

Version Controlled IDE

Solution Sketch:

If we don't save histories, we can use a splay tree or treap to implement such an editor, then inserting/deleting each character can be done in $O(\log C)$, where $C = \text{total_num_chars}$

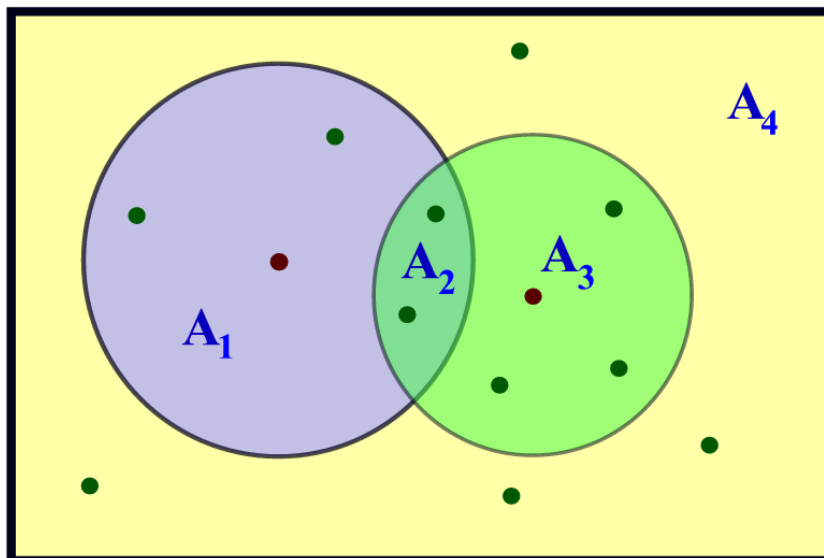
Now we save histories. For each node, we change the two pointers (three if you store father) into two lists of (version, pointer) in increasing order of version, so when you visit the tree, you could do a binary search to get the "old" pointer in a particular version. Since in each operation, there are $O(\log C)$ pointer changes, the total length of all pointer lists is $O(C \log C)$.

Radiation:

Solution Sketch

Problem type: Binary Search.

The solution to this problem is not hard. Let's look at the figure below. Let A_1 , A_2 , A_3 and A_4 denote the following:



A_1 = Number of houses that are in high radiation risk only for first power plant.

A_2 = Number of houses that are in high security risk caused by both power plants.

A_3 = Number of houses that are in high radiation risk only for 2nd power plant.

A_4 = Number of houses

that are in low security risk area.

We note that in this problem the location of Nuclear power plants and location of houses are fixed. For each query the only thing that vary is R_1 and R_2 . As the number of query is very high so a liner time solution for each query will time out. We can create two arrays to store distance of the houses from first and second plant respectively. Then we can sort those distances in ascending order. So now when R_1 and R_2 are given then we can find the following values using binary search in $O(\lg(n))$ complexity

$A_1 + A_2$, $A_2 + A_3$ and

We know that $A_1 + A_2 + A_3 + A_4 = N$,

In this problem we are actually asked to find out the value if $A_4 - A_2$. But note than we cannot separately find the value of A_4 and A_2 using binary search. But we can find the value of $A_4 - A_2$ because $A_4 - A_2 = N - (A_1 + A_2) - (A_2 + A_3)$. But there is a small trap, the total number of unprotected house cannot be negative, so if $A_4 - A_2$ is negative, then we should print 0 instead.