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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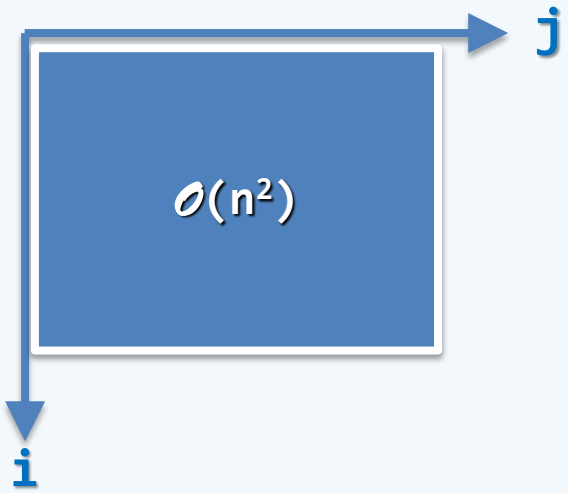
迭代 vs. 级数

```
for (int i = 0; i < n; i++)
  for (int j = 0; j < n; j++)
    O1Operation(i, j);
```

算术级数：

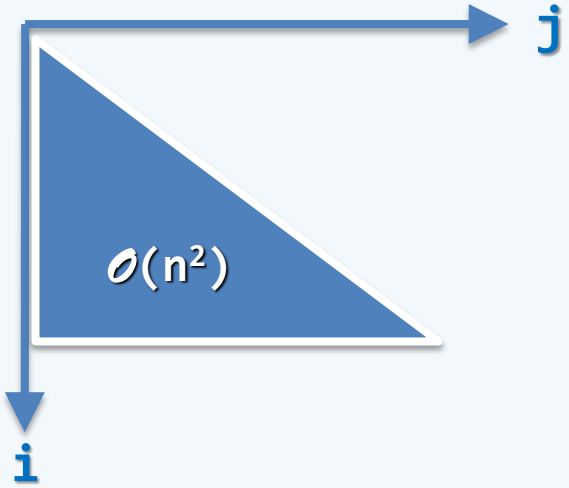
$$\sum_{i=0}^{n-1} n = n + n + \ldots + n = n * n = O(n^2)$$




```
for (int i = 0; i < n; i++)
  for (int j = 0; j < i; j++)
    O1Operation(i, j);
```

算术级数：

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



迭代 vs. 级数

```
❖ for (int i = 0; i < n; i++)
    for (int j = 0; j < i; j += 2015)
      O1Operation(i, j);
```

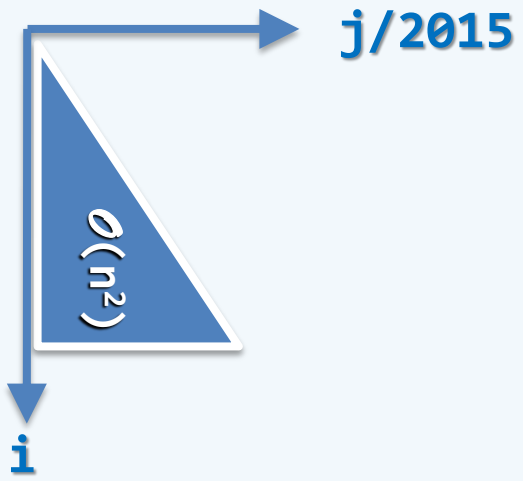
算术级数： ...

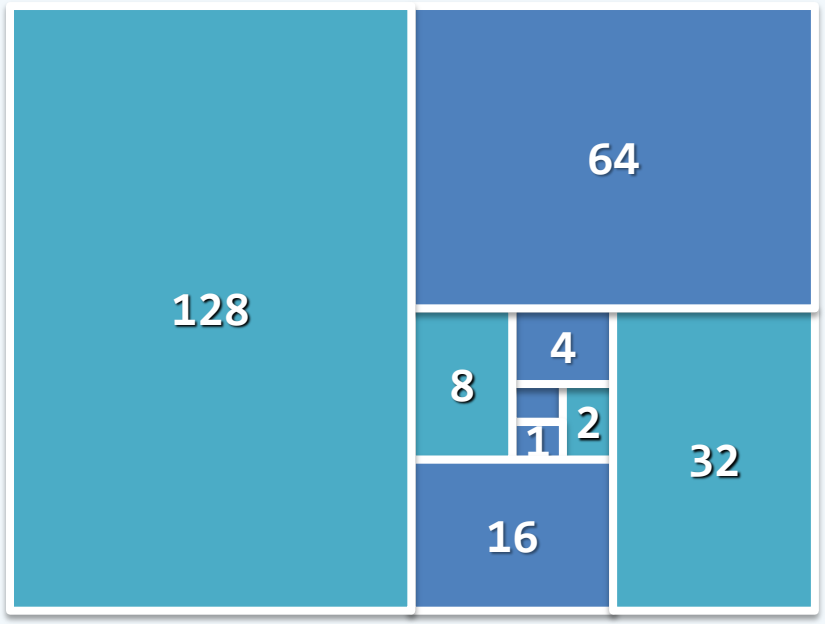
```
❖ for (int i = 1; i < n; i <<= 1)
    for (int j = 0; j < i; j++)
      O1Operation(i, j);
```

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

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

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





迭代 vs. 级数

```
for (int i = 0; i <= n; i++)
  for (int j = 1; j < i; j += j)
    O1Operation(i, j);
```

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

(i = 0, 1, 2, 3~4, 5~8, 9~16, ...)

$= 0 + 0 + 1 + 2*2 + 3*4 + 4*8 + \ldots$

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

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