Lab 4: Jiří Navrátil

Link to your `Digital-electronics-2` GitHub repository:

https://github.com/GeorgeNavratil/Digital-electronics-2

Overflow times

1. Complete table with overflow times.

Module	Number of bits	1	8	32	64	128	256	1024
Timer/Counter0	8	16u	128u	--	1024u	--	4096u	16384u
Timer/Counter1	16	4096u	32768u	--	262144u	--	1048576u	4194304u
Timer/Counter2	8	16u	128u	512u	1024u	2048u	4096u	16384u

Timer library

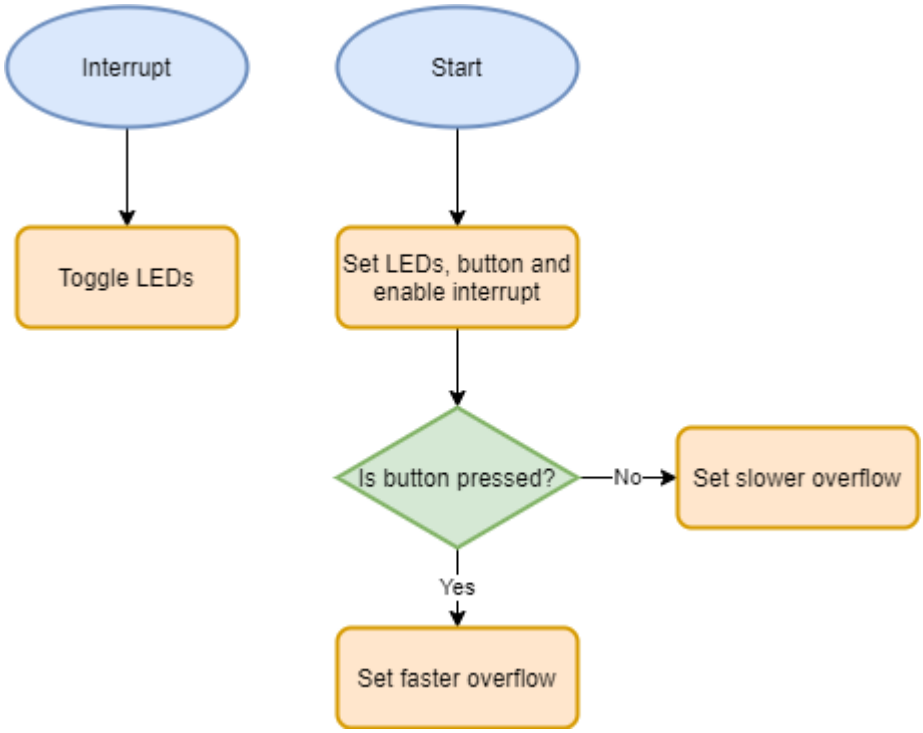
1. In your words, describe the difference between common C function and interrupt service routine.
    - Function - a set of instructions that is executed when called
    - Interrupt service routine - a type of cycle that is called upon an interrupt

2. Part of the header file listing with syntax highlighting, which defines settings for Timer/Counter0:

```
/**
 * @name  Definitions of Timer/Counter0
 * @note  F_CPU = 16 MHz
 */
/** @brief Stop timer, prescaler 000 --> STOP */
#define TIM0_stop()           TCCR0B &= ~((1<<CS02) | (1<<CS01) | (1<<CS00));
/** @brief Set overflow 4ms, prescaler 001 --> 1 */
#define TIM0_overflow_4ms()   TCCR0B &= ~((1<<CS02) | (1<<CS01)); TCCR0B |=
(1<<CS00);
/** @brief Set overflow 33ms, prescaler 010 --> 8 */
#define TIM0_overflow_33ms()  TCCR0B &= ~((1<<CS02) | (1<<CS00)); TCCR0B |=
(1<<CS01);
/** @brief Set overflow 262ms, prescaler 011 --> 64 */
#define TIM0_overflow_262ms() TCCR0B &= ~(1<<CS02); TCCR0B |= (1<<CS01) |
(1<<CS00);
/** @brief Set overflow 1s, prescaler 100 --> 256 */
#define TIM0_overflow_1s()    TCCR0B &= ~((1<<CS01) | (1<<CS00)); TCCR0B |=
(1<<CS02);
/** @brief Set overflow 4s, prescaler // 101 --> 1024 */
#define TIM0_overflow_4s()    TCCR0B &= ~(1<<CS01); TCCR0B |= (1<<CS02) |
(1<<CS00);
/** @brief Enable overflow interrupt, 1 --> enable */
#define TIM0_overflow_interrupt_enable()  TIMSK0 |= (1<<TOIE0);
```

