UNC Charlotte, ECGR 4892/6185, Spring 2006: Lab 6

MicroC/OS-II on Renesas, AVR Butterfly, and MSP430 System

Learning Objectives

This lab will have students learn how to integrate several microcontrollers into a larger system.

General Information

You will use the Renesas board, AVR butterfly board, MSP430 board, and PC to create a system that will use different IDEs and communications concepts.

Hardware needed per lab group:

1. Your Renesas board
2. AVR Butterfly board and JTAG mkII ICE
3. MSP430 board and cable
4. PC with RS232 port running communications software (i.e. hyperTerm)
5. RS232 cable
6. Speaker/Buzzer with 8" leads
7. Extra wire for connectivity

Prelab Activity

Read the main.c file in the test folder to gain a better understanding of the MicroC/OS II port for the Renesas board. You are allowed (and encouraged) to modify this file for the lab.

Requirements

Req. 1 – The code generated is written in C for the MSV30626-SKP, AVR, and MSP430
Req. 2 – The code is well commented and easy to follow
Req. 3 – Your lab report should include the final build output from the builder
Req. 4 – You will need one Renesas board running at 5v.
Req. 5 – You will need one AVR Butterfly board running at 3v (with JTAG ICE).
Req. 6 – You will need one MSP430 board running at 3v (with JTAG).
Req. 7 – uC/OS-II will be running on the Renesas board (Board one).
Req. 8 – A simple program should be running on the AVR Butterfly board (board two).
Req. 9 – A simple program should be running on the MSP430 board (board three).
Req. 10 – Board one: one task should toggle the red LED every 1.0 seconds
Req. 11 – Board one: Every two seconds request from board two the temperature and light level. The request should be a single byte with 0xAA as the data.
Req. 12 – Board one: Receive from Board two 2 bytes:

- a one-byte value which represents the Fahrenheit temperature on the range of 0 to 255 degrees (although the actual value will be closer to room temperature). Store this value in a global variable protected by a semaphore.
- a one-byte value that represents the light level of the room, with 0= total darkness and 255 representing bright light. Store this value in a global variable protected by a semaphore.

Req. 13 – Communicate between board one and two via a UART running at 19200 bps, 8 data bits, no parity, 1 stop bit. There needs to be a transmit AND a receive line between boards one and two, as well as ground..

Req. 14 – Board two: Set the ADC to continually sample the thermistor and light sensor.

Req. 15 – Board two: when a 0xAA message is received, send the two bytes as specified in requirement 12.

Req. 16 – Board three: Every second, send a one-byte potentiometer value to board one. Since board three has no UART and runs at 3v, you will need to do your own level-shifting (opto-isolator). Use whatever means necessary to communicate, but the easiest will be for board three to generate its own clock and provide it to board one on a line separate from a data line.

Req. 17 – Board one: Store the potentiometer value in a global variable protected by a semaphore.

Req. 18 – Board one: The first temperature, light, and potentiometer value received from board two or three is the base value, and should be stored separately (it does not need to be protected by a semaphore). This will serve as the center point in our system.

Req. 19 – Board one: Send all three values in ASCII to the attached PC in the format:
`Temp = xxx, Light = xxx, Potentiometer = xxx`

Req. 20 – Board one: If any of the values of the data (temp, Light, Potentiometer) vary from the original reading by more than 10%, continuously buzz the buzzer until the value goes back below 10%.

Lab Report

Include in your lab report observations and procedures like the following:

The general learning objectives of this lab were . . .
Pre-lab question answers
The general steps needed to complete this lab were . . .
Some detailed steps to complete this lab were . . . .

1. *Step one*
2. *Step two*
3. *. . . .*

Code generated for this lab…
Some important observations while completing/testing this lab were . . .
In this lab we learned . . . .