

Parker Authier & Ben Kepner

Prof. Foster

CEW 420-03L Lab 3

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 milliseconds
    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
```

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

//CPU timings
#define CPU_FREQ 8000000
#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>
```

```
#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);
        }
    }
}
```