RRG & FG

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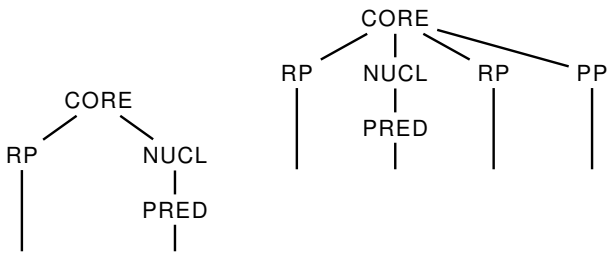
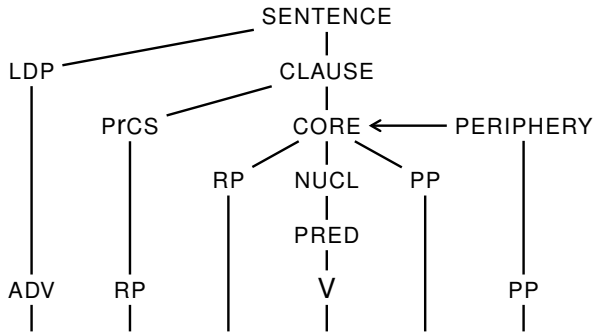
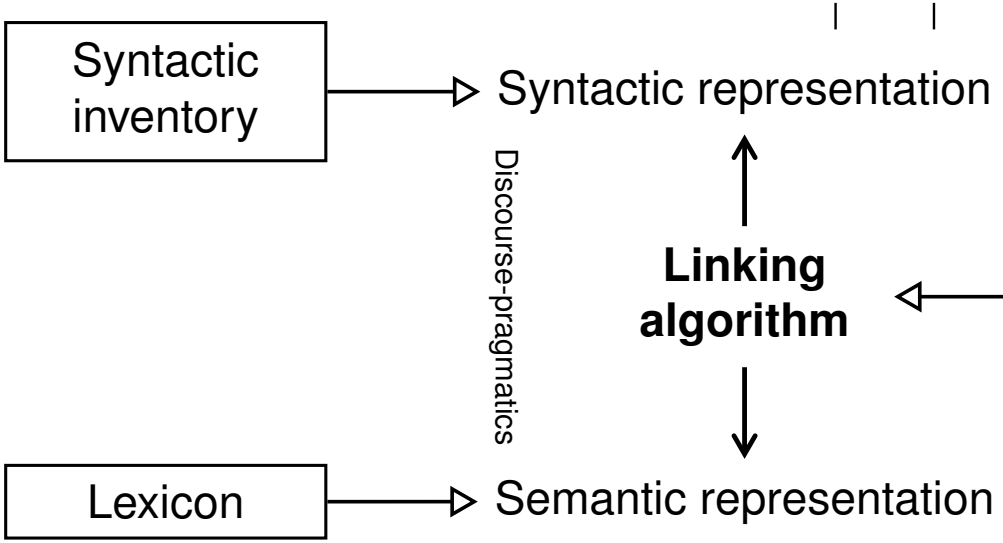
Ask not what RRG can do for you – ask what you can do for RRG.

Ask what you can do for RRG so that RRG can do more for you.

What is RRG (= Role & Reference Grammar) about?







$[\textbf{do}'(x, \varnothing)]$ CAUSE [INGR **shattered**$'(y)$]

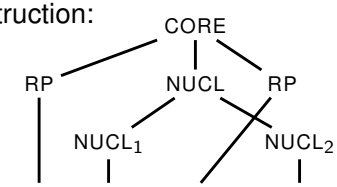
$\langle_{\text{IF}}$ *INT* $\langle_{\text{TNS}}$ *PRES* $\langle_{\text{ASP}}$ *PERF PROG* $\langle$**do**$'$(Kim, [**cry**$'$(Kim)]$\rangle\rangle\rangle\rangle$

MORPHOLOGY —

SYNTAX Juncture: nuclear

Nexus: cosubordination

Construction:



Linking: default

SEMANTICS [SEM$_{\text{NUCL}_1}$] CAUSE [SEM$_{\text{NUCL}_2}$]

PRAGMATICS unspecified

What is FG (= Formal Grammar) about?

- **Formal** (= mathematical/logical) models of grammar

  Precise definition of the set of derivable (tree) structures, …

- **Generative capacity** of grammar formalisms

  Context free languages (but the Swiss!), weakly context sensitive, cross-serial dependencies, copy language, …

- **Complexity** of (parsing, …) **algorithms**

  Polynomial time, …

- **Compositionality** of syntax & semantics

  Montague grammar, λ-calculus, Categorial Grammar, …

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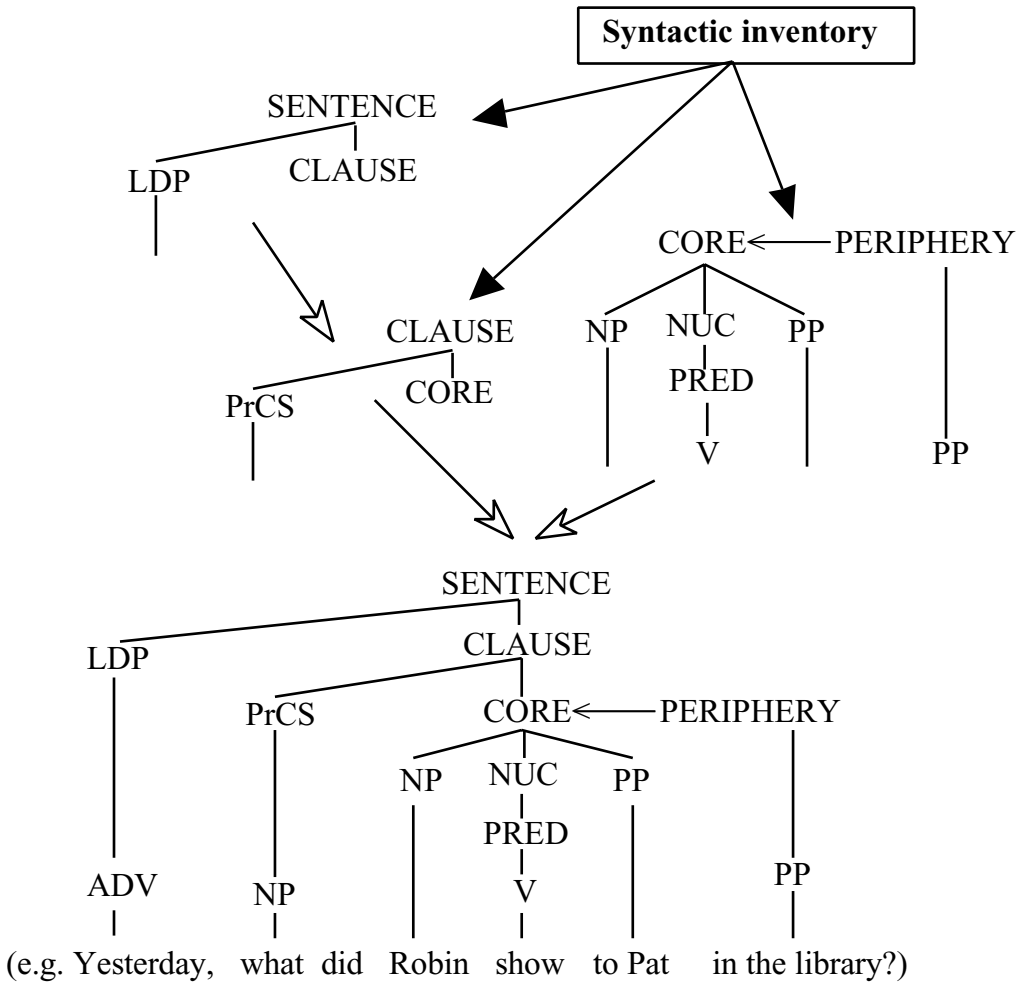
- Further advantages:

