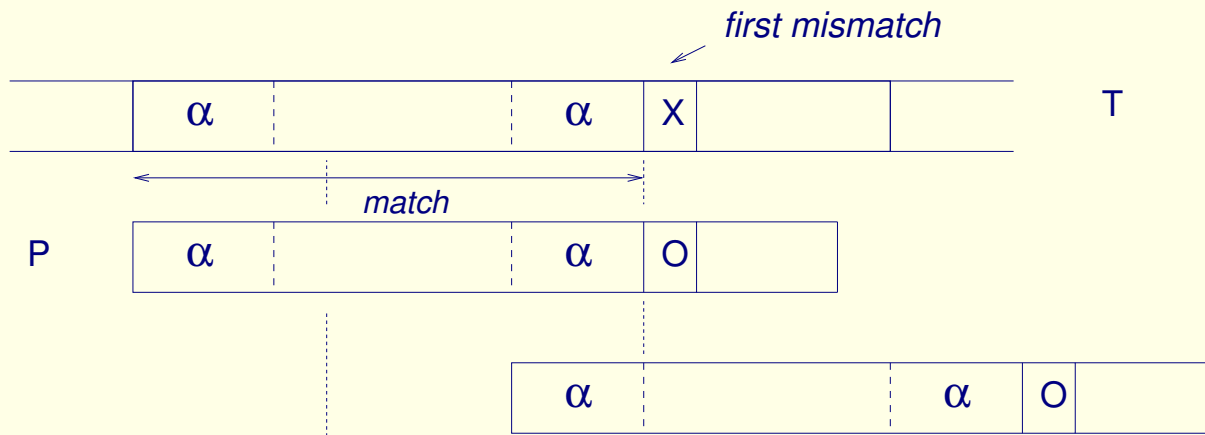
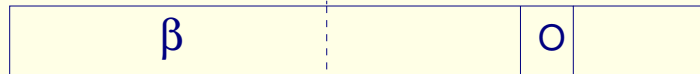


Key Idea of Failure Function in KMP

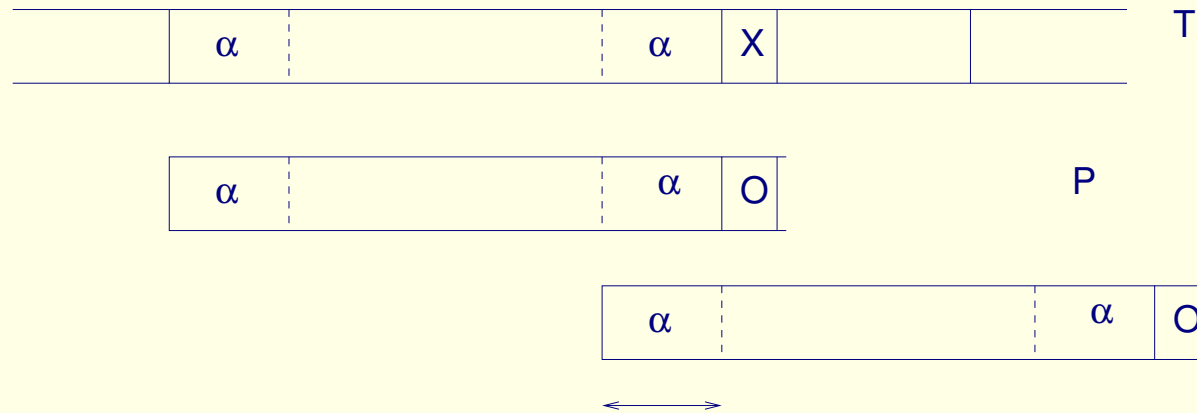


If α is the longest prefix of sub-pattern P (up to but not including O) that is also its suffix, we claim that the "slide" as shown will not omit any possible match; for if not, we have an "earlier" match like:



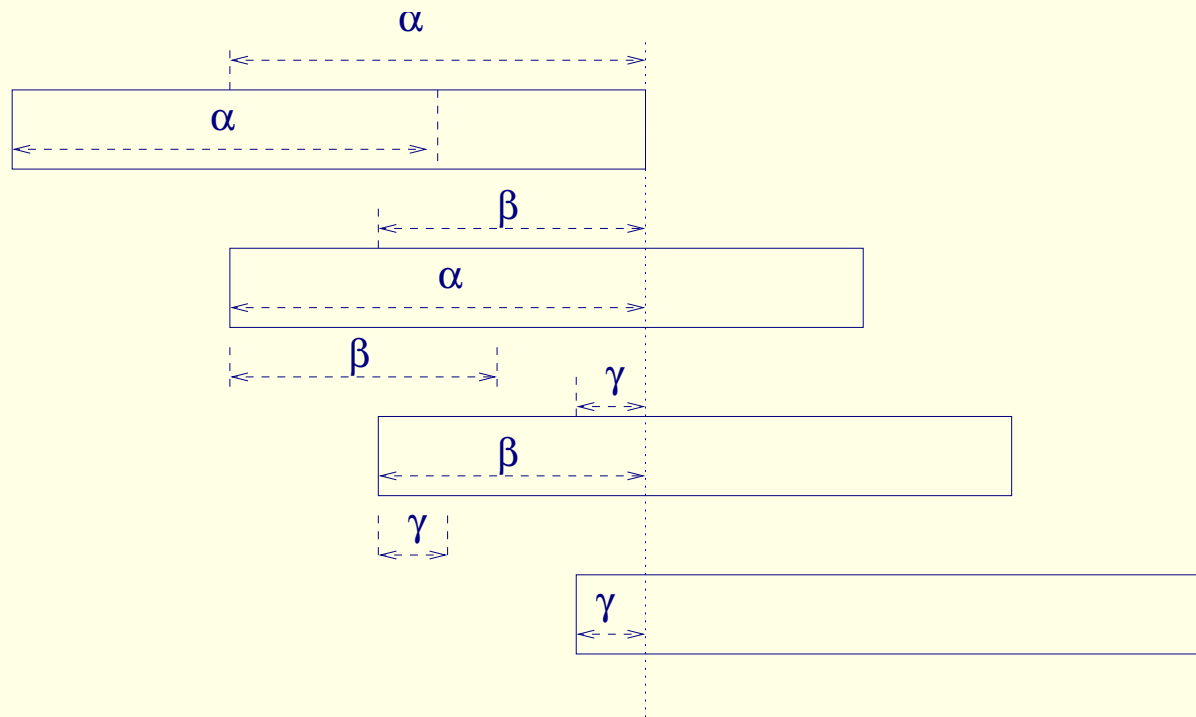
But then β would be a prefix of P that is also its suffix, because it matches T up to X , and also P up to O as well. However, β is longer than α -- contradiction!

KMP is linear-time



In sliding using the failure function, the part in P indicated by the double arrow line does NOT have to be matched, since it is already known to match the corresponding part of T . Hence NO character in T that was previously examined is re-examined.

This is so in all other cases too. Hence KMP scan is $O(n)$ where $|T| = n$.



Computing the Failure Function by "self-sliding" of the pattern against itself. This is done in $O(m)$ comparisons where m is the pattern length.

Hence KMP is $O(n+m)$ complexity.