

CS 273

Discussion section 9

12 March 2008

1 Questions on homework 8?

Any questions? Complaints, etc?

2 Chomsky Normal Form

We want to write this grammar in CNF:

$$\begin{aligned}S &\rightarrow ASA \mid aB \\A &\rightarrow B \mid S \\B &\rightarrow \epsilon\end{aligned}$$

After removing nullable variables and unreachables:

$$\begin{aligned}S &\rightarrow AS \mid SA \mid ASA \mid a \\A &\rightarrow S\end{aligned}$$

Now we remove unit rules:

$$\begin{aligned}S &\rightarrow AS \mid SA \mid ASA \mid a \\A &\rightarrow AS \mid SA \mid ASA \mid a\end{aligned}$$

returning back ϵ to the language:

$$\begin{aligned}S &\rightarrow AS \mid SA \mid ASA \mid a \mid \epsilon \\A &\rightarrow AS \mid SA \mid ASA \mid a\end{aligned}$$

finally:

$$\begin{aligned}S &\rightarrow AS \mid SA \mid AT_{SA} \mid a \mid \epsilon \\A &\rightarrow AS \mid SA \mid AT_{SA} \mid a \\T_{SA} &\rightarrow SA\end{aligned}$$

3 Closure Properties

CFL's are closed under substitution, union, concatenation, Kleen closure and positive closure, reversal, intersection with a regular language, and inverse homomorphism.

Consider $L = \{a^n b^{3n} c^{2n} : n \geq 0\}$. Assume L is CFL. Consider this homomorphism: $h(0) = a, h(1) = bbb, h(2) = cc$. $h^{-1}(L) = \{0^n 1^n 2^n : n \geq 0\}$ and must be CFL, but we know that this is not a CFL. So by contradiction we have shown that L is not a CFL.