  A formalization can serve as a basis (in fact, is a requirement) for a **computational treatment** of RRG.

  It allows us to study the **generative power** of RRG and the **complexity issues** related to processing RRG-based grammars.

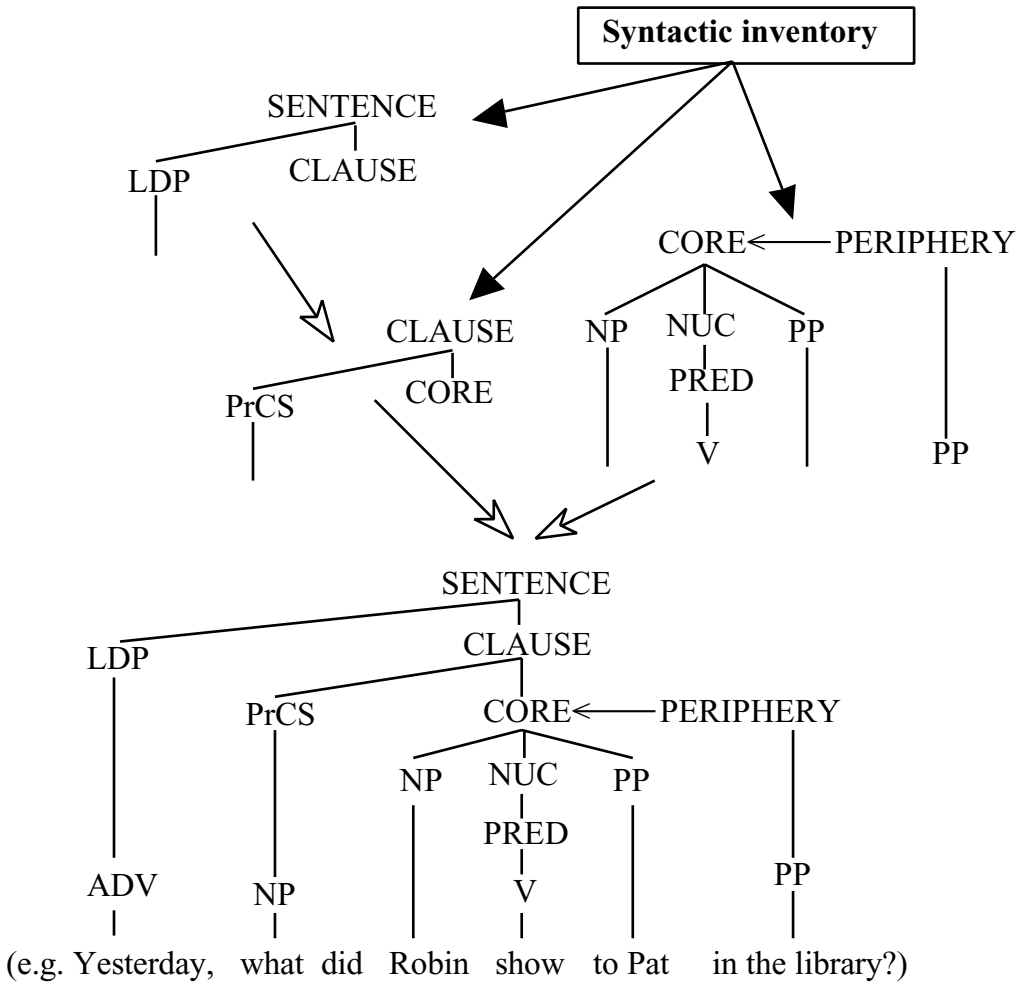
  Moreover, the formalization should make it easier to **extend** and **modify** the theory.

The inventory of syntactic templates



Outline of a formalization of RRG

The inventory of syntactic templates



Issues

- How are syntactic templates defined?
- How do they combine?

