```
/*
 * GccApplication1.c
 *
 * Created: 2015-04-08 13:54:49
 *  Author: digpi03
 */

#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>
#include <stdlib.h>

int onHour=0;
int onMinute=0;
int onSecond=0;

int offHour=0;
int offMinute=0;
int offSecond=0;

int clockHour=0;
int clockMinute=0;
int clockSecond=0;

int onRandom=0;
int offRandom=0;

int homescreen=0;

// KEYPAD
char checkButton() {
	DDRD =0b00001111;
	PORTD = 0b00000001;
	char val;
	val =PIND;
	val=0b11110000&val;

	if(val == 0b00010000){
		return 'F';
	}
	else if(val == 0b00100000){
		return 'B';
	}
	else if(val == 0b01000000){
		return '7';
	}
	else if(val == 0b10000000){
		return '3';
	}

	PORTD = 0b00000010;
	val =PIND;
	val=0b11110000&val;

	if(val == 0b00010000){ //E
		return 'E';
	}
	else if(val == 0b00100000){ //A
```

```
		return 'A';
	}
	else if(val == 0b01000000){
		return '6';
	}
	else if(val == 0b10000000){
		return '2';
	}

	PORTD = 0b00000100;
	val =PIND;
	val=0b11110000&val;

	if(val == 0b00010000){ //D
		return 'D';
	}
	else if(val == 0b00100000){
		return '9';
	}
	else if(val == 0b01000000){
		return '5';
	}
	else if(val == 0b10000000){
		return '1';
	}


	PORTD = 0b00001000;
	val =PIND;
	val=0b11110000&val;

	if(val == 0b00010000){ //C
		return 'C';
	}
	else if(val == 0b00100000){
		return '8';
	}
	else if(val == 0b01000000){
		return '4';
	}
	else if(val == 0b10000000){
		return '0';
	}

	return '-';		// returnerar - om ingen knapp trycks ner.
}


// DISPLAY
void displayCommand(int command){
		PORTC &= ~_BV(PC0);			//Sätter RS i Command-mode (PC0 -> 0)

	PORTB = command;			//Ställ in command 1 - Ställa in inställningar
(001110--)
	_delay_ms(3);
	PORTC &= ~_BV(PC7);			//Verkställ (PC7-> 0) (PC7-> 1)
	PORTC = PORTC | _BV(PC7);
	_delay_ms(3);
```

```
}

void displaySendData(int data){
	PORTC= PORTC | _BV(PC0);                                    //Sätter RS i Text-mode
(PC0 -> 1)
	PORTB = data;
	_delay_ms(3);
	PORTC &= ~_BV(PC7);                                                 //Verkställ (PC7->
0) (PC7-> 1)
	PORTC = PORTC | _BV(PC7);
}

void displaySetup(){
	DDRB=0b11111111; //Databus på PB är endast till för att skicka ut från processorn
	DDRC = DDRC | _BV(PC0);
	DDRC = DDRC | _BV(PC1);
	DDRC = DDRC | _BV(PC7);

	PORTC = _BV(PC7);                  //Sätter E i normal-mode (PC7 -> 1)
	PORTC &= ~_BV(PC1);                //Sätter R/W i Write-mode (PC1 -> 0)
	PORTC &= ~_BV(PC0);                //Sätter RS i Command-mode (PC0 -> 0)

	displayCommand(0b00111000); //Function set
	displayCommand(0b00000001); //Clear Display
	displayCommand(0b00001100); //DisplayOn/Off Cursor
 }

void displayCursorOn(){
	 displayCommand(0b00001111);
 }

void displayCursorOff(){
	 displayCommand(0b00001100);
 }

void displayClear(){
	 displayCommand(0b00000001);
	 _delay_ms(2);
 }


//STANDARDMEDDELANDEN
void displayWelcomeMessage(){
		//Welcome to Secure Light!
