Order and Optionality: Minimalist Grammars with Adjunction

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Overview

- Problem: properties of adjunction to model
Overview

- Problem: properties of adjunction to model
- Minimalist Grammars
Problem: properties of adjunction to model

Minimalist Grammars

Three Models of Adjunction
Overview

- Problem: properties of adjunction to model
- Minimalist Grammars
- Three Models of Adjunction
  - Traditional Minimalist Grammar
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- Problem: properties of adjunction to model
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- Three Models of Adjunction
  - Traditional Minimalist Grammar
  - Frey & Gärtner
Overview

- Problem: properties of adjunction to model
- Minimalist Grammars
- Three Models of Adjunction
  - Traditional Minimalist Grammar
  - Frey & Gärtner
  - Cartography
Overview

- Problem: properties of adjunction to model
- Minimalist Grammars
- Three Models of Adjunction
  - Traditional Minimalist Grammar
  - Frey & Gärtner
  - Cartography
- My model (MGAs)
Properties of adjuncts to be captured

(1) a. The (bad) wolf
Properties of adjuncts to be captured

(1)  a. The (bad) wolf  
     b. The bad wolf  
          ↑

optional

transparent to selection
Properties of adjuncts to be captured

(1)  
a. The (bad) wolf  \hspace{1cm} \textit{optional}
b. The bad wolf  \hspace{1cm} \textit{transparent to selection}
c. The big bad wolf
d. *The bad big wolf  \hspace{1cm} \textit{strictly ordered}
Properties of adjuncts to be captured

(1)  a. The (bad) wolf  \hspace{1cm} \textit{optional}
    b. The bad wolf  \hspace{1cm} \textit{transparent to selection}
    c. The big bad wolf
    d. *The bad big wolf  \hspace{1cm} \textit{strictly ordered}
    e. The Alliance officer shot Kaylee \textit{in the cargo hold with a gun}
    f. The Alliance officer shot Kaylee \textit{with a gun in the cargo}

\textit{Unordered}
a. The small ancient triangular green Irish pagan metal artifact was lost.
Cartography (?)

(2)  a. The **small** ancient triangular **green** **Irish** pagan metal artifact was lost.

b. *The **metal** **green** small artifact was lost.    Adjectives
Cartography (?)

(2) a. The **small ancient triangular green Irish pagan metal** artifact was lost.

b. *The **metal green small** artifact was lost.**

c. Frankly, John probably once usually arrived early.
Cartography (?)

(2)  a. The small ancient triangular green Irish pagan metal artifact was lost.
    b. *The metal green small artifact was lost.  Adjectives
    c. Frankly, John probably once usually arrived early.
    d. *Usually, John early frankly once arrived probably.  Adverbs
(2) a. The small ancient triangular green Irish pagan metal artifact was lost.  
b. *The metal green small artifact was lost.  
c. Frankly, John probably once usually arrived early.  
d. *Usually, John early frankly once arrived probably.  
e. [Il premio Nobel]_{top}, [a chi]_{wh} lo daranno?  
   [the prize Nobel]_{top}, [to whom]_{wh} it give.fut  
   ‘The Nobel Prize, to whom will they give it?’  

Adjectives
Adverbs
Left periphery
Cartography (?)

(2) a. The small ancient triangular green Irish pagan metal artifact was lost.
b. *The metal green small artifact was lost.  Adjectives
c. Frankly, John probably once usually arrived early.  Adverbs
d. *Usually, John early frankly once arrived probably.  Adverbs
e. [Il premio Nobel]$_{\text{top}}$, [a chi]$_{\text{wh}}$ lo daranno?
   [the prize Nobel]$_{\text{top}}$, [to whom]$_{\text{wh}}$ it give.fut
   ‘The Nobel Prize, to whom will they give it?’  Left periphery
f. DP zhe [NumP yi [ClP zhi [NP bi]]]
   DP this [NumP one [ClP Cl [NP pen]]]
   ‘this pen’  Functional DP projections
Features on Lexical Items drive the derivation via **Merge** and **Move**
Features on Lexical Items drive the derivation via **Merge** and **Move**

*Features*: **sel** (for **Merge**): \( =X \) (positive), \( X \) (negative)
Features on Lexical Items drive the derivation via **Merge** and **Move**

- **Features:** sel (for Merge): $=\!X$ (positive), $\!X$ (negative)

**Example:** Merge

```
Merge

⟨the, =ND⟩  ⟨cowboy, N⟩
```
Features on Lexical Items drive the derivation via **Merge** and **Move**.

**Features**: sel (for **Merge**): $\neq X$ (positive), $X$ (negative)

**Example**: Merge

```
Merge

\langle \text{the, }=ND \rangle \langle \text{cowboy, N} \rangle
```
Minimalist Grammars (?)

- Features on Lexical Items drive the derivation via **Merge** and **Move**
- **Features**: sel (for **Merge**): \(=X\) (positive), \(X\) (negative)

**Example: Merge**

```
Merge
the cowboy, D

⟨the, \(=\text{ND}\)⟩  ⟨cowboy, N⟩
```
Minimalist Grammars (?)

Example: Merge

Merge
\langle \text{see the cowboy, } =DV \rangle

\langle \text{see, } \ =D=DV \rangle

\text{Merge}
\langle \text{the cowboy, } D \rangle

\langle \text{the, } =ND \rangle \quad \langle \text{cowboy, } N \rangle
Traditional MG approach

- X-Modifier features: =XX; Verbal modifier: =VV; Nominal modifier: =NN etc.

