Universidad del Valle de Guatemala — Natalia de León Bercián

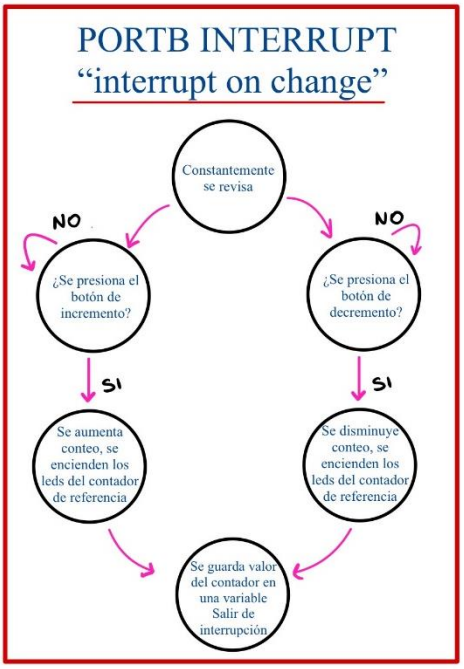
Electrónica Digital 2 — carne: 18193

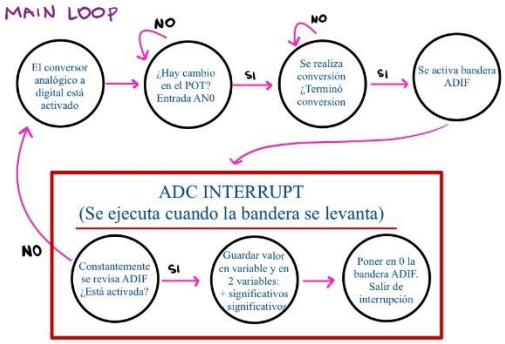
enero 2021 — sección: 20

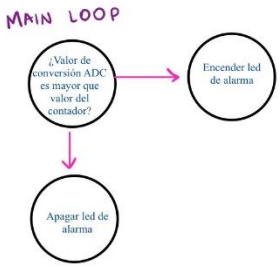
Laboratorio # 2

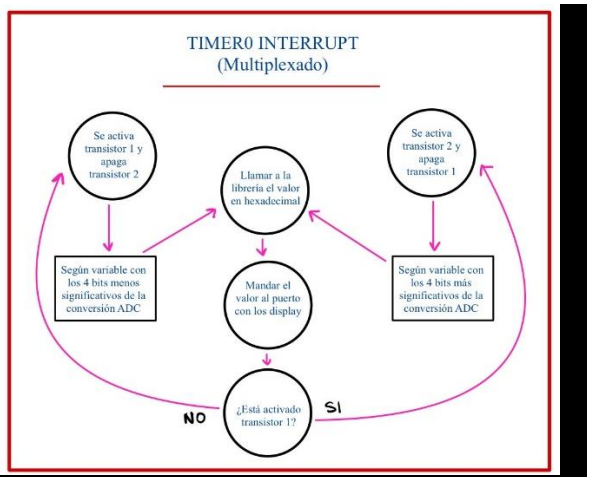
Interrupciones y uso de librerías

Pseudocódigo









Código

```
/*
 * Laboratorio # 2
 * Author: Natalia de León Bercián
 * carné: 18193
 * Digital 2
 *
 * Created on 29 de enero de 2021
 */

//******************************************************************************//
//IMPORTAR LIBRERIAS                                    //
//******************************************************************************//
#include <xc.h>
#include <stdint.h>
#include "Oscilador.h"
#include "Config_ADC.h"
#include "Display.h"

//******************************************************************************//
//CONFIGURACION BITS                                    //
//******************************************************************************//
// CONFIG1
#pragma config FOSC = INTRC_NOCLKOUT// Oscillator Selection bits (INTOSCIO oscillator: I/O function on RA6/OSC2/CLKOUT pin, I/O function on RA7/OSC1/CLKIN)
#pragma config WDTE = OFF       // Watchdog Timer Enable bit (WDT disabled and can be enabled by SWDTEN bit of the WDTCON register)
#pragma config PWRTE = OFF      // Power-up Timer Enable bit (PWRT disabled)
#pragma config MCLRE = OFF      // RE3/MCLR pin function select bit (RE3/MCLR pin function is digital input, MCLR internally tied to VDD)
#pragma config CP = OFF         // Code Protection bit (Program memory code protection is disabled)
#pragma config CPD = OFF        // Data Code Protection bit (Data memory code protection is disabled)
```

```
#pragma config BOREN = OFF      // Brown Out Reset Selection bits (BOR disabled)

#pragma config IESO = OFF         // Internal External Switchover bit (Internal/External Switchover mode is disabled)

#pragma config FCMEN = OFF      // Fail-Safe Clock Monitor Enabled bit (Fail-Safe Clock Monitor is disabled)

#pragma config LVP = OFF        // Low Voltage Programming Enable bit (RB3 pin has digital I/O, HV on MCLR must be used for programming)


// CONFIG2

#pragma config BOR4V = BOR40V   // Brown-out Reset Selection bit (Brown-out Reset set to 4.0V)

#pragma config WRT = OFF        // Flash Program Memory Self Write Enable bits (Write protection off)


//*****************************************************************************//

//DEFINE                                                //

//*****************************************************************************//


#define _XTAL_FREQ 4000000


//*****************************************************************************//

//VARIABLES                                             //

//*****************************************************************************//

uint8_t contador = 0; //Variable de incremento para contador

uint8_t debouncing1 = 0; //Variable que controla debouncing de un push

uint8_t debouncing2 = 0; //Variable que controla debouncing del otro push

uint8_t toggle = 0;

int ADC_NIBBLE1;

int ADC_NIBBLE2;

int ADC_VALOR;

int ADC_SWAP;


//*****************************************************************************//

//PROTOTIPOs DE FUNCIONES                                //
```

```
//*****************************************************************************//
void setup(void);
void Config_INTERRUPT(void);
void CONVERSION_ADC(void);
void TOGGLE_1(void);
void DisplayADC(void);
void Revision(void);

//*****************************************************************************//
//INTERRUPCIONES                                          //
//*****************************************************************************//
void __interrupt() ISR(void) {

  // ---- Interrupción del PUERTO B ----
  if (INTCONbits.RBIF == 1){ // Interrupcion on change

      if (PORTBbits.RB0 == 1){ //debouncing
         debouncing1 = 1;
         contador = contador;
      }
      if (PORTBbits.RB1 == 1){ //debouncing
         debouncing2 = 1;
