2025/10/31 19:32 1/1 Contest Info

Contest Info

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practice link

Solutions

H. Happiness of Frog

题目大意:给一个串□\$n\le3000\$□\$\Sigma\le70\$□问将这个串重排后回文子串数量的最大值,以及达到该数量的重排方案数。

题解:考虑所有回文子串的集合和所有相同字符对的集合。容易注意到前者有一到后者的单射。因而回文子串数量 \$\le\$ 相同字符对的数量。而当所有相同字符排列在一起时,能取到最大值。

接下来考虑有哪些其它 pattern 也能达到最大值。首先一个字符可以如前所述全部排在一起。除此之外,若一个字符 a 有三个以上,首先它们自己的位置必须成一等差数列,其次相邻两个 a 之间的串都相等,且是回文串。考虑 a***a***a,第一个 a 后的 * 和第二个 a 后的 * 应当相等,这将导致第一个 a 后的第二个 *=a,矛盾。因此相邻 a 之间只能是单个字符,即 ababab...的模式。对于有两个的字符,还可以包在某个回文串的外部,如 abcbcba。只有一个的字符,要么单独排列,要么被若干有两个的字符包围,如 abcbal

使用 \$dp\$ 计数。考虑出现次数从大到小转移。设 \$dp[i][j][k][u][v]\$□表示当前字符出现次数为 <math>\$i\$□已经使用出现 \$i\$ 次的字符 \$i\$ 个,已经使用出现 \$i-1\$ 次的字符 \$k\$ 个,有 \$u\$ 个回文串 $\square $v$$ 个非回文串。

- 首先将出现次数为 \$1\$ 的字符直接算入 \$u\$ 中,不参与转移,即 \$dp[\Sigma+1][0][0][cnt[1]][0]=1\$
- \$dp[i][j+1][k][u+1][v]+=dp[i][j][k][u][v]\$
- \$dp[i][i+2][k][u][v+1]+=dp[i][i][k][u][v]*2(cnt[i]-i-1)\$
- \$dp[i][j+1][k+1][u+1][v]+=dp[i][j][k][u][v]*(cnt[i-1]-k)\$
- 这些转移都不难。最后当 \$i=2\$ 时,要注意记录用来包围 \$u\$ 的字符
- 最后所有 \$u+v\$ 可任意排列

其中 \$i,i\$ 可滚动。时间复杂度 \$O(\Sigma^{4})\$□

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Last update: 2020/07/07 11:21