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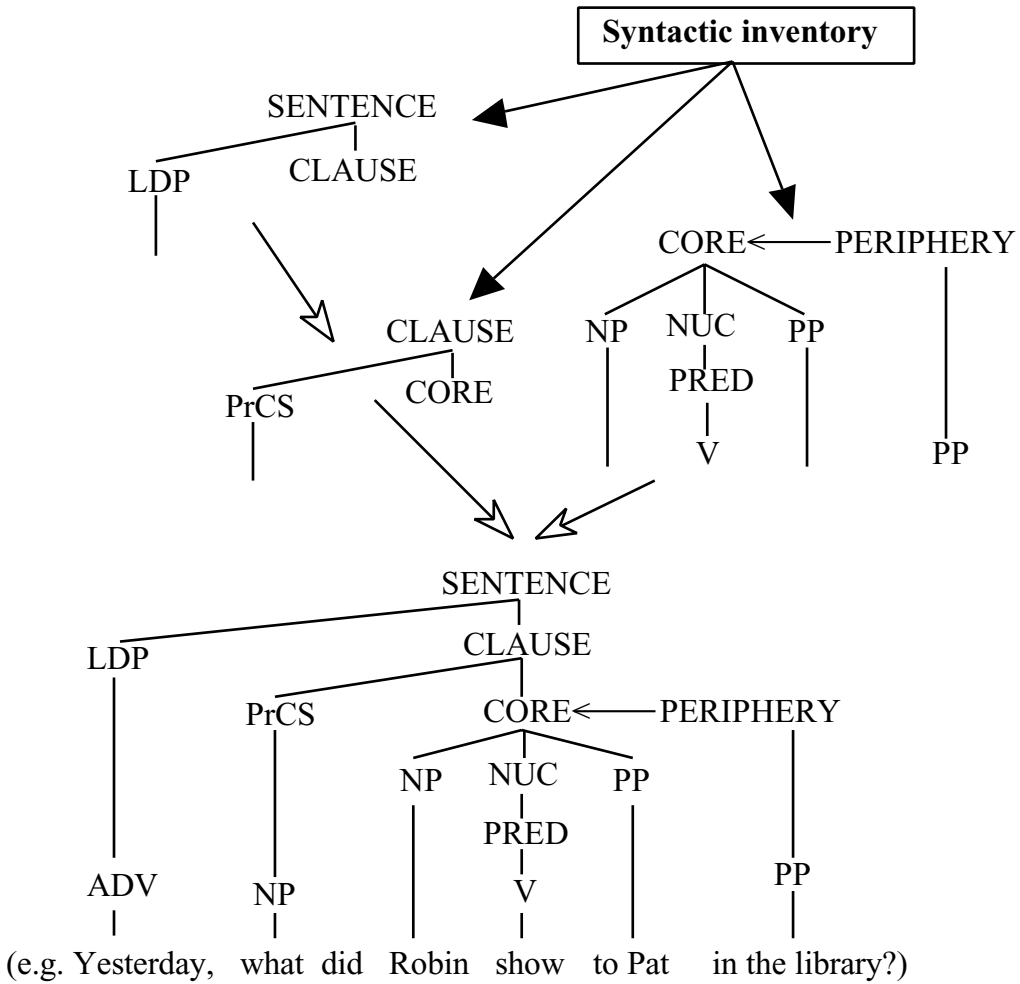

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Proposal

- Use concepts from (Lexicalized) Tree Adjoining Grammars (LTAG)
- Adapt the LTAG formalism to the syntactic dimension of RRG

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An every-day example

(1) Van watched a match.

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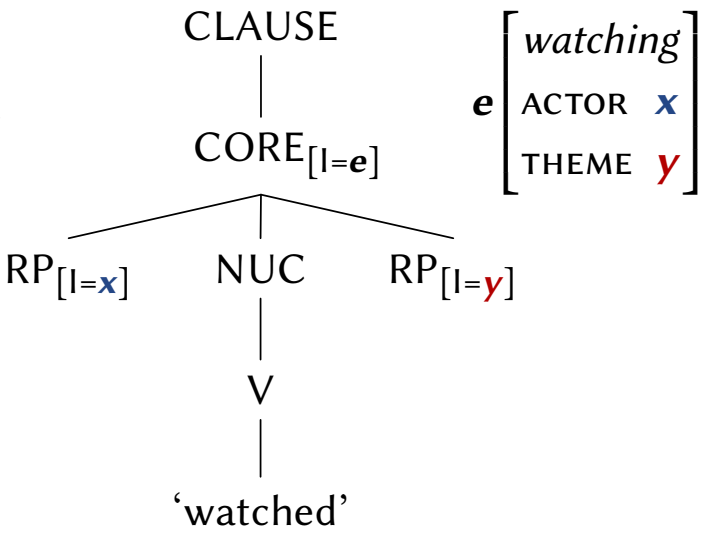

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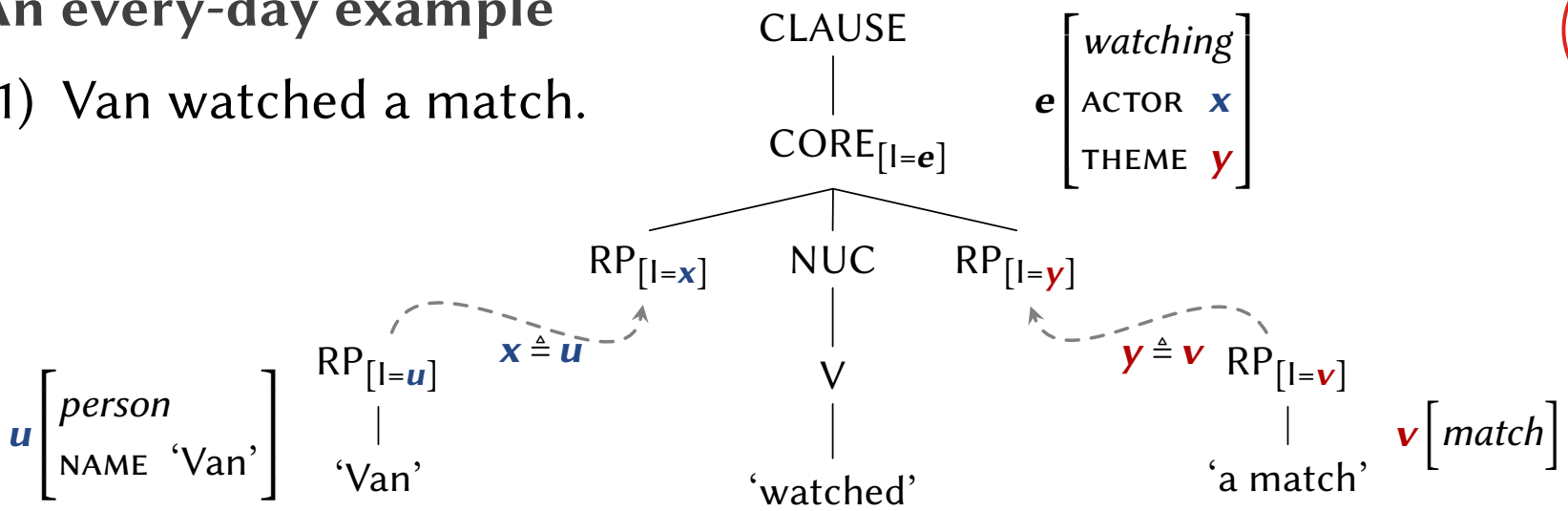

