CPE355 - Real time embedded kernels - Spring'11

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Homework Assignment #6

Due date: 11am, Thursday, February 9th 2012

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Homework turned in after the deadline, will not be graded.

Deliverables:

• For each question, upload to Manhattan a digital copy of your code and detailed instructions on how use it.

• Bring your circuit to class on the HW due date and demo it to your instructor.

Required materials:

You will need the following materials for this homework: an Arduino, a prototype board, some wires, 3 LEDs (red, green and yellow), resistive sensors and switches. Make sure each switch is labelled (e.g. with tape or something similar).

Question #1 (30 points) - Shared data problem in Arduino

Come up with some piece of code and possibly a circuit using the Arduino that will clearly show the occurrence of the "shared data problem" we've extensively discussed in class. I suggest the very first temperature problem, but instead of having the interrupt updating a temperature make it update the input (analog) voltage of two resistive sensors. You will want to trigger an interrupt right before `iTemp1 = iTemperatures[1];` with the help of the delay function.

```
static int iTemperatures[2];
void interrupt vReadTemperatures  (void)
{
  iTemperatures[0] = !! read data from hardware
  iTemperatures[1] = !! read data from hardware
}

void main (void) {
  int iTemp0, iTemp1;
  while (TRUE) {
    iTemp0 = iTemperatures[0];
    iTemp1 = iTemperatures[1];
    if (iTemp0 != iTemp1) { !! Set off howling alarm }
  }
}
```

Question #2 (30 points) - Round-robin in Arduino.

In a round robin fashion implement the following:

* Action #1 - if switch (a) is ON then the green and red LED's will blink for 10 seconds and then they will turn OFF.

* Action #2 - If switch (b) is ON then the yellow LED be on for 5 seconds and then it will turn OFF.

* Action #3 - If switch (c) is ON then the red LED be on for 1 seconds and then it will turn OFF.

Question # (40 points) - Round-robin with interrupts in Arduino.

In a round robin with interrupts fashion implement the following:

* Action #1 - if switch (a) is ON then the green and red LED's will blink for 10 seconds and then they will turn OFF.

* Action #2 - If switch (b) is ON then the yellow LED be on for 5 seconds and then it will turn OFF.

* Action #3 - If switch (c) is ON then the red LED be on for 1 seconds and then it will turn OFF.

Action #1 has the highest priority and action #3 has the lowest priority. Whenever any interrupt occurs, the current behavior should be immediately aborted if an higher priority event is triggered.