

# 01-F-1 动态规划 & 01-F-02 fib() 递推方程 & 01-F-3 fib 封底计算

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Make it work  
make it right  
make it first  
- Kent Beck

## fib(): 递归

```
fib(0) = 0; fib(1) = 1;  
fib(n) = fib(n-1) + fib(n-2) : {0,1,1,2,3,5,8,...}
```

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

为什么这么满?

It work **and** It Right; But it is slow

❖ 复杂度:  $T(0) = T(1) = 1$ ;  $T(n) = T(n-1) + T(n-2) + 1, n > 1$

令  $S(n) = [T(n) + 1] / 2$

则  $S(0) = 1 = \text{fib}(1), S(1) = 1 = \text{fib}(2)$

故  $S(n) = S(n-1) + S(n-2) = \text{fib}(n+1)$  //  $\Phi = \frac{1+\sqrt{5}}{2} = 1.61803\dots$

$T(n) = 2*S(n) - 1 = 2*\text{fib}(n+1) - 1 = O(\text{fib}(n+1)) = O(\Phi^n) = O(2^n)$

指数级别复杂度

❖  $\Phi^{36} = 2^{25}, \quad \Phi^{43} = 2^{30} = 10^9 \text{ flo} = 1 \text{ sec}$

$$\diamond \Phi^5 = 10, \quad \Phi^{67} = 10^{14} \text{ flo} = 10^5 \text{ sec} = 1 \text{ day}$$

$$\Phi^{92} = 10^{19} \text{ flo} = 10^{18} \text{ sec} = 10^5 \text{ day} = 3 \text{ century}$$

计算 67 要1天!!!

计算 92 要3个世纪!!!