

Lab 3

20 February, 2013

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Objective-

The objective of this lab was to become familiar using external I/O devices connected to P0, P1, P2, and P3 by programming traffic lights into the LEDs connected to P1.

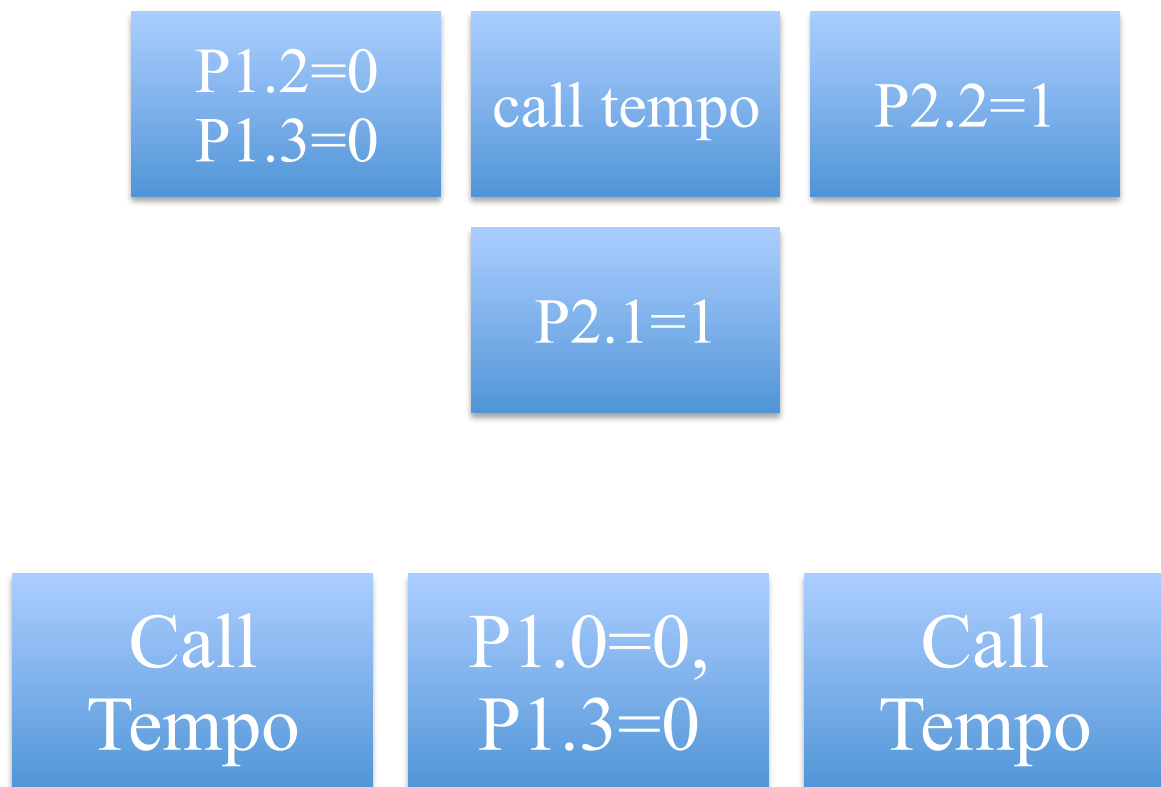
Equipment used-

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-



P1.0=0,
P1.5=0

Call
Tempo

Mov p1,
#0DEH

Call
Tempo

Move p1,
#)f6h

call
tempo

Tempo:

NOP x 8

RET

URG:

mov p1,
#of6h

call tempo

mov p1,
#0ffh

call tempo

JNB P2.2,
NOURG

Call Urg

RET

Test Results-Urgent on and off

The image displays two sequential screenshots of the EdSim51DI simulation environment, showing the execution of assembly code for a microcontroller. The interface includes a register window, a code editor, a peripheral control panel, and a hardware status display.

