Inc Match Two (Easy)

Problem category: Strings
Expected difficulty: 1200

Solution

A key observation to solve this problem is that, at any given time during the game, there can be no adjacent characters that are equal. This implies that, as long as the string length is greater than one, we can choose a character such that one of its immediate neighbors is greater than it and increase the former to match the latter.

But there's a catch: if the neighbors on both sides are the same letter, then increasing the middle one will match three instead of two, and the length of the string will change parity. Fortunately, if the string length is even, there will always be a character that is not surrounded by the same letter. (The proof is left as an exercise.)

It follows that we can always make the string empty if its length is *even*.

The case of odd-length strings is more complicated. We will need to check whether it is possible to change the parity of the length. That is, we need to find a contiguous sequence of odd length that can be removed without disturbing the rest of the string.

In order to do so, we have to find a *valley* of odd length such that we can make the extremities match, then raise the middle characters and possibly remove them until both sides meet. This can be accomplished with a linear search over the string: as soon as we find a valley of minimal length, we try extending it on both sides until it either can be removed or cannot be extended any further.

Complexity

Since we make a single pass over the string, the time complexity is $O(n)$.