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Prof. Foster

CEW 420-03L Lab 4

Fall Semester 11/7/2019

keypad.c

```
#include "keypad.h"

void initKeypad(void)
{
        DDPCONbits.JTAGEN = 0; // disable the JTAG port
        AD1PCFGSET = 0xFFFF; //set all PORTB as digital

        //configure columns as outputs
        TRISBbits.TRISB11 = OUT;
        TRISBbits.TRISB3 = OUT;
        TRISBbits.TRISB15 = OUT;

        //configure rows as inputs
        TRISBbits.TRISB5 = IN;
        TRISBbits.TRISB13 = IN;
        TRISBbits.TRISB1 = IN;
        TRISBbits.TRISB9 = IN;

        // set outputs to default value of on
        column1 = 1;
        column2 = 1;
        column3 = 1;
}

char readKey(void)
{
        char returnVal = NULL;

        //check first column
        column1 = 0;
        if(row1 == 0)
        {
        msDelay(12);
        Debounce();
        returnVal = '1';
        }
        else if(row2 == 0)
        {
        msDelay(12);
        Debounce();
        returnVal = '4';
```

```
}
else if(row3 == 0)
{
msDelay(12);
Debounce();
returnVal = '7';
}
else if(row4 == 0)
{
msDelay(12);
Debounce();
returnVal = '*';
}
//reset column
column1 = 1;

//check second column
column2 = 0;
if(row1 == 0)
{
msDelay(12);
Debounce();
returnVal = '2';
}
else if(row2 == 0)
{
msDelay(12);
Debounce();
returnVal = '5';
}
else if(row3 == 0)
{
msDelay(12);
Debounce();
returnVal = '8';
}
else if(row4 == 0)
{
msDelay(12);
Debounce();
returnVal = '0';
}
//reset column
column2 = 1;
```

```
        ////check third column
        column3 = 0;
        if(row1 == 0)
        {
        msDelay(12);
        Debounce();
        returnVal = '3';
        }
        else if(row2 == 0)
        {
        msDelay(12);
        Debounce();
        returnVal = '6';
        }
        else if(row3 == 0)
        {
        msDelay(12);
        Debounce();
        returnVal = '9';
        }
        else if(row4 == 0)
        {
        msDelay(12);
        Debounce();
        returnVal = '#';
        }
        //reset column
        column3 = 1;
        msDelay(12);
        //returnVal = '\0';

        return returnVal;
}
/*
//setup the time delay
void msDelay(unsigned int ms)
{
        //figures out how many clock cycles it will go through in ms miliseconds
        unsigned int tick = ms * (ONE_SEC_TICK / 1000);

        //set the core timer count to 0
        _CP0_SET_COUNT(0);

        //waits until the core timer reaches the target value
        while(tick > _CP0_SET_COUNT());
```

```
}*/

//generate time delay for the specified amount of milliseconds
void msDelay(unsigned int ms)
{
        // Convert ms microseconds into how many clock ticks it will take
        unsigned int ticks = ms * ( ONE_SEC_TICK /1000);
//      ms *= TIMER_FREQ / 1000000 ; // Core Timer updates every 2 ticks

        _CP0_SET_COUNT(0); // Set Core Timer count to 0

        while (ticks > _CP0_GET_COUNT()); // Wait until Core Timer count reaches the
number we calculated earlier
}
void Debounce (void)
{
        column1 = 0;
        column2 = 0;
        column3 = 0;

        while ((row1 == 0) || (row2 == 0) || (row3 == 0) || (row4 == 0))
        {
        //do nothing
        }
        //reset all columns
        column1 = 1;
        column2 = 1;
        column3 = 1;
}
```

keypad.h

```
/*
 * File:   keypad.h
 * Author: ben
 *
 * Created on October 31, 2019, 9:30 AM
 */
#include <p32xxxx.h>

#ifndef KEYPAD_H
#define  KEYPAD_H
```

```
#ifdef    __cplusplus
extern "C" {
#endif

//CPU timings
#define CPU_FREQ 80000000
#define ONE_SEC_TICK (CPU_FREQ/2)

//port configuration values for input & output
#define IN      1
#define OUT    0

#define column1 PORTBbits.RB15
#define column2 PORTBbits.RB3
#define column3 PORTBbits.RB11

#define row1 PORTBbits.RB5
#define row2 PORTBbits.RB13
#define row3 PORTBbits.RB1
#define row4 PORTBbits.RB9

//function prototypes
void initKeypad(void);
char readKey(void);
void msDelay(unsigned int ms);
void Debounce (void);




#ifdef    __cplusplus
}
#endif

#endif   /* KEYPAD_H */
```

main.c
//provide complete documentation

#include <p32xxxx.h> |

```c
#include "keypad.h"
#include "uart.h"

// configuration bit settings, Fcy=80MHz, Fpb=40MHz
#pragma config POSCMOD=XT, FNOSC=PRIPLL
#pragma config FPLLIDIV=DIV_2, FPLLMUL=MUL_20, FPLLODIV=DIV_1
#pragma config FPBDIV=DIV_2, FWDTEN=OFF, CP=OFF, BWP=OFF

int main(void) {
        DDPCONbits.JTAGEN = 0;
        //declare any local variables you may need
        unsigned char number;

        initKeypad();
        initUART1();

        UART1_putstr("Hello, please enter keys on the keypad:");

    //add your code here

        //infinite loop
        while (1)
        {
        number = readKey();
        if(number != '\0')
        {
        UART1_putchar(number);
        }
        }

}
```