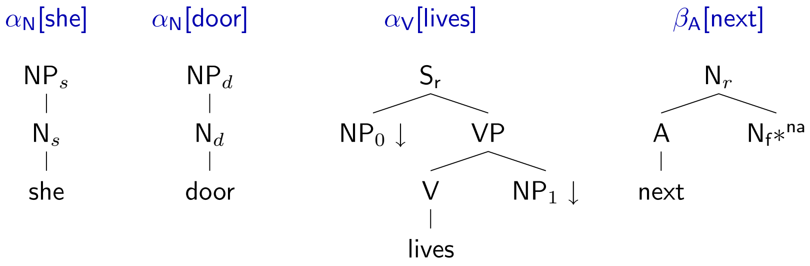
Analyse syntaxique pour les grammaires d'arbres adjoints

Université de Nice - Sophia Antipolis

15 décembre 2006

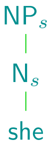
Une grammaire TAG

- un ensemble d'arbres initiaux et un d'arbres auxiliaires
- deux opérations sur les arbres : substitution et adjonction

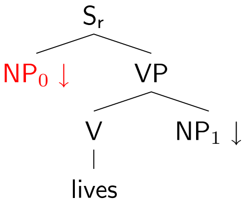


Substitution

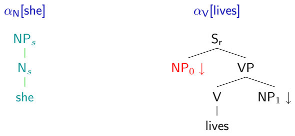
$\alpha_{\mathsf{N}}[\text{she}]$

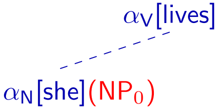


$\alpha_{\mathsf{V}}[\text{lives}]$

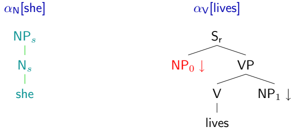


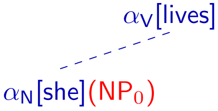
Substitution

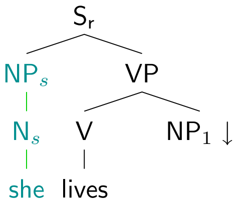




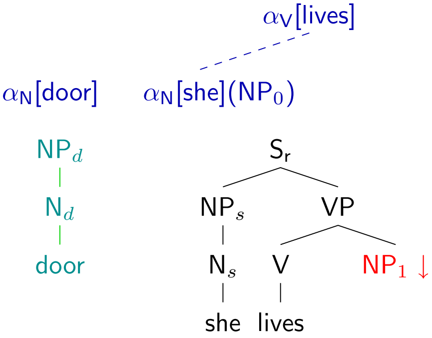
Substitution



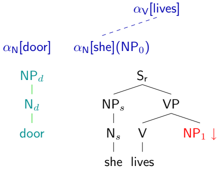


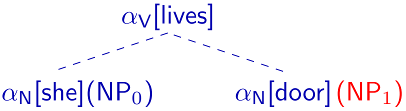


Substitution

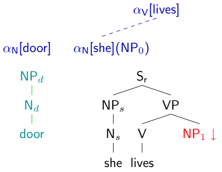


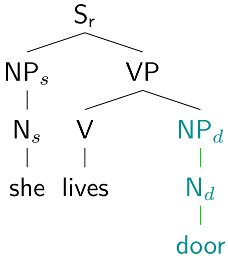
Substitution

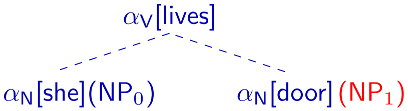




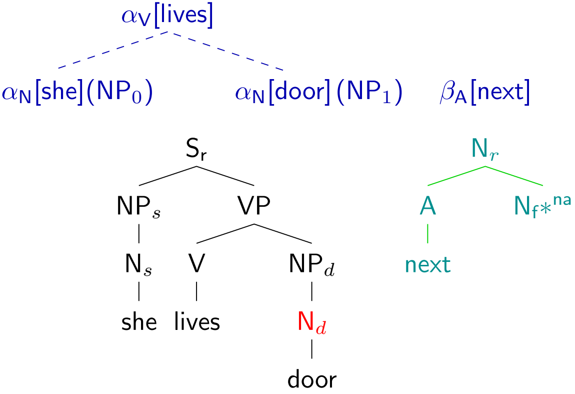
Substitution



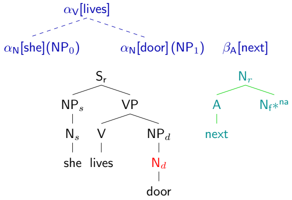




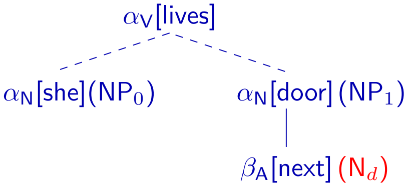
Adjonction


α_V[lives]
α_N[she](NP_0)
α_N[door](NP_1)
β_A[next]
S_r
NP_s
VP
N_s
V
NP_d
she
lives
N_d
door
N_r
A
N_f*^{na}
next

Adjonction

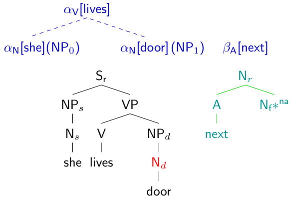


α_{V}[lives]
α_{N}[she](NP$_0$)
α_{N}[door] (NP$_1$)
β_{A}[next]
S$_r$
NP$_s$
VP
N$_s$
V
NP$_d$
she
lives
N$_d$
door
N$_r$
A
N$_f$*^{na}
next

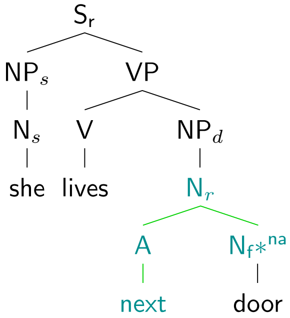


α_{V}[lives]
α_{N}[she](NP$_0$)
α_{N}[door] (NP$_1$)
β_{A}[next] (N$_d$)

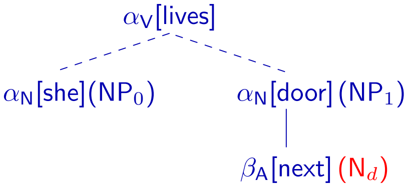
Adjonction



α_{V}[lives]
α_{N}[she](NP$_0$)
α_{N}[door](NP$_1$)
β_{A}[next]
S$_r$
NP$_s$
VP
N$_s$
V
NP$_d$
she
lives
N$_d$
door
N$_r$
A
N$_{f}*^{na}$
next