Top Screenshot (Time: 121us - Instructions: 90):

- Register Window:** Shows various registers including R0-R7, ACC (0x0025), PC (0x0000), and SP (0x11).
- Code Editor:** Displays assembly instructions:


```

      00111| MOV P1, #0xP5H
      0014| CALL TEMPO
      0016| L2: MOV P1, #0xDEH
      0019| CALL TEMPO
      001B| MOV P1, #0xERH
      001E| CALL TEMPO
      0020| JMP start
      ;Mov p1, #0
      ;:;DELAY FUNCTION
      0022| TEMPO: NOP
      0023| NOP
      0024| NOP
      0025| NOP
      
```
- Peripheral Control Panel:** Shows a keyboard (DI, LD), a numeric keypad, and a 4800 Baud UART interface. The DAC output is 4.82 V.
- Hardware Status:** The hex display shows '8888' and the motor status is 'Motor Enabled'.

Bottom Screenshot (Time: 139us - Instructions: 105):

- Register Window:** Shows the PC register updated to 0x0029 and the ACC register to 0x0000.
- Code Editor:** Shows the execution of NOP instructions:


```

      0016| L2: MOV P1, #0xDEH
      0019| CALL TEMPO
      001B| MOV P1, #0xERH
      001E| CALL TEMPO
      0020| JMP start
      ;Mov p1, #0
      ;:;DELAY FUNCTION
      0022| TEMPO: NOP
      0023| NOP
      0024| NOP
      0025| NOP
      0026| NOP
      0027| NOP
      0028| NOP
      0029| NOP
      
```
- Peripheral Control Panel:** Identical to the top screenshot.
- Hardware Status:** The hex display remains '8888' and the motor status remains 'Motor Enabled'.

Red and green continuously on

EdSim51DI - Version 2.1.5 | AOS312lab3.asm

System Clock (MHz) 12.0 | Update Freq. 5

RST Step Pause New Load Save Copy Paste

Time: 302us - Instructions: 230

```
0016| L2: MOV P1, #0DEH
0019| CALL TEMPO
001B| MOV P1, #0DEH
001E| CALL TEMPO
0020| JMP start ;Mov p1, #0
;;DELAY FUNCTION
0022| TEMPO: NOP
0023| NOP
0024| NOP
0025| NOP
0026| NOP
0027| NOP
0028| NOP
0029| NOP
```

DI 7 LD | AND Gate Disabled | No Parity 8-bit UART @ 4800 Baud | 0.0 V input | 11111111 | MAX | MIN | Motor Enabled

4.82 V output | DAC | Error Function set not called | 8888

Normal operation

EdSim51DI - Version 2.1.5 | AOS312lab3.asm

System Clock (MHz) 12.0 | Update Freq. 5

RST Step Run New Load Save Copy Paste

Time: 705us - Instructions: 510

```
0016| L2: MOV P1, #0DEH
0019| CALL TEMPO
001B| MOV P1, #0DEH
001E| CALL TEMPO
0020| JMP start ;Mov p1, #0
;;DELAY FUNCTION
0022| TEMPO: NOP
0023| NOP
0024| NOP
0025| NOP
0026| NOP
0027| NOP
0028| NOP
0029| NOP
```

DI 7 LD | AND Gate Disabled | No Parity 8-bit UART @ 4800 Baud | 0.0 V input | 11111111 | MAX | MIN | Motor Enabled

4.82 V output | DAC | Error Function set not called | 8888

EdSim51DL - Version 2.1.5 [AOS312lab3.asm]

System Clock (MHz): 12.0

Register File:

R0	0x00	R4	0x1B	R8	0x00
R1	0x00	R5	0x1B	R9	0x00
R2	0x00	R6	0x1B	RA	0x00
R3	0x00	R7	0x1B	RB	0x00