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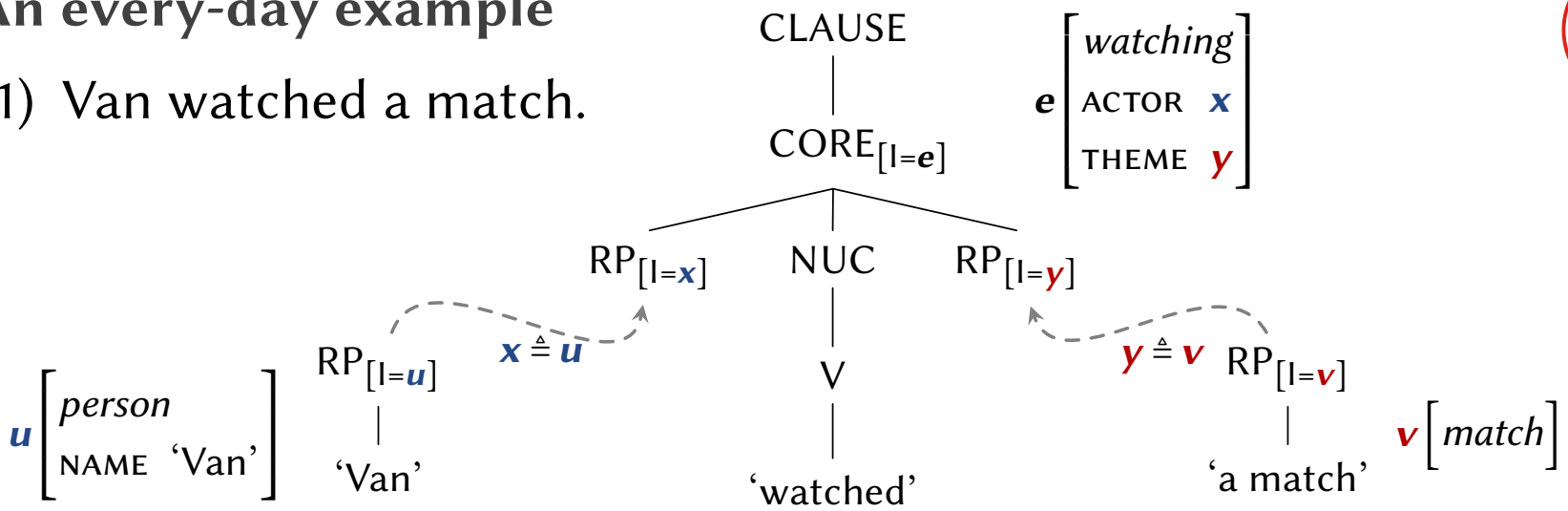

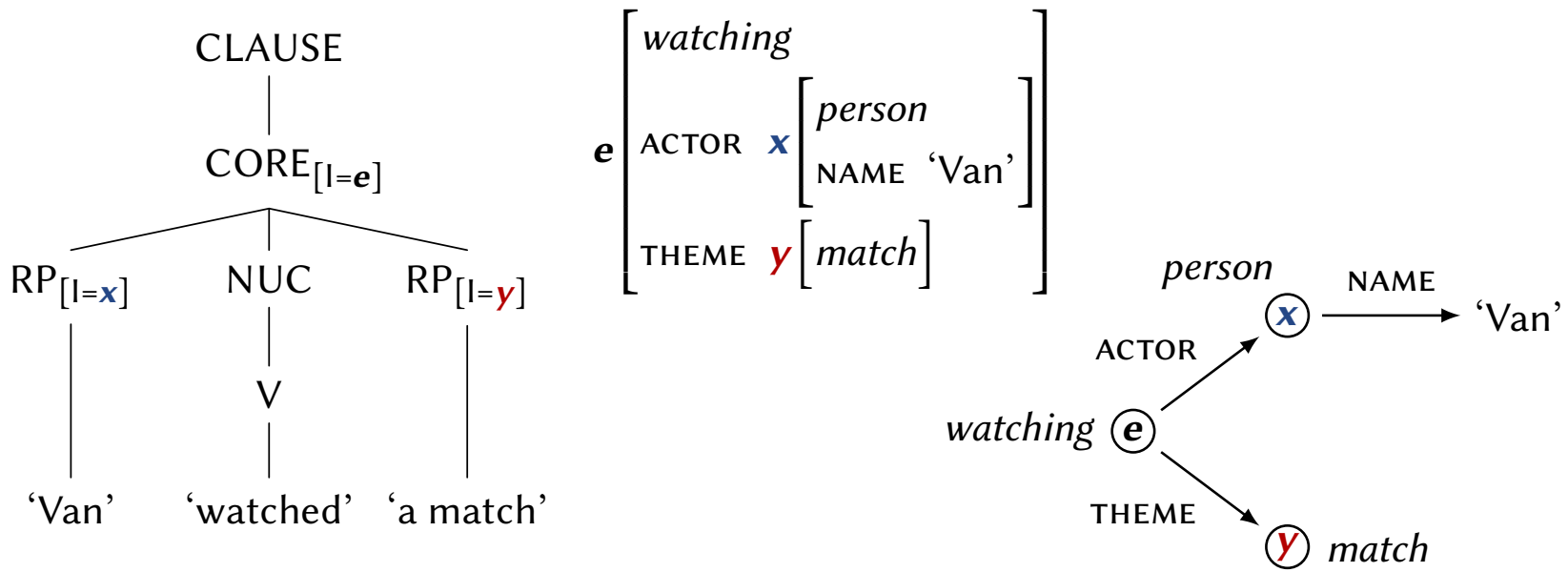

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- **Elementary construction**
  = elementary tree (full argument projection) + semantic frame
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"It's the metagrammar where the action is." [≈ Van Valin, p.c.]

Example (cont'd)

(2) Fortuna Van claimed will probably win the match.