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');

		displaySendData('W');
		displaySendData('e');
		displaySendData('l');
		displaySendData('c');
		displaySendData('o');
		displaySendData('m');
		displaySendData('e');
```

```
                displaySendData(' ');

                displaySendData('t');
                displaySendData('o');

                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');

                displaySendData('S');
                displaySendData('e');
                displaySendData('c');
                displaySendData('u');
                displaySendData('r');
                displaySendData('e');

                displaySendData(' ');

                displaySendData('L');
                displaySendData('i');
                displaySendData('g');
                displaySendData('h');
                displaySendData('t');

                displaySendData('!');

        }

void displayHomeScreen(){
                displayClear();
                displaySendData('T'); //Time
                displaySendData('i');
                displaySendData('m');
                displaySendData('e');
                displaySendData(':'); // :

                displaySendData(' '); //mellanslag

                char clockHour1=((clockHour/10)+0x30);
                char clockHour2=(clockHour%10)+0x30;
                displaySendData(clockHour1);
                displaySendData(clockHour2);
                displaySendData(':');
                char clockMinute1=((clockMinute/10)+0x30);
                char clockMinute2=(clockMinute%10)+0x30;
                displaySendData(clockMinute1);
                displaySendData(clockMinute2);
                displaySendData(':');
                char clockSecond1=((clockSecond/10)+0x30);
                char clockSecond2=(clockSecond%10)+0x30;
                displaySendData(clockSecond1);
                displaySendData(clockSecond2);
```

```
                displaySendData(' '); // mellanslag
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');
                displaySendData(' ');


                displaySendData('o');
                displaySendData('n');
                displaySendData(':');
                displaySendData(' ');

                char onHour1=((onHour/10)+0x30);
                char onHour2=(onHour%10)+0x30;
                displaySendData(onHour1);
                displaySendData(onHour2);
                displaySendData(0b00111010); // :
                char onMinute1=((onMinute/10)+0x30);
                char onMinute2=(onMinute%10)+0x30;
                displaySendData(onMinute1);
                displaySendData(onMinute2);

                displaySendData(0b11111110); // mellanslag

                displaySendData('o');
                displaySendData('f');
                displaySendData('f');
                displaySendData(':');
                displaySendData(' ');

                char offHour1=((offHour/10)+0x30);
                char offHour2=(offHour%10)+0x30;
                displaySendData(offHour1);
                displaySendData(offHour2);
                displaySendData(':');
                char offMinute1=((offMinute/10)+0x30);
                char offMinute2=(offMinute%10)+0x30;
                displaySendData(offMinute1);
                displaySendData(offMinute2);

        }

void displayFunMessage(){
        displayClear();
        displaySendData(' ');
        displaySendData(' ');
        displaySendData(' ');
        displaySendData('H');
        displaySendData('e');
        displaySendData('l');
        displaySendData('l');
        displaySendData('o');
        displaySendData(' ');
        displaySendData('S');
        displaySendData('u');
```

```
	displaySendData('n');
	displaySendData('s');
	displaySendData('h');
	displaySendData('i');
	displaySendData('n');
	displaySendData('e');