Diagram:
```
Merge
⟨the big wolf, D⟩

⟨the, =ND⟩      Merge

⟨big wolf, N⟩

⟨big, =NN⟩      ⟨wolf, N⟩
```
Traditional MG approach

- X-Modifier features: $=XX$; Verbal modifier: $=VV$; Nominal modifier: $=NN$ etc.
- ✓ Optionality

\[
\begin{align*}
\text{Merge} & \quad \langle \text{the wolf, } D \rangle \\
\langle \text{the, } =\text{ND} \rangle & \quad \langle \text{wolf, } N \rangle \\
\text{Merge} & \quad \langle \text{the big wolf, } D \rangle \\
\langle \text{the, } =\text{ND} \rangle & \quad \langle \text{big wolf, } N \rangle \\
\text{Merge} & \quad \langle \text{big, } =\text{NN} \rangle \\
\langle \text{big, } =\text{NN} \rangle & \quad \langle \text{wolf, } N \rangle
\end{align*}
\]
Traditional MG approach

- X-Modifier features: \( =XX \); Verbal modifier: \( =VV \); Nominal modifier: \( =NN \) etc.
- ✓ Optionality
- ? Transparency to selection

\[
\text{Merge} \\
\langle \text{the bad wolf}, D \rangle
\]

\[
\langle \text{the,}=ND \rangle \\
\langle \text{bad wolf},N \rangle
\]

\[
\langle \text{bad,}=NN \rangle \\
\langle \text{wolf,}N \rangle
\]
Traditional MG approach

✓ Unordered

```
Merge
the big bad wolf:D

the,=ND Merge
big bad wolf:N

big,=NN Merge
bad wolf:N

bad,=NN wolf,N
```
Traditional MG approach

- ✓ Unordered
- ✗ Ordering

```
Merge
the,=ND
  Merge
  big bad wolf:D
  the,=ND
    Merge
    big bad wolf:N
    big,=NN
      Merge
      bad wolf:N
      bad,=NN
        wolf,N
```
Traditional MG approach

- ✓ Unordered
- ✗ Ordering

```
Merge
the big bad wolf:D

the,=ND

Merge
big bad wolf:N

big,=NN

Merge
bad wolf:N

bad,=NN wolf,N
```
Traditional MG approach

- ✓ Unordered
- ✗ Ordering

```
Models of Adjunction
Traditional MG Approach

\[\text{Merge}
\text{the big bad wolf:D}
\]

\[\text{the,=ND}
\]

\[\text{Merge}
\text{big bad wolf:N}
\]

\[\text{big,=NN}
\]

\[\text{Merge}
\text{bad wolf:N}
\]

\[\text{bad,=NN}
\text{wolf,}N\]

\[\text{the bad big wolf:D}
\]

\[\text{the,=ND}
\]

\[\text{Merge}
\text{*bad big wolf:N}
\]

\[\text{bad,=NN}
\]

\[\text{Merge}
\text{big wolf:N}
\]

\[\text{big,=NN}
\text{wolf,}N\]
```

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Add new polarity for selectional features: $X,=X,\approx X$
?: asymmetric feature checking

- Add new polarity for selectional features: \( X,=X,\approx X \)
- Add operation \textbf{Adjoin}
Asymmetric feature checking

- Add new polarity for selectional features: $X, =X, \sim X$
- Add operation \textbf{Adjoin}
- Asymmetrically checks category feature:
?: asymmetric feature checking

- Add new polarity for selectional features: $X, = X, \approx X$
- Add operation **Adjoin**
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?: asymmetric feature checking

- Add new polarity for selectional features: \( X, \equiv X, \approx X \)
- Add operation \textbf{Adjoin}
- Asymmetrically checks category feature:

\[
\text{Adjoin}(\langle s, \approx X \rangle, \langle t, X\alpha \rangle) = \]

Meaghan Fowlie (UCLA)
?: asymmetric feature checking

- Add new polarity for selectional features: $X = X, \approx X$
- Add operation Adjoin
- Asymmetrically checks category feature:

$$\text{Adjoin}(\langle s, \approx X \rangle, \langle t, X\alpha \rangle) =$$
?: asymmetric feature checking

- Add new polarity for selectional features: \( X, = X, \approx X \)
- Add operation **Adjoin**
- Asymmetrically checks category feature:

\[
\text{Adjoin}(\langle s, \approx X \rangle, \langle t, X\alpha \rangle) = \langle st, X\alpha \rangle
\]
Frey & Gärtner: asymmetric feature checking

Diagram:

```
Merge
the, = ND

the bad wolf, D

Adjoin
bad wolf, N

bad, ≈ N    wolf, N
```
Frey & Gärtnerr: asymmetric feature checking

- ✓ Optionality

\[ \text{Merge} \]
\[ \langle \text{the, } =_{\text{ND}} \text{ wolf, } N \rangle \]

\[ \text{Merge} \]
\[ \text{the, } =_{\text{ND}} \text{ bad wolf: } D \]
\[ \text{the, } =_{\text{ND}} \text{ Adjoin} \]
\[ \text{bad wolf, } N \]
\[ \text{bad, } \approx_{\text{N}} \text{ wolf, } N \]
Frey & Gärtner: asymmetric feature checking

- ✓ Optionality
- ✓ Transparent to selection

```
Merge
  the, =ND
  Adjoin
    bad wolf, N
      bad, ≈N
      wolf, N
```

Meaghan Fowlie (UCLA)
Frey & Gärtner: asymmetric feature checking

- ✓ Unordered
- Ordering

```
Merge
the big bad wolf: D
```
```
the, = ND
``` Merge
```
big bad wolf: N
``` Merge
```
big, ≈ N
``` Merge
```
bad wolf: N
``` Merge
```
bad, ≈ N

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Frey & Gärtner: asymmetric feature checking

- √ Unordered
- × Ordering

```
Merge
the big bad wolf: \(D\)

the, \(\approx ND\)
Merge
big bad wolf: \(N\)

big, \(\approx N\)
Merge
bad wolf: \(N\)

bad, \(\approx N\)
wolf, \(N\)
```

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MGAs
MoL13  12 / 26
Frey & Gärtner: asymmetric feature checking

- ✓ Unordered
- XOrdering

