Lab 1

30 January, 2013

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Objective-

The objective of this lab is to get familiar with the virtual lab program edsim51.jar and to input assembly source program, assemble the program to hex/machine code and execute and debug the program.

Equipment used-

Software: a text editor and an 8051 ASM assembler

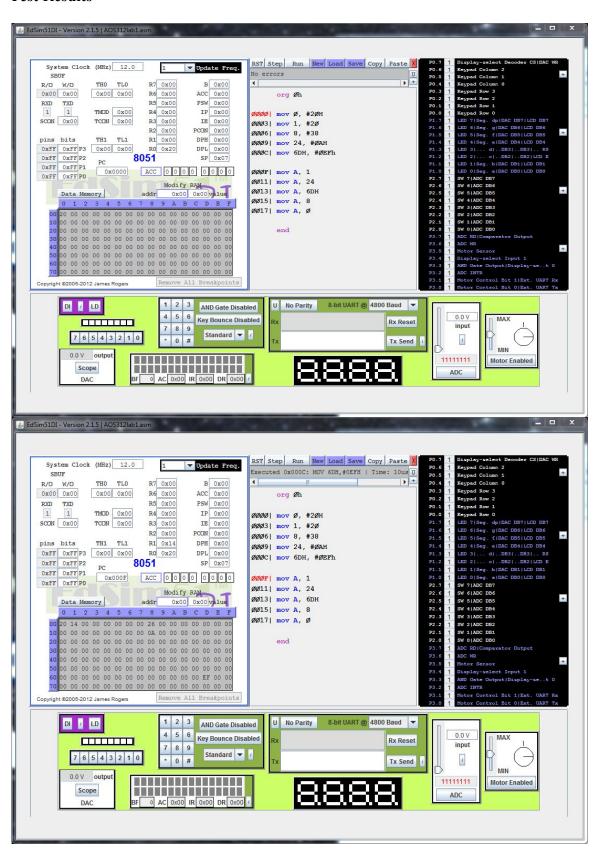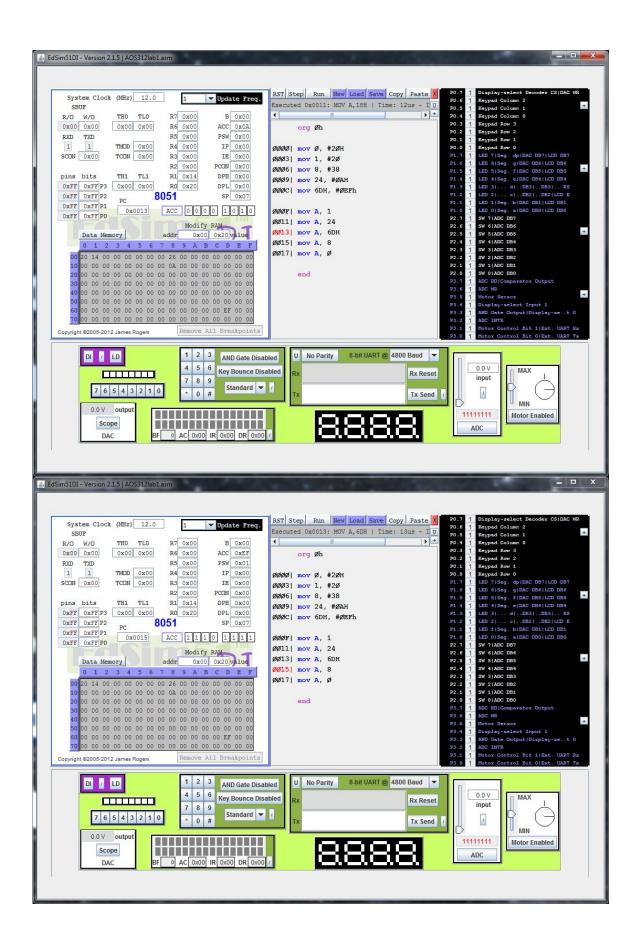A step debugger that can be used to execute a program one step at

a time

Register, code memory, data memory, and input/output port

contents are displayed to aid debugging.

