DSA Homework 2

Roger Jang

Due date: 20190408 23:59:59

Longest Common Prefix (LCP)

Problem definition

The length of the longest common prefix of two strings A[0..m) and B[0..n), denoted by lcp(A,B), is the largest integer $k \leq min\{m, n\}$ such that A[0..k)=B[0..k). In this homework, we need to build a data structure that can compute LCP efficiently.

First of all, we need to construct a large set of strings, as follows.

- We define that the 0'th string is a empty string.
- For the i'th string, it is one of previous strings (The p'th string where $0 \leq p < i$) with a lower case English letter appended to it.

For example:

- The first string is “a”, which is the 0'th string with ‘a’ appended to it.
- The second string is “ab” , which is the first string with ‘b’ appended to it.
- The third string is “abc”, which is the second string with ‘c’ appended to it.
- The forth string is “abd”, which is the second string with ‘d’ appended to it.

Then you have to answer q questions. For every question, you are given two positive integers i, j , please output the lcp(i'th string, j'th string) in a line.

I/O formats

- Input format
  - The first line contain a single integer n , which denotes the number of strings.
  - For the next n line, the i'th line decribes the i'th string. In i'th line , there’re a integer l and a character c, which means that the i'th string is the l'th string with c appended to it.
  - The next line contain a single integer q, which denotes the number of questions.
  - In each of next q line, there’re two integer i, j , which means that you are asked to output the lcp(i'th string, j'th string).
- Output format

  For each question, output the anser of it in a line.

- Limits
  - $n \leq 2 \times 10^5$
  - $q \leq 5 \times 10^6$

I/O Examples

- Sample input file

```
10
0 e
0 f
```

```
2 f
2 f
2 e
0 e
3 e
2 f
1 f
6 f
10
1 1
8 10
10 9
1 3
10 2
7 2
7 4
1 6
1 5
6 3
```

- Sample Output file

```
1
0
2
0
0
1
2
1
0
0
```

Open Test Sets

- sample_input.txt
- sample_output.txt

Hints and Suggestions

- If you use cin/cout, please add “ios_base::sync_with_stdio(0); cin.tie(0);” in the beginning of main function, and don’t use any scanf/printf.
- LCA的倍增算法
  - 簡略版，首推建中講義 4.3節 (陳冠宇高三的時候寫的)
  - 詳細版

Last updated on 12/23/2021 17:10:46.