

Lab 7

10 April 2013

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Objective-

The objective of this lab was to learn how to write a program to accept V_{in} from the slide bar of the analog to digital panel, and display V_{out} on the digital to analog panel.

Equipment used-

Software: a text editor and an 8051 ASM assembler

A step debugger that can be used to execute a program one step at a time

Register, code memory, data memory, and input/output port contents are displayed to aid debugging.

Test Results-

$V_{in} = 0v$, $V_{out} = 5v$

The screenshot displays the EdSim51DI software interface for an 8051 microcontroller simulation. The main window is divided into several sections:

- Register Window:** Shows the status of various registers including SBUF, TH0, TL0, R7, B, ACC, R6, PSW, R5, IP, R4, IE, R3, PCON, R2, DPH, R1, DPL, R0, SP, and PC. The PC register is highlighted with the value 0x0077.
- Code Editor:** Contains assembly code for the program. The code includes instructions like `Org 0h`, `clr p0.7`, `jmp start`, `org 30h`, `start:`, `clr p3.6`, `setb p3.6`, `jb p3.2, $;wait for complet`, `clr p3.7`, `mov a, p2`, `mov b, #204`, `subb a, b`, `jc lessthan4`, `mov a, p2`, `mov b, #4`, `mul AB`, `mov b, a`, and `mov a, #20`.
- Data Memory Window:** Shows a table of data memory addresses (00 to 50) and their corresponding values.
- DAC Scope:** A graph showing the DAC output on scope, with a vertical axis ranging from 0.0 V to 5.0 V. The output is currently at 0.0 V.
- Control Panel:** Includes a UART configuration section (8-bit UART @ 2400 Baud), Rx and Tx input fields, and a digital display showing the value 00000000.

Vin = 1v, Vout = 1v

The screenshot shows the EdSim51DI interface with the following components:

- System Clock:** 11.0592 MHz, 750 Update Freq.
- Registers:** R7-0x00, R6-0x00, R5-0x00, R4-0x00, R3-0x00, R2-0x00, R1-0x00, R0-0x31; B-0x33, ACC-0x32, PSW-0x01, IE-0x00, DPH-0x00, DPL-0x00, SP-0x07.
- PC:** 8051
- Data Memory:** Address 0x00, Value 0x00.
- Code Memory:**

```

Org 0h
0000| clr p0.7
0002| jmp start
org 30h

start:
0030| clr p3.6
0032| setb p3.6
0034| jb p3.2, $ ;wait for complet

0037| clr p3.7
0039| mov a, p2
003B| mov b, #204
003E| subb a, b
0040| jc lessthan4

0042| mov a, p2
0044| mov b, #4
0047| mul AB
0048| mov b, a
004A| mov a, #20

```
- Hardware:** 8-bit UART @ 2400 Baud, No Parity. DAC Scope shows 1.0V. 7-segment display shows '11111111'.

Vin = 2v, Vout = 1v

The screenshot shows the EdSim51DI interface with the following components:

- System Clock:** 11.0592 MHz, 750 Update Freq.
- Registers:** R7-0x00, R6-0x00, R5-0x00, R4-0x00, R3-0x00, R2-0x00, R1-0x00, R0-0x31; B-0x33, ACC-0x32, PSW-0x01, IE-0x00, DPH-0x00, DPL-0x00, SP-0x07.
- PC:** 8051
- Data Memory:** Address 0x00, Value 0x00.
- Code Memory:**

```

Org 0h
0000| clr p0.7
0002| jmp start
org 30h

start:
0030| clr p3.6
0032| setb p3.6
0034| jb p3.2, $ ;wait for complet

0037| clr p3.7
0039| mov a, p2
003B| mov b, #204
003E| subb a, b
0040| jc lessthan4

0042| mov a, p2
0044| mov b, #4
0047| mul AB
0048| mov b, a
004A| mov a, #20

```
- Hardware:** 8-bit UART @ 2400 Baud, No Parity. DAC Scope shows 1.0V. 7-segment display shows '01111111'. Motor Enabled.

