

Lab02

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1. PURPOSE

This lab let us use ASSEMBLE language to write programs. Through this experience, I can have a deep understanding of the ISA and use assemble language more proficiently.

Assemble language is interesting and more brief,friendly than machine language. I am willing to use assemble language to build programs.

2. PRINCEPLE

linstructions I used are as follows

- LD
- LDR
- STR
- ADD
- AND
- BR
- JSR
- RET

and **persudo-op**
.FILL

Some key points in this lab and solutions

key points	solution
control structure	if else if else
mul	add
compare	add,BR

Since there has no instructions for multiplication, SO I write a subroutine to calculate it. To achieve this, I use addition. For example, to calculate $a*b$, you can add a for b times or add b for a times.

3. PROCEDURE

Firstly, I learned the assembly language for some time. Then I quickly write the program. There have been some problems when debugging.

I use $R0$ to store the result of $R0*R1$, and I add $R0$ for $R1$ times. It's wrong, since $R0$ has a value, I should add it for $(R1-1)$ times.

Another problem is the branch condition, it must be precise and correct.

One annoying point is that the LC-editor doesn't display the line number, so it's troublesome to locate the line which has errors.

Also, the o and θ are too similar in shape. You can easily recognize one of them as another.

4. RESULT

Before executing the program:

LC3 Simulator - PB16030899_朱河勤_Lab03.obj

File Execute Simulate Help

Dump to: x3200

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	

x3200	0000000000000000	x0000	NOP
x3201	0000000000000001	x0001	NOP
x3202	0000000000000011	x0003	NOP
x3203	00000000000001010	x000A	NOP
x3204	00000000000010001	x0011	NOP
x3205	0000000011111111	x00FF	NOP
x3206	0000000000000000	x0000	NOP
x3207	0000000000000000	x0000	NOP
x3208	0000000000000000	x0000	NOP
x3209	0000000000000000	x0000	NOP
x320A	0000000000000000	x0000	NOP
x320B	0000000000000000	x0000	NOP
x320C	0000000000000000	x0000	NOP
x320D	0000000000000000	x0000	NOP
x320E	0000000000000000	x0000	NOP
x320F	0000000000000000	x0000	NOP
x3210	0000000000000000	x0000	NOP
x3211	0000000000000000	x0000	NOP
x3212	0000000000000000	x0000	NOP
x3213	0000000000000000	x0000	NOP
x3214	0000000000000000	x0000	NOP
x3215	0000000000000000	x0000	NOP
x3216	0000000000000000	x0000	NOP
x3217	0000000000000000	x0000	NOP
x3218	0000000000000000	x0000	NOP
x3219	0000000000000000	x0000	NOP
x321A	0000000000000000	x0000	NOP
x321B	0000000000000000	x0000	NOP
x321C	0000000000000000	x0000	NOP
x321D	0000000000000000	x0000	NOP
x321E	0000000000000000	x0000	NOP
x321F	0000000000000000	x0000	NOP

PB16030899_朱河勤_Lab03.obj 0 instructions executed Idle

x3300	0000000000000000	x0000	NOP
x3301	0000000000000000	x0000	NOP
x3302	0000000000000000	x0000	NOP
x3303	0000000000000000	x0000	NOP
x3304	0000000000000000	x0000	NOP
x3305	0000000000000000	x0000	NOP
x3306	0000000000000000	x0000	NOP
x3307	0000000000000000	x0000	NOP
x3308	0000000000000000	x0000	NOP
x3309	0000000000000000	x0000	NOP
x330A	0000000000000000	x0000	NOP
x330B	0000000000000000	x0000	NOP
x330C	0000000000000000	x0000	NOP

After executing the program:

LC3 Simulator - PB16030899_朱河勤_Lab03.obj

File Execute Simulate Help

Jump to: x3300

R0	x0002	2	R4	xFFFF	-2	PC	x3013	12307
R1	x0002	2	R5	x333E	13118	IR	x7100	28928
R2	x0000	0	R6	xFFFF	-1	PSR	x8001	-32767
R3	xFEFE	-258	R7	x3010	12304	CC	P	

x3300	0000000000000010	x0002	NOP	
x3301	0000000000000010	x0002	NOP	
x3302	00000000000011000	x0018	NOP	
x3303	0000001111011110	x03DE	BRP	x32E2
x3304	00000000000010010	x0012	NOP	
x3305	00000001000000000	x0100	NOP	
x3306	00000000000000010	x0002	NOP	
x3307	00000000000000010	x0002	NOP	
x3308	00000000000000010	x0002	NOP	
x3309	00000000000000010	x0002	NOP	
x330A	00000000000000010	x0002	NOP	
x330B	00000000000000010	x0002	NOP	
x330C	00000000000000010	x0002	NOP	
x330D	00000000000000010	x0002	NOP	
x330E	00000000000000010	x0002	NOP	
x330F	00000000000000010	x0002	NOP	
x3310	00000000000000010	x0002	NOP	
x3311	00000000000000010	x0002	NOP	
x3312	00000000000000010	x0002	NOP	
x3313	00000000000000010	x0002	NOP	
x3314	00000000000000010	x0002	NOP	
x3315	00000000000000010	x0002	NOP	
x3316	00000000000000010	x0002	NOP	
x3317	00000000000000010	x0002	NOP	
x3318	00000000000000010	x0002	NOP	
x3319	00000000000000010	x0002	NOP	
x331A	00000000000000010	x0002	NOP	
x331B	00000000000000010	x0002	NOP	
x331C	00000000000000010	x0002	NOP	
x331D	00000000000000010	x0002	NOP	
x331E	00000000000000010	x0002	NOP	
x331F	00000000000000010	x0002	NOP	

PB16030899_朱河勤_Lab03.obj 1417059 instructions execute Idle

It works well. Through this lab , I learned a lot. Assemble language is so brief and useful.