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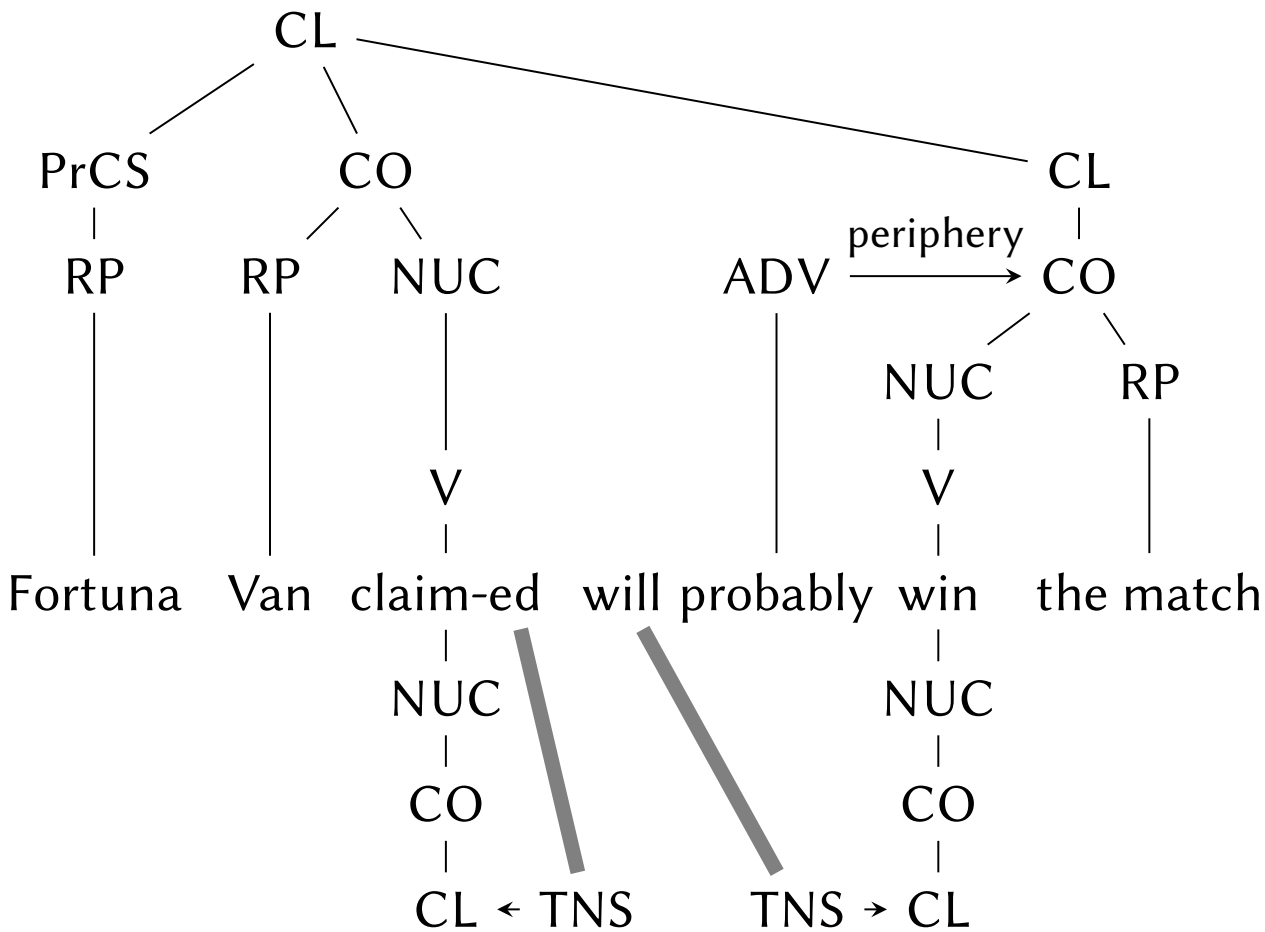
Syntax:



Example (cont'd)

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Semantics:

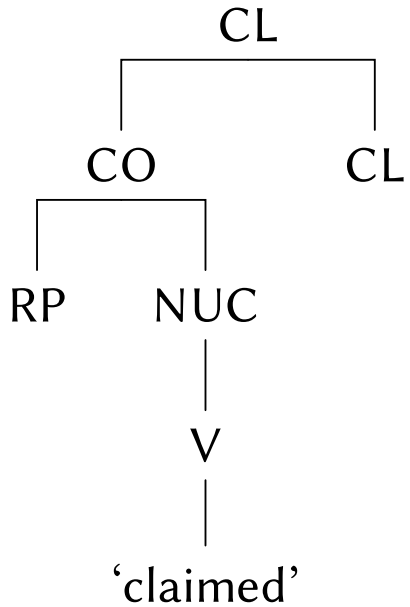
$$\begin{bmatrix} \textit{statement} & \\ \textsc{actor} & \boxed{1}\begin{bmatrix} \textit{person} \\ \textsc{name} \ \text{`Van'} \end{bmatrix} \\ \textsc{speaker} & \boxed{1} \\ \textsc{message} & \begin{bmatrix} \textit{prediction} & \\ \textsc{about} & \begin{bmatrix} \textit{winning} & \\ \textsc{actor} & \begin{bmatrix} \textit{team} \\ \textsc{name} \ \text{`Fortuna'} \end{bmatrix} \\ \textsc{theme} & \begin{bmatrix} \textit{match} \end{bmatrix} \end{bmatrix} \\ \textsc{probability} & \begin{bmatrix} \textit{high} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Questions for the formalization

- What are the elementary building blocks?
- How is the syntactic tree generated?
- What do the funny bold edges in the operator projection mean?
- How are periphery modifiers added to the structure?
- How do we make sure certain parts are obligatory, for instance syntactic arguments but also operators such as TNS?
- How do we link syntax to semantics in such as way as to enable a compositional semantics?

Example: Argument insertion

Arguments are added by (wrapping) substitution.



Argument slots (= substitution nodes) have to be filled in order to obtain a well-formed complete syntactic tree.

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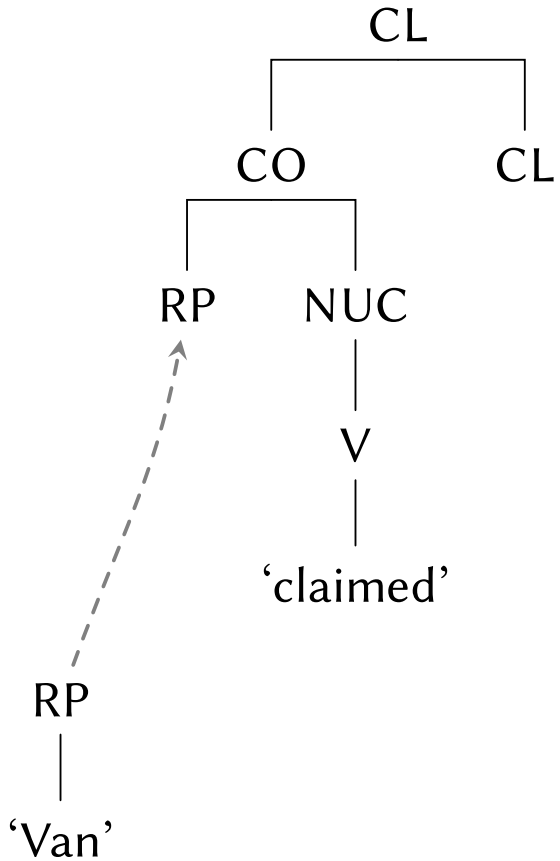