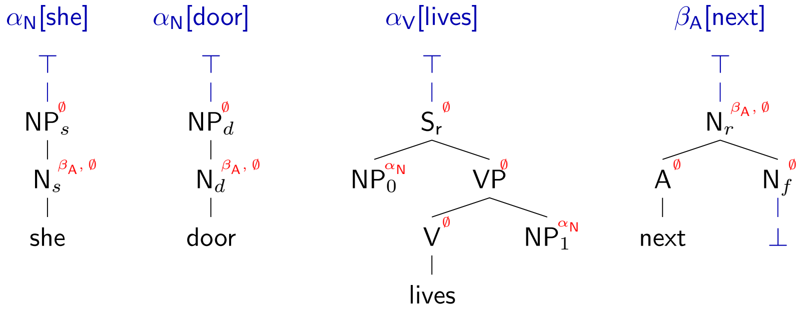
S$_r$
NP$_s$
VP
N$_s$
V
NP$_d$
she
lives
N$_r$
A
N$_{f}*^{na}$
next
door



α_{V}[lives]
α_{N}[she](NP$_0$)
α_{N}[door](NP$_1$)
β_{A}[next](N$_d$)

Listes d'adjonctions

- une liste d'arbres *Adj* par noeud non terminal
- $\emptyset$ pour une absence d'adjonction



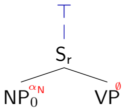
Parcours de l'arbre résultat

$$\top \rightarrow .S$$

$$\begin{array}{c} \top \\ | \\ S_r^{\emptyset} \end{array}$$

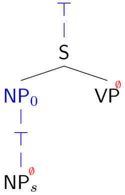
Parcours de l'arbre résultat

$S \longrightarrow \bullet NP_0\ VP$



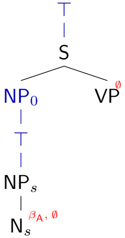
Parcours de l'arbre résultat

$$\top \longrightarrow \bullet \mathrm{NP}_s$$

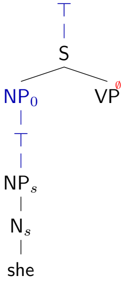


Parcours de l'arbre résultat

$$NP_s \longrightarrow \bullet N_s$$

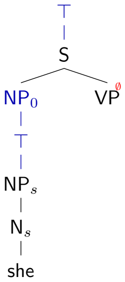


Parcours de l'arbre résultat



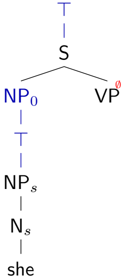
$N_s \longrightarrow \bullet \text{she}$

Parcours de l'arbre résultat



$N_s \longrightarrow$she$\bullet$

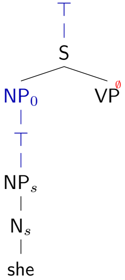
Parcours de l'arbre résultat



$$NP_s \longrightarrow N_s \bullet$$

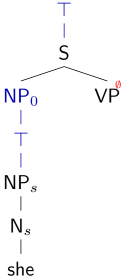
Parcours de l'arbre résultat

$\top \longrightarrow NP_s \bullet$



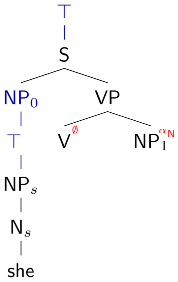
Parcours de l'arbre résultat

$$\mathsf{S_r} \longrightarrow \mathsf{NP_0} \bullet \mathsf{VP}$$

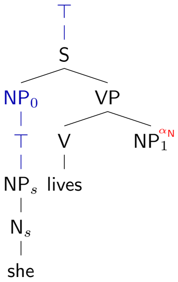


Parcours de l'arbre résultat

$$\mathrm{VP} \rightarrow \bullet\, \mathrm{V}\ \mathrm{NP}_1$$

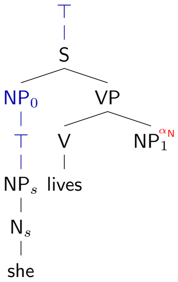


Parcours de l'arbre résultat



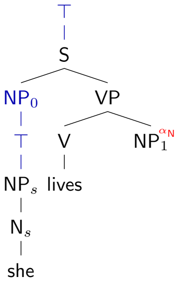
V$\longrightarrow\bullet$lives

Parcours de l'arbre résultat



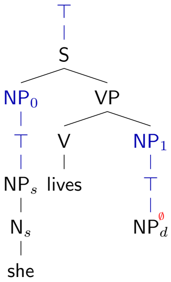
V⟶lives•

Parcours de l'arbre résultat



$$\mathrm{VP} \rightarrow \mathrm{V} \bullet \mathrm{NP}_1$$

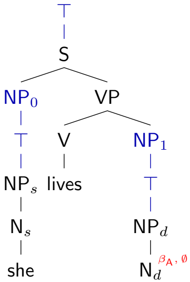
Parcours de l'arbre résultat



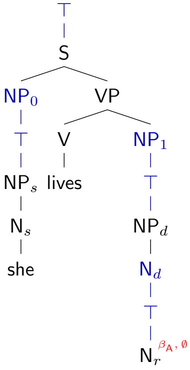
$\top \longrightarrow .\mathrm{NP}_d$

Parcours de l'arbre résultat

$$\mathrm{NP}_d \longrightarrow \bullet \mathrm{N}_d$$

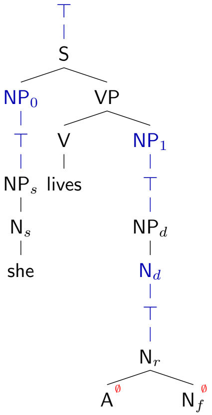


Parcours de l'arbre résultat



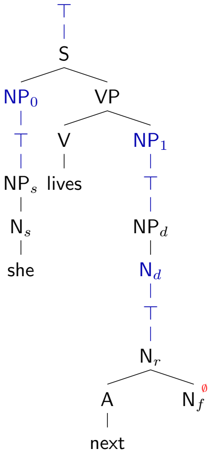
$$\top \longrightarrow \bullet N_r$$

Parcours de l'arbre résultat



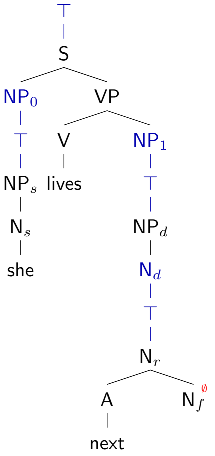
$$N_r \longrightarrow \bullet A\ N_f$$

Parcours de l'arbre résultat



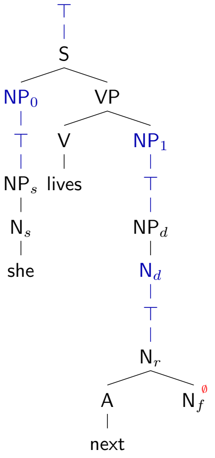
$A \longrightarrow \bullet next$

Parcours de l'arbre résultat



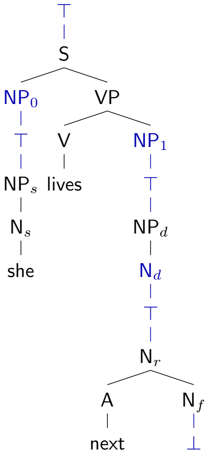
A⟶next.

