

Formal grammars: Homework 9

Alexander Okhotin

April 17, 2009

- Due on April 23.
1. Prove that linear context-free languages are closed under intersection with regular languages.
 - The same construction as given for the context-free grammars is valid for this case. Nevertheless, writing it down for this special case is a good exercise.
 2. Let $K, L \subseteq \Sigma^*$ be linear conjunctive languages and let $c \notin \Sigma$. Prove that the language KcL is linear conjunctive.
 - Note that it is essential that c is not in Σ : for $c \in \Sigma$ the closure does not hold.
 3. Prove that the language $\{a^n b^{2^n} a^{2^{2^n}} \mid n \geq 1\}$ is linear conjunctive.
 - Recall the trellis automaton for $\{a^n b^{2^n} \mid n \geq 1\}$ given in the lecture.
 4. Prove that the language $\{a^n b^{i \cdot n^2} \mid n, i \geq 1\}$ is not linear conjunctive.
 5. Are linear context-free languages closed under the cyclic shift operation, $\text{SHIFT}(L) = \{vu \mid u, v \in \Sigma^*, uv \in L\}$?
 6. Are linear conjunctive languages closed under the cyclic shift?
 7. Are linear conjunctive languages closed under star?