Flow Chart-

Test Results-

EdSim51DI - Version 2.1.5 | AOS312lab1.asm

Screenshot 1

System Clock (MHz) 12.0   1 ▼ Update Freq.

SBUF
R/O W/O   TH0   TL0   R7 0x00   B   0x00
0x00 0x00   0x00 0x00   R6 0x00   ACC 0x0A
RXD TXD   R5 0x00   PSW 0x00
 1   1   TMOD 0x00   R4 0x00   IP   0x00
SCON 0x00   TCON 0x00   R3 0x00   IE   0x00
                           R2 0x00   PCON 0x00
pins bits   TH1   TL1   R1 0x14   DPH 0x00
0xFF 0xFF P3 0x00 0x00   R0 0x00   DPL 0x00
0xFF 0xFF P2   SP   0x07
0xFF 0xFF P1   PC
0xFF 0xFF P0   0x0013   ACC 0 0 0 0 1 0 1 0

Modify RAM
Data Memory   addr 0x00 0x20 value

      0 1 2 3 4 5 6 7 8 9 A B C D E F
00 20 14 00 00 00 00 00 00 26 00 00 00 00 00 00 00
10 00 00 00 00 00 00 00 00 0A 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 00 00 00 00 00 00 00 00 00 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
60 00 00 00 00 00 00 00 00 00 00 00 00 00 EF 00 00
70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

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RST | Step | Run | New | Load | Save | Copy | Paste
Executed 0x0011: MOV A,18H | Time: 12us - I

```
        org Øh

0000|   mov Ø, #2ØH
0003|   mov 1, #2Ø
0006|   mov 8, #38
0009|   mov 24, #ØAH
000C|   mov 6DH, #ØEFh

000F|   mov A, 1
0011|   mov A, 24
0013|   mov A, 6DH
0015|   mov A, 8
0017|   mov A, Ø

        end
```

Remove All Breakpoints

DI | i | LD

7 6 5 4 3 2 1 0

0.0 V output
Scope
DAC

1 2 3   AND Gate Disabled
4 5 6   Key Bounce Disabled
7 8 9
* 0 #   Standard ▼ i

BF 0 AC 0x00 IR 0x00 DR 0x00

U No Parity   8-bit UART @ 4800 Baud ▼
Rx
Tx   Rx Reset
            Tx Send i

0.0 V input
11111111
ADC

MAX
MIN
Motor Enabled

P0.7 1 Display-select Decoder CS|DAC WR
P0.6 1 Keypad Column 2
P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
P0.3 1 Keypad Row 3
P0.2 1 Keypad Row 2
P0.1 1 Keypad Row 1
P0.0 1 Keypad Row 0
P1.7 1 LED 7|Seg. dp|DAC DB7|LCD DB7
P1.6 1 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 1 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 1 LED 3|... d|..DB3|..DB3|.. RS
P1.2 1 LED 2|... c|..DB2|..DB2|LCD E
P1.1 1 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 1 LED 0|Seg. a|DAC DB0|LCD DB0
P2.7 1 SW 7|ADC DB7
P2.6 1 SW 6|ADC DB6
P2.5 1 SW 5|ADC DB5
P2.4 1 SW 4|ADC DB4
P2.3 1 SW 3|ADC DB3
P2.2 1 SW 2|ADC DB2
P2.1 1 SW 1|ADC DB1
P2.0 1 SW 0|ADC DB0
P3.7 1 ADC RD|Comparator Output
P3.6 1 ADC WR
P3.5 1 Motor Sensor
P3.4 1 Display-select Input 1
P3.3 1 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
P3.0 1 Motor Control Bit 0|Ext. UART Tx

Screenshot 2

EdSim51DI - Version 2.1.5 | AOS312lab1.asm

System Clock (MHz) 12.0   1 ▼ Update Freq.