Program Counter: PC 0x0029

Accumulator: ACC 0x0000

Instruction List:

```
0000: MOV R0, #0x00
0001: MOV R1, #0x00
0002: MOV R2, #0x00
0003: MOV R3, #0x00
0004: MOV R4, #0x1B
0005: MOV R5, #0x1B
0006: MOV R6, #0x1B
0007: MOV R7, #0x1B
0008: MOV R8, #0x00
0009: MOV R9, #0x00
000A: MOV RA, #0x00
000B: MOV RB, #0x00
000C: MOV R0, #0x00
000D: MOV R1, #0x00
000E: MOV R2, #0x00
000F: MOV R3, #0x00
0010: MOV R4, #0x1B
0011: MOV R5, #0x1B
0012: MOV R6, #0x1B
0013: MOV R7, #0x1B
0014: MOV R8, #0x00
0015: MOV R9, #0x00
0016: MOV RA, #0x00
0017: MOV RB, #0x00
0018: MOV R0, #0x00
0019: MOV R1, #0x00
001A: MOV R2, #0x00
001B: MOV R3, #0x00
001C: MOV R4, #0x1B
001D: MOV R5, #0x1B
001E: MOV R6, #0x1B
001F: MOV R7, #0x1B
0020: MOV R8, #0x00
0021: MOV R9, #0x00
0022: MOV RA, #0x00
0023: MOV RB, #0x00
0024: MOV R0, #0x00
0025: MOV R1, #0x00
0026: MOV R2, #0x00
0027: MOV R3, #0x00
0028: MOV R4, #0x1B
0029: MOV R5, #0x1B
002A: MOV R6, #0x1B
002B: MOV R7, #0x1B
002C: MOV R8, #0x00
002D: MOV R9, #0x00
002E: MOV RA, #0x00
002F: MOV RB, #0x00
0030: MOV R0, #0x00
0031: MOV R1, #0x00
0032: MOV R2, #0x00
0033: MOV R3, #0x00
0034: MOV R4, #0x1B
0035: MOV R5, #0x1B
0036: MOV R6, #0x1B
0037: MOV R7, #0x1B
0038: MOV R8, #0x00
0039: MOV R9, #0x00
003A: MOV RA, #0x00
003B: MOV RB, #0x00
003C: MOV R0, #0x00
003D: MOV R1, #0x00
003E: MOV R2, #0x00
003F: MOV R3, #0x00
0040: MOV R4, #0x1B
0041: MOV R5, #0x1B
0042: MOV R6, #0x1B
0043: MOV R7, #0x1B
0044: MOV R8, #0x00
0045: MOV R9, #0x00
0046: MOV RA, #0x00
0047: MOV RB, #0x00
0048: MOV R0, #0x00
0049: MOV R1, #0x00
004A: MOV R2, #0x00
004B: MOV R3, #0x00
004C: MOV R4, #0x1B
004D: MOV R5, #0x1B
004E: MOV R6, #0x1B
004F: MOV R7, #0x1B
0050: MOV R8, #0x00
0051: MOV R9, #0x00
0052: MOV RA, #0x00
0053: MOV RB, #0x00
0054: MOV R0, #0x00
0055: MOV R1, #0x00
0056: MOV R2, #0x00
0057: MOV R3, #0x00
0058: MOV R4, #0x1B
0059: MOV R5, #0x1B
005A: MOV R6, #0x1B
005B: MOV R7, #0x1B
005C: MOV R8, #0x00
005D: MOV R9, #0x00
005E: MOV RA, #0x00
005F: MOV RB, #0x00
0060: MOV R0, #0x00
0061: MOV R1, #0x00
0062: MOV R2, #0x00
0063: MOV R3, #0x00
0064: MOV R4, #0x1B
0065: MOV R5, #0x1B
0066: MOV R6, #0x1B
0067: MOV R7, #0x1B
0068: MOV R8, #0x00
0069: MOV R9, #0x00
006A: MOV RA, #0x00
006B: MOV RB, #0x00
006C: MOV R0, #0x00
006D: MOV R1, #0x00
006E: MOV R2, #0x00
006F: MOV R3, #0x00
0070: MOV R4, #0x1B
0071: MOV R5, #0x1B
0072: MOV R6, #0x1B
0073: MOV R7, #0x1B
0074: MOV R8, #0x00
0075: MOV R9, #0x00
0076: MOV RA, #0x00
0077: MOV RB, #0x00
0078: MOV R0, #0x00
0079: MOV R1, #0x00
007A: MOV R2, #0x00
007B: MOV R3, #0x00
007C: MOV R4, #0x1B
007D: MOV R5, #0x1B