Parcours de l'arbre résultat



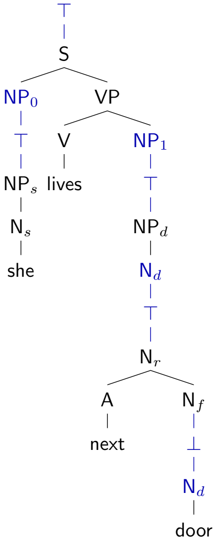
$$N_r \longrightarrow A \bullet N_f$$

Parcours de l'arbre résultat



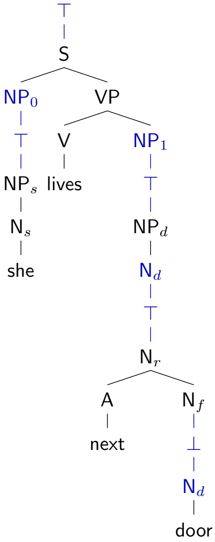
$\mathsf{N}_f \longrightarrow \bullet \bot$

Parcours de l'arbre résultat



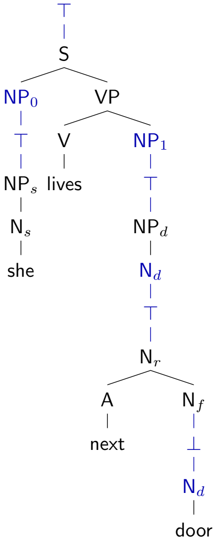
$N_d \longrightarrow \bullet door$

Parcours de l'arbre résultat



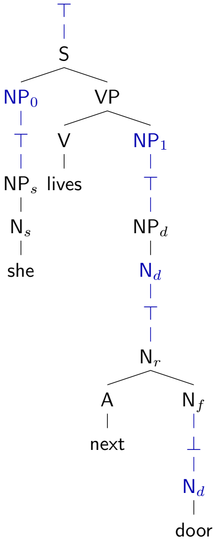
$N_d \longrightarrow$ door.

Parcours de l'arbre résultat



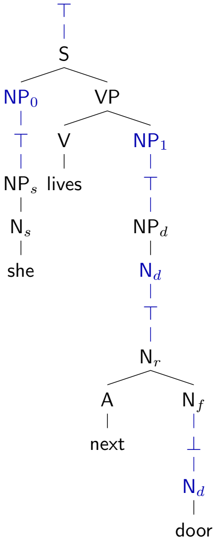
$N_f \longrightarrow \perp \bullet$

Parcours de l'arbre résultat



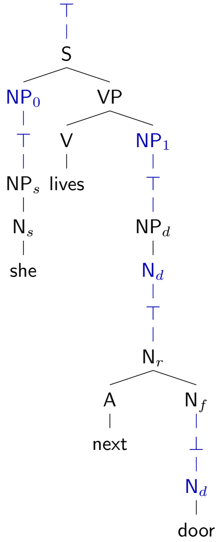
$N_r \longrightarrow A\ N_f \bullet$

Parcours de l'arbre résultat



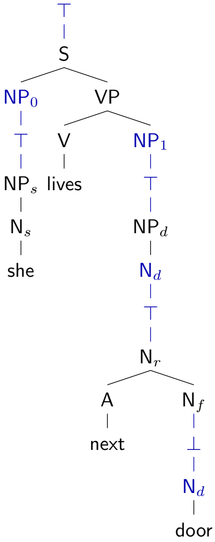
$\top \rightarrow N_r \bullet$

Parcours de l'arbre résultat



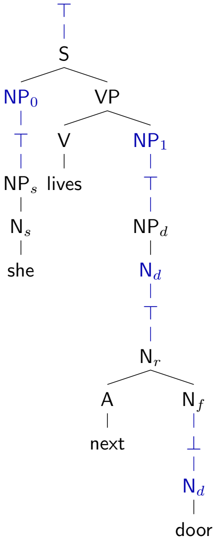
$$NP_d \rightarrow N_d \bullet$$

Parcours de l'arbre résultat



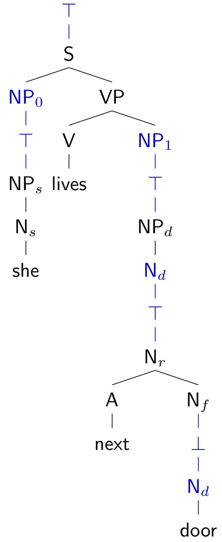
$\top \rightarrow \mathrm{NP}_d \bullet$

Parcours de l'arbre résultat



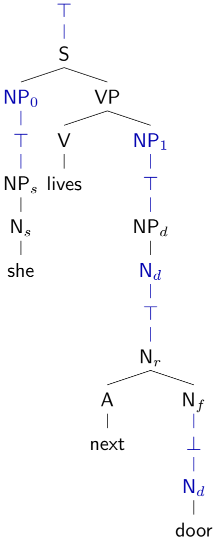
$VP \rightarrow V\ NP_1 \bullet$

Parcours de l'arbre résultat



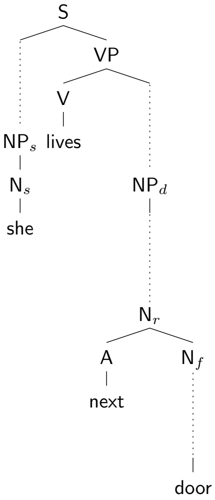
$S \rightarrow NP_0\ VP\bullet$

Parcours de l'arbre résultat

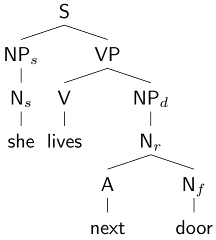


$\top \rightarrow S \bullet$

Parcours de l'arbre résultat



Parcours de l'arbre résultat



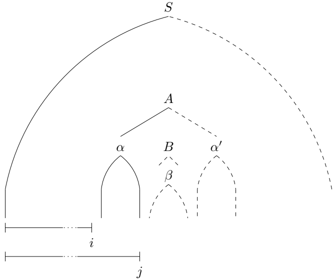
Rappel : analyse d'Earley pour CFGs

- ensemble d'items associé à chaque symbole d'entrée (par exemple le j^{e} symbole)
- construction des items par déduction
- besoin d'un seul indice en plus de l'indice courant :