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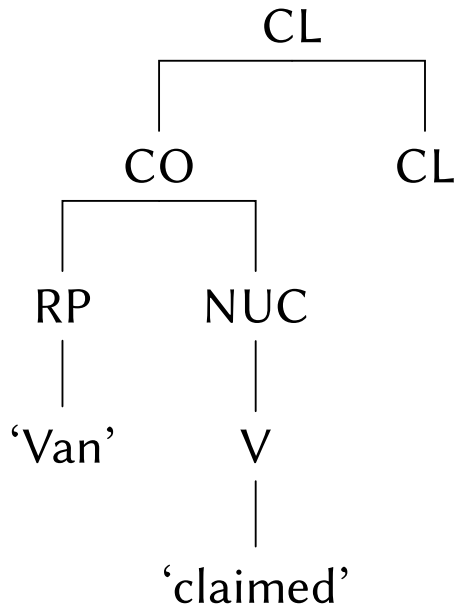

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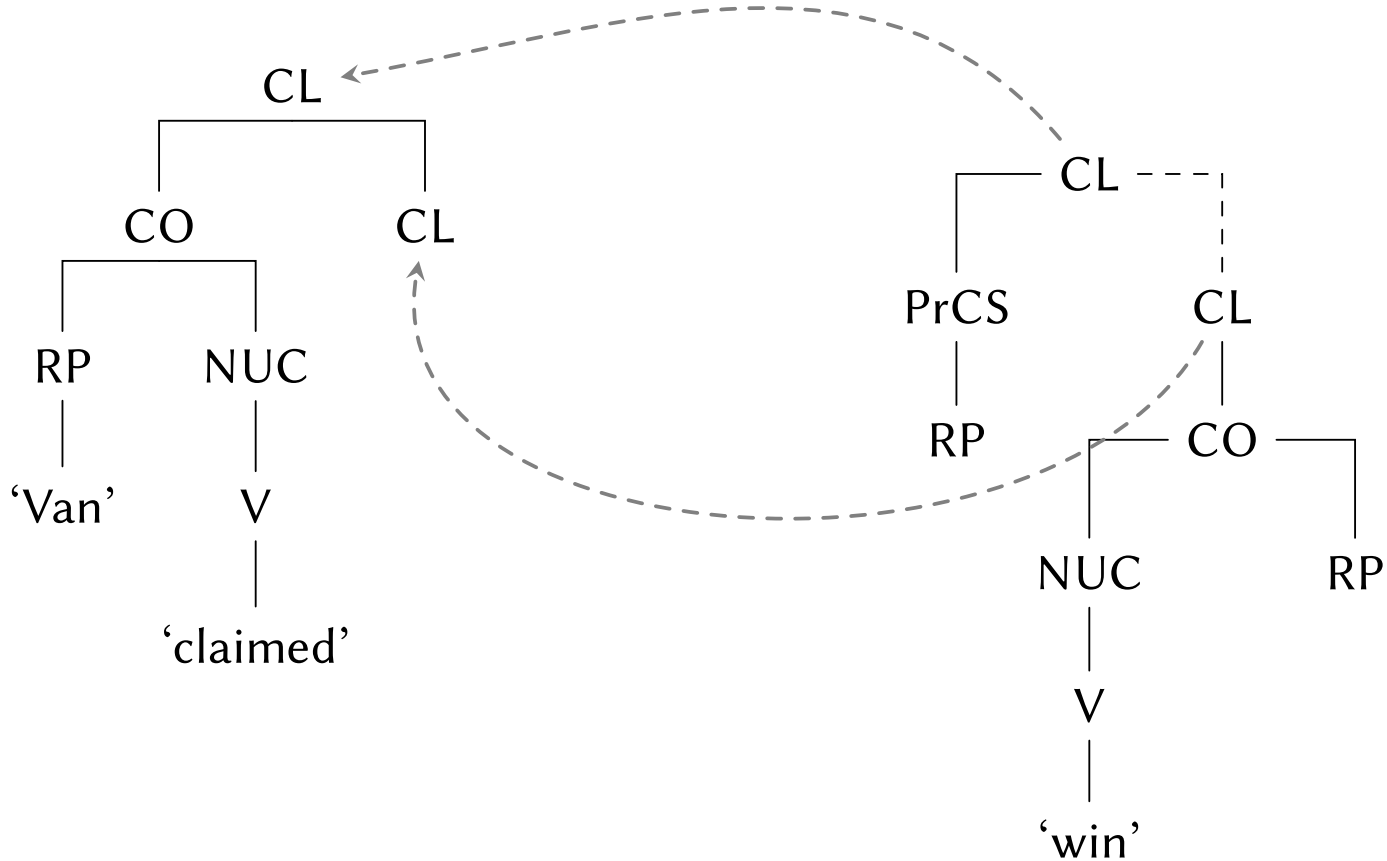

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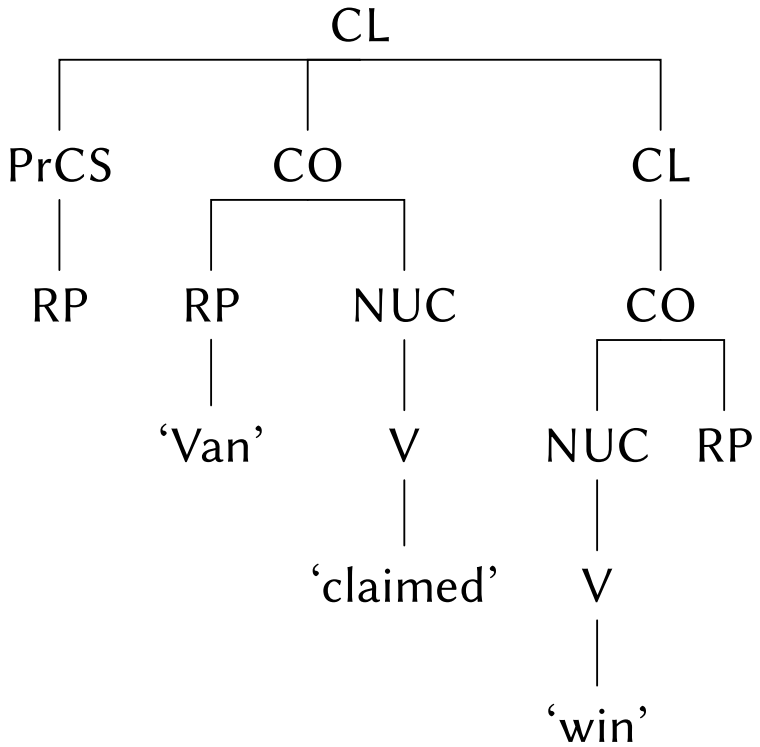

