Lab 6

I/O, LED, LCD

Pengantar Organisasi Komputer Semester Ganjil 2016/2017

In this lab session we will discuss the use of input / output registers. An example of using the input / output registers is the commands that the AVR program performs on some devices (eg LCD or LED).
The use of this device will utilize a device simulation named Hapsim. Please download the simulator at Scele and try the program below:

```
.include "m8515def.inc"

.def sem =r18 ; temporary register
INIT:

ser sem ; load  $FF to sem

out DDRB,sem ; Set PORTB to output
TEST_LED:

out PORTB,sem ; Update LEDS
ldi sem,0x00

out PORTB,sem ; Update LEDS
ldi sem,0x01

out PORTB,sem ; Update LEDS
ldi sem,0x02

out PORTB,sem ; Update LEDS
ldi sem,0x04

out PORTB,sem ; Update LEDS
ldi sem,0x08

out PORTB,sem ; Update LEDS
ldi sem,0x10

out PORTB,sem ; Update LEDS
ldi sem,0x20

out PORTB,sem ; Update LEDS
ldi sem,0x40
```

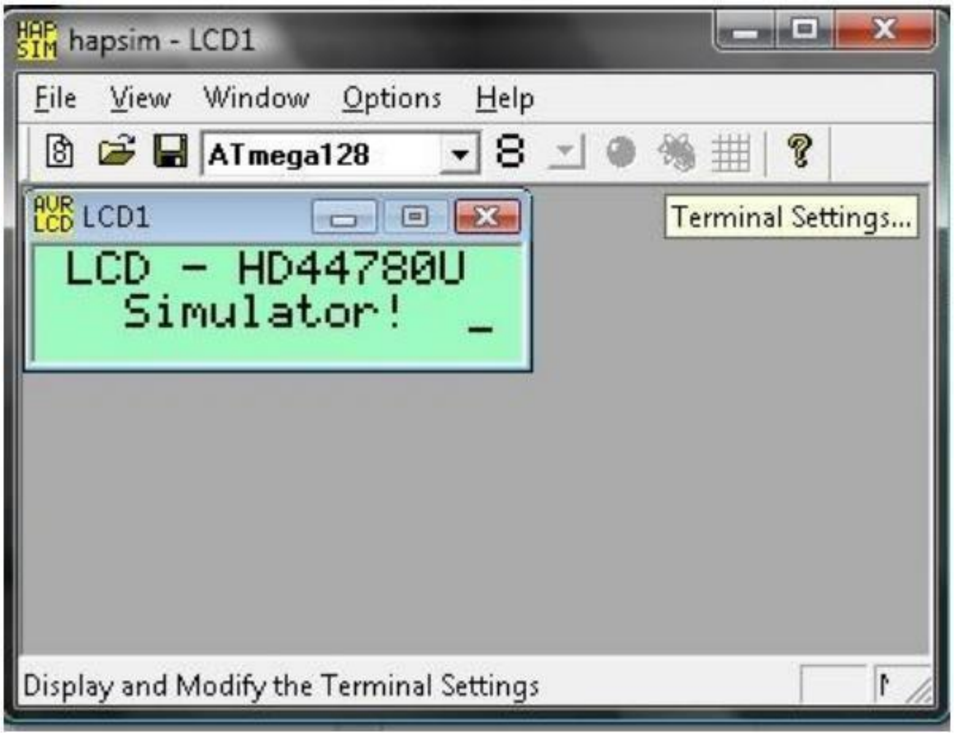
Program above uses PORTB as output register to LED so that it will affect LED on Hapsim.

For better understanding on how to use Hapsim, follow tutorial below!

Steps to run Hapsim

1. Open Hapsim.exe

   After opening Hapsim it should be like this:

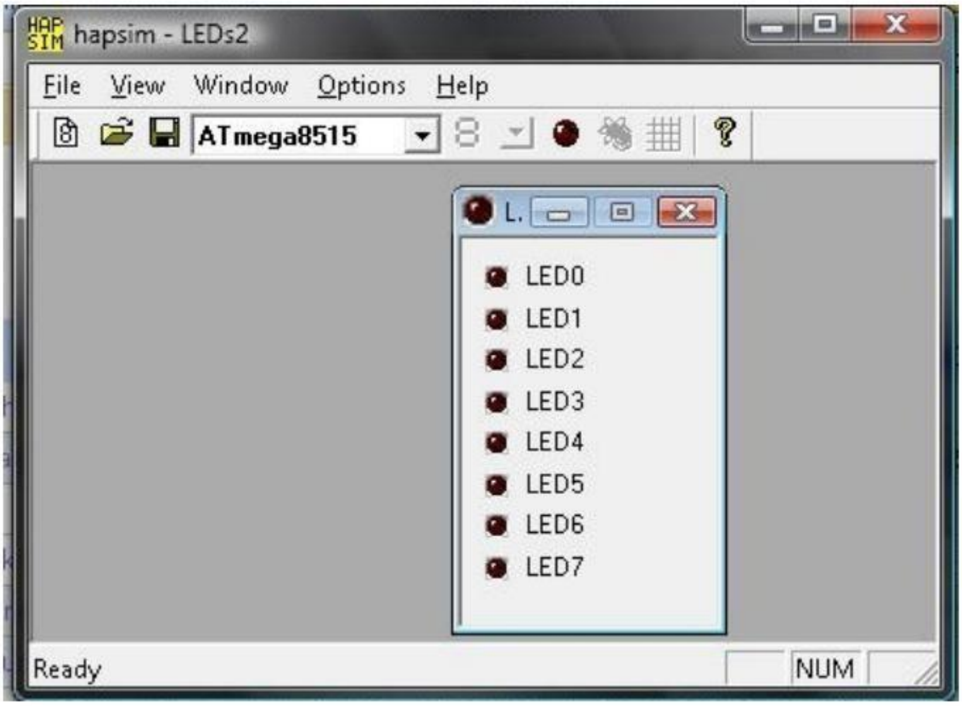


```
LCD - HD44780U
  Simulator!  _
```