```
Merge
  the big bad wolf:D
the,=ND
          Merge
         big bad wolf:N
     big,≈N
         Merge
        bad wolf:N
    bad,≈N  wolf,N
```
Frey & Gärtner: asymmetric feature checking

- **Ordered**
- **Unordered**

```
Merge
  the big bad wolf: D

the, = ND
```

```
Merge
  big bad wolf: N

big, ≈ N
```

```
Merge
  bad wolf: N

bad, ≈ N
```

```
Merge
  *the bad big wolf: D

the, = ND
```

```
Merge
  *bad big wolf: N

bad, ≈ N
```

```
Merge
  big wolf: N

big, ≈ N
```

```
Merge
  wolf, N

wolf, N
```
Cartography – Properties

? Optional
Cartography – Properties

- ? Optional
- ✗ Transparent
Cartography – Properties

- ? Optional
- ✗ Transparent
- ✓ Ordering
Cartography – Properties

- ? Optional
- ✗ Transparent
- ✓ Ordering
- ✗ Free ordering
Proposal

- Set of adjuncts for each category (?)
Minimalist Grammars with Adjunction (MGAs)

Proposal

- Set of adjuncts for each category (?)
- Impose a partial order $>$ on the selectional features
Proposal

- Set of adjuncts for each category (؟)
- Impose a partial order $>$ on the selectional features
- Add an operation **Adjoin** that operates on *pairs of categories* $[X, Y]$
Lexical Items in MGAs

Traditional MGs: \langle \text{did}, +\text{wh}=\text{TC} \rangle
Lexical Items in MGAs

Traditional MGs: \langle \text{did, } +\text{wh}=\text{TC} \rangle

MGAs: \langle \text{did, } +\text{wh}=\text{T}[\text{C,C}] \rangle
Lexical Items in MGAs

Traditional MGs: ⟨did, +wh=TC⟩

MGAs: ⟨did, +wh=T[C,C]⟩

Traditional MGs: ⟨big, =NN⟩
Lexical Items in MGAs

Traditional MGs: \langle \text{did}, \ +\text{wh}=\text{TC} \rangle

MGAs: \langle \text{did}, \ +\text{wh}=\text{T}[C,C] \rangle

Traditional MGs: \langle \text{big}, \ =\text{NN} \rangle

MGAs: \langle \text{big}, \ [\text{Adj, Adj}] \rangle
Adjoin example

*The big bad wolf*

Suppose

\[ D \geq S \geq G \geq M \geq N \]
Adjoin example

*The big bad wolf*

Suppose
\[
D \geq S \geq G \geq M \geq N
\]

\[\text{ad}(N) = \{S, G, M, P, C\}\]
Adjoin example

*The big bad wolf*

Suppose

\[ D \geq S \geq G \geq M \geq N \]

**ad** \((N) = \{S, G, M, P, C\}\)

Lexicon:

- \langle bad, [G,G] \rangle,
- \langle big, [S,S] \rangle,
- \langle the, =N [D,D] \rangle,
- \langle wolf, [N,N] \rangle,
- \langle woods, [N,N] \rangle,
- \langle in, =D [P,P] \rangle
Adjoin example

The big bad wolf

Suppose
\[ D \geq S \geq G \geq M \geq N \]

\[ \text{ad}(N) = \{S, G, M, P, C\} \]

Lexicon:
- \( \langle \text{bad}, [G, G] \rangle \),
- \( \langle \text{big}, [S, S] \rangle \),
- \( \langle \text{the}, =N[D,D] \rangle \),
- \( \langle \text{wolf}, [N, N] \rangle \),
- \( \langle \text{woods}, [N, N] \rangle \),
- \( \langle \text{in}, =D[P,P] \rangle \)
Adjoin example

*The big bad wolf*

Suppose
\[ D \geq S \geq G \geq M \geq N \]

\[ \text{ad}(N) = \{ S, G, M, P, C \} \]

Lexicon:
- \langle \text{bad}, [G,G] \rangle,
- \langle \text{big}, [S,S] \rangle,
- \langle \text{the}, =N[D,D] \rangle,
- \langle \text{wolf}, [N,N] \rangle,
- \langle \text{woods}, [N,N] \rangle,
- \langle \text{in}, =D[P,P] \rangle
**Adjoin example**

*The big bad wolf*

Suppose
\[ D \geq S \geq G \geq M \geq N \]

\[ \text{ad}(N) = \{S, G, M, P, C\} \]

Lexicon:
- \( \langle \text{bad}, [G,G] \rangle \)
- \( \langle \text{big}, [S,S] \rangle \)
- \( \langle \text{the}, =N[D,D] \rangle \)
- \( \langle \text{wolf}, [N,N] \rangle \)
- \( \langle \text{woods}, [N,N] \rangle \)
- \( \langle \text{in}, =D[P,P] \rangle \)
Adjoin

Let $X \in \text{ad}(Z)$ and $X \geq Y$. 
Adjoin

Let $X \in \text{ad}(Z)$ and $X \geq Y$. 

\[ \text{Adjoin} \left( \langle s, [X, W] \rangle, \langle t, [Z, Y] \rangle \right) = \langle st, [Z, X] \rangle \]

\[ \text{Adjoin} \langle st, [Z, X] \rangle \langle s, [X, W] \rangle \langle t, [Z, Y] \rangle \]
Adjoin

Let $X \in \text{ad}(Z)$ and $X \geq Y$.
Adjoin

Let $x \in \text{ad}(z)$ and $x \geq y$. 

adjoin-mol-3.pdf
Let $X \in \text{ad}(Z)$ and $X \geq Y$. 

adjoin-mol-4.pdf
Let $X \in \text{ad}(Z)$ and $X \geq Y$. 

adjoin-mol-4.pdf
Adjoin

Let $X \in \text{ad}(Z)$ and $X \geq Y$. 

adjoin-mol-4.pdf
Failed example: bad adjunct order

\[ D \geq S \geq G \geq M \geq N \]

\[ \text{ad}(N) = \{S, G, M, P, C\} \]

Lexicon:
- \langle \text{bad}, [G,G] \rangle,
- \langle \text{big}, [S,S] \rangle,
- \langle \text{the}, =N[D,D] \rangle,
- \langle \text{wolf}, [N,N] \rangle,
- \langle \text{woods}, [N,N] \rangle,
- \langle \text{in}, =D[P,P] \rangle
Examples

Failed example: bad adjunct order

\[ D \geq S \geq G \geq M \geq N \]

\( \text{ad}(N) = \{S, G, M, P, C\} \)

Lexicon:
- \( \langle \text{bad}, [G, G] \rangle \)
- \( \langle \text{big}, [S, S] \rangle \)
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- \( \langle \text{wolf}, [N,N] \rangle \)
- \( \langle \text{woods}, [N,N] \rangle \)
- \( \langle \text{in}, =D[P,P] \rangle \)
Failed example: bad adjunct order

\[
D \geq S \geq G \geq M \geq N
\]

\[
\text{ad}(N) = \{S, G, M, P, C\}
\]