007E: MOV R6, #0x1B
007F: MOV R7, #0x1B
0080: MOV R8, #0x00
0081: MOV R9, #0x00
0082: MOV RA, #0x00
0083: MOV RB, #0x00
0084: MOV R0, #0x00
0085: MOV R1, #0x00
0086: MOV R2, #0x00
0087: MOV R3, #0x00
0088: MOV R4, #0x1B
0089: MOV R5, #0x1B
008A: MOV R6, #0x1B
008B: MOV R7, #0x1B
008C: MOV R8, #0x00
008D: MOV R9, #0x00
008E: MOV RA, #0x00
008F: MOV RB, #0x00
0090: MOV R0, #0x00
0091: MOV R1, #0x00
0092: MOV R2, #0x00
0093: MOV R3, #0x00
0094: MOV R4, #0x1B
0095: MOV R5, #0x1B
0096: MOV R6, #0x1B
0097: MOV R7, #0x1B
0098: MOV R8, #0x00
0099: MOV R9, #0x00
009A: MOV RA, #0x00
009B: MOV RB, #0x00
009C: MOV R0, #0x00
009D: MOV R1, #0x00
009E: MOV R2, #0x00
009F: MOV R3, #0x00
00A0: MOV R4, #0x1B
00A1: MOV R5, #0x1B
00A2: MOV R6, #0x1B
00A3: MOV R7, #0x1B
00A4: MOV R8, #0x00
00A5: MOV R9, #0x00
00A6: MOV RA, #0x00
00A7: MOV RB, #0x00
00A8: MOV R0, #0x00
00A9: MOV R1, #0x00
00AA: MOV R2, #0x00
00AB: MOV R3, #0x00
00AC: MOV R4, #0x1B
00AD: MOV R5, #0x1B
00AE: MOV R6, #0x1B
00AF: MOV R7, #0x1B
00B0: MOV R8, #0x00
00B1: MOV R9, #0x00
00B2: MOV RA, #0x00
00B3: MOV RB, #0x00
00B4: MOV R0, #0x00
00B5: MOV R1, #0x00
00B6: MOV R2, #0x00
00B7: MOV R3, #0x00
00B8: MOV R4, #0x1B
00B9: MOV R5, #0x1B
00BA: MOV R6, #0x1B
00BB: MOV R7, #0x1B
00BC: MOV R8, #0x00
00BD: MOV R9, #0x00
00BE: MOV RA, #0x00
00BF: MOV RB, #0x00
00C0: MOV R0, #0x00
00C1: MOV R1, #0x00
00C2: MOV R2, #0x00
00C3: MOV R3, #0x00
00C4: MOV R4, #0x1B
00C5: MOV R5, #0x1B
00C6: MOV R6, #0x1B
00C7: MOV R7, #0x1B
00C8: MOV R8, #0x00
00C9: MOV R9, #0x00
00CA: MOV RA, #0x00
00CB: MOV RB, #0x00
00CC: MOV R0, #0x00
00CD: MOV R1, #0x00
00CE: MOV R2, #0x00
00CF: MOV R3, #0x00
00D0: MOV R4, #0x1B
00D1: MOV R5, #0x1B
00D2: MOV R6, #0x1B
00D3: MOV R7, #0x1B
00D4: MOV R8, #0x00
00D5: MOV R9, #0x00
00D6: MOV RA, #0x00
00D7: MOV RB, #0x00
00D8: MOV R0, #0x00
00D9: MOV R1, #0x00
00DA: MOV R2, #0x00
00DB: MOV R3, #0x00
00DC: MOV R4, #0x1B
00DD: MOV R5, #0x1B
00DE: MOV R6, #0x1B
00DF: MOV R7, #0x1B
00E0: MOV R8, #0x00
00E1: MOV R9, #0x00
00E2: MOV RA, #0x00
00E3: MOV RB, #0x00
00E4: MOV R0, #0x00
00E5: MOV R1, #0x00
00E6: MOV R2, #0x00
00E7: MOV R3, #0x00
00E8: MOV R4, #0x1B
00E9: MOV R5, #0x1B
00EA: MOV R6, #0x1B
00EB: MOV R7, #0x1B
00EC: MOV R8, #0x00
00ED: MOV R9, #0x00
00EE: MOV RA, #0x00
00EF: MOV RB, #0x00
00F0: MOV R0, #0x00
00F1: MOV R1, #0x00
00F2: MOV R2, #0x00
00F3: MOV R3, #0x00
00F4: MOV R4, #0x1B
00F5: MOV R5, #0x1B
00F6: MOV R6, #0x1B
00F7: MOV R7, #0x1B
00F8: MOV R8, #0x00
00F9: MOV R9, #0x00
00FA: MOV RA, #0x00
00FB: MOV RB, #0x00
00FC: MOV R0, #0x00
00FD: MOV R1, #0x00
00FE: MOV R2, #0x00
00FF: MOV R3, #0x00
```