SBUF
R/O W/O   TH0   TL0   R7 0x00   B   0x00
0x00 0x00   0x00 0x00   R6 0x00   ACC 0xEF
RXD TXD   R5 0x00   PSW 0x01
 1   1   TMOD 0x00   R4 0x00   IP   0x00
SCON 0x00   TCON 0x00   R3 0x00   IE   0x00
                           R2 0x00   PCON 0x00
pins bits   TH1   TL1   R1 0x14   DPH 0x00
0xFF 0xFF P3 0x00 0x00   R0 0x20   DPL 0x00
0xFF 0xFF P2   SP   0x07
0xFF 0xFF P1   PC
0xFF 0xFF P0   0x0015   ACC 1 1 1 0 1 1 1 1

Modify RAM
Data Memory   addr 0x00 0x20 value

      0 1 2 3 4 5 6 7 8 9 A B C D E F
00 20 14 00 00 00 00 00 00 26 00 00 00 00 00 00 00
10 00 00 00 00 00 00 00 00 0A 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 00 00 00 00 00 00 00 00 00 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
60 00 00 00 00 00 00 00 00 00 00 00 00 00 EF 00 00
70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

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RST | Step | Run | New | Load | Save | Copy | Paste
Executed 0x0013: MOV A,6DH | Time: 13us - I

```
        org Øh

0000|   mov Ø, #2ØH
0003|   mov 1, #2Ø
0006|   mov 8, #38
0009|   mov 24, #ØAH
000C|   mov 6DH, #ØEFh

000F|   mov A, 1
0011|   mov A, 24
0013|   mov A, 6DH
0015|   mov A, 8
0017|   mov A, Ø

        end
```

Remove All Breakpoints

DI | i | LD

7 6 5 4 3 2 1 0

0.0 V output
Scope
DAC

1 2 3   AND Gate Disabled
4 5 6   Key Bounce Disabled
7 8 9
* 0 #   Standard ▼ i

BF 0 AC 0x00 IR 0x00 DR 0x00

U No Parity   8-bit UART @ 4800 Baud ▼
Rx
Tx   Rx Reset
            Tx Send i

0.0 V input
11111111
ADC

MAX
MIN
Motor Enabled

P0.7 1 Display-select Decoder CS|DAC WR
P0.6 1 Keypad Column 2
P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
P0.3 1 Keypad Row 3
P0.2 1 Keypad Row 2
P0.1 1 Keypad Row 1
P0.0 1 Keypad Row 0
P1.7 1 LED 7|Seg. dp|DAC DB7|LCD DB7
P1.6 1 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 1 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 1 LED 3|... d|..DB3|..DB3|.. RS
P1.2 1 LED 2|... c|..DB2|..DB2|LCD E
P1.1 1 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 1 LED 0|Seg. a|DAC DB0|LCD DB0
P2.7 1 SW 7|ADC DB7
P2.6 1 SW 6|ADC DB6
P2.5 1 SW 5|ADC DB5
P2.4 1 SW 4|ADC DB4
P2.3 1 SW 3|ADC DB3
P2.2 1 SW 2|ADC DB2
P2.1 1 SW 1|ADC DB1
P2.0 1 SW 0|ADC DB0
P3.7 1 ADC RD|Comparator Output
P3.6 1 ADC WR
P3.5 1 Motor Sensor
P3.4 1 Display-select Input 1
P3.3 1 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
P3.0 1 Motor Control Bit 0|Ext. UART Tx

EdSim51DI - Version 2.1.5 | AOS312lab1.asm

Window 1:

System Clock (MHz) 12.0 — 1 ▼ Update Freq.

