GRAMMATICHE LIBERE

$S \to () \mid (S) \mid SS$ è ambigua

$S \to () \mid (S) \mid AS$

$A \to () \mid (S)$

Comandi di un linguaggio imperativo

$\Lambda = \{ =, ;, \text{if}, (,), , \text{else}, \text{while}, \{, \}, +, *, \ldots \}$

$Com \to Ide = Exp; \mid \text{if } (Exp)\ Com \text{ else } Com \mid \text{while } (Exp)\ Com \mid \{ ComList \}$

$ComList \to Com \mid Com\ ComList$

$Ide \to Letter\ Seq$

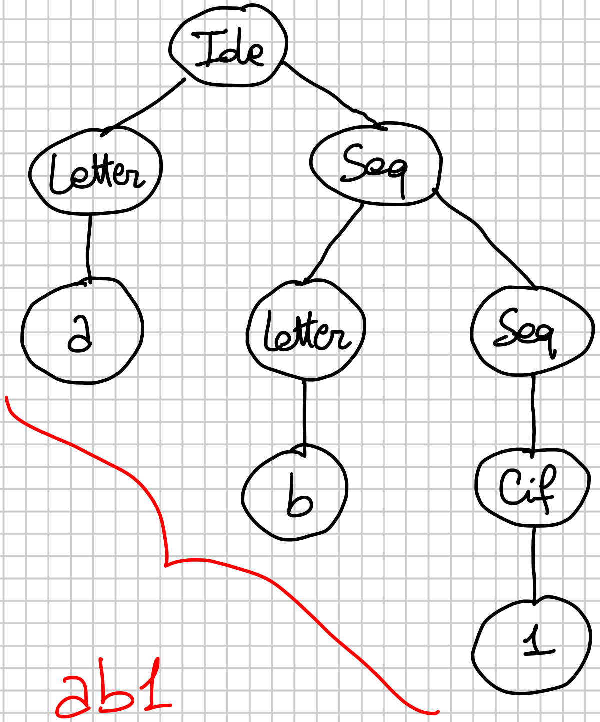
$Letter \to a \mid b \mid c \mid \ldots \mid z \mid A \mid B \mid \ldots \mid Z$