Rappel : analyse d'Earley pour CFGs

- ensemble d'items associé à chaque symbole d'entrée (par exemple le j^{e} symbole)
- construction des items par déduction

$$\frac{A \rightarrow \alpha \bullet B\alpha', i, j}{B \rightarrow \bullet \beta, j, j} \qquad \text{(Pred)}$$



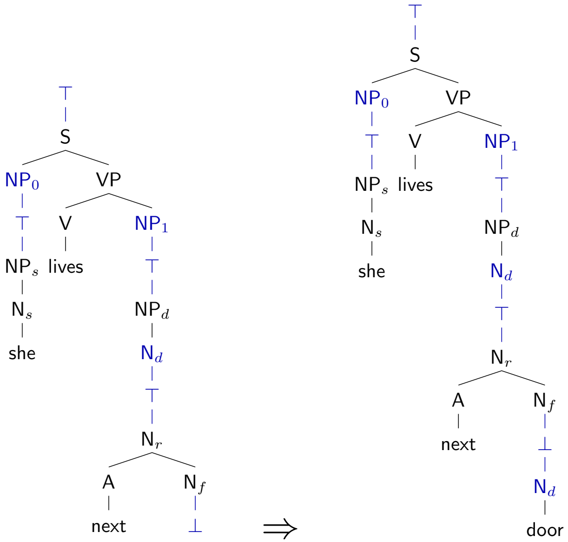
Rappel : analyse d'Earley pour CFGs

- ensemble d'items associé à chaque symbole d'entrée (par exemple le k^{e} symbole)
- construction des items par déduction
- besoin d'un seul indice en plus de l'indice courant :

$$\frac{B \to \beta \bullet, j, k \qquad A \to \alpha \bullet B\alpha', i, j}{A \to \alpha B \bullet \alpha', i, k} \quad \text{(Comp)}$$

Items pour TAGs

Le pied d'adjonction

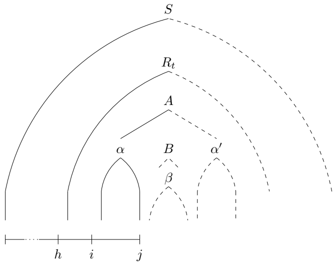


Items pour TAGs

Le pied d'adjonction

Ajout de l'indice de début de l'arbre courant :

$$h, A \rightarrow \alpha \bullet B\alpha', i, j$$



Items pour TAGs

Le pied d'adjonction

Ajout de l'indice de début de l'arbre courant :

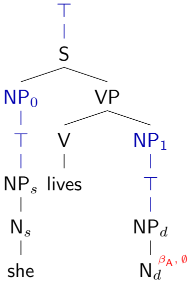
$$\frac{\begin{array}{l} h, A \rightarrow \alpha \bullet B\alpha', i, j \\ t \in \mathrm{Adj}(B) \end{array}}{j, \top \rightarrow \bullet R_t, j, j} \qquad \text{(Pred 1)}$$

$$\frac{\begin{array}{l} j, F_t \rightarrow \bullet \bot, k, k \\ h, A \rightarrow \alpha \bullet B\alpha', i, j \\ t \in \mathrm{Adj}(B) \end{array}}{h, B \rightarrow \bullet \beta, k, k} \qquad \text{(Pred 3)}$$

Items pour TAGs

Le pied d'adjonction

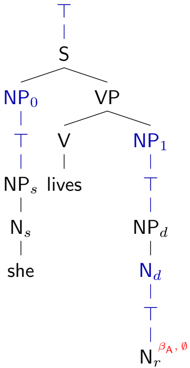
$$\frac{\begin{array}{l}2, \mathrm{NP}_d \rightarrow \bullet \mathrm{N}_d, 2, 2 \\ \beta_A \in \mathrm{Adj}(\mathrm{N}_d)\end{array}}{} \quad \text{(Pred 1)}$$



Items pour TAGs

Le pied d'adjonction

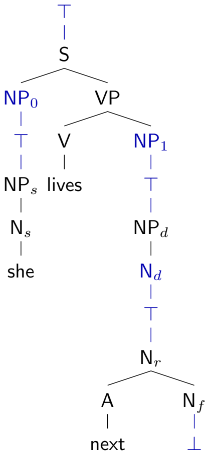
$$\frac{2, \mathsf{NP}_d \rightarrow \bullet \mathsf{N}_d, 2, 2 \quad \beta_A \in \mathsf{Adj}(\mathsf{N}_d)}{2, \top \rightarrow \bullet \mathsf{N}_r, 2, 2} \quad \text{(Pred 1)}$$



Items pour TAGs

Le pied d'adjonction

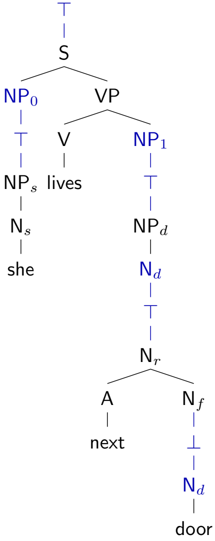
$$\frac{\begin{array}{l} 2, \mathrm{N}_f \rightarrow \bullet \bot, 3, 3 \\ 2, \mathrm{NP}_d \rightarrow \bullet \mathrm{N}_d, 2, 2 \\ \beta_A \in \mathrm{Adj}(\mathrm{N}_d) \end{array}}{\quad} \quad \text{(Pred 3)}$$



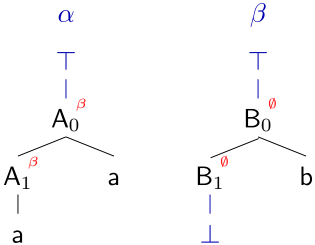
Items pour TAGs

Le pied d'adjonction

$$\frac{\begin{array}{l} 2, \mathsf{N}_f \longrightarrow \bullet \perp, 3, 3 \\ 2, \mathsf{NP}_d \longrightarrow \bullet \mathsf{N}_d, 2, 2 \\ \beta_A \in \mathsf{Adj}(\mathsf{N}_d) \end{array}}{2, \mathsf{N}_d \longrightarrow \bullet \mathsf{door}, 3, 3} \quad (\mathsf{Pred}\ 3)$$

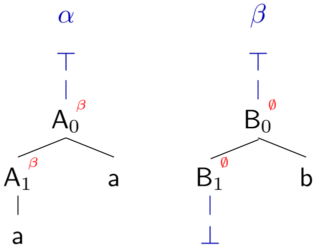


Items pour TAGs
Le retour d'adjonction



Items pour TAGs

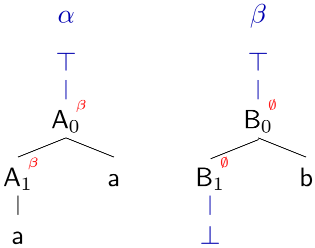
Le retour d'adjonction



$$\frac{\begin{array}{l} j, \top \rightarrow \mathrm{R}_t \bullet, j, k \\ h, A \rightarrow \alpha \bullet B\alpha', i, j \\ t \in \mathrm{Adj}(B) \end{array}}{h, A \rightarrow \alpha B \bullet \alpha', i, k} \qquad (\mathrm{Adj}\,?)$$

