

Right-Linear Grammar

A grammar is **right-linear**, if all productions have one of the two forms:

$$V \rightarrow T^* V \text{ or}$$

$$V \rightarrow T^*$$

We can have only one variable-symbol on the left-hand side and on the right-hand side, we have at most one variable, and this is at the far right.

Left-Linear Grammar

A grammar is **left-linear**, if all productions have one of the two forms:

$$V \rightarrow V T^* \text{ or}$$

$$V \rightarrow T^*$$

We can have only one variable-symbol on the left-hand side and on the right-hand side, we have at most one variable, and this is at the far left.

Regular Grammar

A grammar is **regular**, if it is either right-linear or left-linear.

This means, all productions in the grammar have to be completely left-linear or completely right-linear but not mixed left-linear and right-linear.

Linear Grammar

Grammars, in which each rule is in right-linear or left-linear form, i.e. left-linear and right-linear rules can be mixed, is called **linear**.

Linear grammars are a more general class of grammars than regular grammars.

Example

The grammar with the following productions:

$$S \rightarrow a X$$

$$X \rightarrow S b$$

$$S \rightarrow \lambda$$

Lecture1\ : RG

is linear but neither right-linear nor left-linear, and thus not a regular grammar.

Which language does this grammar describe? H.W

Example – Grammars

What languages do the following grammars generate? H.W

$G_1 = (V, T, P_1, S)$ with $V = \{A, B\}$ $T = \{a, b\}$ and Productions P_1 :

$S \rightarrow A \mid B$

$A \rightarrow a A \mid a$

$B \rightarrow b B \mid b$

$G_2 = (V, T, P_2, S)$ with V, T as above and Productions P_2 :

$S \rightarrow A$

$A \rightarrow a A \mid B \mid \lambda$

$B \rightarrow b B \mid \lambda$

DONE

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