

Homework Assignment 1

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1 Exercise 1 - [Edit Distance/Levenshtein Distance]

1.1 Question 1

Proposition 1.1.1 (Complexity and Correction). *If we denote C_f the complexity of f , this algorithm has time complexity $\mathcal{O}C_f \left(\frac{n}{t}\right)^2$*

Algorithm 1 Levenshtein Distance with f

Input S, T, f, t \triangleright Two Strings, the function f computing the values and the step t

$\mathbf{D} = \text{zeros}(n+1, n+1)$ $\triangleright \text{len}(S) = \text{len}(T) = n$

for $i \leftarrow 0$ to $n+1$ **do**

$\mathbf{D}[i][0] \leftarrow i$

end for

for $j \leftarrow 0$ to $n+1$ **do**

$\mathbf{D}[0][j] \leftarrow j$

end for

$\text{up}, \text{left} \leftarrow 0, 0$

while $\text{up} < n$ **do**

$\text{left} \leftarrow 0$

while $\text{left} < n$ **do**

$d \leftarrow \min(n - \text{up}, t)$

$e \leftarrow \min(n - \text{left}, t)$

$b \leftarrow \mathbf{D}[\text{up}][\text{left}]$

$a \leftarrow \mathbf{D}[\text{up} + 1 \rightarrow \text{up} + 1 + d][\text{left}]$

$c \leftarrow \mathbf{D}[\text{up}][\text{left} + 1 \rightarrow \text{left} + 1 + e]$

$f(a, b, c, d, e)$ \triangleright We can suppose here that f modifies only the last line and column of F in D with side-effect.

end while

end while

return $\mathbf{D}[n][n]$