Display and Modify the Terminal Settings

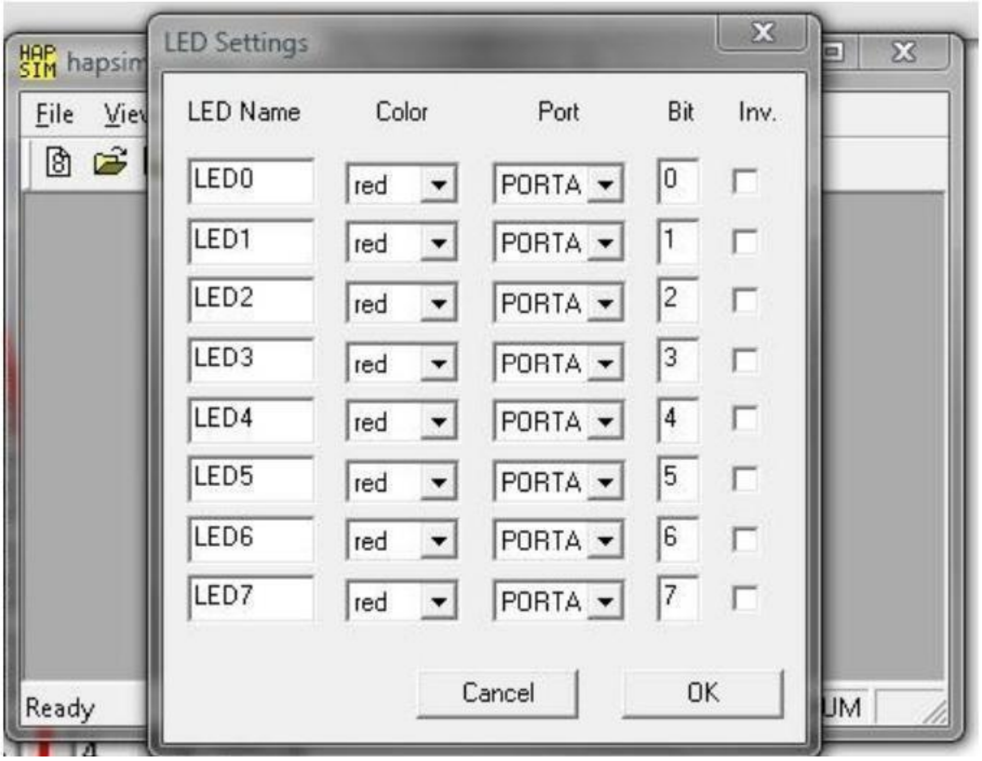
2. There is a dropdown menu that contains “Atmega128” on the toolbar. Change that menu to “ATmega8515”.

   To show or add device, choose menu **File -> New Control**, and then choose **LED** to show LED Menu.



Ready

3. Do configurations to LED by choosing menu **Options -> LED Settings.** On **Port** menu, change them all according to what is used in program (**PORTA** to **PORTB**).



LED Name	Color	Port	Bit	Inv.
LED0	red	PORTA	0	☐
LED1	red	PORTA	1	☐
LED2	red	PORTA	2	☐
LED3	red	PORTA	3	☐
LED4	red	PORTA	4	☐
LED5	red	PORTA	5	☐
LED6	red	PORTA	6	☐
LED7	red	PORTA	7	☐

4. To do synchronizing with the program at AVR Studio, choose menu **Options -> AVR Studio Hook** first. After choosing that menu, run the program above and see the changes at Hapsim.
5. For better experience while using Hapsim, configure your Hapsim **Options -> Stay On Top**

Run the program below and change the value1 and value2. See what happens.

```
; a simple program using compare
.include "m8515def.inc"
.def value1 = r16
.def value2= r17
.def temp1 = r18
.def secret = r20
.equ huehue = 69
ser temp1
out
DDRA,temp
1
ldi value1,
50
ldi value2, 19
ldi secret, huehue
add value1, value2
cp secret, value1
brne turn_on_top_led
rjmp forever


turn_on_top_led:
ldi temp1, 0x01
out

PORTA,tem

p1 forever:

rjmp forever ;infinite loop
```

Exercise :

1. Compare the value of value1 and value2. If value1 > value2, then LED0-LED3 will be turned on. jika value1 < value2 thenLED4-LED7 will be turned on. If value1=value2, then all LED will be turned on. (name it question1_1.asm dan question1_1.xml)