SBUF

R/O	W/O		TH0	TL0		R7	0x00		B	0x00
0x00	0x00		0x00	0x00		R6	0x00		ACC	0x26
RXD	TXD					R5	0x00		PSW	0x01
1	1		TMOD	0x00		R4	0x00		IP	0x00
SCON	0x00		TCON	0x00		R3	0x00		IE	0x00
						R2	0x00		PCON	0x00

pins bits TH1 TL1 R1 0x14 DPH 0x00
0xFF 0xFF P3 0x00 0x00 R0 0x00 DPL 0x00
0xFF 0xFF P2 **8051** SP 0x07
0xFF 0xFF P1 PC
0xFF 0xFF P0 0x0017 ACC 0 0 1 0 0 1 1 0

Modify RAM

Data Memory addr 0x00 0x20 value

```
    0 1 2 3 4 5 6 7 8 9 A B C D E F
00  20 14 00 00 00 00 00 00 26 00 00 00 00 00 00 00
10  00 00 00 00 0A 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 00 00 00 00 00 00 00 00 00 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
60  00 00 00 00 00 00 00 00 00 00 00 EF 00 00 00 00
70  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

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RST Step Run New Load Save Copy Paste X
Executed 0x0015: MOV A,08H | Time: 14us - I

```
        org Øh

0000|   mov Ø, #2ØH
0003|   mov 1, #2Ø
0006|   mov 8, #38
0009|   mov 24, #ØAH
000C|   mov 6DH, #ØEFh

000F|   mov A, 1
0011|   mov A, 24
0013|   mov A, 6DH
0015|   mov A, 8
0017|   mov A, Ø

        end
```

P0.7 1 Display-select Decoder CS|DAC WR
P0.6 1 Keypad Column 2
P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
P0.3 1 Keypad Row 3
P0.2 1 Keypad Row 2
P0.1 1 Keypad Row 1
P0.0 1 Keypad Row 0
P1.7 1 LED 7|Seg. dp|DAC DB7|LCD DB7
P1.6 1 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 1 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 1 LED 3|... d|..DB3|..DB3|.. RS
P1.2 1 LED 2|... c|..DB2|..DB2|LCD E
P1.1 1 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 1 LED 0|Seg. a|DAC DB0|LCD DB0
P2.7 1 SW 7|ADC DB7
P2.6 1 SW 6|ADC DB6
P2.5 1 SW 5|ADC DB5
P2.4 1 SW 4|ADC DB4
P2.3 1 SW 3|ADC DB3
P2.2 1 SW 2|ADC DB2
P2.1 1 SW 1|ADC DB1
P2.0 1 SW 0|ADC DB0
P3.7 1 ADC RD|Comparator Output
P3.6 1 ADC WR
P3.5 1 Motor Sensor
P3.4 1 Display-select Input 1
P3.3 1 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
P3.0 1 Motor Control Bit 0|Ext. UART Tx

DI i LD
7 6 5 4 3 2 1 0

0.0 V output
Scope
DAC

BF 0 AC 0x00 IR 0x00 DR 0x00

1 2 3   AND Gate Disabled
4 5 6   Key Bounce Disabled
7 8 9
* 0 #   Standard ▼ i

U No Parity   8-bit UART @ 4800 Baud ▼
Rx
Tx   Rx Reset
      Tx Send i

0.0 V input
i
11111111
ADC

MAX
MIN
Motor Enabled

Window 2:

EdSim51DI - Version 2.1.5 | AOS312lab1.asm

System Clock (MHz) 12.0 — 1 ▼ Update Freq.

SBUF

R/O	W/O		TH0	TL0		R7	0x00		B	0x00
0x00	0x00		0x00	0x00		R6	0x00		ACC	0x20
RXD	TXD					R5	0x00		PSW	0x01
1	1		TMOD	0x00		R4	0x00		IP	0x00
SCON	0x00		TCON	0x00		R3	0x00		IE	0x00
						R2	0x00		PCON	0x00

pins bits TH1 TL1 R1 0x14 DPH 0x00
0xFF 0xFF P3 0x00 0x00 R0 0x20 DPL 0x00
0xFF 0xFF P2 **8051** SP 0x07
0xFF 0xFF P1 PC
0xFF 0xFF P0 0x0019 ACC 0 0 1 0 0 0 0 0

Modify RAM

Data Memory addr 0x00 0x20 value