Lexicon:

- \langle \text{bad}, [G,G] \rangle,
- \langle \text{big}, [S,S] \rangle,
- \langle \text{the}, =N[D,D] \rangle,
- \langle \text{wolf}, [N,N] \rangle,
- \langle \text{woods}, [N,N] \rangle,
- \langle \text{in}, =D[P,P] \rangle

\[
\begin{array}{c}
\text{Adjoin} \\
(*\text{bad big wolf, } [N,S])
\end{array}
\]

\[
\begin{array}{c}
\text{Adjoin} \\
\text{(big wolf, } [N,S])
\end{array}
\]

\[
\begin{array}{c}
\text{Adjoin} \\
\text{(big, } [S,S]) \quad \text{(wolf, } [N,N])
\end{array}
\]
Optional

**Merge**

(the wolf, [D,D])

(the, =N [D,D]) (wolf, [N,N])

**Merge**

(the bad wolf, [D,D])

(the, =N [D,D])

**Adjoin**

(bad wolf, [N,G])

(bad, [G,G]) (wolf, [N,N])
MGA – properties

Transparent to selection

\[
\text{Merge} \\
(\text{the bad wolf, } [D,D])
\]

\[
(\text{the, } = N [D,D]) \\
\text{Adjoin} \\
(\text{bad wolf, } [N,G])
\]

\[
(\text{bad, } [G,G]) \\
(\text{wolf, } [N,N])
\]
MGA – properties

Ordering

D > S > G > M > N

\[
\text{Merge} \\
\text{(the big bad wolf, [D,D])}
\]

\[
\text{Adjoin} \\
\text{(big bad wolf, [N,S])}
\]

\[
\text{Adjoin} \\
\text{(big, [S,S])}
\]

\[
\text{Adjoin} \\
\text{(bad wolf, [N,G])}
\]

\[
\text{(bad, [G,G])} \quad \text{(wolf, [N,N])}
\]

\[
\text{Adjoin} \\
\text{(*bad big wolf, [N,S])}
\]

\[
\text{(bad, [G,G])} \quad \text{Adjoin}
\]

\[
\text{(big wolf, [N,S])}
\]

\[
\text{Adjoin} \\
\text{(big, [S,S])}
\]

\[
\text{(wolf, [N,N])}
\]
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  - \(=X \ Y, \ X\)

Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge) $Y,$
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  \[ X \sim Y, X \]
- Frey & Gärtner: asymmetric feature checking (Adjoin)
  \[ X, W, Z, \]
  symmetric-ish: category of original does change – the second member of the pair changes
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge) 
  \( \equiv X \ Y, \ X \)
- Frey & Gärtnern: asymmetric feature checking (Adjoin) 
  \( \approx X \ Y, \ X \)
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  - \( =X Y, X \)
- Frey & Gärtner: asymmetric feature checking (Adjoin)
  - \( Y, X \)
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  \( =X \ Y, \ X \)
- Frey & Gärtner: asymmetric feature checking (Adjoin)
  \( \approx X \ Y, \ X \)
- MGAs: asymmetric-ish: keep original category as first member of pair
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  \[ \equiv X Y, X \]
- Frey & Gärtner: asymmetric feature checking (Adjoin)
  \[ \approx X Y, X \]
- MGAs: asymmetric-ish: keep original category as first member of pair
  \[ [X,W], [Z,Y] \]
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  \[ \equiv X \ Y, \ X \]
- Frey & Gärtner: asymmetric feature checking (Adjoin)
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Semi-symmetric feature checking

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  - \( =X \ Y, \ X \)
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  - \( \approx X \ Y, \ X \)
- MGAs: asymmetric-ish: keep original category as first member of pair
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- symmetric-ish: category of original does change – the second member of the pair changes
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Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  \[ =X \ Y, \ X \]
- Frey & Gärtner: asymmetric feature checking (Adjoin)
  \[ \approx X \ Y, \ X \]
- MGAs: asymmetric-ish: keep original category as first member of pair
  \[ [X,W], [Z,X] \]
- symmetric-ish: category of original does change – the second member of the pair changes
  \[ [X,W], [Z,X] \]
Semi-symmetric feature checking

- Traditional, cartographic: symmetric feature checking (Merge)
  \( =X \ Y, \ X \)
- Frey & Gärtner: asymmetric feature checking (Adjoin)
  \( \approx X \ Y, \ X \)
- MGAs: asymmetric-ish: keep original category as first member of pair
  \([X,W], [Z,X]\)
- symmetric-ish: category of original does change – the second member of the pair changes
  \([X,W], [Z,X]\)
## Comparison

<table>
<thead>
<tr>
<th>Optionality</th>
<th>Trad.</th>
<th>F &amp; G</th>
<th>Cart.</th>
<th>MGAs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
</tr>
</tbody>
</table>
## Comparison

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Optionality</strong></td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Selector selects expected category</strong></td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>
## Comparison

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<tr>
<th></th>
<th>Trad.</th>
<th>F &amp; G</th>
<th>Cart.</th>
<th>MGAs</th>
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<td>Optionality</td>
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<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Selector selects expected category</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Adjunct does not become head</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
