2017ICS_Lab01

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1. PURPOSE

This lab makes us use machine language, namely 0&1, to write programs. Through this experience, we can have a deep understanding of the ISA and use machine language more proficiently.

2. PRINCEPLE

I wrote program by using the instructions of ISA of LC-3,

such as: LEA ADD LDR STR BR HALT

Once I wrote this program by binary or hexes or assemble language, I can convert it into executable object file. Then I load this file in the LC-3 simulator and it will execute the program and get the result.

3. PROCEDURE

Firstly, I learned the ISA hardly and painfully. Because the instructions introduced by the book I borrowed has some rules mismatch the rules of LC-3.

Once I knew the instructions, I can quickly and correctly write the program.

Then, I knew how to use the simulator, such as registers , PC ,memory etc.

At last, I chose some test cases and ran the program .It got the right

result.

4. RESULT

Before executing the program:

```
    R0   x0000  0          R4   x0000  0          PC   x3000  12288
    R1   x0000  0          R5   x0000  0          IR   x0000  0
    R2   x0000  0          R6   x0000  0          PSR  x8002  -32766
    R3   x0000  0          R7   x0000  0          CC   Z

■ x3050  0000000001100001  x0061          NOP
■ x3051  0000000000110101  x0035          NOP
■ x3052  0000111100010010  x0F12          BRNZP  x2F65
■ x3053  0000000000000001  x0001          NOP
■ x3054  0000001000110000  x0230          BRP    x3085
■ x3055  0000000000000000  x0000          NOP
■ x3056  0000000000000000  x0000          NOP
■ x3057  0000000000000000  x0000          NOP
■ x3058  0000000000000000  x0000          NOP
■ x3059  0000000000000000  x0000          NOP
■ x305A  0000000000000000  x0000          NOP
■ x305B  0000000000000000  x0000          NOP
■ x305C  0000000000000000  x0000          NOP
```

After executing the program:

```
    R0   x7FFF  32767      R4   x0000  0          PC   xFD79  -647
    R1   xFFFF  -1         R5   x0000  0          IR   xB02C  -20436
    R2   x3055  12373      R6   x0000  0          PSR  x8001  -32767
    R3   x0000  0          R7   xFD75  -651       CC   P

■ x3050  0000000001000001  x0041          NOP
■ x3051  0000000000010101  x0015          NOP
■ x3052  0000111011110010  x0EF2          BRNZP  x3145
■ x3053  1111111111100001  xFFE1          TRAP   xE1
■ x3054  0000001000010000  x0210          BRP    x3065
■ x3055  0000000000000000  x0000          NOP
■ x3056  0000000000000000  x0000          NOP
■ x3057  0000000000000000  x0000          NOP
■ x3058  0000000000000000  x0000          NOP
■ x3059  0000000000000000  x0000          NOP
■ x305A  0000000000000000  x0000          NOP
■ x305B  0000000000000000  x0000          NOP
```

It works well. Through this lab , I learned a lot. (When learning new things, choosing a good book is the most important thing.)