Embedded Systems
LA1 (C1-C2)

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Lab 3a Worksheet

MSP430ware DriverLib

1. Where is your MSP430ware folder located? (You should have written this down in the Installation Guide)

   C:\ti\msp430\MSP430ware_1_97_00_47\~TIRex

2. To use the MSP430ware GPIO and Watchdog API, which header file needs to be included in your source file? (Hint: We discussed this during the presentation in the "Before We Get Started" section.)

   #include <driverlib.h>

3. Which DriverLib function stops the Watchdog timer?

   void WDT_A_hold (uint16_t baseAddress)

4. Which I/O pin on Port 1 is connected to an LED (on your Launchpad)?
   (Hint: Look in DriverLib User's Guide or the "Before We Get Started" section of this chapter.)

   Pin0

   What two GPIO DriverLib functions are required to initialize this GPIO pin (from previous question) as an output and set its value to "1"?
   (Hint: Look at the chapter slides titled: "PxDIR (Pin Direction)" and "GPIO Output".)

   void GPIO_setAsOutputPin (uint8_t selectedPort, uint16_t selectedPins)
   void GPIO_setOutputHighOnPin (uint8_t selectedPort, uint16_t selectedPins)

5. Using the _delay_cycles() intrinsic function (from the last chapter), write the code to blink an LED with a 1 second delay setting the pin (P1.0) high, and then low?
   (Hint: What two GPIO functions set an I/O Pin high and low?)

```
#define ONE_SECOND 800000
while (1) {
//Set pin to "1" (hint, see question 4)
GPIO_setOutputHighOnPin (GPIO_PORT_P1,GPIO_PIN0);
_delay_cycles( ONE_SECOND );
// Set pin to "0"
GPIO_setOutputLowOnPin (GPIO_PORT_P1,GPIO_PIN0);
_delay_cycles( ONE_SECOND );
          }
```

Step 13.Load and Run your program.

Click the Debug button to start the debugger and download your program. Then click the Resume button to run the code.

Does your LED flash?

Yes

Lab 3b – Reading a Push Button

GPIO Input Worksheet

1. What three different DriverLib functions can set up a GPIO pin for input?

   void GPIO_setAsInputPin (uint8_t selectedPort, uint16_t selectedPins)

   void GPIO_setAsInputPinWithPullDownResistor (uint8_t selectedPort, uint16_t selectedPins)

   void GPIO_setAsInputPinWithPullUpResistor (uint8_t selectedPort, uint16_t selectedPins)

2. What can happen to an input pin that isn't tied high or low?

   When not driven, Hi-Z inputs may float up/down and can change state arbitrarily. Not only is this undesirable from a logical point of view, but even worse, power is consumed every time the pin changes state. The common solution is to tie the pin high (or low) through a resistor.

3. Which I/O pin on Port 1 is connected to a Switch (on your Launchpad)?

   Pin1

   Assuming you need a pull-up resistor for a GPIO input, write the line of code required to setup this pin as an input:

   GPIO_setAsInputPinWithPullUpResistor (GPIO_PORT_P1,GPIO_PIN1);

4. Complete the following code to read pin P1.1:

```
volatile unsigned short usiButton1 = 0;
while(1) {
       // Read the pin for push-button 2
       usiButton1 = GPIO_getInputPinValue (GPIO_PORT_P1,GPIO_PIN1);
       if ( usiButton1 == GPIO_INPUT_PIN_LOW ) {
              // If button is down, turn on LED
              GPIO_setOutputHighOnPin( GPIO_PORT_P1, GPIO_PIN0 );
                                                  }
       else {
              // Otherwise, if button is up, turn off LED
              GPIO_setOutputLowOnPin( GPIO_PORT_P1, GPIO_PIN0 );
          } }
```

5. In embedded systems, what is the name given to the way in which we are reading the button?

   Polling

Step 9. unsigned short … You tell us, why did we pick that?

Because usiButton1 will store either a 0 or 1, therefore, we chose it to be unsigned because we don't have negative numbers and we want to use as minimum memory as possible.