$V_{in} = 3v, V_{out} = 1v$

The screenshot shows the EdSim51DI simulation environment. The register window displays the following values:

R/O	W/O	TH0	TL0	R7	0x00	B	0x33
0x00	0x00	0x00	0x00	R6	0x00	ACC	0x99
RXD	TXD			R5	0x00	PSW	0xC0
1	1	TMOD	0x00	R4	0x00	IP	0x00
SCON	0x00	TCON	0x02	R3	0x00	IE	0x00
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x00	DPH	0x00
0x7B	0x7F	P3	0x00	R0	0x31	DPL	0x00
0x99	0xFF	P2				SP	0x07
0x33	0x33	P1					
0x7F	0x7F	P0					

The PC register is 8051. The assembly code window shows the following instructions:

```

Org 0h
0000| clr p0.7
0002| jmp start
      org 30h

start:
0030| clr p3.6
0032| setb p3.6
0034| jb p3.2, $ ;wait for complet

0037| clr p3.7
0039| mov a, P2
003B| mov b, #204
003E| subb a, b
0040| jc lessthan4

0042| mov a, p2
0044| mov b, #4
0047| mul AB
0048| mov b, a
004A| mov a, #20
  
```

The DAC scope shows a constant output of 1.0 V. The ADC input is 3.0 V, and the ADC value is 10011001.

$V_{in} = 4v, V_{out} = 4v$

The screenshot shows the EdSim51DI simulation environment. The register window displays the following values:

R/O	W/O	TH0	TL0	R7	0x00	B	0x03
0x00	0x00	0x00	0x00	R6	0x00	ACC	0xCC
RXD	TXD			R5	0x00	PSW	0x00
1	1	TMOD	0x00	R4	0x00	IP	0x00
SCON	0x00	TCON	0x02	R3	0x00	IE	0x00
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x00	DPH	0x00
0x7B	0x7F	P3	0x00	R0	0x31	DPL	0x00
0xCC	0xFF	P2				SP	0x07
0xCC	0xCC	P1					
0x7F	0x7F	P0					

The PC register is 8051. The assembly code window shows the following instructions:

```

Org 0h
0000| clr p0.7
0002| jmp start
      org 30h

start:
0030| clr p3.6
0032| setb p3.6
0034| jb p3.2, $ ;wait for complet

0037| clr p3.7
0039| mov a, P2
003B| mov b, #204
003E| subb a, b
0040| jc lessthan4

0042| mov a, p2
0044| mov b, #4
0047| mul AB
0048| mov b, a
004A| mov a, #20
  
```

The DAC scope shows a constant output of 4.0 V. The ADC input is 4.0 V, and the ADC value is 11001100.

$V_{in} = 5v, V_{out} = 0v$

The screenshot displays the EdSim51DI software interface. At the top, the system clock is set to 11.0592 MHz and the update frequency is 750. The assembly code window shows the following instructions:

```

Org 0h
0000| clr p0.7
0002| jmp start
      org 30h

start:
0030| clr p3.6
0032| seth p3.6
0034| jb p3.2, $ ;wait for complet
0037| clr p3.7
0039| mov a, p2
003B| mov b, #204
003E| subb a, b
0040| jc lessthan4
0042| mov a, p2
0044| mov b, #4
0047| mul AB
0048| mov b, a
004A| mov a, #20
  
```

The register window shows the PC register at address 0x004A with a value of 8051. The Data Memory window shows a table of memory addresses and values:

addr	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	31	00	00	00	00	00	00	00	00	45	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	31	32	33	34	35	36	37	38	39	00	00	00	00	00	00
40	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

The DAC Scope window shows a plot of the DAC output on scope, with a scale from 0.0 V to 5.0 V. The output is currently at 0.47 V. The UART window shows the configuration: No Parity, 8-bit UART @ 2400 Baud. The Tx and Rx registers are empty, and the Tx Send button is visible. The ADC window shows the input value 11111111 and the ADC button.

Flow Chart-

Conclusion-

This lab was effective in teaching me how to use the DAC and ADC parts of the 8051.

Program

```
Org 0h
clr p0.7
jmp start
org 30h
start:
    clr p3.6
    setb p3.6
    jb p3.2, $ ;wait for completion of current
conversion
    clr p3.7
    mov a,P2
    mov b, #204
    subb a, b
    jc lessthan4
    mov a, p2
    mov b, #4
    mul AB
    mov b, a
    mov a, #20
    subb a, b
    mov p1,a
setb p3.7
    jmp start
lessthan4:
    clr p3.7
    mov a,P2
    mov b, #153
    subb a, b
    jc lessthan3
    mov a, p2
    mov b, #3
    mul AB
    mov b, #408
    subb a, b
    mov p1,a
    setb p3.7
    jmp start
lessthan3:
    clr p3.7
    mov a,P2
    mov b, #51
    subb a, b
    jc lessthan1
    mov p1, #51
    setb p3.7
    jmp start
lessthan1:
    clr p3.7
    mov a,P2
    mov b, #4
    mul AB
    mov b, a
    mov a, #255
    subb a, b
    mov p1,a
    setb p3.7
    jmp start
end
```