	displaySendData('!');
}


//MENYVAL
void displaySetOnTime(){
		displayClear();
		displaySendData('S');
		displaySendData('e');
		displaySendData('t');
		displaySendData(' ');
		displaySendData('o');
		displaySendData('n');
		displaySendData(' ');
		displaySendData('t');
		displaySendData('i');
		displaySendData('m');
		displaySendData('e');
		displaySendData(':');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		_delay_ms(1500);
		displayCursorOn();
		char x = 0;
		char onHour1;
		while(x==0){
			onHour1=checkButton();
			if(onHour1!='-'){
				displaySendData(onHour1);
				x=1;
			}
		}
		_delay_ms(1500);
		char onHour2;
		x=0;
		while(x==0){
			onHour2=checkButton();
			if(onHour2!='-'){
				displaySendData(onHour2);
				x=1;
			}
		}
		displaySendData(':');
		_delay_ms(1500);
		char onMinute1;
		x=0;
```

```
		while(x==0){
			onMinute1=checkButton();
			if(onMinute1!='-'){
				displaySendData(onMinute1);
				x=1;
			}
		}
		_delay_ms(1500);
		char onMinute2;
		x=0;
		while(x==0){
			onMinute2=checkButton();
			if(onMinute2!='-'){
				displaySendData(onMinute2);
				x=1;
			}
		}
	onHour=(onHour1-0x30)*10+(onHour2-0x30);
	onMinute=(onMinute1-0x30)*10+(onMinute2-0x30);
	displayCursorOff();
	_delay_ms(500);
	displaySendData(' ');
	displaySendData(' ');
	displaySendData('S');
	displaySendData('a');
	displaySendData('v');
	displaySendData('e');
	displaySendData('d');
	displaySendData('.');
	_delay_ms(1000);
	displayClear();
}

void displaySetOffTime(){
		displayClear();
		displaySendData('S');
		displaySendData('e');
		displaySendData('t');
		displaySendData(' ');
		displaySendData('o');
		displaySendData('f');
		displaySendData('f');
		displaySendData(' ');
		displaySendData('t');
		displaySendData('i');
		displaySendData('m');
		displaySendData('e');
		displaySendData(':');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		displaySendData(' ');
		_delay_ms(1500);
		displayCursorOn();
		char x = 0;
```

```
		char offHour1;
		while(x==0){
			offHour1=checkButton();
			if(offHour1!='-'){
				displaySendData(offHour1);
				x=1;
			}
		}
		_delay_ms(1500);
		char offHour2;
		x=0;
		while(x==0){
			offHour2=checkButton();
			if(offHour2!='-'){
				displaySendData(offHour2);
				x=1;
			}
		}
		displaySendData(':');
		_delay_ms(1500);
		char offMinute1;
		x=0;
		while(x==0){
			offMinute1=checkButton();
			if(offMinute1!='-'){
				displaySendData(offMinute1);
				x=1;
			}
		}
		_delay_ms(1500);
		char offMinute2;
		x=0;
		while(x==0){
			offMinute2=checkButton();
			if(offMinute2!='-'){
				displaySendData(offMinute2);
				x=1;
			}
		}
	offHour=(offHour1-0x30)*10+(offHour2-0x30);
	offMinute=(offMinute1-0x30)*10+(offMinute2-0x30);
	displayCursorOff();
	_delay_ms(500);
	displaySendData(' ');
	displaySendData(' ');
	displaySendData('S');
	displaySendData('a');
	displaySendData('v');
	displaySendData('e');
	displaySendData('d');
	displaySendData('.');
	_delay_ms(1000);
	displayClear();
}

void displaySetCurrTime(){
	displayClear();
	displaySendData('S');
```

```
displaySendData('e');
displaySendData('t');
displaySendData(' ');
displaySendData('c');
displaySendData('u');
displaySendData('r');
displaySendData('r');
displaySendData('e');
displaySendData('n');
displaySendData('t');
displaySendData(' ');
displaySendData('t');
displaySendData('i');
displaySendData('m');
displaySendData('e');
displaySendData(':');
displaySendData(' ');
displaySendData(' ');
displaySendData(' ');
_delay_ms(1500);
displayCursorOn();
char x = 0;
char currHour1;
while(x==0){
	currHour1=checkButton();
	if(currHour1!='-'){
		displaySendData(currHour1);
		x=1;
	}
}
_delay_ms(1500);
char currHour2;
x=0;
while(x==0){
	currHour2=checkButton();
	if(currHour2!='-'){
		displaySendData(currHour2);
		x=1;
	}
}
displaySendData(':');
_delay_ms(1500);
char currMinute1;
x=0;
while(x==0){
	currMinute1=checkButton();
	if(currMinute1!='-'){
