DE2 lab 7

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Table with voltage divider

$$U_R = 5V \cdot \frac{0}{R_2 + 0} = 5V \cdot \frac{0}{3000 + 0} = 0V$$

$$U_U = 5V \cdot \frac{R_3}{R_2 + R_3} = 5V \cdot \frac{330}{3000 + 330} = 0.495V$$

$$U_D = 5V \cdot \frac{R_3 + R_4}{R_2 + R_3 + R_4} = 5V \cdot \frac{330 + 620}{3000 + 330 + 620} = 1.203V$$

$$U_L = 5V \cdot \frac{R_3 + R_4 + R_5}{R_2 + R_3 + R_4 + R_5} = 5V \cdot \frac{330 + 620 + 1000}{3000 + 330 + 620 + 1000} = 1.970V$$

$$U_{SEL} = 5V \cdot \frac{R_3 + R_4 + R_5 + R_6}{R_2 + R_3 + R_4 + R_5 + R_6} = 5V \cdot \frac{330 + 620 + 1000 + 3300}{3000 + 330 + 620 + 1000 + 3300} = 3.182V$$

$$U_{none} = 5V$$

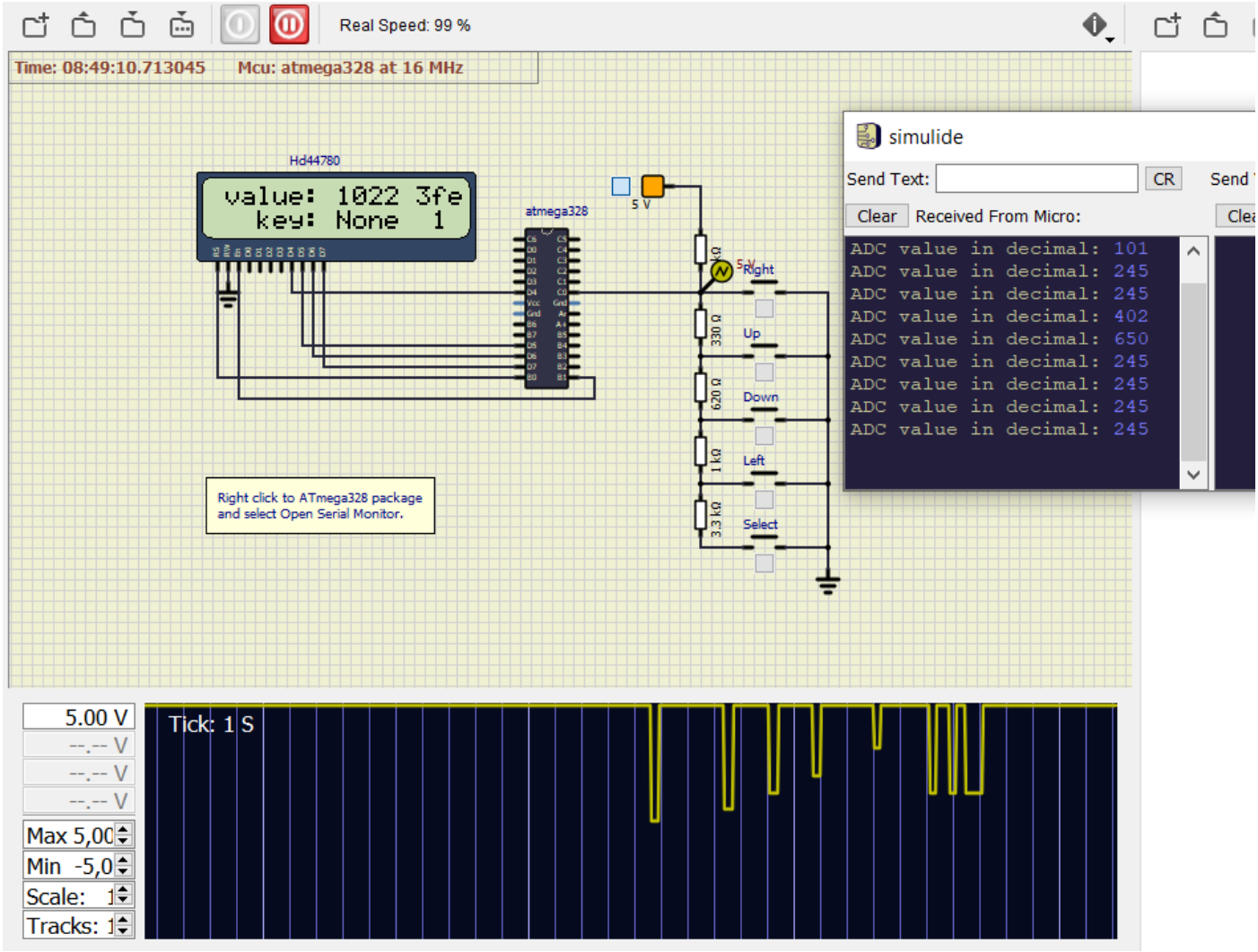
ADC values for all buttons

$$ADC = \frac{V_i}{V_{ref}} \cdot (2^n - 1) = \frac{V_i}{5} \cdot (2^{10} - 1)$$

Push button	PC0[A0] voltage	ADC value (calculated)	ADC value (measured)
Right	0	0	0
Up	0.495	101	101
Down	1.203	246	245
Left	1.970	403	402
Select	3.182	651	650
none	5	1023	1022

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: enables the ADC, 0: the ADC is turned off (0: while a conversion is in progress --> terminate conversion)
Start conversion	ADCSRA	ADSC	Single Conversion mode: 1: to start each conversion; Free Running mode: 1: to start the first conversion.
ADC interrupt enable	ADCSRA	ADIE	1: ADC Conversion Complete Interrupt is activated
ADC clock prescaler	ADCSRA	ADPS2:0	000: Division fator 2, 001: 2, 010: 4, …
ADC result	ADCH, ADCL	ADC9:0	ADLAR=1: ADCH9:2, ADCL1:0, result is left adjusted
			ADLAR=0: ADCH9:8, ADCL7:0, result is right adjusted

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(9600, F_CPU));
uart_getc	void	Get received byte from ringbuffer	uart_getc();
uart_putc	data	Put byte to ringbuffer for transmitting via UART.	uart_putc('A');
uart_puts	* s	Put string to ringbuffer for transmitting via UART.	uart_puts("Hello world");


Real Speed: 99 %
Time: 08:49:10.713045
Mcu: atmega328 at 16 MHz
Hd44780
value: 1022 3fe
key: None 1
atmega328
5 V
5 V
Right
Up
Down
Left
Select
330 Ω
620 Ω
1 kΩ
3.3 kΩ
Right click to ATmega328 package and select Open Serial Monitor.
simulide
Send Text:
CR
Send
Clear
Received From Micro:
ADC value in decimal: 101
ADC value in decimal: 245
ADC value in decimal: 245
ADC value in decimal: 402
ADC value in decimal: 650
ADC value in decimal: 245
ADC value in decimal: 245
ADC value in decimal: 245
ADC value in decimal: 245
5.00 V
--.-- V
--.-- V
--.-- V
Max 5,00
Min -5,0
Scale: 1
Tracks: 1
Tick: 1 S