Minimum ASCII Delete Sum for Two Strings

Low Jun Kai, Sean

August 31, 2021

Preface

Given two strings s1 and s2, return the lowest ASCII sum of deleted characters to make two strings equal.

Theorem

Let $f(i, j)$ denote the function of the lowest ASCII sum given indexes i, j where i is the index of the first string and j is the index of the second string. Let us denote the strings to be $s_1[1...N] \wedge s_2[1...M]$

$$f(i,j) = \left\{ \begin{array}{ll} 0 & \textbf{if } i = N \wedge n = M \\ \sum ASCII(s_2[j...M]) & \textbf{if } i = N \\ \sum ASCII(s_1[i...N]) & \textbf{if } j = M \\ min(ASCII(s_1[i]) + f(i+1,j), ASCII(s_2[j]) + f(i,j+1)) & \textbf{otherwise} \end{array} \right\}$$

Proof of Correctness

1. We can reduce the $MinASCIIDiff$ problem into the LCS problem, aka the **Longest Common Subsequence Problem**
2. The reduction is trivial as this problem aim to remove the different characters to get the longest common subsequence
3. As a result, proving the correctness of the $MinASCIIDiff$ problem is **equivalent** to proving the correctness of the LCS problem