

TD Series N°2

Exercise1

- Examine the following three grammars, then give their types according to Chomsky hierarchy :

$$G = (N, T, S, P); N = \{S, A\}; T = \{a, b, c\}, P = (S \rightarrow abcA | Aabc; A \rightarrow \varepsilon; Aa \rightarrow Sa; cA \rightarrow cS)$$

$$G = (N, T, S, P); N = \{S\}; T = \{0, 1\}, P = (S \rightarrow 0 | 1 | 1S)$$

$$G = (N, T, S, P); N = \{S\}; T = \{a, *, +\}, P = (S \rightarrow a | * SS | + SS)$$

- Derive in one step does the word belongs to $L(G)$?
- Drive in two steps does the word belongs to $L(G)$?
- Does $\varepsilon \in L(G)$?
- Give two derivations on the first grammar that generate the word **abcabcabc**
- Specify In natural language then formally $L(G)$

Exercise2

Let $G = (N, T, S, P)$ be a grammar their rewriting rules are:

$$P = (S \rightarrow AB; A \rightarrow Aa | bB; B \rightarrow a | Sb)$$

- Does G a regular? If not give the type (class) of G using Chomsky classification?
- Draw the derivation tree for each of the following words : $(baabaab, bBABb, baSb)$
- Give left and right derivation for: $baabaab$.

Exercise3

- Give a context –free grammar that generates $L(G)$

$$L(G) = \{u \in \{a, b\}^+ \text{ where } |u|_a > |u|_b \}$$

- Check your grammar on the word $baaba$,

Exercise4

Let $G = (N, T, S, P)$, $N = \{S, S', A, B, C\}$, $T = \{a, b, c\}$, $P = (S \rightarrow S' | \varepsilon; S' \rightarrow ABCS | ABC;$
 $AB \rightarrow BA; AC \rightarrow CA; BA \rightarrow AB; BC \rightarrow CB; CA \rightarrow AC; CB \rightarrow BC; A \rightarrow a; B \rightarrow b; C \rightarrow c)$

be a grammar

- Determine the type of G
- Give two words belong to $L(G)$
- Specify in natural language then formally $L(G)$.

Exercise5

We consider the grammar

$$G = (N, T, S, P), N = \{S, U\}, T = \{a, b, c, d\}, P = (S \rightarrow aU | c; U \rightarrow Sb | d)$$

- Determine the type of G
- Derive three words belong to $L(G)$
- Specify formally $L(G)$.

Exercise6

We consider the two languages:

- $L1 = \{a^n b^n, \text{such as } n \geq 0\}$
- $L1 = \{a^n b^p, \text{such as } n \geq 0, n \leq p, p \leq 2n\}$
- Propose two grammars that generate $L1$ and $L2$.
- What is the type of each grammar?
- Calculate $L1 \cap L2$.