4.栈与队列

调用栈：实例

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```
int fac(int n) { return (n < 1) ? 1 : n * fac(n - 1); }
```

```
main(2, 3)
   x
```

```
main(2, 3)
   x

fac(3)
3 * x
```

```
main(2, 3)
   x

fac(3)
3 * x

fac(2)
2 * x
```

```
main(2, 3)
   x

fac(3)
3 * x

fac(2)
2 * x

fac(1)
  1
```

```
main(2, 3)
   x

fac(3)
3 * x

fac(2)
2 * 1
```

```
main(2, 3)
   x

fac(3)
3 * 2
```

```
main(2, 3)
   6
```

```
int fib( int n ) { return (n < 2) ? n : fib(n - 1) + fib(n - 2); }
```

| main(2,3) |
| x |
| fib(3) |
| x + x |

| main(2,3) |
| x |
| fib(3) |
| x + x |
| fib(2) |
| x + x |

| main(2,3) |
| x |
| fib(3) |
| x + x |
| fib(2) |
| x + x |
| fib(1) |
| 1 |

| main(2,3) |
| x |
| fib(3) |
| x + x |
| fib(2) |
| 1 + x |

| main(2,3) |
| x |
| fib(3) |
| x + x |
| fib(2) |
| 1 + x |
| fib(0) |
| 0 |

| main(2,3) |
| x |
| fib(3) |
| x + x |
| fib(2) |
| 1 + 0 |

| main(2,3) |
| x |
| fib(3) |
| 1 + x |

| main(2,3) |
| x |
| fib(3) |
| 1 + x |
| fib(1) |
| 1 |

| main(2,3) |
| x |
| fib(3) |
| 1 + 1 |

| main(2,3) |
| 2 |
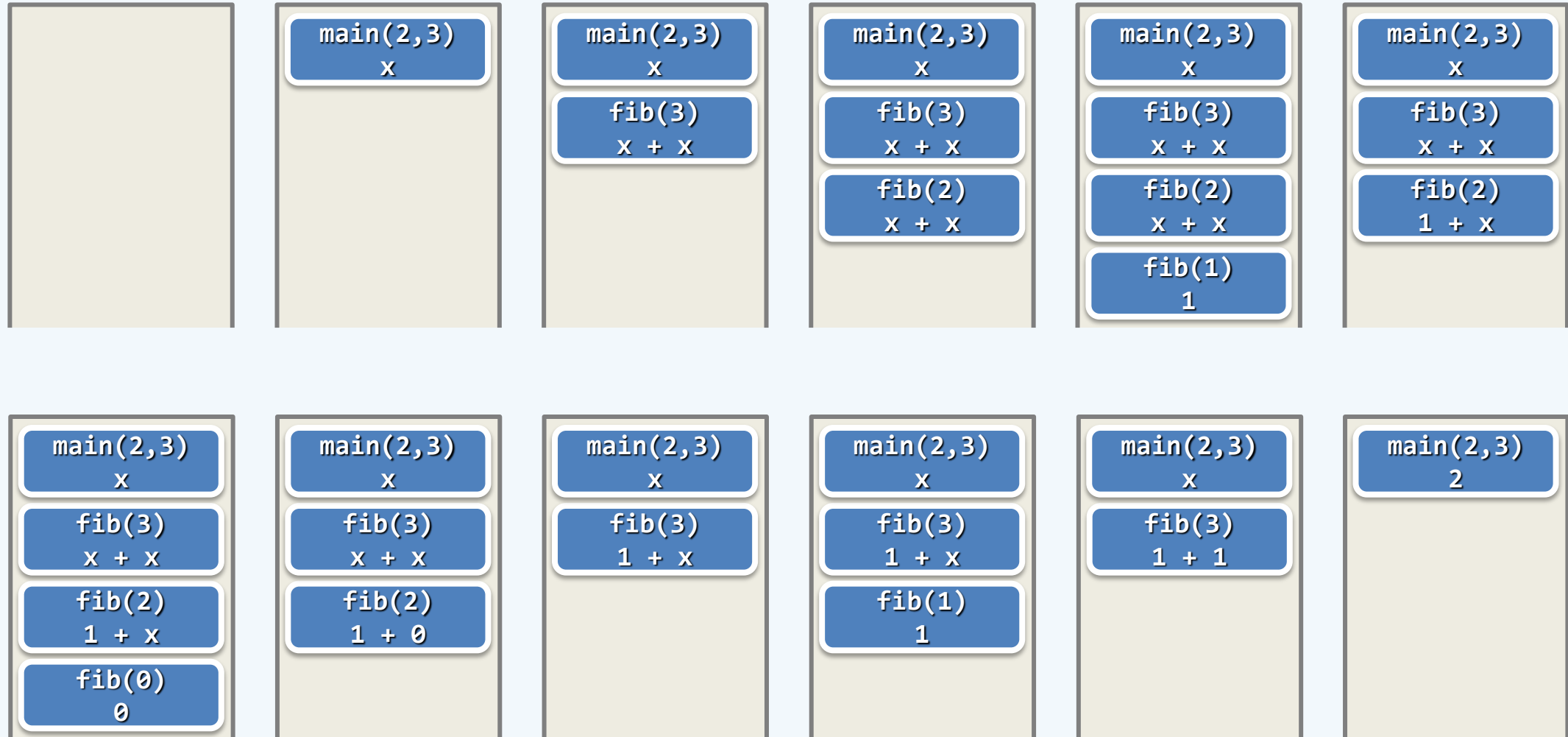
```
hailstone(int n) {

    if ( 2 > n ) return;

    n % 2  ?  odd( n ): even( n );

}


even( int n ) { hailstone( n / 2 ); }

odd( int n ) { hailstone( 3*n + 1 ); }

main(int argc, char* argv[])

{ hailstone( atoi( argv[1] ) ); }
```

call stack

| main(2, 10) |
| hailstone(10) |
| even(10) |
| hailstone(5) |
| odd(5) |
| hailstone(16) |
| even(16) |
| hailstone(8) |
| even(8) |
| hailstone(4) |
| even(4) |
| hailstone(2) |
| even(2) |
| hailstone(1) |

call stack

| main(2, 27) |
| hailstone(27) |
| odd(27) |
| hailstone(82) |
| even(82) |
| hailstone(41) |
| odd(41) |
| hailstone(124) |
| even(124) |
| hailstone(62) |
| even(62) |
| hailstone(31) |
| odd(31) |
| hailstone(94) |
| ... ... |