Problem

We defined the rotational closure of language A to be *RC*(A) = {yxl xy ? A}. Show that the class of CFLs is closed under rotational closure.

Step-by-step solution

Step 1 of 1

CFLs is closed under rotational closure

The rotational closure of a language A is defined as $RC(A)=\{yx \mid xy \in A\}$.

The class of CFLs is closed under the concatenation operation. In other words if L_1 and L_2 are CFLs then the language $L=L_1 \bullet L_2$ is also a CFL. The converse is also true: if language $L=L_1 \bullet L_2$ is a CFL, then language L_1 and language L_2 are CFLs.

Consider a string $s=xy$ in the language A. It can be formed from the concatenation of two languages X and Y, such that $x \in X$ and $y \in Y$. As the language $A=X \bullet Y$ is a CFL, the languages X and Y will also be CFLs.

The rotational closure of the string $s=xy$ will be $RC(s)=RC(xy)=yx$. It can be formed by concatenating Y and X.

$$RC(s)=Y \bullet X$$

As both Y and X are context-free languages, the language $RC(s)$ is a context-free language for any string $s \in A$.

The rotational closure has been proven for the class of CFLs.

Comments (1)