Go To Statement Considered Harmful.

- E. Dijkstra, 1968

'GOTO Considered Harmful' Considered Harmful.

- F. Rubin , 1985

'"GOTO Considered Harmful" Considered Harmful'

Considered Harmful?

- Communications of the ACM , 1987

1.绪论

算法分析

迭代

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❖ `for (int i = 0; i < n; i++)`

  `for (int j = 0; j < ⬚n⬚; j++)`

    `O1Operation(i, j);`
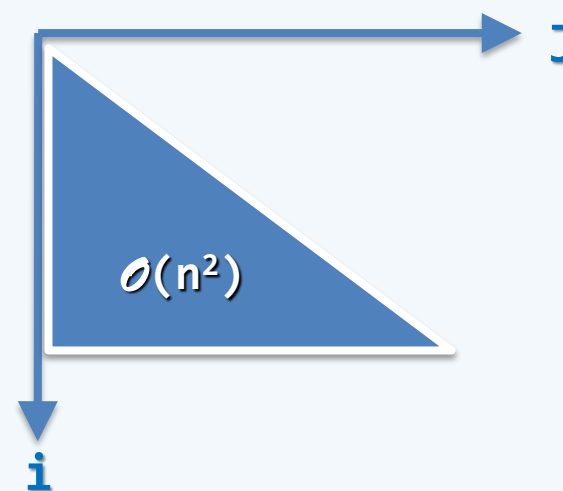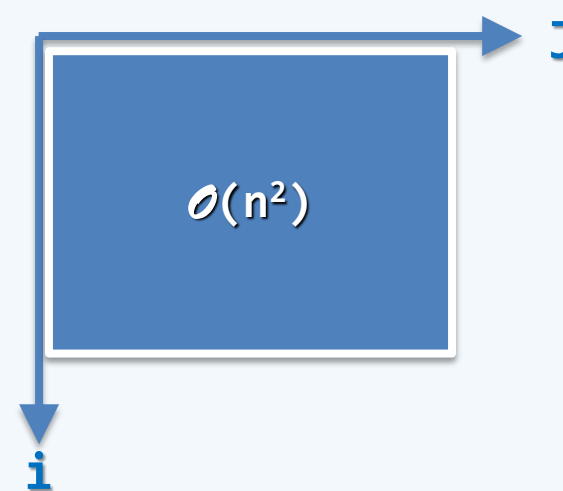
  算术级数：

$$\sum_{i=0}^{n-1} n = n + n + \ldots + n = n * n = O(n^2)$$

$$O(n^2)$$

j

i

❖ `for (int i = 0; i < n; i++)`

  `for (int j = 0; j < ⬚i⬚; j++)`

    `O1Operation(i, j);`

  算术级数：

$$\sum_{i=0}^{n-1} i = 0 + 1 + \ldots + (n-1) = \frac{n(n-1)}{2} = O(n^2)$$

$$O(n^2)$$

j

i

❖ `for (int i = 0; i < n; i++)`

   `for (int j = 0; j < ⌞i⌟; ⌞j += 2015⌟)`
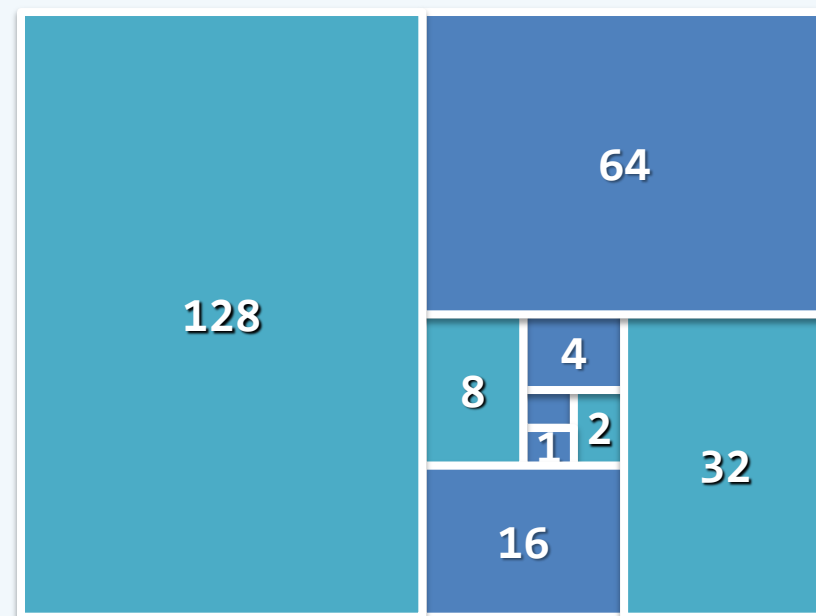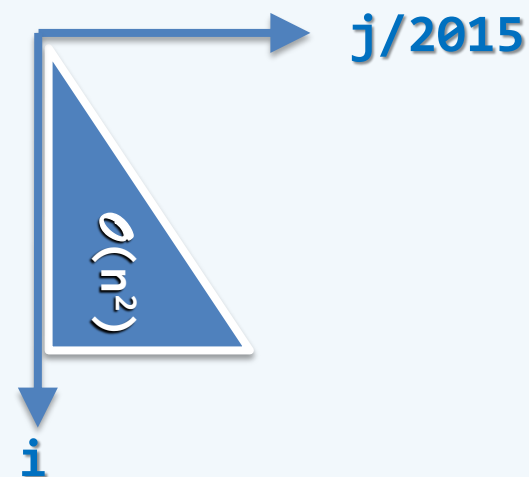
      `O1Operation(i, j);`

   算术级数： ...

❖ `for (int i = 1; i < n; ⌞i <<= 1⌟)`

   `for (int j = 0; j < ⌞i⌟; j++)`

      `O1Operation(i, j);`

几何级数：$1 + 2 + 4 + ... + 2^{\lfloor \log_2(n-1) \rfloor}$

$$= \sum_{k=0}^{\lfloor \log_2(n-1) \rfloor} 2^k \qquad (\text{let } k = \log_2 i)$$

$$= 2^{\lceil \log_2 n \rceil} - 1 = O(n)$$

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$O(n^2)$

i

64

128

8

4

1 2

32

16

❖ `for (int i = 0; i <= n; i++)`

  `for (int j = 1; j < i;` `j += j` `)`

    `O1Operation(i, j);`

几何级数：$\sum_{k=0}^{n}\lceil\log_2 i\rceil$ = $O(n\log n)$

$(i = 0, 1, 2, 3\sim4, 5\sim8, 9\sim16, ...)$

$= 0 + 0 + 1 + 2*2 + 3*4 + 4*8 + ...$

$= \Sigma_{k=0..\log n}(k * 2^{k-1})$

$= O(\log n * 2^{\log n})$ (CM page#33)

j

i