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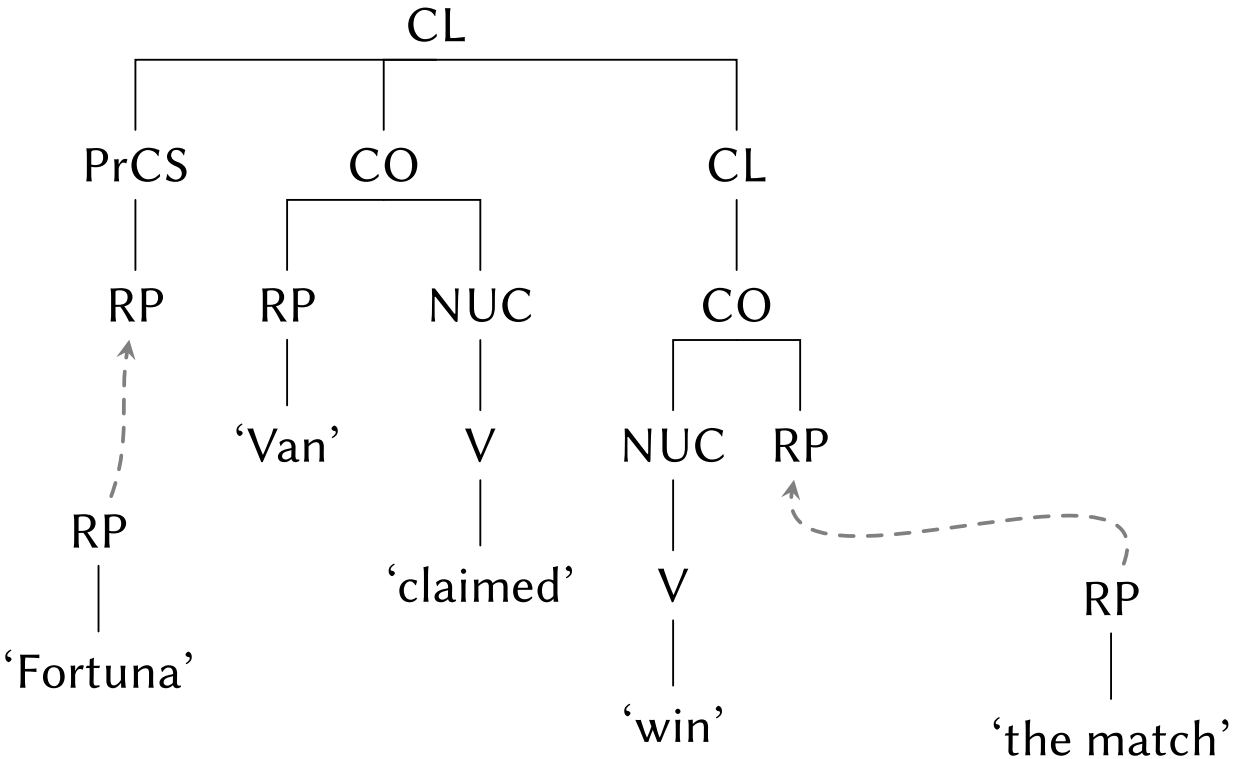

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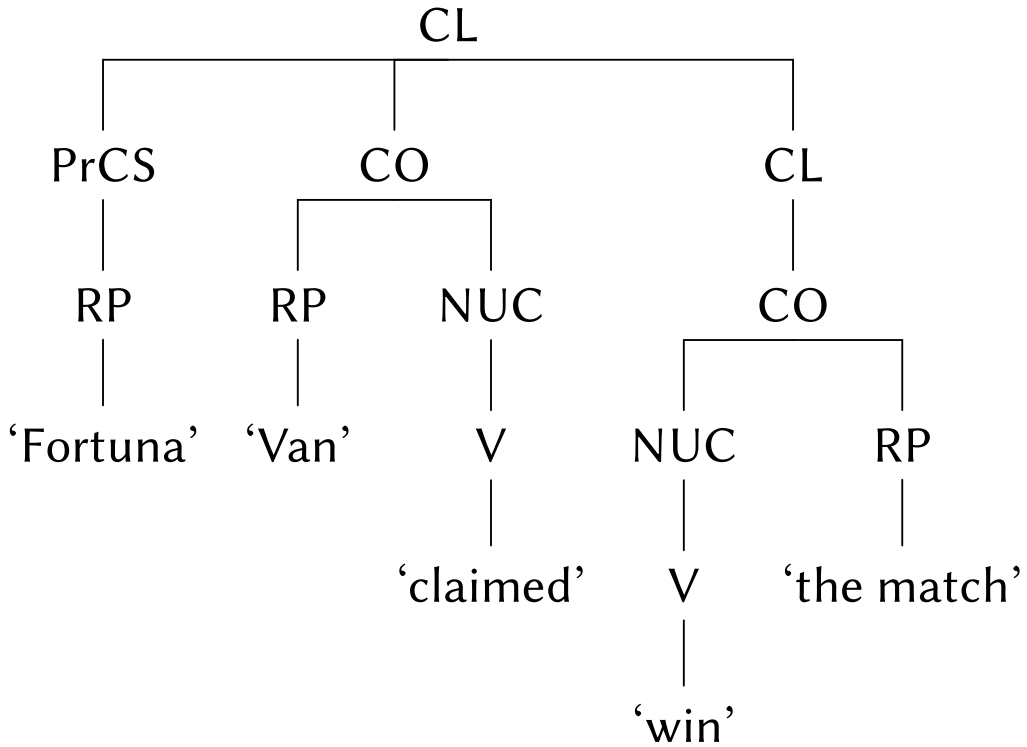
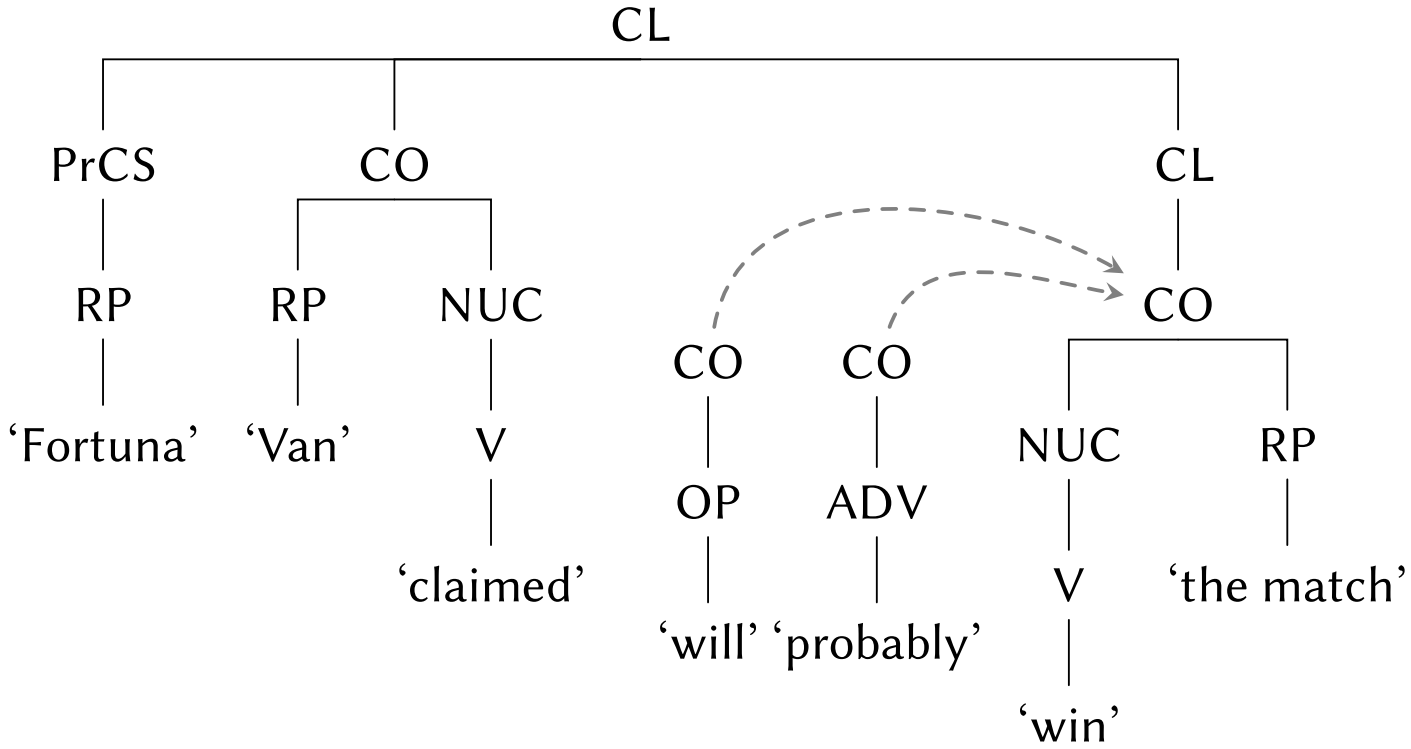