$Cif \to 0 \mid 1 \mid 2 \mid \ldots \mid 9$

$Seq \to Letter \mid Cif \mid \varepsilon \mid Cif\ Seq \mid Letter\ Seq$

$ab1 \in Ide$

$1ab \notin Ide$



$Exp \rightarrow Num \mid Exp + Exp \mid Exp * Exp$

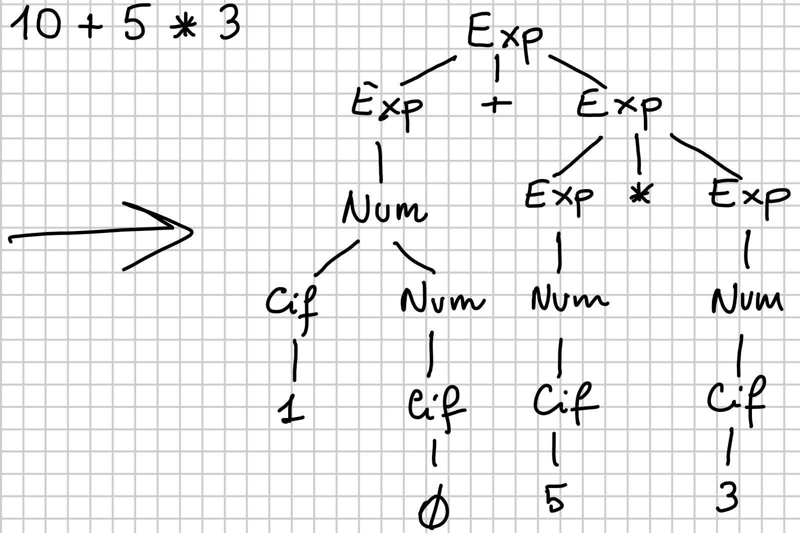
solo operatori di + e *
per semplicità

$Num \rightarrow Cif \mid Cif\ Num$

$\emptyset\emptyset 1 \in Num$

$\emptyset a 1 \notin Num$

$10 + 5 * 3$



← è la somma di due exp

10 + il prodotto di due exp

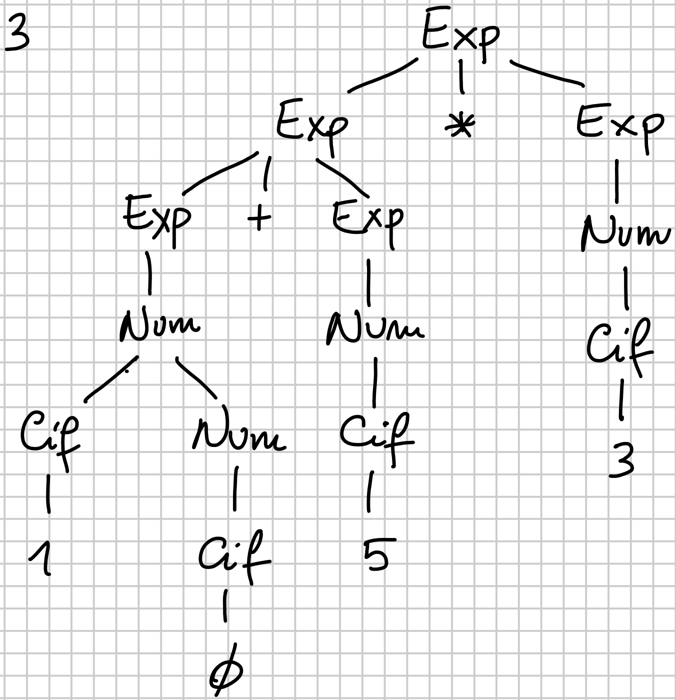
5 * 3

||

10 + 15

25

$10 + 5 * 3$



← il valore è il prodotto di due espressioni

la somma di due exp $\quad * \quad 3$

$10 + 5$

$\parallel$

$15 \quad * \quad 3$

$\parallel$

45

1) Introduciamo una nuova produzione

$Exp \rightarrow (Exp)$

$10 + (5 * 3)$

$(10 + 5) * 3$

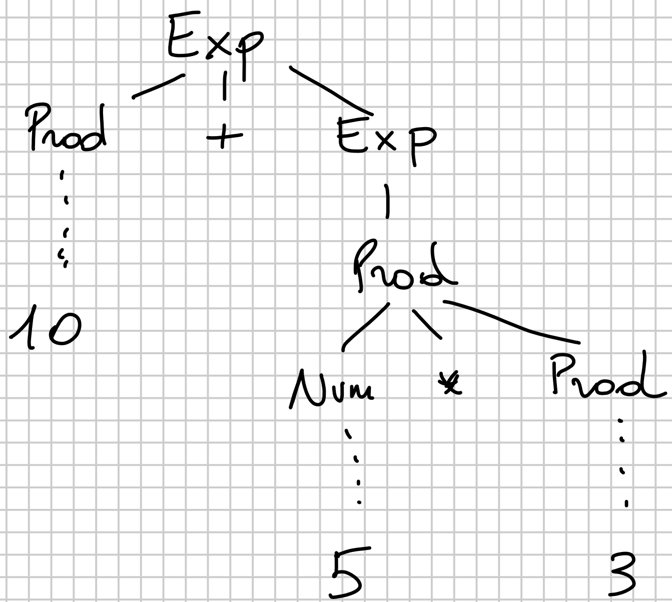
$Exp \to Prod + Exp \mid Prod$

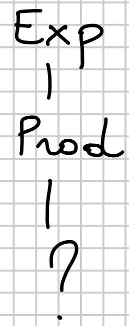
$Prod \to Num \mid Num * Prod$

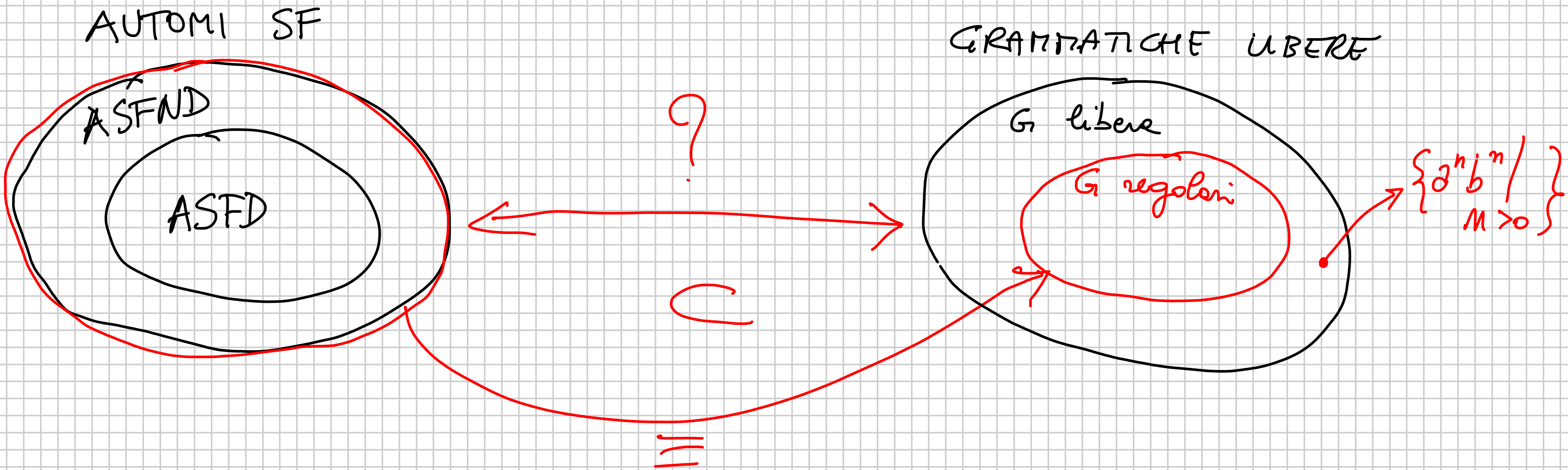
$Num \to \ldots$

GRAMMATICA a PRECEDENZA

$10 + 5 * 3$







GRAMMATICHE LIBERE

$A \to \alpha$ con

$A \in V$ $\quad \alpha \in (\Lambda \cup V)^*$

$G = \langle \Lambda, V, S, P \rangle$

$A \to \cancel{abcAdd}$

