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Digital-electronics-2 / Labs / 07-uart / README.md



amwellius Update README.md



1 contributor

113 lines (85 sloc) | 4.96 KB

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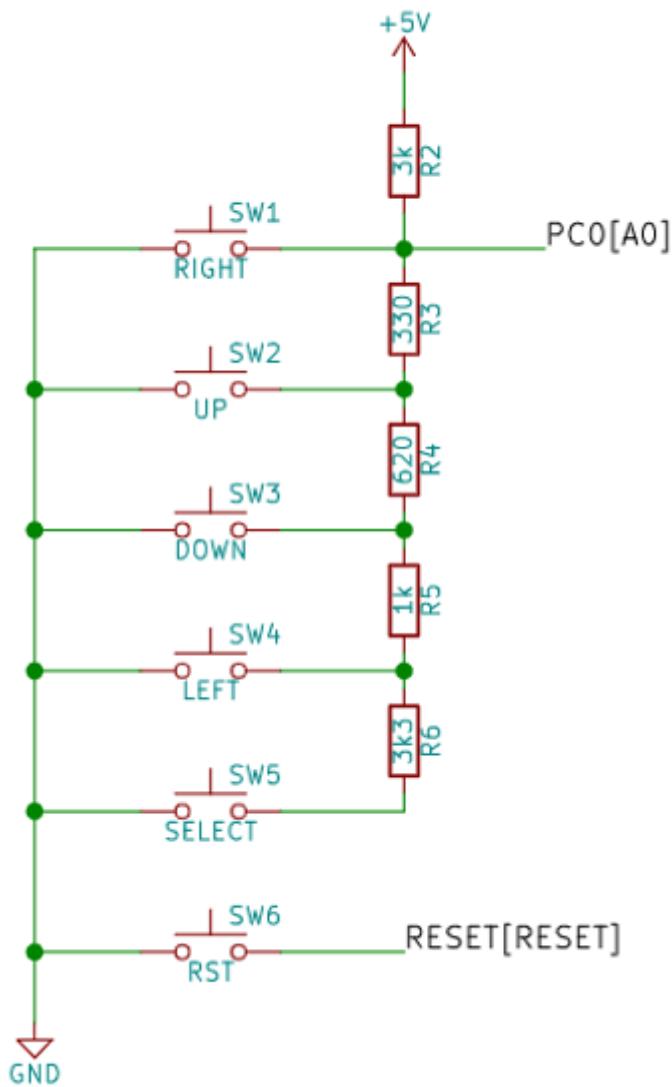
Lab 7: Samuel Košík

Link to my Digital-electronics-2 GitHub repository:

(<https://github.com/amwellius/Digital-electronics-2>)

Analog-to-Digital Conversion

Buttons



1. Complete table with voltage divider, calculated, and measured ADC values for all five push buttons.

Push button	PC0[A0] voltage	ADC value (calculated)	ADC value (measured)
Right	0 V	0	0
Up	0.495 V	101	99
Down	1.203 V	246	255
Left	1.970 V	403	408
Select	3.182 V	651	638
none	5.000 V	1023	1023

Operation	Register(s)	Bit(s)	Description

Operation	Register(s)	Bit(s)	Description
Voltage reference	ADMUX	REFS1:0	01: AVcc voltage reference (5V), ...
Input channel	ADMUX	MUX3:0	0000: ADC0, 0001: ADC1, ...
ADC enable	ADCSRA	ADEN	1 = ADC ON; 0 = ADC OFF
Start conversion	ADCSRA	ADSC	1 = Start conver.; 0 = No Efect!
ADC interrupt enable	ADCSRA	ADIE	1 = Activated all interrupts
ADC clock prescaler	ADCSRA	ADPS2:0	000: Division factor 2, 001: 2, 010: 4, ...
ADC 10-bit result	ADCL	ADC9:0	Represents the result according (Vin x 1024)/Vref