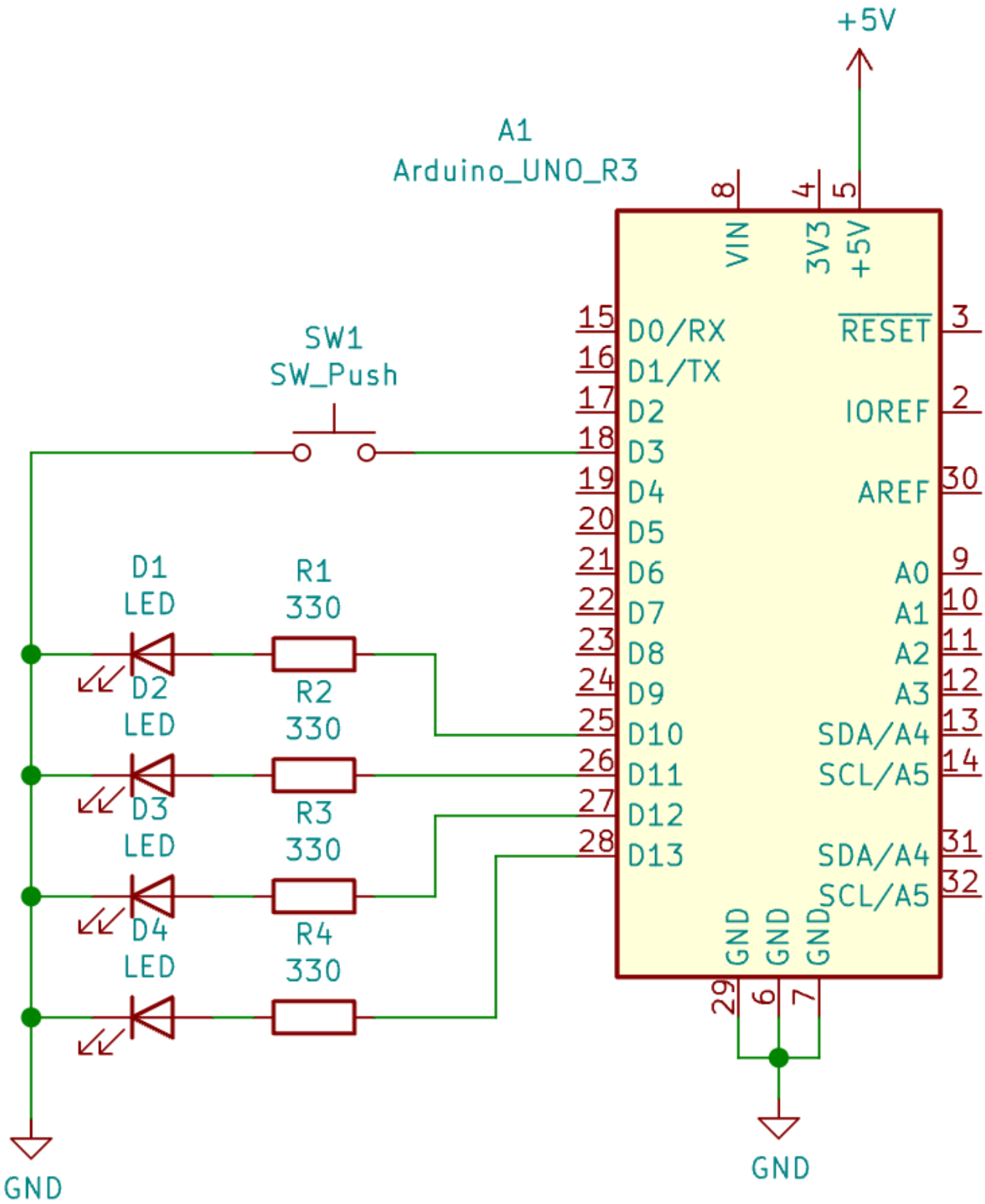
```
/** @brief Disable overflow interrupt, 0 --> disable */
#define TIM0_overflow_interrupt_disable() TIMSK0 &= ~(1<<TOIE0);
```

3. Flowchart figure for function `main()` and interrupt service routine `ISR(TIMER1_OVF_vect)` of application that ensures the flashing of one LED in the timer interruption. When the button is pressed, the blinking is faster, when the button is released, it is slower. Use only a timer overflow and not a delay library.



Knight Rider

1. Scheme of Knight Rider application with four LEDs and a push button, connected according to Multi-function shield. Connect AVR device, LEDs, resistors, push button, and supply voltage. The image can be drawn on a computer or by hand. Always name all components and their values!


+5V
A1
Arduino_UNO_R3
8
4
5
VIN
3V3
+5V
SW1
SW_Push
15
D0/RX
16
D1/TX
17
D2
18
D3
19
D4
20
D5
21
D6
22
D7
23
D8
24
D9
25
D10
26
D11
27
D12
28
D13
RESET
3
IOREF
2
AREF
30
A0
9
A1
10
A2
11
A3
12
SDA/A4
13
SCL/A5
14
SDA/A4
31
SCL/A5
32
GND
GND
GND
29
6
7
GND
D1
LED
R1
330
D2
LED
R2
330
D3
LED
R3
330
D4
LED
R4
330
GND