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</tbody>
</table>
## Comparison

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<td>✓</td>
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<tr>
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<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>become head</strong></td>
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<td>✓</td>
<td>✗</td>
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<tr>
<td><strong>possible</strong></td>
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## Comparison

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<td>Ordered adjuncts possible</td>
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<td>✗</td>
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References
Acknowledgements

Many thanks to:

- My doctoral committee: Edward Stabler (Chair), Edward Keenan, Martin Monti, Carson Schutze
- The organisers and three anonymous reviewers for MoL13
- Attendees at NWLC 2013 in Vancouver, Canada and CLiN 2013 in Enschede, NL
- Thomas Graf, Kathleen O’Flynn, Floris van Vugt, Jesse Zymet
Unordered, post-head Adjuncts

Unordered

(3) a. The Alliance officer shot Kaylee in the cargo hold with a gun
   b. The Alliance officer shot Kaylee with a gun in the cargo hold
Unordered, post-head Adjuncts

Unordered

(3)  a. The Alliance officer shot Kaylee in the cargo hold with a gun
    b. The Alliance officer shot Kaylee with a gun in the cargo hold

English: the adjuncts that are unordered are also the ones that appear after the head:

(4)  a. The big red \textbf{cup} on the table with the blue handle
    b. The big red \textbf{cup} with the blue handle on the table
Unordered, post-head adjuncts

For \( x, y \) elements of a partially ordered set, there are three possibilities:

- \( x \geq y \)
- \( x < y \)
- \( x \parallel y \) (\( x \) and \( y \) are incomparable)

For adjoin to work, we need two things to be true:

1. Adjunct \( \in \text{ad}(\text{head}) \)
2. Adjunct is higher than last adjunct (\( X > Y \))

Extention: Adjunct can also be incomparable with last adjunct.
Unordered, post-head adjuncts

For $x, y$ elements of a partially ordered set, there are three possibilities:

- $x \geq y$
Unordered, post-head adjuncts

For $x, y$ elements of a partially ordered set, there are three possibilities:

- $x \geq y$
- $x < y$

Extention:
Adjunct can also be incomparable with last adjunct.
Unordered, post-head adjuncts

For $x, y$ elements of a partially ordered set, there are three possibilities:

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- $x < y$
- $x \parallel y$ ($x$ and $y$ are incomparable)
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Unordered, post-head adjuncts

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For adjoin to work, we need two things to be true:

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2. Adjunct is higher than last adjunct ($X > Y$)
Unordered, post-head adjuncts

For $x, y$ elements of a partially ordered set, there are three possibilities:

- $x \geq y$
- $x < y$
- $x \parallel y$ ($x$ and $y$ are incomparable)

For adjoin to work, we need two things to be true:

1. Adjunct $\in \text{ad}(\text{head})$
2. Adjunct is higher than last adjunct ($X > Y$)

**Extention:** Adjunct can also be incomparable with last adjunct.
Unordered, post-head adjuncts

Let $W \in \text{ad}(Y)$

$$\text{Adjoin}(\langle s, [W, X]\rangle, \langle t, [Y, Z]\rangle) = \begin{cases} 
\langle st, [Y, W]\rangle & \text{if } W \geq Z \\
\langle ts, [Y, Z]\rangle & \text{if } W \parallel Z 
\end{cases}$$
Unordered, post-head adjuncts

\[
D \geq S \geq G \geq M \geq N
\]

\[
ad(N) = \{S, G, M, P, C\}
\]

Lexicon:

- \(\langle \text{bad, } [G,G]\rangle,\)
- \(\langle \text{big, } [S,S]\rangle,\)
- \(\langle \text{the, } =N[D,D]\rangle,\)
- \(\langle \text{wolf, } [N,N]\rangle,\)
- \(\langle \text{woods, } [N,N]\rangle,\)
- \(\langle \text{in, } =D[P,P]\rangle\)
Unordered, post-head adjuncts

\[ D \geq S \geq G \geq M \geq N \]

\[ \text{ad}(N) = \{ S, G, M, P, C \} \]

Lexicon:

- \( \langle \text{bad}, [G, G] \rangle \),
- \( \langle \text{big}, [S, S] \rangle \),
- \( \langle \text{the}, =N[D,D] \rangle \),
- \( \langle \text{wolf}, [N, N] \rangle \),
- \( \langle \text{woods}, [N, N] \rangle \),
- \( \langle \text{in}, =D[P,P] \rangle \)

Diagram:

- **Adjoin**
  - \( \langle \text{wolf in the woods}, [N, N] \rangle \)
  - **Merge**
    - \( \langle \text{in the woods}, [P, P] \rangle \)
    - **Merge**
      - \( \langle \text{the woods} \rangle \)
      - **Merge**
        - \( \langle \text{the}, =N[D,D] \rangle \)
        - \( \langle \text{woods}, [N, N] \rangle \)
Unordered, post-head adjuncts

\[ D \geq S \geq G \geq M \geq N \]

\[ \text{ad}(N) = \{S, G, M, P, C\} \]
Specifiers of adjuncts

Adjuncts can have specifiers because the features that came after the category of the adjunct may include positive polarity features.

