

Lab 1 report

PB22051022 王嘉宁

实验目的与内容

熟悉 RISC 指令集（龙芯 LA32R 指令集以及 RV32I 指令集）的部分指令及编码格式，以便后续在硬件层面上实现这些指令。

逻辑设计

任务 1：斐波那契数列

```
li.w $r2, 9
andi $r1, $r1, 0
andi $r3, $r3, 0
andi $r4, $r4, 0
andi $r5, $r5, 0
addi.w $r3, $r3, 1
addi.w $r4, $r4, 1
addi.w $r1, $r1, 2
a:
bge $r1, $r2, exit
addi.w $r5, $r4, 0
addi.w $r4, $r3, 0
add.w $r3, $r4, $r5
addi.w $r1, $r1, 1
b a
exit:
addi.w $r3, $r3, 0
```

任务 2：大整数处理

```
li.w $r2, 80
andi $r1, $r1, 0
andi $r3, $r3, 0
andi $r4, $r4, 0
andi $r5, $r5, 0
andi $r6, $r6, 0
andi $r7, $r7, 0
andi $r8, $r8, 0
addi.w $r4, $r4, 1
addi.w $r6, $r6, 1
addi.w $r1, $r1, 2
a:
bge $r1, $r2, exit
```

```
andi $r9, $r9, 0
addi.w $r8, $r6, 0
addi.w $r6, $r4, 0
add.w $r4, $r6, $r8
bgeu $r4, $r6, m
addi.w $r9, $r9, 1
m:
addi.w $r7, $r5, 0
addi.w $r5, $r3, 0
add.w $r3, $r5, $r7
add.w $r3, $r3, $r9
addi.w $r1, $r1, 1
b a
exit:
addi.w $r3, $r3, 0
addi.w $r4, $r4, 0
```

结果与分析

任务 1：斐波那契数列

LARS

```
li.w $r2, 9
andi $r1, $r1, 0
andi $r3, $r3, 0
andi $r4, $r4, 0
andi $r5, $r5, 0
addi.w $r3, $r3, 1
addi.w $r4, $r4, 1
addi.w $r1, $r1, 2
a:
bge $r1, $r2, exit
addi.w $r5, $r4, 0
addi.w $r4, $r3, 0
add.w $r3, $r4, $r5
addi.w $r1, $r1, 1
b a
exit:
addi.w $r3, $r3, 0
```

PC0x1c0003cInstNOP

R0 / ZERO0x0

R1 / RA0x9

R2 / TP0x9

R3 / SP0x22

R4 / A00x15

R5 / A10xd

R6 / A20x0

R7 / A30x0

R8 / A40x0

R9 / A50x0

R10 / A60x0

R11 / A70x0

R12 / T00x0

R13 / T10x0

R14 / T20x0

R15 / T30x0

R16 / T40x0

R17 / T50x0

R18 / T60x0

R19 / T70x0

输入16进制内存地址

Memory	+0	+4	+8	+c
0x1c000000	0x03802402	0x03400021	0x03400063	0x03400084
0x1c000010	0x034000a5	0x02800463	0x02800484	0x02800821
0x1c000020	0x64001822	0x02800085	0x02800064	0x00101483
0x1c000030	0x02800421	0x53ffff	0x02800063	0x00000000
0x1c000040	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000050	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000060	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000070	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000080	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000090	0x00000000	0x00000000	0x00000000	0x00000000
0x1c0000a0	0x00000000	0x00000000	0x00000000	0x00000000

任务 2：大整数处理

LARS

li.w \$r2, 80
andi \$r1, \$r1, 0
andi \$r3, \$r3, 0
andi \$r4, \$r4, 0
andi \$r5, \$r5, 0
andi \$r6, \$r6, 0
andi \$r7, \$r7, 0
andi \$r8, \$r8, 0
addi.w \$r4, \$r4, 1
addi.w \$r6, \$r6, 1
addi.w \$r1, \$r1, 2
a:
bge \$r1, \$r2, exit
andi \$r9, \$r9, 0
addi.w \$r8, \$r8, 0
addi.w \$r6, \$r4, 0
add.w \$r4, \$r6, \$r8
bgeu \$r4, \$r6, m
addi.w \$r9, \$r9, 1
m:
addi.w \$r7, \$r5, 0
addi.w \$r5, \$r3, 0
add.w \$r3, \$r5, \$r7
add.w \$r3, \$r3, \$r9
addi.w \$r1, \$r1, 1
b a
exit:
addi.w \$r3, \$r3, 0
addi.w \$r4, \$r4, 0

PC
0x1c000068

Inst
NOP

R0 / ZERO
0x0

R1 / RA
0x50

R2 / TP
0x50

R3 / SP
0x533163

R4 / A0
0xef0321e5

R5 / A1
0x336a82

R6 / A2
0xd89c937d

R7 / A3
0x1fc6e1

R8 / A4
0x16668e68

R9 / A5
0x0

R10 / A6
0x0

R11 / A7
0x0

R12 / T0
0x0

R13 / T1
0x0

R14 / T2
0x0

R15 / T3
0x0

R16 / T4
0x0

R17 / T5
0x0

R18 / T6
0x0

R19 / T7
0x0

输入16进制内存地址

Memory	+0	+4	+8	+c
0x1c000000	0x03814002	0x03400021	0x03400063	0x03400084
0x1c000010	0x034000a5	0x034000c6	0x034000e7	0x03400108
0x1c000020	0x02800484	0x028004c6	0x02800821	0x64003422
0x1c000030	0x03400129	0x028000c8	0x02800086	0x001020c4
0x1c000040	0x6c000886	0x02800529	0x028000a7	0x02800065
0x1c000050	0x00101ca3	0x00102463	0x02800421	0x53ffe3ff
0x1c000060	0x02800063	0x02800084	0x00000000	0x00000000
0x1c000070	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000080	0x00000000	0x00000000	0x00000000	0x00000000
0x1c000090	0x00000000	0x00000000	0x00000000	0x00000000
0x1c0000a0	0x00000000	0x00000000	0x00000000	0x00000000

任务 3：导出 COE 文件

任务一

```
C: > Users > Lenovo > Desktop > t1.coe  
  
1  memory_initialization_radix=16;  
2  memory_initialization_vector=  
3  03802402,  
4  03400021,  
5  03400063,  
6  03400084,  
7  034000a5,  
8  02800463,  
9  02800484,  
10 02800821,  
11 64001822,  
12 02800085,  
13 02800064,  
14 00101483,  
15 02800421,  
16 53ffe3ff,  
17 02800063,  
18
```

任务二

预览 li.md

t1.coe

t2.coe

X

C: > Users > Lenovo > Desktop > t2.coe

```
1  memory_initialization_radix=16;
2  memory_initialization_vector=
3  03814002,
4  03400021,
5  03400063,
6  03400084,
7  034000a5,
8  034000c6,
9  034000e7,
10 03400108,
11 02800484,
12 028004c6,
13 02800821,
14 64003422,
15 03400129,
16 028000c8,
17 02800086,
18 001020c4,
19 6c000886,
20 02800529,
21 028000a7,
22 02800065,
23 00101ca3,
24 00102463,
25 02800421,
26 53ffd3ff,
27 02800063,
28 02800084,
29
```

总结

对龙芯 LA32R 指令集部分指令及编码格式有所熟悉，并掌握了一些使用软件基本技巧。