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FACULTY OF ENGINEERING

DEPARTMENT OF COMPUTER ENGINEERING

2021 - 2022
SPRING SEMESTER

CME 3208
PRINCIPLES OF EMBEDDED SYSTEMS

LAB 4 – 22.03.2022
LCD CONTROLLER

In this lab session, you are required to create a LCD controller using Arduino and other circuit elements. This controller will be managed over serial monitor. It will display and control which texts are currently shown in LCD (in both rows), if they are currently scrolling or not, the direction of scrolling and the speed of scrolling. An example serial monitor screen and resulting LCD screen are given below.

```
0 – PRINT THIS STATUS SCREEN
LCD ROW 0 (UP)
1 – TEXT                :
2 – SCROLLING STATUS    : DISABLED
3 – SCROLLING DIRECTION : LEFT
4 – SCROLLING SPEED (MS): 1000 MILLISECONDS
LCD ROW 1 (DOWN)
5 – TEXT                :
6 – SCROLLING STATUS    : DISABLED
7 – SCROLLING DIRECTION : LEFT
8 – SCROLLING SPEED (MS): 1000 MILLISECONDS

PLEASE ENTER SETTING NUMBER: 1
PLEASE ENTER TEXT FOR ROW 0:
This text is for row 0 and longer than 16 characters.

PLEASE ENTER SETTING NUMBER: 2
PLEASE ENTER 0 TO DISABLE OR 1 TO ENABLE SCROLLING: 1

PLEASE ENTER SETTING NUMBER: 5
PLEASE ENTER TEXT FOR ROW 1:
This text is for row 1 and longer than 16 characters.

PLEASE ENTER SETTING NUMBER: 6
PLEASE ENTER 0 TO DISABLE OR 1 TO ENABLE SCROLLING: 1

PLEASE ENTER SETTING NUMBER: 7
PLEASE ENTER 0 FOR LEFT AND 1 FOR RIGHT SCROLLING DIRECTION: 1

PLEASE ENTER SETTING NUMBER: 8
PLEASE ENTER SCROLLING SPEED FOR ROW 1 (MS): 2000

PLEASE ENTER SETTING NUMBER: 0
0 – PRINT THIS STATUS SCREEN
LCD ROW 0 (UP)
1 – TEXT                : This text is for row 0 and longer than 16 characters.
2 – SCROLLING STATUS    : ENABLED
3 – SCROLLING DIRECTION : LEFT
4 – SCROLLING SPEED (MS): 1000 MILLISECONDS
LCD ROW 1 (DOWN)
5 – TEXT                : This text is for row 1 and longer than 16 characters.
6 – SCROLLING STATUS    : ENABLED
7 – SCROLLING DIRECTION : RIGHT
8 – SCROLLING SPEED (MS): 2000 MILLISECONDS
```

You do not have to create this serial monitor exactly but your serial monitor interface should have similar functionality and information. You should try to uses spaces to make serial monitor more readable.

The scrolling speed is the time period after 1 left or right scroll is executed.

Assuming all of this information are entered at time 0, the resulting LCD screen of these settings are given below.

LCD SCREEN AT TIME 0 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	T	h	i	s		t	e	x	t		i	s		f	o	r
01	T	h	i	s		t	e	x	t		i	s		f	o	r

LCD SCREEN AT TIME 1000 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	h	i	s		t	e	x	t		i	s		f	o	r	
01	T	h	i	s		t	e	x	t		i	s		f	o	r

LCD SCREEN AT TIME 2000 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	i	s		t	e	x	t		i	s		f	o	r		r
01	.	T	h	i	s		t	e	x	t		i	s		f	o

LCD SCREEN AT TIME 3000 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	s		t	e	x	t		i	s		f	o	r		r	o
01	.	T	h	i	s		t	e	x	t		i	s		f	o

LCD SCREEN AT TIME 4000 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00		t	e	x	t		i	s		f	o	r		r	o	w
01	s	.	T	h	i	s		t	e	x	t		i	s		f

LCD SCREEN AT TIME 5000 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	t	e	x	t		i	s		f	o	r		r	o	w	
01	s	.	T	h	i	s		t	e	x	t		i	s		f

LCD SCREEN AT TIME 6000 (MILLISECONDS):

	00	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
00	e	x	t		i	s		f	o	r		r	o	w		0
01	r	s	.	T	h	i	s		t	e	x	t		i	s	

There will be two problems that you will encounter during this lab session.

First is printing Turkish characters on LCD. Before attempting to printing on LCD, you should check if you can send them over serial monitor correctly or not. If the serial monitor works for non ASCII characters, then try to print them on LCD itself.

Second is for text shorter than 16 characters. While printing on LCD screen, you should assume it as a text that is 16 characters long and filled with space characters (“ ”). That may make it easier for you to perform scrolling operation.

If you have any questions, please write it on class forums.

GOOD LUCK TO YOU ALL!