- $\langle \epsilon, [T_{pst}, T_{pst}]^{+nom} \rangle$
- $T_{pst} \in \text{ad}(V)$
Example – spec of adjunct

\[ T_{\text{pst}} > V; T_{\text{pst}} \in \text{ad}(V) \]

\[ \text{Move} \]
\[ \langle \text{She slept, } [V, T_{\text{pst}}] \rangle \]

\[ \text{Adjoin} \]
\[ \langle \text{slept, } +\text{nom}[V, T_{\text{pst}}] \rangle, \langle \text{She, } -\text{nom} \rangle \]
Specifiers of adjuncts

For $s, t$ derived structures, $\gamma, \beta \in \{-f | f \in \text{lic}\}^*$, $\alpha \in \{+f, = X | f \in \text{lic}, X \in \text{sel}\}^*$, $W, X, Y, Z \in \text{sel}$, $W \in \text{ad}(Y)$, $f_{\text{adj}}([W, X], [Y, Z]) = [Y, Z]$ if $W \parallel Y$; $[Y, W]$ otherwise, $C = f_{\text{adj}}([W, X], [Y, Z])$:

$$\text{Adjoin}(\langle s, [W, X] \alpha \gamma \rangle :: \text{mvrs}_s, \langle t, [Y, Z] \beta \rangle :: \text{mvrs}_t) =$$

$$\begin{align*}
\langle st, \alpha C \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \quad \text{if } \gamma, \beta = \epsilon \land W \geq Z \\
\langle ts, \alpha C \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \quad \text{if } \gamma, \beta = \epsilon \land W \parallel Z \\
\langle s, \alpha C \rangle :: \langle t, \beta \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \quad \text{if } \gamma = \epsilon, \beta \neq \epsilon \land W \not< Z \\
\langle t, \alpha C \rangle :: \langle s, \gamma \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \quad \text{if } \gamma \neq \epsilon, \beta = \epsilon \land W \not< Z \\
\langle \epsilon, \alpha C \rangle :: \langle s, \gamma \rangle :: \langle t, \beta \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \quad \text{if } \gamma, \beta \neq \epsilon \land W \not< Z
\end{align*}$$
Adjuncts of adjuncts

Fr ≥ Fo ≥ Al ≥ V, S ≥ G ≥ N, P
ad(N) = {S, G, P}
ad(V) = ad(S) = ad(G) = {Fr, Fo, Al}

• ⟨frankly, [Fr, Fr]⟩
• ⟨unfortunately, [Fo, Fo]⟩
• ⟨allegedly, [Al, Al]⟩
• ⟨bad, [G, G]⟩
• ⟨wolf, [N, N]⟩

Adjoin
⟨unfortunately bad, [G, G]⟩

⟨unfortunately, [Fo, Fo]⟩  ⟨bad, [G, G]⟩
Adjuncts of adjuncts

Fr ≥ Fo ≥ A1 ≥ V, S ≥ G ≥ N, P
\( \text{ad}(N) = \{S, G, P\} \)
\( \text{ad}(V) = \text{ad}(\text{ad}(N)) = \{\text{Fr}, \text{Fo}, A1\} \)
- \( \langle\text{frankly,} \quad \text{[Fr,Fr]} \rangle \)
- \( \langle\text{unfortunately,} \quad \text{[Fo,Fo]} \rangle \)
- \( \langle\text{allegedly,} \quad \text{[Al,Al]} \rangle \)
- \( \langle\text{bad,} \quad \text{[G,G]} \rangle \)
- \( \langle\text{wolf,} \quad \text{[N,N]} \rangle \)

Adjoin

\( \langle\text{unfortunately bad,} \quad \text{[G,G]} \rangle \)

\( \langle\text{unfortunately,} \quad \text{[Fo,Fo]} \rangle \quad \langle\text{bad,} \quad \text{[G,G]} \rangle \)
Selecting adjuncts

(5) She is kind

\[
\begin{array}{c}
\text{Merge} \\
\text{is kind, } =D[V,V] \\
\langle \text{is, } =GV \rangle \langle \text{kind, } [G,G] \rangle
\end{array}
\]
Selecting adjuncts

(5) She is kind

\[
\text{Merge} \\
\text{is kind, } =D[V, V] \\
\langle \text{is, } =GV \rangle \langle \text{kind, } [G, G] \rangle
\]

(6) She is tall

\[
\text{Merge} \\
\text{is kind, } =D[V, V] \\
\langle \text{is, } =SV \rangle \langle \text{tall, } [S, S] \rangle
\]
Selecting adjuncts

(5) She is kind

\[
\text{Merge} \\
\text{is kind, } =\text{D}[V, V] \\
\langle \text{is}, =\text{GV} \rangle \langle \text{kind}, [G, G] \rangle
\]

(6) She is tall

\[
\text{Merge} \\
\text{is kind, } =\text{D}[V, V] \\
\langle \text{is}, =\text{SV} \rangle \langle \text{tall}, [S, S] \rangle \\
\langle \text{is}, =\text{ad}(N)V \rangle
\]
Selecting adjuncts

(7) She is kind

\[
\text{Merge} \\
\text{is kind, } = \text{D}[V, V] \\
\langle \text{is, } = \text{ad}(N)V \rangle \langle \text{kind, } [G, G] \rangle
\]

(8) She is tall

\[
\text{Merge} \\
\text{is kind, } = \text{D}[V, V] \\
\langle \text{is, } = \text{ad}(N)V \rangle \langle \text{tall, } [S, S] \rangle \\
\langle \text{is, } = \text{ad}(N)V \rangle
\]
Problem

*Allegedly, she sang*

**Lexicon:**

- (Allegedly, =PrAl)
- (probably, =T_{pst}Pr)
- (\(\epsilon\), =T_{fut}T_{pst})
- ...
- (completely, =VCo)
- (she, D)
- (sang, =D V)
Allegedly, she sang

Lexicon:

- (Allegedly, $=\text{PrAl}$)
- (probably, $=T_{\text{pst}Pr}$)
- ($\varepsilon, =T_{\text{fut}T_{\text{pst}}}$)
- ...
- (completely, $=\text{VCo}$)
- (she, $D$)
- (sang, $=D\ V$)
Solution 1: multiplication of the lexicon

Lexicon:

- (Allegedly, =PrAl)
- (Allegedly, =T_{pst}A1)
- (Allegedly, =T_{fut} A1)
- (Allegedly, =Per A1)
- (Allegedly, =Nec A1)
- (Allegedly, =Pos A1)
- (Allegedly, =Us A1)
- (Allegedly, =Ag A1)
- ...about 20 more...
- (Allegedly, =V A1)
- (she, D)
- (sang, =D V)
Solution 1: multiplication of the lexicon

Lexicon:

- (Allegedly, =PrA1)
- (Allegedly, =T_pstA1)
- (Allegedly, =T_futA1)
- (Allegedly, =PerA1)
- (Allegedly, =NecA1)
- (Allegedly, =PosA1)
- (Allegedly, =UsA1)
- (Allegedly, =AgA1)
- ...about 20 more...
- (Allegedly, =V A1)
- (she, D)
- (sang, =D V)

