CS 280 Hw 2 solution:

#16.3

Source string x(1...m), Target string y(1..n)

\[ C(i,j) = \text{The optimal cost of converting source string } x(1...i) \ (1 \leq i \leq m) \text{ to target string } y(1...j) \ (1 \leq j \leq n) \]

\[ C(i, j) = \min \{ \ C(i-1,j-1) + C_c ; // \text{if } X_i = Y_j, \text{ the operation is copy} \\
\quad C(i-1,j) + C_r ; // \text{if it is a replace operation} \\
\quad C(i,j-1) + C_d ; // \text{if it is a delete operation} \\
\quad C(i-2,j-2) + C_t ; // \text{if } X_{i-1}X_i = Y_{i-1}Y_i, \text{ and the operation is twiddle} \\
\quad \min C(k, j) + C_k ; // \text{when } I = m, \text{ the operation is a kill so it reach the end} \]

//of source string , 1\leq k \leq m.

The initial condition:

\[ C(1,0) = I \times C_{\text{delete}} \]
\[ C(0,J) = J \times C_{\text{insert}} \]
\[ C(0,0) = 0 \]

Space: It is filled within a N*M matrix, from left to right, top to bottom. The final optimal solution is Matrix(n,m). Each operation takes 1 and there are N * M elements to be filled. So the total run time is O(N*M).

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