2. Code listing of ACD interrupt service routine for sending data to the LCD/UART and identification of the pressed button. Always use syntax highlighting and meaningful comments:

```

ISR(ADC_vect)
{
    uint16_t value = 0;
    char lcd_string[4] = "0000";

    //ADC je 16 bitova hodnota ktoru on precita naraz
    value = ADC;           // Copy ADC result to 16-bit variable
    itoa(value, lcd_string, 10); // Convert decimal value to string

    // A value displaying
    lcd_gotoxy(8,0);
    lcd_puts("    ");
    lcd_gotoxy(8,0);
    lcd_puts(lcd_string);
    //uart communication
    uart_puts(lcd_string);
    uart_puts("\r\n");

    // B value
    value = ADC;           // Copy ADC result to 16-bit variable
    itoa(value, lcd_string, 16);

    lcd_gotoxy(13,0);
    //display clearing
    lcd_puts("    ");
    lcd_gotoxy(13,0);

```

```

lcd_puts(lcd_string);
//uart communication
uart_puts(lcd_string);
uart_puts("\r\n");

// C value
value = ADC; // Copy ADC result to 16-bit variable
itoa(value, lcd_string, 2);
lcd_gotoxy(8,1);
lcd_puts("      ");
//uart communication
uart_puts(lcd_string);
uart_puts("\r\n");

switch(value){
    case 0 ... 90 : lcd_gotoxy(8,1); lcd_puts("right"); uart_puts("right");
    case 91 ... 200 : lcd_gotoxy(8,1); lcd_puts("up"); uart_puts("up");
    case 201 ... 400 : lcd_gotoxy(8,1); lcd_puts("down"); uart_puts("down");
    case 401 ... 600 : lcd_gotoxy(8,1); lcd_puts("left"); uart_puts("left");
    case 601 ... 1000 : lcd_gotoxy(8,1); lcd_puts("select"); uart_puts("select");
    case 1001 ... 1050 : lcd_gotoxy(8,1); lcd_puts("none"); uart_puts("none");
    default:lcd_puts("      ");
}
}

```

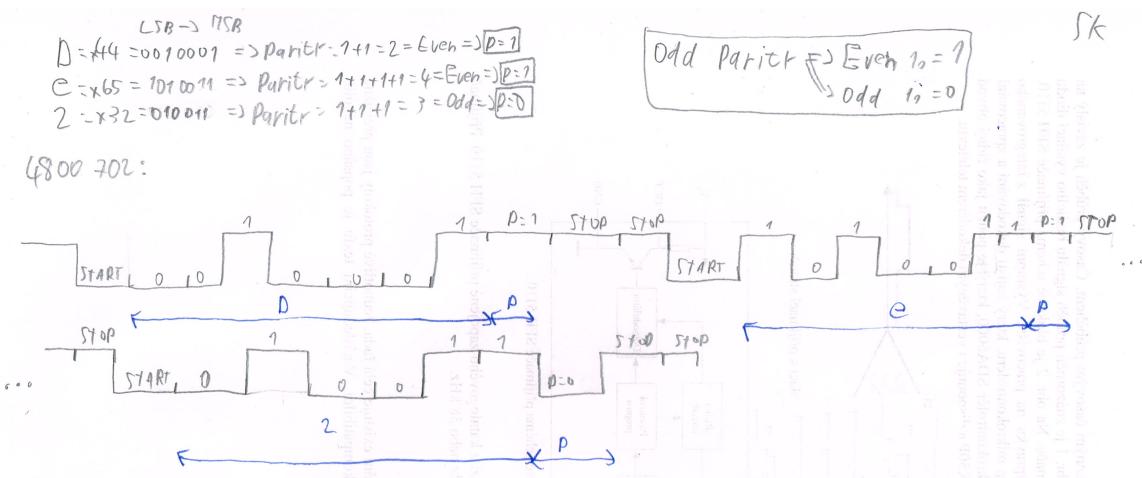
UART communication

Function name	Function parameters	Description	Example
uart_init	UART_BAUD_SELECT(9600, F_CPU)	Initialize UART to 8N1 and set baudrate to 9600 Bd	uart_init(UART_BAUD_SELECT(F_CPU));
uart_getc	void	Get received byte from ringbuffer	uart_getc()

