```
/*
 * LCD_Testing.c
 *
 * Created: 2022-05-12 13:48:03
 * Author : ra5327ru-s
 */
#define F_CPU 16000000UL
#include <stdio.h>
#include <avr/io.h>
#include <avr/interrupt.h>
#include  <util/delay.h>
#include <time.h>

#define KEY_PRT PORTA
#define KEY_DDR DDRA
#define KEY_PIN PINA
#define LCD_Data_Dir DDRB
#define LCD_Command_Dir DDRD
#define LCD_Data_Port PORTB
#define LCD_Command_Port PORTD
#define BUZZ PD2
#define SENSOR PC0
#define RS PD4
#define RW PD5
#define EN PD6

int alarm_activated = 0;
int triggered = 0;


void LCD_Command(unsigned char cmnd)
{

	LCD_Data_Port = cmnd;
	LCD_Command_Port &= ~ (1<<RS);
	LCD_Command_Port &= ~ (1<<RW);
	LCD_Command_Port |= (1<<EN);
	_delay_us(1);
	LCD_Command_Port &= ~ (1<<EN);
	_delay_ms(3);
}


void LCD_Char(unsigned char_data){
```

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	LCD_Data_Port = char_data;
	LCD_Command_Port |= (1<<RS);
	LCD_Command_Port &= ~ (1<<RW);
	LCD_Command_Port |= (1<<EN);
	_delay_us(1);
	LCD_Command_Port &= ~(1<<EN);
	_delay_ms(1);

}

void LCD_Init(void){
	LCD_Command_Dir = 0xFF;
	LCD_Data_Dir = 0xFF;
	_delay_ms(20);

	LCD_Command(0x38);
	LCD_Command(0x0C);
	LCD_Command(0x06);
	LCD_Command(0x01);
	LCD_Command(0x80);
	_delay_ms(2);
	}

void LCD_String(char*str){

	int i;
	for(i = 0; str[i]!=0;i++){
		LCD_Char(str[i]);
	}
}



void LCD_String_xy (char row, char pos, char*str){

	if(row == 0 && pos < 16){
		LCD_Command((pos & 0x0F) | 0x80);
		LCD_String(str);
	}
		else if(row == 1 && pos < 16){
		LCD_Command((pos & 0x0F) | 0xC0);
		LCD_String(str);
		}
```

```
        }

void LCD_Clear(){

        LCD_Command(0x01);
        LCD_Command(0x80);

}


unsigned char keypad [4][4] = { {'9', '8', '7', '*'},
                                                        {'6', '5' , '4', '/'},
                                                        {'3' , '2' ,'1', '-'},
                                                        {'R' , '0', '=' , '+'}};

unsigned char colloc, rowloc;

char keyfind()
{
        while(1)
        {
           KEY_DDR = 0xF0;          /* set port direction as input-output */
           KEY_PRT = 0xFF;

           do
           {
                KEY_PRT &= 0x0F;      /* mask PORT for column read only */
                asm("NOP");
                colloc = (KEY_PIN & 0x0F); /* read status of column */
           }while(colloc != 0x0F);

           do
           {
                do
                {
                _delay_ms(20);            /* 20ms key debounce time */
                   colloc = (KEY_PIN & 0x0F); /* read status of column */
                }while(colloc == 0x0F);       /* check for any key press */

                _delay_ms (40);                  /* 20 ms key debounce time */
                colloc = (KEY_PIN & 0x0F);
           }while(colloc == 0x0F);
```

```
  /* now check for rows */
   KEY_PRT = 0xEF;          /* check for pressed key in 1st row */
   asm("NOP");
   colloc = (KEY_PIN & 0x0F);
   if(colloc != 0x0F)
{
        rowloc = 0;
        break;
   }

   KEY_PRT = 0xDF;          /* check for pressed key in 2nd row */
   asm("NOP");
   colloc = (KEY_PIN & 0x0F);
   if(colloc != 0x0F)
   {
        rowloc = 1;
        break;
   }

   KEY_PRT = 0xBF;          /* check for pressed key in 3rd row */
   asm("NOP");
colloc = (KEY_PIN & 0x0F);
   if(colloc != 0x0F)
   {
        rowloc = 2;
        break;
   }

   KEY_PRT = 0x7F;          /* check for pressed key in 4th row */
   asm("NOP");
   colloc = (KEY_PIN & 0x0F);
   if(colloc != 0x0F)
   {
        rowloc = 3;
        break;
   }
}

if(colloc == 0x0E)
  return(keypad[rowloc][0]);
else if(colloc == 0x0D)
  return(keypad[rowloc][1]);
else if(colloc == 0x0B)
  return(keypad[rowloc][2]);
```

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        else
          return(keypad[rowloc][3]);

}
void sound(int length){
        LCD_Clear();
        LCD_String_xy(0,0, "Popo pull up");
        LCD_String_xy(1,0,"Skriv in kod");
        for(int i = 0; i < length; i++){
                LCD_Command_Port |= (1<<BUZZ);
                _delay_ms(300);
                LCD_Command_Port &= ~(1<<BUZZ);
                _delay_ms(300);
                if(alarm_activated == 0){
                        break;
                }

        }
}

void alarm_triggered(void) {
        DDRC &= ~(1<<SENSOR);
        int temp = PINC & 0x01;
        if(temp == 0x01){
                triggered = 1;
        } else {
                triggered = 0;
        }

}


ISR(PCINT2_vect){
        alarm_triggered();
        if(alarm_activated == 1 && triggered == 1){
                sound(5);
                main();
        }
}


int main(void)
{
```

```
PCICR = 0b00000100;
PCMSK2 = 0b00000001;
LCD_Init();

LCD_String_xy(0,0, "Ange kod:");

int i = 0;
char correct[6] = {'2', '2', '0', '2','2','4'};
char inserted[6] = { ' ' };
int right = 0;
sei();

while(1){
        inserted[i] =  keyfind();
        LCD_Char(inserted[i]);


        if(i == 5){
                for(i = 0; i < 6; i++){
                        if(inserted[i] == correct[i]){
                                right = 1;
                        } else{
                                right = 0;
                                break;
                        }
                }
                if (right == 1){
                        _delay_ms(200);
                        LCD_Clear();
                        LCD_String_xy(0,0, "Korrekt kod");
                        _delay_ms(500);
                        if(alarm_activated == 0){
                                alarm_activated = 1;
                                LCD_Clear();
                                LCD_String_xy(0,0, "Larmet");
                                LCD_String_xy(1, 0, "Aktiverat");
                                _delay_ms(700);
                                main();
                        } else {
                                LCD_Clear();
                                LCD_String_xy(0,0, "Larmet");
                                LCD_String_xy(1,0, "Avaktiverat");
                                alarm_activated = 0;
                                _delay_ms(700);
```

```
                                        main();
                                }
                        } else{
                                _delay_ms(200);
                                LCD_Clear();
                                LCD_String_xy(0,0, "Fel kod");
                                _delay_ms(700);
                                if(alarm_activated == 1){
                                        sound(5);
                                }

                                main();
                        }
                }

                i+=1;
        }
}
```