

实验 5

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一. 熟悉 SIMD intrinsics 函数

- 4 个并行的单精度浮点数除法

```
1  __m128 _mm_div_ps (__m128 a, __m128 b)
```

- 16 个并行求 8 位无符号整数的最大值

```
1  __m128i _mm_max_epi16 (__m128i a, __m128i b)
```

- 8 个并行的 16 位带符号短整数的算术右移

```
1  __m128i _mm_bsrl_i128 (__m128i a, int imm8)
```

二. 阅读 SIMD 代码 仅关注函数的主要部分, 执行 SIMD 操作的行用 ;SIMD 标识。

```

1  .LFB5548:
2      .cfi_startproc
3      endbr64
4      sub rsp, 120
5      .cfi_def_cfa_offset 128
6      pxor    xmm6, xmm6
7      movsd   xmm1, QWORD PTR .LC2[rip]    ;SIMD
8      movsd   xmm10, QWORD PTR .LC0[rip]    ;SIMD
9      mov rax, QWORD PTR fs:40
10     mov QWORD PTR 104[rsp], rax
11     xor eax, eax
12     mov rax, QWORD PTR .LC3[rip]
13     movsd   xmm8, QWORD PTR .LC1[rip]    ;SIMD
14     mov QWORD PTR 64[rsp], 0x000000000
15     movsd   QWORD PTR 48[rsp], xmm1      ;SIMD
16     pxor    xmm9, xmm9
17     lea rsi, .LC6[rip]
18     mov edi, 1
19     mov QWORD PTR 56[rsp], rax
20     movapd  xmm0, XMMWORD PTR 48[rsp]    ;SIMD
21     movapd  xmm3, xmm9                  ;SIMD
22     mov eax, 6
23     movsd   QWORD PTR 32[rsp], xmm10     ;SIMD
24     movapd  xmm2, xmm0                  ;SIMD
25     movsd   QWORD PTR 40[rsp], xmm8      ;SIMD
26     movapd  xmm7, XMMWORD PTR 32[rsp]    ;SIMD
27     addpd   xmm0, xmm0                  ;SIMD
28     mov QWORD PTR 72[rsp], 0x000000000
29     mulpd   xmm2, xmm6                  ;SIMD
30     mov QWORD PTR 80[rsp], 0x000000000
31     mulpd   xmm6, XMMWORD PTR 32[rsp]    ;SIMD
32     mulpd   xmm7, XMMWORD PTR .LC5[rip]  ;SIMD
33     mov QWORD PTR 88[rsp], 0x000000000
34     addpd   xmm7, XMMWORD PTR 64[rsp]    ;SIMD
35     addpd   xmm6, XMMWORD PTR 80[rsp]    ;SIMD
36     addpd   xmm7, xmm2                  ;SIMD
37     addpd   xmm6, xmm0                  ;SIMD
38     movapd  xmm2, xmm1                  ;SIMD
39     movapd  xmm0, xmm10                  ;SIMD
40     movapd  xmm5, xmm6                  ;SIMD
41     movapd  xmm4, xmm7                  ;SIMD
42     movaps  XMMWORD PTR 16[rsp], xmm6    ;SIMD
43     movaps  XMMWORD PTR [rsp], xmm7      ;SIMD
44     call    __printf_chk@PLT
45     movapd  xmm6, XMMWORD PTR 16[rsp]    ;SIMD

```

<pre> 46 movapd xmm7, XMMWORD PTR [rsp] 47 pxor xmm9, xmm9 48 mov rax, QWORD PTR .LC1[rip] 49 movapd xmm2, xmm9 50 mov edi, 1 51 lea rsi, .LC7[rip] 52 unpckhpd xmm6, xmm6 53 unpckhpd xmm7, xmm7 54 movq xmm8, rax 55 movq xmm3, rax 56 mov rax, QWORD PTR .LC3[rip] 57 movapd xmm5, xmm6 58 movapd xmm4, xmm7 </pre>	<pre> ;SIMD ;SIMD ;SIMD ;SIMD ;SIMD ;SIMD ;SIMD ;SIMD </pre>	<pre> 59 movapd xmm0, xmm8 60 movq xmm1, rax 61 mov eax, 6 62 call __printf_chk@PLT 63 mov rax, QWORD PTR 104[rip] 64 xor rax, QWORD PTR fs:40 65 jne .L5 66 xor eax, eax 67 add rsp, 120 68 .cfi_remember_state 69 .cfi_def_cfa_offset 8 70 ret </pre>
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三. 书写 SIMD 代码