Items pour TAGs

Le retour d'adjonction



$$\frac{\begin{array}{l} 0, \top \rightarrow \mathrm{B}_0 \bullet, 0, 2 \\ 0, \top \rightarrow \bullet \mathrm{A}_0, 0, 0 \\ \beta \in \mathrm{Adj}(A_0) \end{array}}{0, \top \rightarrow \mathrm{A}_0 \bullet, 0, 2} \quad (\mathrm{Adj}\,?)$$

Items pour TAGs

Le retour d'adjonction

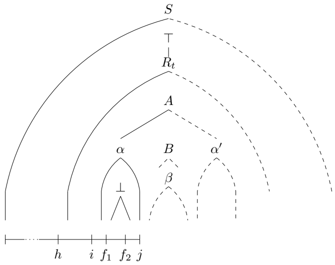
Ajout des indices de début et de fin du pied

Items pour TAGs

Le retour d'adjonction

Ajout des indices de début et de fin du pied

$$h, A \rightarrow \alpha \bullet B\alpha', i, j, f_1, f_2$$



Items pour TAGs

Le retour d'adjonction

$$\frac{\begin{array}{l} 0, \top \longrightarrow B_0 \bullet, 0, 2, 0, 1 \\ 0, A_0 \longrightarrow \bullet A_1 a, 0, 0, ., . \\ \beta \in \mathrm{Adj}(A_1) \\ 0, A_1 \longrightarrow a \bullet, 0, 1, ., . \end{array}}{0, A_0 \longrightarrow A_1 \bullet a, 0, 2, ., .} \quad (\mathrm{Adj}\,?)$$

Items pour TAGs

Le retour d'adjonction

$$\frac{\begin{array}{l} j, \top \rightarrow \mathrm{R}_t \bullet, j, k, f_1, f_2 \\ h, A \rightarrow \alpha B \alpha', i, j, ., . \\ t \in \mathrm{Adj}(B) \\ h, \mathrm{B} \rightarrow \beta \bullet, f_1, f_2, ., . \end{array}}{h, A \rightarrow \alpha B \bullet \alpha', i, k, ., .} \qquad \text{(Adj 1' et 2')}$$

Items pour TAGs

Le retour d'adjonction

$$\frac{\begin{array}{l} j, \top \rightarrow \mathrm{R}_t \bullet, j, k, f_1, f_2 \\ h, A \rightarrow \alpha B \alpha', i, j, f_1', f_2' \\ t \in \mathrm{Adj}(B) \\ h, \mathrm{B} \rightarrow \beta \bullet, f_1, f_2, -, - \end{array}}{h, A \rightarrow \alpha B \bullet \alpha', i, k, f_1', f_2'} \qquad (\text{Adj 2'})$$

Items pour TAGs

Le retour d'adjonction

$$\frac{\begin{array}{l} j, \top \rightarrow \mathrm{R}_t \bullet, j, k, f_1, f_2 \\ h, A \rightarrow \alpha B \alpha', i, j, -, - \\ t \in \mathrm{Adj}(B) \\ h, \mathrm{B} \rightarrow \beta \bullet, f_1, f_2, f_1', f_2' \end{array}}{h, A \rightarrow \alpha B \bullet \alpha', i, k, f_1', f_2'} \quad \text{(Adj 1')}$$

... En fait plus complexe, voir l'article...

Règles manquantes

$$\frac{t \text{ initial avec racine } S}{0, \top \rightarrow \bullet \mathrm{S}_t, 0, 0, -, -} \quad \text{(Init)}$$

Règles manquantes

$$\frac{\begin{array}{l} h, B{\rightarrow}\beta\bullet, k, l, f_1', f_2' \\ t \in \mathrm{Adj}(B) \\ j, F_t{\rightarrow}\bullet\perp, k, k, -, - \\ h, A{\rightarrow}\alpha\bullet B\alpha', i, j, f_1, f_2 \end{array}}{j, F_t{\rightarrow}\perp\bullet, k, l, k, l} \qquad \text{(Comp 1)}$$

Règles manquantes

$$\frac{h, B \rightarrow \beta \bullet, j, k, ., . \quad h, A \rightarrow \alpha \bullet B\alpha', i, j, ., .}{h, A \rightarrow \alpha B \bullet \alpha', i, k, ., .} \qquad \text{(Comp 2 et 3)}$$

Règles manquantes

$$\frac{h, A \rightarrow \alpha \bullet a_{j+1} \alpha', i, j, f_1, f_2}{h, A \rightarrow \alpha a_{j+1} \bullet \alpha', i, j+1, f_1, f_2} \quad \text{(Scan 1)}$$

Règles manquantes

$$\frac{h, A \rightarrow \alpha \bullet \varepsilon \alpha', i, j, f_1, f_2}{h, A \rightarrow \alpha \varepsilon \bullet \alpha', i, j, f_1, f_2} \qquad \text{(Scan 2)}$$

Règles manquantes

$$\frac{\begin{array}{l} g, \top \rightarrow \mathrm{R}_t \bullet, j, k, f_1', f_2' \\ t \in \mathrm{Adj}(B) \\ t \text{ initial} \\ h, A \rightarrow \alpha \bullet B\alpha', i, j, f_1, f_2 \end{array}}{h, A \rightarrow \alpha B \bullet \alpha', i, k, f_1, f_2} \quad \text{(Subst)}$$

Complexité

Lire l'article : $\mathcal{O}(n^6)$

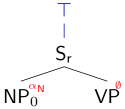
Exemple d'analyse

$$\frac{\alpha_V \text{ initial avec racine } S}{0, \top \rightarrow \bullet \mathrm{S}, 0, 0, -, -} \quad \text{(Init)}$$

$$\begin{array}{c} \top \\ | \\ \mathrm{S}_r^{\emptyset} \end{array}$$

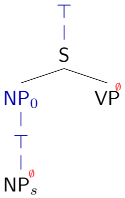
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \top \rightarrow \bullet\, \mathsf{S}, 0, 0, -, - \\ \emptyset \in \mathsf{Adj}(\mathsf{S}) \end{array}}{0, \mathsf{S} \rightarrow \bullet\, \mathsf{NP}_0\ \mathsf{VP}, 0, 0, -, -} \qquad \text{(Pred 2)}$$



