

Programming Embedded Systems 2017 / JB

Exercise 4 /8/9.2.2017 / Deadline for submitting report 27.2.2017

Return report electronically on address: <https://abacus.abo.fi/ro.nsf>. If you do not have an ÅA account, please email jerker.bjorkqvist@abo.fi

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Equipment and tools

Equipment used:

- a) Texas Instruments LaunchPad **MSP430G2** development card
- b) NTC / cables
- c) Own laptop

Task

This time, we will go a step further, and implement the co-operative Embedded Operating system. We are also going to use the inbuilt A/D converter to read the ambient temperature using a Negative Temperature Coefficient (NTC) resistor.

Re-use the code from the previous exercise, but update it in the following way.

- Implement the interrupt driven co-operative EOS (i.e. scheduler / dispatcher) (lecture notes, set II)
- Create tasks
 - 1: Use the A/D converter on the board for sampling either
 - a) The integrated temperature sensor (on line 0b1010, 0xA)
 - b) A external sensor (limited availability... ;), NTC
 - 2: Using the value read from the sensor/NTC, make the led (red / or yellow) blink with a frequency correlating to the A/D value read
 - Output the temperature (in C) every second over the serial line
 - 3: Check the buttons, enable / disable blinking by pressing a button

For both cases, figure out suitable intervals for running the two tasks.

Registers for A/D on MSP430

Table 22-3. ADC10 Registers

Register	Short Form	Register Type	Address	Initial State
ADC10 input enable register 0	ADC10AE0	Read/write	04Ah	Reset with POR
ADC10 input enable register 1	ADC10AE1	Read/write	04Bh	Reset with POR
ADC10 control register 0	ADC10CTL0	Read/write	01B0h	Reset with POR
ADC10 control register 1	ADC10CTL1	Read/write	01B2h	Reset with POR
ADC10 memory	ADC10MEM	Read	01B4h	Unchanged
ADC10 data transfer control register 0	ADC10DTC0	Read/write	048h	Reset with POR
ADC10 data transfer control register 1	ADC10DTC1	Read/write	049h	Reset with POR
ADC10 data transfer start address	ADC10SA	Read/write	01BCh	0200h with POR

For guidelines, see

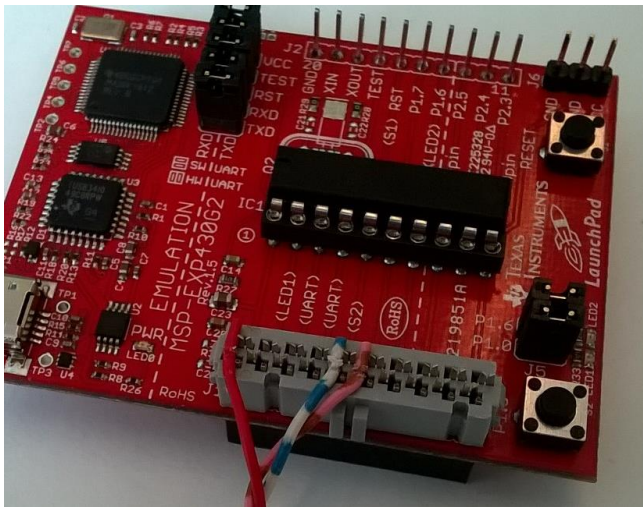
<http://coder-tronics.com/msp430-adc-tutorial/>

Connections

Vcc – Red

GND/P1.4 – White-blue (connected to P1.4, make sure to drive to zero!).

P1.5 / A5 – ADC input



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General rules for documenting exercises

Each report should include:

- Title
- Name
- Date / timeframe when exercise performed
- Group (if not done individually)
- Assumptions on knowledge of the reader
- Own contribution (if performed in group)
- Description of the task / exercise
- Description of the equipment used
- Description of performed work
- Achieved results