GRAMMATICHE REGOLARI

$A \to \underline{a}$ con $A \in V$, $a \in \Lambda$

$A \to \underline{aB}$ $\quad A, B \in V$, $a \in \Lambda$

$A \to aA$

Dato un ASF è possibile COSTRUIRE una grammatica REGOLARE che genera lo stesso linguaggio riconosciuto dall'automa

$$A = (\Lambda, \Sigma, S, F, \delta)$$

$$\Downarrow$$

$$G_A = (\Lambda, \Sigma, S, P)$$

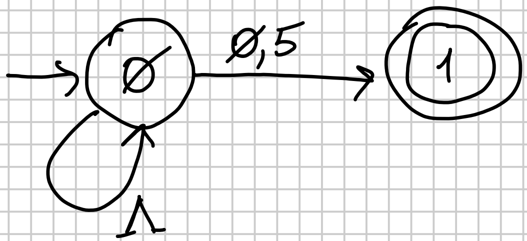
$Q, Q' \in \Sigma$
$a \in \Lambda$

- se $\underline{Q' \in \delta(Q, a)}$ allora in P c'è la produzione

$$\underline{Q \rightarrow a Q'}$$

- se poi $\underline{Q' \in F}$ aggiungo ANCHE la produzione

$$Q \rightarrow a$$



$\Lambda = \{\varnothing, 1, \dots, 9\}$

$1 \in \delta(\varnothing, \varnothing)$

$\varnothing \in \delta(\varnothing, \varnothing)$

ASFND

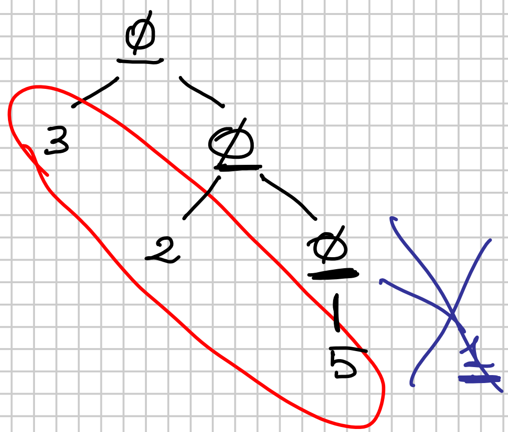
$G = (\Lambda, \{\underline{\varnothing}, \cancel{\underline{1}}\}, \underline{\varnothing}, P)$

$\underline{\varnothing} \to \varnothing\underline{\varnothing} \mid 1\underline{\varnothing} \mid 2\underline{\varnothing} \mid \dots \mid 9\underline{\varnothing} \mid \cancel{\varnothing\underline{1}} \mid \cancel{5\underline{1}} \mid \varnothing \mid 5$

