

問題: 把2个 string 经由定義的 operation 修正成一致後的最低成本為何?

定義: 三個 operation:

- (1). delete: cost 為 1
- (2). insert: cost 為 2
- (3). substitution: cost 為 3

令  $cs[i, j]$  代表一个 string  $X: a_1, \dots, a_i$  转变成另一个 string  $Y: b_1, \dots, b_j$  之最小成本

case: "i":  $i=j$  then  $a_i = b_j \Rightarrow c[i,j] = c[i-1,j-1]$

14.  $i=j$  时  $a_i = b_j \Rightarrow c[i, j] = c[i-1, j-1] + \text{cost}(\text{sub})$

(3).  $i < j$  時  $\Rightarrow C[i, j] = C[i, j-1] + \text{cost}(\text{insert})$  # 插入  $b_j$  到  $X$

(4).  $i > j$  Base  $\Rightarrow c[i, j] = c[i-1, j] + \text{cost}(\text{delete})$

$$\therefore c[i, j] = \min \begin{cases} c[i-1, j] + \text{cost}(\text{delete}) \\ c[i, j-1] + \text{cost}(\text{insert}) \\ c[i-1, j-1] + \text{cost}(\text{substitution}) \text{ if } a_i \neq b_j \\ c[i-1, j-1] \text{ if } a_i = b_j \end{cases}$$

(12). boundary condition:

$$c[i, 0] = \text{cost(delete)} \times i$$
$$c[0, j] = \text{cost(insert)} \times j$$

13). Instance: 令 3 种 cost 皆为 1, 算  $X = GAC$  &  $Y = AGCAT$

|   |   | A | G | C | A | T |
|---|---|---|---|---|---|---|
| 0 |   | 1 | 2 | 3 | 4 | 5 |
| G | 1 | 1 | 1 | 2 | 3 | 4 |
| A | 2 | 1 | 2 | 2 | 2 | 3 |
| C | 3 | 2 | 2 | 2 | 3 | 3 |

Example:  $X = ACABCD$   
 $Y = CACB$

|       |   | A | C | A | B | C | D |
|-------|---|---|---|---|---|---|---|
| J \ i | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| 0     | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| C 1   | 1 | 1 | 1 | 2 | 3 | 4 | 5 |
| A 2   | 2 | 1 | 2 | 1 | 2 | 3 | 4 |
| C 3   | 3 | 2 | 1 | 2 | 3 | 2 | 3 |
| B 4   | 4 | 3 | 2 | 3 | 2 | 3 | 4 |