Assembly Code:

```
0016: L2: MOV R1, #0x0Eh
0019: CALL TEMPO
001B: MOV R1, #0x0Eh
001E: CALL TEMPO
0020: JMP start
0021: /Mov r1, #8
0022: TEMPO: NOP
0023: NOP
0024: NOP
0025: NOP
0026: NOP
0027: NOP
0028: NOP
0029: NOP
```

Hardware Status:

- 4.82 V output DAC
- ADC: 11111111
- Motor Enabled

EdSim51DL - Version 2.1.5 [AOS312lab3.asm]

System Clock (MHz): 12.0

Register File:

R0	0x00	R4	0x1B	R8	0x00
R1	0x00	R5	0x1B	R9	0x00
R2	0x00	R6	0x1B	RA	0x00
R3	0x00	R7	0x1B	RB	0x00

Program Counter: PC 0x0029

Accumulator: ACC 0x0000

Instruction List:

```
0016: MOV R1, #0x0Eh
0019: CALL TEMPO
001B: L2: MOV R1, #0x0Eh
001E: CALL TEMPO
0020: MOV R1, #0x0Eh
0023: CALL TEMPO
0025: JMP start
0026: /Mov r1, #8
0027: TEMPO: NOP
0028: NOP
0029: NOP
002A: NOP
002B: NOP
```

Hardware Status:

- 4.82 V output DAC
- ADC: 11111111
- Motor Enabled

EdSim51DL - Version 2.1.5 [AOS312lab3.asm]

System Clock (MHz): 12.0

Register File:

R0	0x00	R4	0x1B	R8	0x00
R1	0x00	R5	0x1B	R9	0x00
R2	0x00	R6	0x1B	RA	0x00
R3	0x00	R7	0x1B	RB	0x00

Program Counter: PC 0x002A

Accumulator: ACC 0x0000

Instruction List:

```
0021: RET
```

Hardware Status:

- 4.82 V output DAC
- ADC: 11111111
- Motor Enabled

EdSim51DL - Version 2.1.5 [AOS312lab3.asm]

System Clock (MHz): 12.0

Register File:

R0	0x00	R4	0x1B	R8	0x00
R1	0x00	R5	0x1B	R9	0x00
R2	0x00	R6	0x1B	RA	0x00
R3	0x00	R7	0x1B	RB	0x00

Program Counter: PC 0x002A

Accumulator: ACC 0x0000

Instruction List:

```
0021: RET
```

Hardware Status:

- 4.82 V output DAC
- ADC: 11111111
- Motor Enabled

Conclusion-

This lab was effective in showing how to write code using the external I/O pins connected to the LED and push buttons.

Program-

```
;;TRAFFIC LIGHTS
```

```
Start:
```

```
    mov p1,#0F3H
    CALL TEMPO
    JNB P2.2, NOURG
    CALL URG
NOURG: JB P2.1,FJ
JMP START
FJ: CALL TEMPO
MOV P1, #0F5H
CALL TEMPO
mov p1, #0f6h
call tempo
L2: MOV P1, #0DEH
CALL TEMPO
MOV P1,#0EEH
CALL TEMPO
mov p1, #0f6h
call tempo
JMP start
;Mov p1, #0
;;;DELAY FUNCTION
TEMPO: NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
NOP
RET
;;;URGENT ROUTINE
URG:
    mov p1, #0f6h
    call tempo
    mov p1, #0FFh
    call tempo
    JNB P2.2, NOURG
    call urg
    RET
    jmp start
```