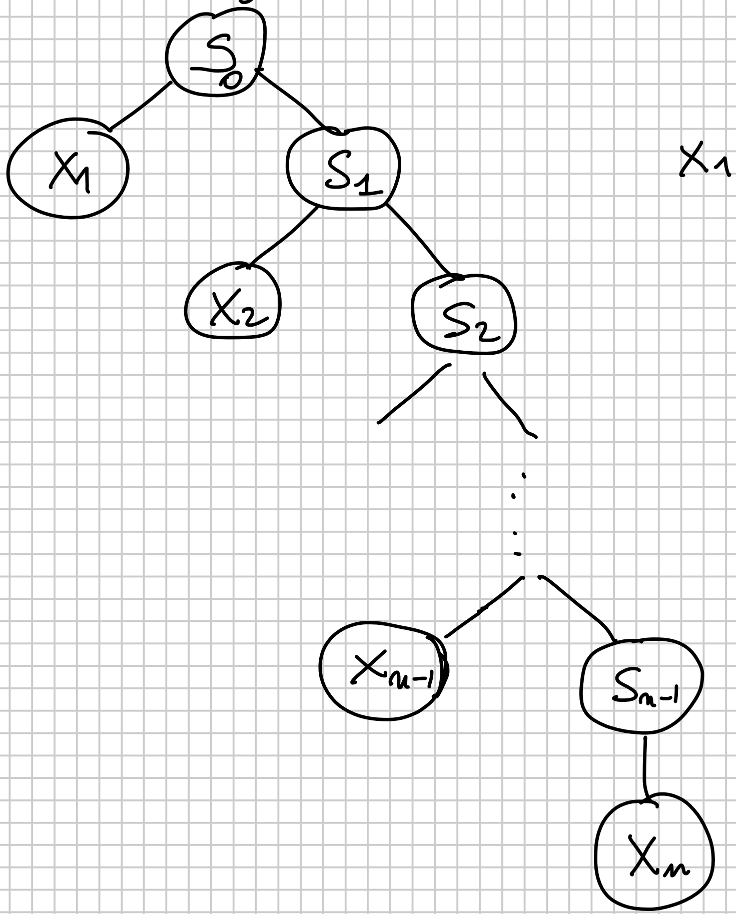
325 cammino di riconoscimento nell'automa

$\to \varnothing \xrightarrow{3} \varnothing \xrightarrow{2} \varnothing \xrightarrow{5} 1$ ✓

Albero di derivazione nella grammatica



Nelle grammatiche regolari gli alberi di derivazione hanno sempre la forma



$x_1 x_2 \dots x_n$

$S' \rightarrow x\, S''$

$S' \rightarrow x$

ESERCIZIO

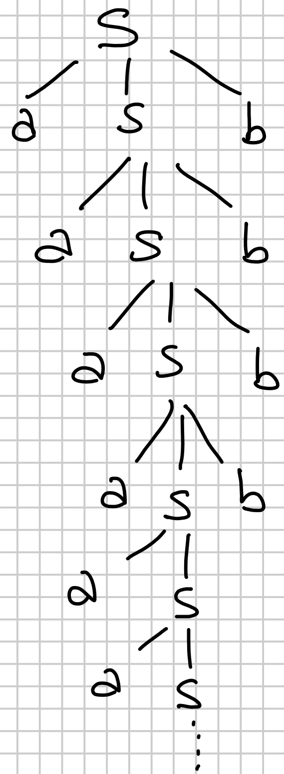
$\mathcal{L} = \{ a^n b^m \mid n > m > \emptyset \}$ $\quad \Lambda = \{a, b\}$

$S \to a\underline{ab} \mid \underline{aSb} \mid aS$

$\cancel{S \to ASB \mid AS \mid aab}$

$\cancel{A \to a \mid aA}$

$\cancel{B \to b \mid bB}$



$\mathcal{L} = \{ a^n b^{n+1} \mid n \geq 0 \}$

$S \to aSb \mid \cancel{abb} \quad b$

$n, m, k > 0$

$\mathcal{L} = \{ a^n b^m c^k \mid k = n + m \wedge n+m+k > \emptyset \}$

$S \to aSc \mid \underline{aBc} \mid \cancel{ac} \mid \cancel{bc}$

$B \to bBc \mid \underline{bc}$