```
Merge ⟨Allegedly she sang, A1⟩
  ⟨allegedly, =VA1⟩
  Merge ⟨she sang, V⟩
    ⟨sang, =DV⟩
    ⟨she, D⟩
```

Meaghan Fowlie (UCLA)
Solution 2: silent, meaningless LIs

**Lexicon:**

- (Allegedly, [allegedly], =PrAl)
- ($\epsilon$, id, =PrAl)
- (probably, [prob], =T\textsubscript{pst}Pr)
- ($\epsilon$, id, =T\textsubscript{pst}Pr)
- ($\epsilon$, [past], =T\textsubscript{fut}T\textsubscript{pst})
- ($\epsilon$, id, =T\textsubscript{fut}T\textsubscript{pst})
- ...
- (completely, [compl], =VCo)
- ($\epsilon$, id, =VCo)
- (she, D)
- (sang, =D V)
Solution 2: silent, meaningless LIs

\[
\begin{align*}
\text{Merge} & \quad \langle \text{Allegedly, she sang, A1} \rangle \\
\text{(Allegedly, [allegedly], =PrA1)} & \quad \text{Merge} \\
\langle \text{she sang, Pr} \rangle & \quad \langle \epsilon, \text{id}, =T_{\text{pstPr}} \rangle \\
\langle \text{she sang, T}_{\text{pst}} \rangle & \quad \text{Merge} \\
\langle \epsilon, [\text{past}], =T_{\text{fut}}T_{\text{pst}} \rangle & \quad \text{Merge} \\
\langle \text{she sang, T}_{\text{fut}} \rangle & \quad \text{more LIs...} \\
\text{...} & \\
\text{Merge} & \quad \langle \text{she sang, Co} \rangle \\
\langle \epsilon, \text{id}, =VCo \rangle & \quad \text{Merge} \\
\langle \text{sang, =DV} \rangle & \quad \langle \text{she, D} \rangle
\end{align*}
\]
Appendix 3: Move

Example: *Who did Jayne shoot?*

Merge

\[
\begin{align*}
\langle \text{shoot, } \text{=D=DV} \rangle & \quad \langle \text{who, D-wh} \rangle 
\end{align*}
\]
Example: *Who did Jayne shoot?*

\[
\text{Merge}
\]

\[
\langle \text{shoot, } =\text{DV} \rangle \langle \text{who, } -\text{wh} \rangle
\]

While *who* is waiting to move, just store it in a Mover list.
Example: *Who did Jayne shoot?*

