reason is it better to choose a longer (slower) period? For what reason is it better to choose a shorted (faster) period?

Q5 Timer_A

Use Timer A0 to create stepper motor outputs. There is an initialization function and a Timer A0 ISR that outputs the four signals run continuously. Assume the bus clock is 48 MHz and SMCLK is 12 MHz. The stepper motor has 200 steps per rotation; so if the signals change (step) every 50 ms, the motor spins at 1 rps. The duty cycle for each wave is 50%. The software rotates the stepper motor using the standard full-step (5–6–10–9...) sequence





Q6 PWM

Create a 5 kHz 50% duty cycle output on P2.4.

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