

Regular Grammars

A grammar $G = (V, T, S, P)$ is *right-linear* if each production has one of the two forms:

$$A \rightarrow xB$$

$$A \rightarrow x$$

where $A, B \in V$ and $x \in T^*$

A *left-linear* grammar has the forms:

$$A \rightarrow Bx$$

$$A \rightarrow x$$

Examples: $S \rightarrow aS$ $B \rightarrow A$
 $S \rightarrow B$ $A \rightarrow aA$
 $B \rightarrow bB$ $A \rightarrow \lambda$

$S \rightarrow aS$ $A \rightarrow aaA$
 $S \rightarrow bS$ $A \rightarrow \lambda$
 $S \rightarrow bA$

Regular Grammars Generate Regular Languages

Construction of transition graph from grammar.

1. Map each variable to a state.
 2. S maps to the initial state.
 3. Create a final state q_f .
 4. Map each production $A \rightarrow xB$ to a (q_A, q_B) edge labeled x .
 5. Map each production $A \rightarrow x$ to a (q_A, q_f) edge labeled x .
-

Regular Languages have Regular Grammars.

Construction of grammar from transition graph.

1. Map each state q_i to a variable A_i .
2. For the initial state q_0 , create a production $S \rightarrow A_0$.
3. Map each edge (q_i, q_j) with label a to a production $A_i \rightarrow aA_j$.
4. For each final state q_i , create a production $A_i \rightarrow \lambda$.