ECE 375 PRELAB 6

Lab Time: Tuesday 4-6

Owen Markley 2/11

QUESTIONS

1. In computing, there are traditionally two ways for a microprocessor to listen to other devices and communicate: polling and interrupts. Give a concise overview/description of each method, and give a few examples of situations where you would want to choose one method over the other.

   Interrupts stop the flow of execution. They are triggered by things like hardware pins, or clock. They are sudden abrupt changes in the execution as opposed to the polling which is "softer". Polling will check periodically to see whether a condition has been met which constitutes a break in the flow of programming. An interrupt could appear for something like a dishwasher, which should stop immediately when opened. Polling could occur in something like a car, when the transmission checks to see the rpms and based off the value, whether it needs to shift gears.

2. Describe the function of each bit in the following ATmega128 I/O registers: EICRA, EICRB, and EIMSK. Do not just give a brief summary of these registers; give specific details for each bit of each register, such as its possible values and what function or setting results from each of those values. Also, do not just directly paste your answer from the datasheet, but instead try to describe these details in your own words

   EICRA: or external interrupt control register A is a register of size 8 bits, that works with registers0 to 3. These are divided into four nibbles with an interrupt each. Nibbles have four states that tell what type of signal it is that is intended to cause the interrupt. 0b00 is low level signal, 0b01 is falling edge

   EICRB: alternate of the above. Ob01 interrupts on for any logical change, 0b00 and 0b10 are the same, and 0b11 is rising edge

   EIMSK: or external interrupt mask register is 8 bits as well and has the ability to toggle the various types of interrupts.

3. The ATmega128 microcontroller uses interrupt vectors to execute particular instructions when an interrupt occurs. What is an interrupt vector? List the interrupt vector (address) for each of the following ATmega128 interrupts: Timer/Counter0 Overflow, External Interrupt 5, and Analog Comparator.

   The interrupt vectors are in the memory of the interrupt handler. These vectors are the signals that actually tell the program to stop and go into a subroutine

   Timer/Counter0: $0011 External Interrupt 5: $0012 Analog Comparator: $002F

4. Microcontrollers often provide several different ways of configuring interrupt triggering, such as level detection and edge detection. Suppose the signal shown in Figure 1 was connected to a microcontroller pin that was configured as an input and had the ability to trigger an interrupt based on certain signal conditions. List the cycles (or range of cycles) for which an external interrupt would be triggered if that pin's sense control was configured for: (a) rising edge detection, (b) falling edge detection, (c) low level detection, and (d) high level detection. Note: There should be no overlap in your answers, i.e., only one type of interrupt condition can be detected during a given cycle.

   Rising: 6 18

Falling: 3 9

Low: 4-5, 10-17

High: 1-2, 7-8, 19-21

REFERENCE