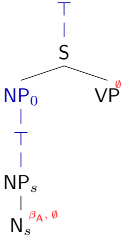
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \mathsf{S} \rightarrow \bullet\, \mathsf{NP}_0\ \mathsf{VP}, 0, 0, -, - \\ \alpha_N[\mathit{she}] \in \mathsf{Adj}(\mathsf{NP}_0) \end{array}}{0, \top \rightarrow \bullet\, \mathsf{NP}_s, 0, 0, -, -} \quad \text{(Pred 1)}$$



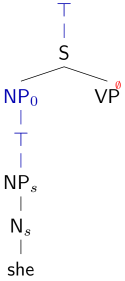
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \top \rightarrow \bullet \mathsf{NP}_s, 0, 0, -, - \\ \emptyset \in \mathsf{Adj}(\mathsf{NP}_s) \end{array}}{0, \mathsf{NP}_s \rightarrow \bullet \mathsf{N}_s, 0, 0, -, -} \qquad \text{(Pred 2)}$$



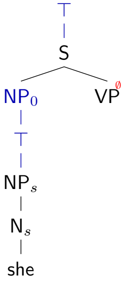
Exemple d'analyse

$$\frac{\begin{array}{l}0, \mathsf{NP}_s \rightarrow \bullet\, \mathsf{N}_s, 0, 0, -, -\\ \emptyset \in \mathsf{Adj}(\mathsf{N}_s)\end{array}}{0, \mathsf{N}_s \rightarrow \bullet\, \mathsf{she}, 0, 0, -, -} \quad \text{(Pred 2)}$$



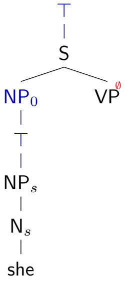
Exemple d'analyse

$$\frac{0, \mathsf{N}_s \rightarrow \bullet\, \mathsf{she}, 0, 0, -, -}{0, \mathsf{N}_s \rightarrow \mathsf{she}\, \bullet, 0, 1, -, -} \qquad \text{(Scan 1)}$$



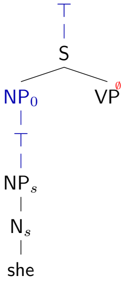
Exemple d'analyse

$$\frac{\begin{array}{c}0, N_s \rightarrow \text{she} \bullet, 0, 1, -, - \\ 0, NP_s \rightarrow \bullet N_s, 0, 0, -, -\end{array}}{0, NP_s \rightarrow N_s \bullet, 0, 1, -, -} \quad \text{(Comp 2 et 3)}$$



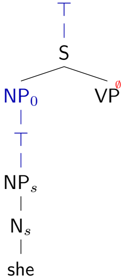
Exemple d'analyse

$$\frac{\begin{array}{c} 0, \mathrm{NP}_s \rightarrow \mathrm{N}_s \bullet, 0, 1, -, - \\ 0, \top \rightarrow \bullet \mathrm{NP}_s, 0, 0, -, - \end{array}}{0, \top \rightarrow \mathrm{NP}_s \bullet, 0, 1, -, -} \qquad \text{(Comp 2 et 3)}$$



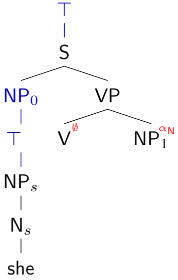
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \top \rightarrow \mathsf{NP}_s \bullet, 0, 1, -, - \\ \alpha_N[she] \in \mathsf{Adj}(\mathsf{NP}_0) \\ \alpha_N[she] \text{ initial} \\ 0, \mathsf{S} \rightarrow \bullet \mathsf{NP}_0\ \mathsf{VP}, 0, 0, -, - \end{array}}{0, \mathsf{S}_r \rightarrow \mathsf{NP}_0 \bullet \mathsf{VP}, 0, 1, -, -} \quad (\mathsf{Subst})$$



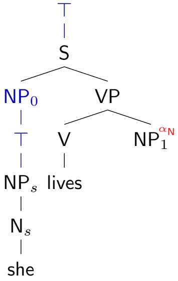
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \mathsf{S}{\rightarrow}\mathsf{NP}_0 \bullet \mathsf{VP}, 0, 1, -, - \\ \emptyset \in \mathsf{Adj}(\mathsf{VP}) \end{array}}{0, \mathsf{VP}{\rightarrow} \bullet \mathsf{V}\ \mathsf{NP}_1, 1, 1, -, -} \qquad \text{(Pred 2)}$$



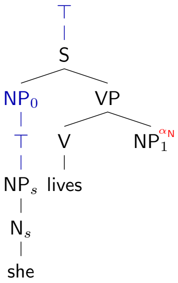
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \mathsf{VP} \rightarrow \bullet\, \mathsf{V}\ \mathsf{NP}_1, 1, 1, -, - \\ \emptyset \in \mathsf{Adj}(\mathsf{V}) \end{array}}{0, \mathsf{V} \rightarrow \bullet\, \mathsf{lives}, 1, 1, -, -} \qquad \text{(Pred 2)}$$



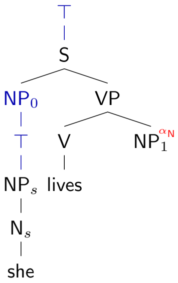
Exemple d'analyse

$$\frac{0, \mathrm{V}{\rightarrow} \bullet \mathrm{lives}, 1, 1, -, -}{0, \mathrm{V}{\rightarrow}\mathrm{lives} \bullet, 1, 2, -, -} \quad \text{(Scan 1)}$$



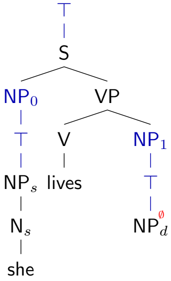
Exemple d'analyse

$$\frac{\begin{array}{c}0, \mathrm{V} \rightarrow \mathrm{lives} \bullet, 1, 2, -, - \\ 0, \mathrm{VP} \rightarrow \bullet \mathrm{V}\ \mathrm{NP}_1, 1, 1, -, -\end{array}}{0, \mathrm{VP} \rightarrow \mathrm{V} \bullet \mathrm{NP}_1, 1, 2, -, -} \quad \text{(Comp 2 et 3)}$$



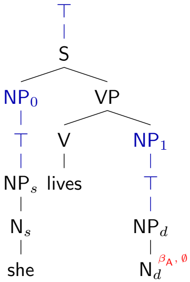
Exemple d'analyse

$$\frac{\begin{array}{l} 0, \mathsf{VP} \rightarrow \mathsf{V} \bullet \mathsf{NP}_1, 1, 2, -, - \\ \alpha_N[\mathit{door}] \in \mathsf{Adj}(\mathsf{NP}_1) \end{array}}{2, \top \rightarrow \bullet \mathsf{NP}_d, 2, 2, -, -} \quad \text{(Pred 1)}$$