         contador = contador;
      }
      if(PORTBbits.RB0 == 0 && debouncing1 == 1){//hasta revisar bandera...
         contador++;              // de deboucing y que el boton no...
         PORTC = contador;         //este presionado, se aumenta o...
         debouncing1 = 0;          //decrementa.
      }
      if(PORTBbits.RB1 == 0 && debouncing2 == 1){
         contador--;
```

```
            PORTC = contador;
            debouncing2 = 0;
          }
          INTCONbits.RBIF = 0; //limpiar bandera
      }

    // ---- Interrupción del ADC ----
    if (PIR1bits.ADIF) {
      PIR1bits.ADIF = 0;
      __delay_ms(2); //Inicio de conversion ADC
      ADCON0bits.GO = 1;
      while (ADCON0bits.GO != 0) { //Mientras no se haya termindo una convers.
        ADC_VALOR = ADC(ADRESL, ADRESH);
        Revision(); //revisar si el valor del ADC es mayor al contador
        DisplayADC();
      }
    }

    // ---- Interrupción del TMR0 ----
    if (INTCONbits.TMR0IF == 1) {
      INTCONbits.TMR0IF  = 0;
      TMR0 = 6; //valor que se le agrega para que ocurra cada 1000 ns
      Revision();
      TOGGLE_1(); //toggle de variables cada 1000 ns, para encender trasnsistores
    }
}

//*****************************************************************************//
//PROGRAMACION PRINCIPAL                                                       //
//*****************************************************************************//
void main(void) {
```

```
    PORTEbits.RE0 = 0;
    setup(); //Configuracion de puertos de entrada y salida
    Config_INTERRUPT(); //Configuracion de la interrupcion del puerto B

    //*********************************************************************//
    //LOOP PRINCIPAL                                                       //
    //*********************************************************************//
    while (1) {
        CONVERSION_ADC(); //Separacion de Nibbles
    }
    return;
}

//*************************************************************************//
//FUNCIONES                                                                //
//*************************************************************************//

void TOGGLE_1(void) { //toggle para luego encender los transistores
    if (toggle == 1) {
        toggle = 0;
    } else if (toggle == 0) {
        toggle = 1;
    }
}

void DisplayADC(void) { //segun la variable de toggle se enciende cada trasnsistor
    PORTE = 0;
    if (toggle == 0) {
        PORTEbits.RE1 = 1;
        PORTD = display(ADC_NIBBLE2);//se busca en la libreria el valor en HEX
    } else if (toggle == 1) {
```

```
        PORTEbits.RE2 = 1;
        PORTD = display(ADC_NIBBLE1);
    }
}

void CONVERSION_ADC(void) {
    ADC_SWAP = SWAP_ADC(ADC_VALOR); // swap de los nibbles para tener los valores
                                    // de los 'msb'
    ADC_NIBBLE1 = NIBBLE1_ADC(ADC_VALOR); // AND con 0b00001111 para dejar
    ADC_NIBBLE2 = NIBBLE2_ADC(ADC_SWAP);  //solo el los 'lsb' en ambas variables

}

void Revision(void){
    if (ADC_VALOR > contador) {
            PORTEbits.RE0 = 1;

        }
    else if (ADC_VALOR < contador){
            PORTEbits.RE0 = 0;
        }
}

//********************* CONFIGURACION PRINCIPAL ****************************//

void setup(void) { //Configuración de puertos de entrada y salida
    initOsc(0b00000110);
    ANSEL = 0b00000001; //RA0 como analogico
    ANSELH = 0;
    TRISA = 0b00000001; //potenciometro, como entrada
    PORTA = 0;
```

```
    TRISB = 0b00000011; // pussh, como entradas
    PORTB = 0;
    PORTC = 0;
    TRISC = 0;
    TRISD = 0;
    PORTD = 0;
    TRISE = 0;
    PORTE = 0;
}

//*************** **** CONFIGURACION INTERRUPCIONES ************************//

void Config_INTERRUPT(void) {
    TMR0 = 6; // Valor que se le agrega al TMR0 para que ocurra cada 1000ns
    OPTION_REG = 0b10001000;
    INTCON = 0b10101001;
    IOCB = 0b00000011;
    PIE1bits.ADIE = 1; // enables ADC interrupt
    PIR1bits.ADIF = 1;
    ADCON1 = 0b00000000;
    ADCON0 = 0b01000001;

}
```

Link de Github

https://github.com/nataliadlb/LABS_REPOSITORIO.git