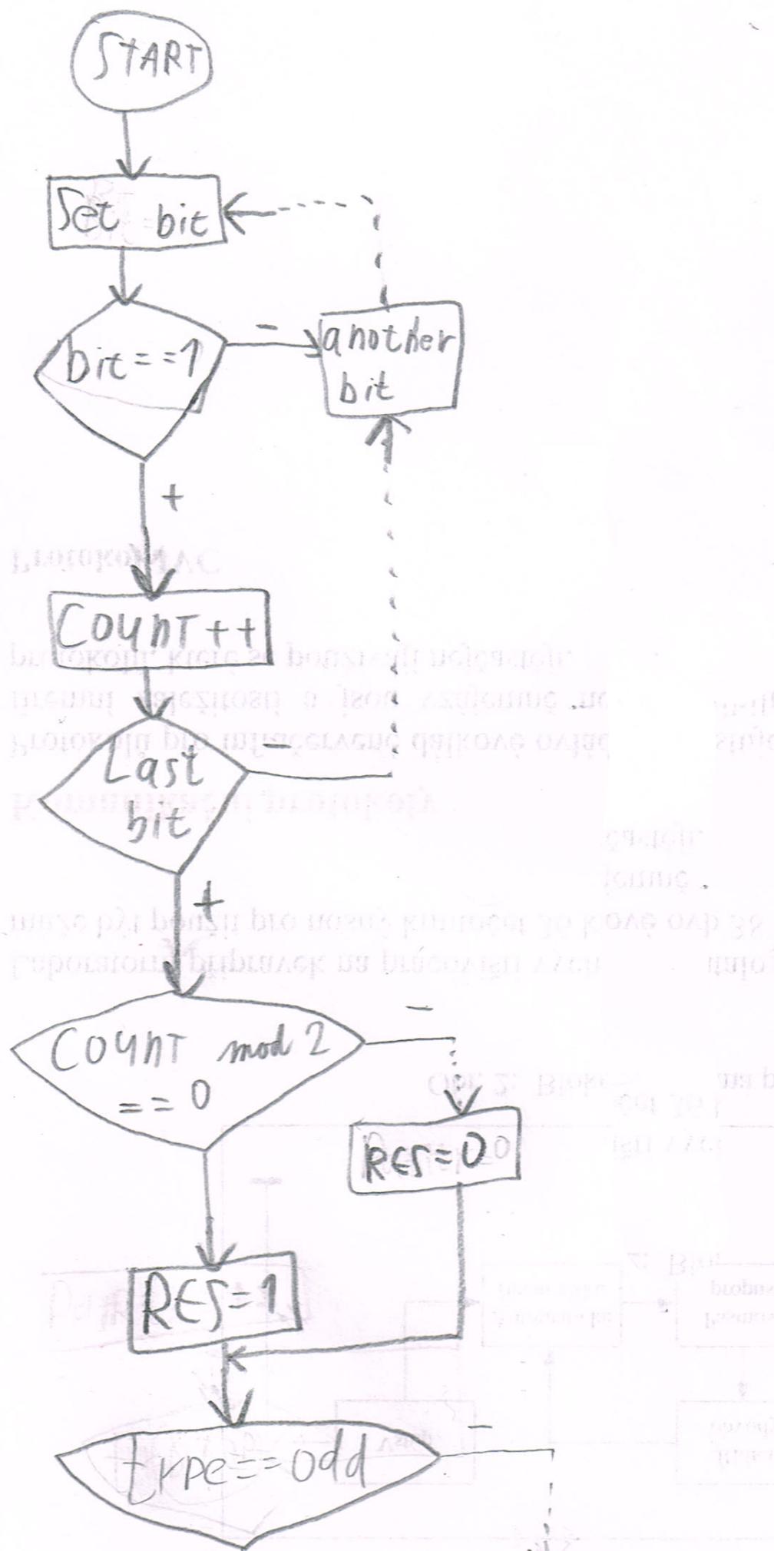
		Put byte to ringbuffer	
--	--	------------------------	--