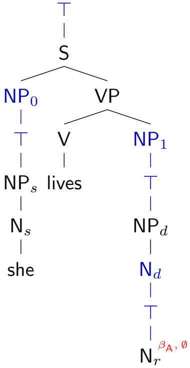
Exemple d'analyse

$$\frac{\begin{array}{l} 2, \top \rightarrow \bullet\, \mathsf{NP}_d, 2, 2, -, - \\ \emptyset \in \mathsf{Adj}(\mathsf{NP}_d) \end{array}}{2, \mathsf{NP}_d \rightarrow \bullet\, \mathsf{N}_d, 2, 2, -, -} \quad \text{(Pred 2)}$$



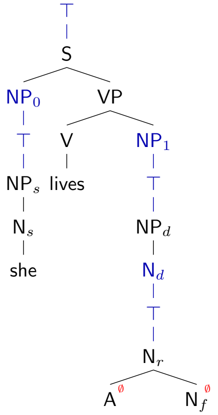
Exemple d'analyse

$$\frac{\begin{array}{l}2, \mathsf{NP}_d \rightarrow \bullet\, \mathsf{N}_d, 2, 2, -, - \\ \beta_A[\mathit{next}] \in \mathsf{Adj}(\mathsf{N}_d)\end{array}}{2, \top \rightarrow \bullet\, \mathsf{N}_r, 2, 2, -, -} \quad \text{(Pred 1)}$$

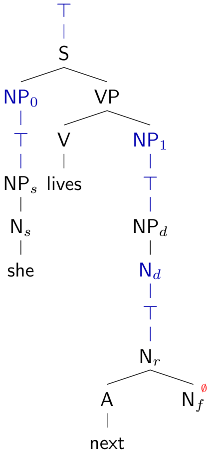


Exemple d'analyse

$$\frac{\begin{array}{l} 2, \top \rightarrow \bullet\, N_r, 2, 2, -, - \\ \emptyset \in \mathrm{Adj}(N_r) \end{array}}{2, N_r \rightarrow \bullet\, A\ N_f, 2, 2, -, -} \qquad \text{(Pred 2)}$$

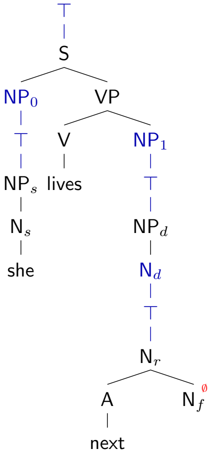


Exemple d'analyse



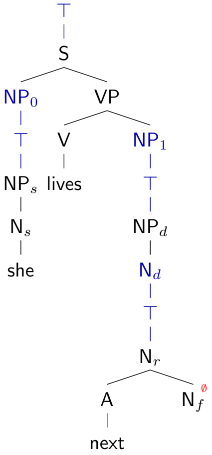
$$\frac{2, N_r \rightarrow \bullet A\ N_f, 2, 2, -, - \quad \emptyset \in Adj(A)}{2, A \rightarrow \bullet next, 2, 2, -, -} \quad (\text{Pred } 2)$$

Exemple d'analyse



$$\frac{2, \mathrm{A}\rightarrow \bullet\, \mathrm{next}, 2, 2, -, -}{2, \mathrm{A}\rightarrow \mathrm{next}\,\bullet, 2, 3, -, -} \qquad \text{(Scan 1)}$$

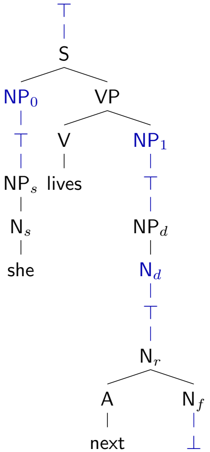
Exemple d'analyse



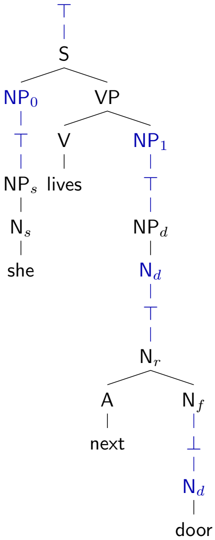
$$\frac{\begin{array}{c}2, \mathsf{A} \rightarrow \mathsf{next} \bullet, 2, 3, -, - \\ 2, \mathsf{N}_r \rightarrow \bullet \mathsf{A}\ \mathsf{N}_f, 2, 2, -, -\end{array}}{2, \mathsf{N}_r \rightarrow \mathsf{A} \bullet \mathsf{N}_f, 2, 3, -, -} \quad \text{(Comp 2 et 3)}$$

Exemple d'analyse

$$\frac{\begin{array}{l} 2, \mathsf{N}_r \rightarrow \mathsf{A} \bullet \mathsf{N}_f, 2, 3, -, - \\ \emptyset \in \mathsf{Adj}(\mathsf{N}_f) \end{array}}{2, \mathsf{N}_f \rightarrow \bullet \perp, 3, 3, -, -} \quad \text{(Pred 2)}$$

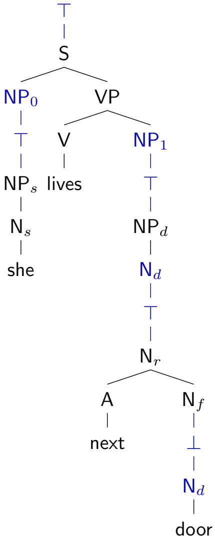


Exemple d'analyse



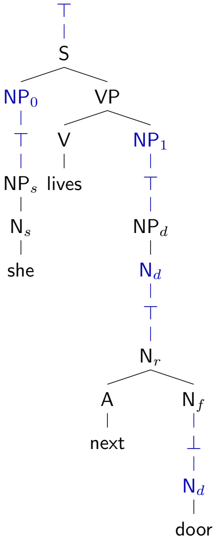
$$\frac{\begin{array}{l}2, N_f \rightarrow \bullet \perp, 3, 3, -, -\\ 2, NP_d \rightarrow \bullet N_d, 2, 2, -, -\\ \beta_A[next] \in \mathrm{Adj}(N_d)\end{array}}{2, N_d \rightarrow \bullet \mathrm{door}, 3, 3, -, -} \qquad \text{(Pred 3)}$$

Exemple d'analyse



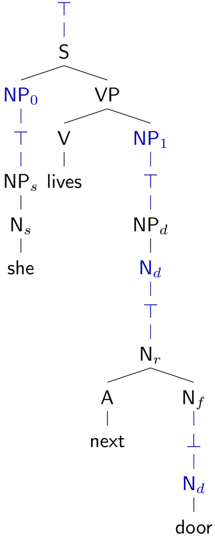
$$\frac{2, \mathsf{N}_d \rightarrow \bullet\, \text{door}, 3, 3, -, -}{2, \mathsf{N}_d \rightarrow \text{door} \bullet, 3, 4, -, -} \quad \text{(Scan 1)}$$