```
Merge
shoot =DV, who =wh

⟨shoot, =DV⟩ ⟨who, =wh⟩
```

While *who* is waiting to move, just store it in a Mover list.
Example: *Who did Jayne shoot?*

```
Merge
  Merge
    ⟨shoot =DV⟩, ⟨who =wh⟩
    ⟨shoot, =D=DV⟩  ⟨who, D=wh⟩
  ⟨Jayne, D⟩
```
Example: *Who did Jayne shoot?*

```
(merge [Jayne shoot V], [who, -wh])
```

```
(merge [shoot =DV], [who, -wh])
```

```
(merge [shoot, =D=DV], [who, D-wh])
```

Meaghan Fowlie (UCLA)
Appendix 3: Move

Move

Example: *Who did Jayne shoot?*

```
(\text{did}, \text{=V+whC})
```

```
\text{Merge}
```

```
(\text{Jayne shoot V}, \text{who,-wh})
```

```
\text{Merge}
```

```
(\text{shoot =DV}, \text{who -wh})
```

```
\text{Merge}
```

```
(\text{Jayne, D})
```

```
(\text{shoot, =D=DV} \text{ who, D-wh})
```

Meaghan Fowlie (UCLA)
Move

Example: *Who did Jayne shoot?*

\[
\text{Merge} \\
\langle \text{did Jayne shoot, } +\text{whC} \rangle, \langle \text{who } -\text{wh} \rangle \\
\langle \text{did, } =\text{V}+\text{whC} \rangle \\
\text{Merge} \\
\langle \text{Jayne shoot } \text{V} \rangle, \langle \text{who, } -\text{wh} \rangle \\
\text{Merge} \\
\langle \text{shoot } =\text{DV} \rangle, \langle \text{who } -\text{wh} \rangle \\
\langle \text{shoot, } =\text{D}=\text{DV} \rangle \quad \langle \text{who, } D-\text{wh} \rangle \\
\text{Merge} \\
\langle \text{Jayne, } D \rangle
\]
Example: *Who did Jayne shoot?*

\[
\text{Merge}\ 
\langle \text{did Jayne shoot, } +\text{whC}\rangle, \langle \text{who } -\text{wh}\rangle
\]

\[
\langle \text{did, } =\text{V+whC}\rangle
\]

\[
\text{Merge}\ 
\langle \text{Jayne shoot V}\rangle, \langle \text{who, } -\text{wh}\rangle
\]

\[
\langle \text{Jayne, } D\rangle
\]

\[
\text{Merge}\ 
\langle \text{shoot } =\text{DV}\rangle, \langle \text{who } -\text{wh}\rangle
\]

\[
\langle \text{shoot, } =\text{D=DV}\rangle \quad \langle \text{who, } D-\text{wh}\rangle
\]
Example: Who did Jayne shoot?

Move
⟨Who did Jayne shoot, C⟩
  Merge
  ⟨did Jayne shoot, +whC⟩, ⟨who −wh⟩
    ⟨did, =V+whC⟩
      Merge
      ⟨Jayne shoot V⟩, ⟨who, −wh⟩
        Merge
        ⟨shoot =DV⟩, ⟨who −wh⟩
          ⟨shoot, =D=DV⟩  ⟨who, D−wh⟩
  ⟨Jayne, D⟩

Meaghan Fowlie (UCLA)
**Definition (Move)**

For $\alpha, \beta, \gamma$ sequences of negative lic features, $s, t$ derived structures, suppose $\exists! \langle t, \beta \rangle \in \text{movers}$ such that $\beta = -f\gamma$. Then:

$$\text{Move}(\langle s, +f\alpha \rangle :: \text{movers}) =$$

$$\begin{cases} 
\langle st, \alpha \rangle :: \text{movers} - \langle t, \beta \rangle & \text{if } \gamma = \epsilon \\
\langle s, \alpha \rangle :: \langle t, \gamma \rangle :: \text{movers} - \langle t, \beta \rangle & \text{if } \gamma \neq \epsilon
\end{cases}$$
Appendix 3: Move

Formal Adjoin rule

For $s, t$ derived structures, $\gamma, \beta \in \{-f | f \in \text{lic}\}^*$, $\alpha \in \{+f, = X | f \in \text{lic}, X \in \text{sel}\}^*$, $W, X, Y, Z \in \text{sel}$, $W \in \text{ad}(Y)$,

$f_{\text{adj}}([W, X], [Y, Z]) = [Y, Z]$ if $W \parallel Y$; $[Y, W]$ otherwise,

$C = f_{\text{adj}}([W, X], [Y, Z])$:

$\text{Adjoin}((s, [W, X] \alpha \gamma) :: \text{mvrs}_s, (t, [Y, Z] \beta) :: \text{mvrs}_t) =$

\[
\begin{align*}
\langle st, \alpha C \rangle & :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma, \beta = \epsilon & \& W \geq Z \\
\langle ts, \alpha C \rangle & :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma, \beta = \epsilon & \& W \parallel Z \\
\langle s, \alpha C \rangle & :: \langle t, \beta \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma = \epsilon, \beta \neq \epsilon & \& W < Z \\
\langle t, \alpha C \rangle & :: \langle s, \gamma \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma \neq \epsilon, \beta = \epsilon & \& W < Z \\
\langle \epsilon, \alpha C \rangle & :: \langle s, \gamma \rangle :: \langle t, \beta \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma, \beta \neq \epsilon & \& W < Z 
\end{align*}
\]
New Merge rule

Original:
For $\alpha, \beta \in \mathbb{F}^+$:

$$\text{Merge}(\langle s, =X\alpha \rangle \:: \text{movers}_s, \langle t, X\beta \rangle \:: \text{movers}_t) =$$

$$\begin{cases} 
\langle st, \alpha \rangle \:: \text{movers}_s \cdot \text{movers}_t & \text{if } \beta = \epsilon \\
\langle s, \alpha \rangle \:: \langle t, \beta \rangle \:: \text{movers}_s \cdot \text{movers}_t & \text{if } \beta \neq \epsilon 
\end{cases}$$
New Merge rule

Original:
For $\alpha, \beta \in \mathbb{F}^+$:
\[
\text{Merge}(\langle s, =X\alpha \rangle :: \text{movers}_s, \langle t, X\beta \rangle :: \text{movers}_t) =
\begin{cases}
  \langle st, \alpha \rangle :: \text{movers}_s \cdot \text{movers}_t & \text{if } \beta = \epsilon \\
  \langle s, \alpha \rangle :: \langle t, \beta \rangle :: \text{movers}_s \cdot \text{movers}_t & \text{if } \beta \neq \epsilon
\end{cases}
\]

New:
\[
\text{Merge}(\langle s, =X\alpha \rangle :: \text{movers}_s, \langle t, [X,Z] \beta \rangle :: \text{movers}_t) =
\begin{cases}
  \langle st, \alpha \rangle :: \text{movers}_s \cdot \text{movers}_t & \text{if } \beta = \epsilon \\
  \langle s, \alpha \rangle :: \langle t, \beta \rangle :: \text{movers}_s \cdot \text{movers}_t & \text{if } \beta \neq \epsilon
\end{cases}
\]
Unordered Adjuncts

For $s, t$ derived structures, $\gamma, \beta \in \{-f|f \in \text{lic}\}^*$, $\alpha \in \{+f, = X|f \in \text{lic}, X \in \text{sel}\}^*$, $W, X, Y, Z \in \text{sel}$, $W \in \text{ad}(Y)$, $f_{\text{adj}}([W, X], [Y, Z]) = [Y, Z]$ if $W||Y$; $[Y, W]$ otherwise, $C = f_{\text{adj}}([W, X], [Y, Z])$:

\[
\text{Adjoin}(\langle s, [W, X]\alpha\gamma \rangle :: \text{mvrs}_s, \langle t, [Y, Z]\beta \rangle :: \text{mvrs}_t) =
\]

\[
\begin{cases}
\langle st, \alpha C \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma, \beta = \epsilon & W \geq Z \\
\langle ts, \alpha C \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma, \beta = \epsilon & W||Z \\
\langle s, \alpha C \rangle :: \langle t, \beta \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma = \epsilon, \beta \neq \epsilon & W \not< Z \\
\langle t, \alpha C \rangle :: \langle s, \gamma \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma \neq \epsilon, \beta = \epsilon & W \not< Z \\
\langle \epsilon, \alpha C \rangle :: \langle s, \gamma \rangle :: \langle t, \beta \rangle :: \text{mvrs}_s \cdot \text{mvrs}_t & \text{if } \gamma, \beta \neq \epsilon & W \not< Z
\end{cases}
\]