```
    0 1 2 3 4 5 6 7 8 9 A B C D E F
00  20 14 00 00 00 00 00 00 26 00 00 00 00 00 00 00
10  00 00 00 00 0A 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 00 00 00 00 00 00 00 00 00 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
60  00 00 00 00 00 00 00 00 00 00 00 EF 00 00 00 00
70  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

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RST Step Run New Load Save Copy Paste X
Executed 0x0017: MOV A,00H | Time: 15us - I

```
        org Øh

0000|   mov Ø, #2ØH
0003|   mov 1, #2Ø
0006|   mov 8, #38
0009|   mov 24, #ØAH
000C|   mov 6DH, #ØEFh

000F|   mov A, 1
0011|   mov A, 24
0013|   mov A, 6DH
0015|   mov A, 8
0017|   mov A, Ø

        end
```

P0.7 1 Display-select Decoder CS|DAC WR
P0.6 1 Keypad Column 2
P0.5 1 Keypad Column 1
P0.4 1 Keypad Column 0
P0.3 1 Keypad Row 3
P0.2 1 Keypad Row 2
P0.1 1 Keypad Row 1
P0.0 1 Keypad Row 0
P1.7 1 LED 7|Seg. dp|DAC DB7|LCD DB7
P1.6 1 LED 6|Seg. g|DAC DB6|LCD DB6
P1.5 1 LED 5|Seg. f|DAC DB5|LCD DB5
P1.4 1 LED 4|Seg. e|DAC DB4|LCD DB4
P1.3 1 LED 3|... d|..DB3|..DB3|.. RS
P1.2 1 LED 2|... c|..DB2|..DB2|LCD E
P1.1 1 LED 1|Seg. b|DAC DB1|LCD DB1
P1.0 1 LED 0|Seg. a|DAC DB0|LCD DB0
P2.7 1 SW 7|ADC DB7
P2.6 1 SW 6|ADC DB6
P2.5 1 SW 5|ADC DB5
P2.4 1 SW 4|ADC DB4
P2.3 1 SW 3|ADC DB3
P2.2 1 SW 2|ADC DB2
P2.1 1 SW 1|ADC DB1
P2.0 1 SW 0|ADC DB0
P3.7 1 ADC RD|Comparator Output
P3.6 1 ADC WR
P3.5 1 Motor Sensor
P3.4 1 Display-select Input 1
P3.3 1 AND Gate Output|Display-se..t 0
P3.2 1 ADC INTR
P3.1 1 Motor Control Bit 1|Ext. UART Rx
P3.0 1 Motor Control Bit 0|Ext. UART Tx

DI i LD
7 6 5 4 3 2 1 0

0.0 V output
Scope
DAC

BF 0 AC 0x00 IR 0x00 DR 0x00

1 2 3   AND Gate Disabled
4 5 6   Key Bounce Disabled
7 8 9
* 0 #   Standard ▼ i

U No Parity   8-bit UART @ 4800 Baud ▼
Rx
Tx   Rx Reset
      Tx Send i

0.0 V input
i
11111111
ADC

MAX
MIN
Motor Enabled

The program runs successfully and moves the data to the correct memory locations.

Conclusion-

This was a good first introduction lab. I installed the edsim51 on my computer and became familiar with the interface. I learned how to interpret

Program-

org 0h ;starts the code at memory location 0

;Storing 5 data values to 5 data memory locations/addresses

mov 0, #20H ; stores hex value 20 at location 0

mov 1, #20 ; stores decimal value 20 at data decimal address 1

mov 8, #38 ; stores decimal value 38 or 26H to data memory decimal adress 8

mov 24, #0AH; stores hex value AH to data memory address 24 (hex 18h)

mov 6DH, #0EFh ; stores hex value EFH at data memory hex address 6D

;The following instructions read each data back from data memory and put the data

;in register A (ACC).

mov A, 1 ; read data from memory location 1 to register A

mov A, 24; read data from memory address 24 to register A

mov A, 6DH; read data from memory location 6DH to register A

mov A, 8; read data from memory location 8 to register A

mov A, 0; read data from memory location 0 to register A

end