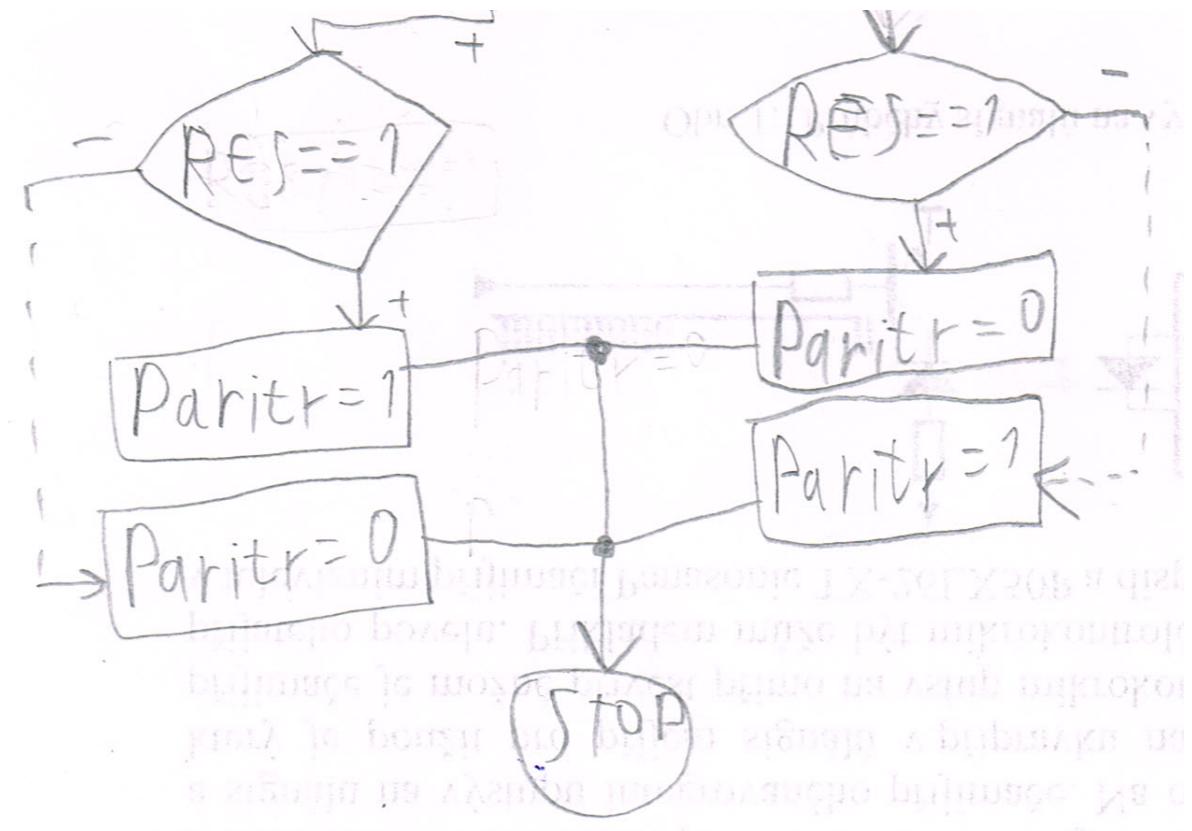
uart_putchar function name	data Function parameters	for Description via UART	uart_putchar(data) Example
uart_puts	s	Put string to ringbuffer for transmitting via UART	uart_puts("Help Me Please ")

1. (Hand-drawn) picture of UART signal when transmitting three character data D e2 in 4800 702 mode (7 data bits, odd parity, 2 stop bits, 4800 Bd).



2. Flowchart figure for function `get_parity(uint8_t data, uint8_t type)` which calculates a parity bit of input 8-bit `data` according to parameter `type`. The image can be drawn on a computer or by hand. Use clear descriptions of the individual steps of the algorithms.





Temperature meter

Consider an application for temperature measurement and display. Use temperature sensor [TC1046](#), LCD, one LED and a push button. After pressing the button, the temperature is measured, its value is displayed on the LCD and data is sent to the UART. When the temperature is too high, the LED will start blinking.

1. Scheme of temperature meter. The image can be drawn on a computer or by hand. Always name all components and their values.