		displaySendData(currMinute1);
		x=1;
	}
}
_delay_ms(1500);
char currMinute2;
x=0;
while(x==0){
	currMinute2=checkButton();
	if(currMinute2!='-'){
		displaySendData(currMinute2);
```

```
                        x=1;
                }
        }
        clockHour=(currHour1-0x30)*10+(currHour2-0x30);
        clockMinute=(currMinute1-0x30)*10+(currMinute2-0x30);
        clockSecond=0;

        displayCursorOff();
        _delay_ms(500);
        displaySendData(' ');
        displaySendData(' ');
        displaySendData('S');
        displaySendData('a');
        displaySendData('v');
        displaySendData('e');
        displaySendData('d');
        displaySendData('.');
        _delay_ms(1000);
        displayClear();
}


// KLOCKA (Aktuell tid)
void clockSetup(){
        TIMSK= (1<<TOIE1);          // Tillåt Timer1 overflow
        TCCR1B |= (1 << CS10) | (1 << CS12);
        TCNT1 = 65536-3906;         // 2930= 3MHz/1024 (prescaler = 1024) talet som
räknaren ska starta på

        sei();                              //Tillåt interrupts
        onRandom= getRandom();
        offRandom = getRandom();
}

ISR(TIMER1_OVF_vect){
        TCNT1 = 65536-3906;

        if(homescreen==1){
                displayHomeScreen();
        }

        clockSecond++;
        if(clockSecond>59){
                clockMinute++;
                clockSecond=0;
                checkTimer();
                if(clockMinute>59){
                        clockHour++;
                        clockMinute=0;
                        clockSecond=0;
                        if(clockHour>23){
                                clockHour=0;
                                clockMinute=0;
                                clockSecond=0;
                        }
                }
        }
}
```

```
// TIMER (Jämför aktuell tid med inställd tid + dagens slump)
void checkTimer(){
	if (onMinute + onRandom <=59){
		if(clockHour == onHour){
			if(clockMinute == onMinute + onRandom){
				lightOn();
				onRandom = getRandom();
			}
		}
	}
	else{
		if(onHour<=22){
			if(clockHour == onHour + 1){
				if(clockMinute == onMinute + onRandom - 60){
					lightOn();
					onRandom = getRandom();
				}
			}
		} else {
			if(clockHour == 0){
				if(clockMinute == onMinute + onRandom - 60){
					lightOn();
					onRandom = getRandom();
				}
			}
		}
	}
	if (offMinute + offRandom <=59){
		if(clockHour == offHour){
			if(clockMinute == offMinute + offRandom){
				lightOff();
				offRandom = getRandom();
			}
		}
	}
	else{
		if(offHour<=22){
			if(clockHour == offHour + 1){
				if(clockMinute == offMinute + offRandom - 60){
					lightOff();
					offRandom = getRandom();
				}
			}
			} else {
			if(clockHour == 0){
				if(clockMinute == offMinute + offRandom - 60){
					lightOff();
					offRandom = getRandom();
				}
			}
		}
	}

}

int getRandom(){
```

```
	int r = rand() % 3;
	return r;
}


// LAMPKONTROLL (Sätter på och stänger av lampa)
void lightOn(){
	DDRA = DDRA | _BV(PA0);
	PORTA = PORTA | _BV(PA0);		//
	}

void lightOff(){
	PORTA &= ~_BV(PA0);				//
}


//MAINMETOD
int main(void){
	displaySetup();
	displayWelcomeMessage();	//Välkomstutskrift
	_delay_ms(4000);
	displaySetCurrTime();
	clockSetup();
	homescreen=1;

    while(1){
		char button=checkButton();
		if(button!='-') {		//någon knapp nedtryckt
			if(button=='A'){	//knapp A nedtryckt
				homescreen=0;
				_delay_ms(10);
				displaySetOnTime();
				homescreen=1;
			} else if(button =='B'){	//knapp B nedtryckt
				homescreen=0;
				_delay_ms(10);
				displaySetOffTime();
				homescreen=1;
			} else if(button=='C'){
				homescreen=0;
				_delay_ms(10);
				displaySetCurrTime();
				homescreen=1;
			} else if(button =='E'){
				homescreen=0;
				lightOn();
				displayClear();
				displayFunMessage();
				_delay_ms(3000);
				homescreen=1;
			}else if(button =='F'){
				lightOff();
			}
		}
	}
	return;
}
```