Exemple d'analyse



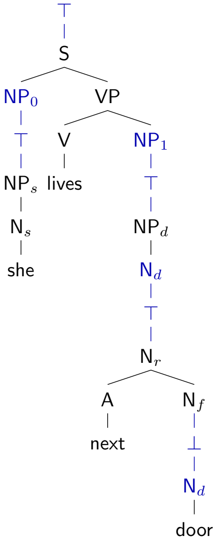
$$\frac{\begin{array}{l} 2, \mathsf{N}_d \rightarrow \mathsf{door}\,\bullet\,, 3, 4, -, - \\ \beta_A[\mathit{next}] \in \mathsf{Adj}(\mathsf{N}_d) \\ 2, \mathsf{N}_f \rightarrow \bullet\,\bot, 3, 3, -, - \\ 2, \mathsf{NP}_d \rightarrow \bullet\,\mathsf{N}_d, 2, 2, -, - \end{array}}{2, \mathsf{N}_f \rightarrow \bot\,\bullet\,, 3, 4, 3, 4} \quad \text{(Comp 1)}$$

Exemple d'analyse



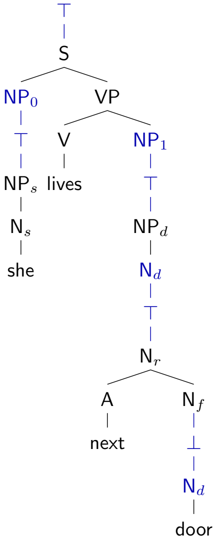
$$\frac{\begin{array}{c} 2, N_f \rightarrow \perp \bullet, 3, 4, 3, 4 \\ 2, N_r \rightarrow A \bullet N_f, 2, 3, -, - \end{array}}{2, N_r \rightarrow A\ N_f \bullet, 2, 4, 3, 4} \quad \text{(Comp 2 et 3)}$$

Exemple d'analyse



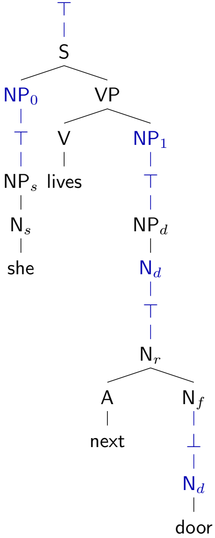
$$\frac{\begin{array}{l} 2, \mathsf{N}_r \rightarrow \mathsf{A}\ \mathsf{N}_f \bullet, 2, 4, 3, 4 \\ 2, \top \rightarrow \bullet \mathsf{N}_r, 2, 2, -, - \end{array}}{2, \top \rightarrow \mathsf{N}_r \bullet, 2, 4, 3, 4} \qquad \text{(Comp 2 et 3)}$$

Exemple d'analyse



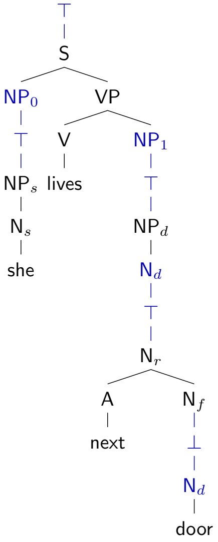
$$\frac{\begin{array}{l} 2, \top \rightarrow N_r \bullet, 2, 4, 3, 4 \\ 2, N_d \rightarrow \text{door} \bullet, 3, 4, -, - \\ \beta_A[\textit{next}] \in \text{Adj}(N_d) \\ 2, NP_d \rightarrow \bullet N_d, 2, 2, -, - \end{array}}{2, NP_d \rightarrow N_d \bullet, 2, 4, -, -} \quad (\text{Adj})$$

Exemple d'analyse



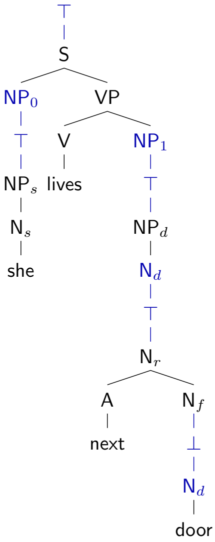
$$\frac{\begin{array}{c}2, NP_d \rightarrow N_d \bullet, 2, 4, -, - \\ 2, \top \rightarrow \bullet NP_d, 2, 2, -, -\end{array}}{2, \top \rightarrow NP_d \bullet, 2, 4, -, -} \quad \text{(Comp 2 et 3)}$$

Exemple d'analyse



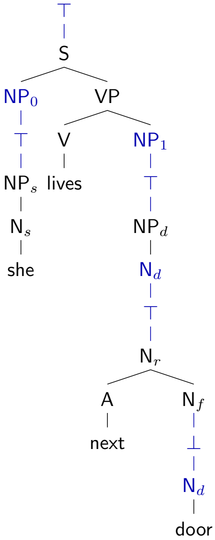
$$\frac{\begin{array}{l} 2, \top \rightarrow \mathrm{NP}_d \bullet, 2, 4, -, - \\ \alpha_N[\mathit{door}] \in \mathrm{Adj}(\mathrm{NP}_1) \\ \alpha_N[\mathit{door}] \text{ initial} \\ 0, \mathrm{VP} \rightarrow \mathrm{V} \bullet \mathrm{NP}_1, 1, 2, -, - \end{array}}{0, \mathrm{VP} \rightarrow \mathrm{V}\ \mathrm{NP}_1 \bullet, 1, 4, -, -} \quad \text{(Subst)}$$

Exemple d'analyse



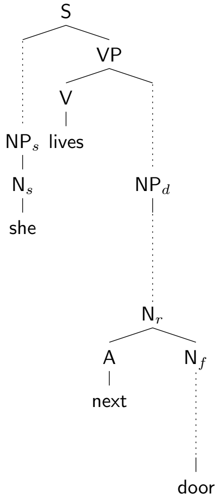
$$\frac{0, VP \rightarrow V\ NP_1 \bullet, 1, 4, -, - \qquad 0, S \rightarrow NP_0 \bullet VP, 0, 1, -, -}{0, S \rightarrow NP_0\ VP \bullet, 0, 4, -, -} \quad \text{(Comp 2 et 3)}$$

Exemple d'analyse



$$\frac{\begin{array}{l} 0, \mathsf{S} \rightarrow \mathsf{NP}_0\ \mathsf{VP}\bullet, 0, 4, -, - \\ 0, \top \rightarrow \bullet\mathsf{S}, 0, 0, -, - \end{array}}{0, \top \rightarrow \mathsf{S}\bullet, 0, 4, -, -} \quad \text{(Comp 2 et 3)}$$

Exemple d'analyse



Exemple d'analyse