Example: Operators and modifiers

Operators and modifiers are added by sister adjunction.



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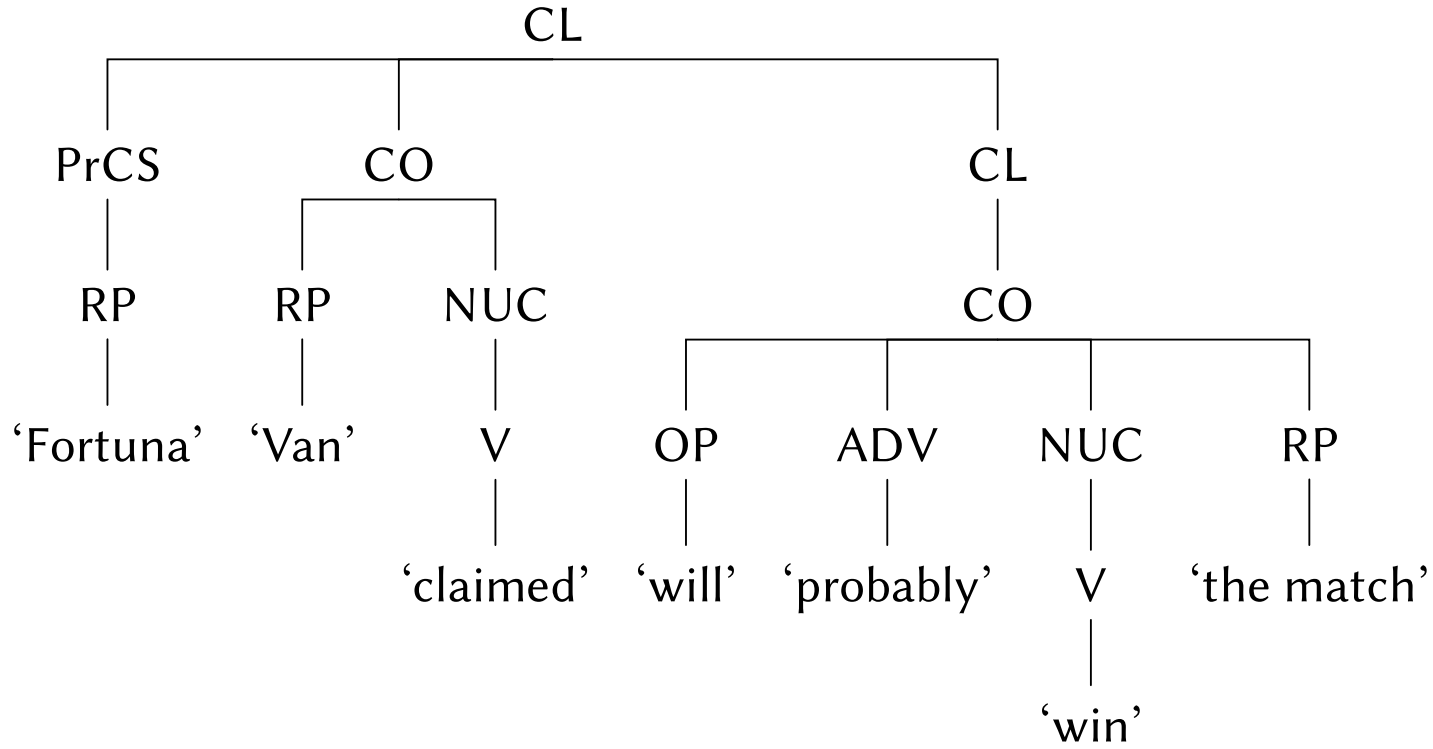

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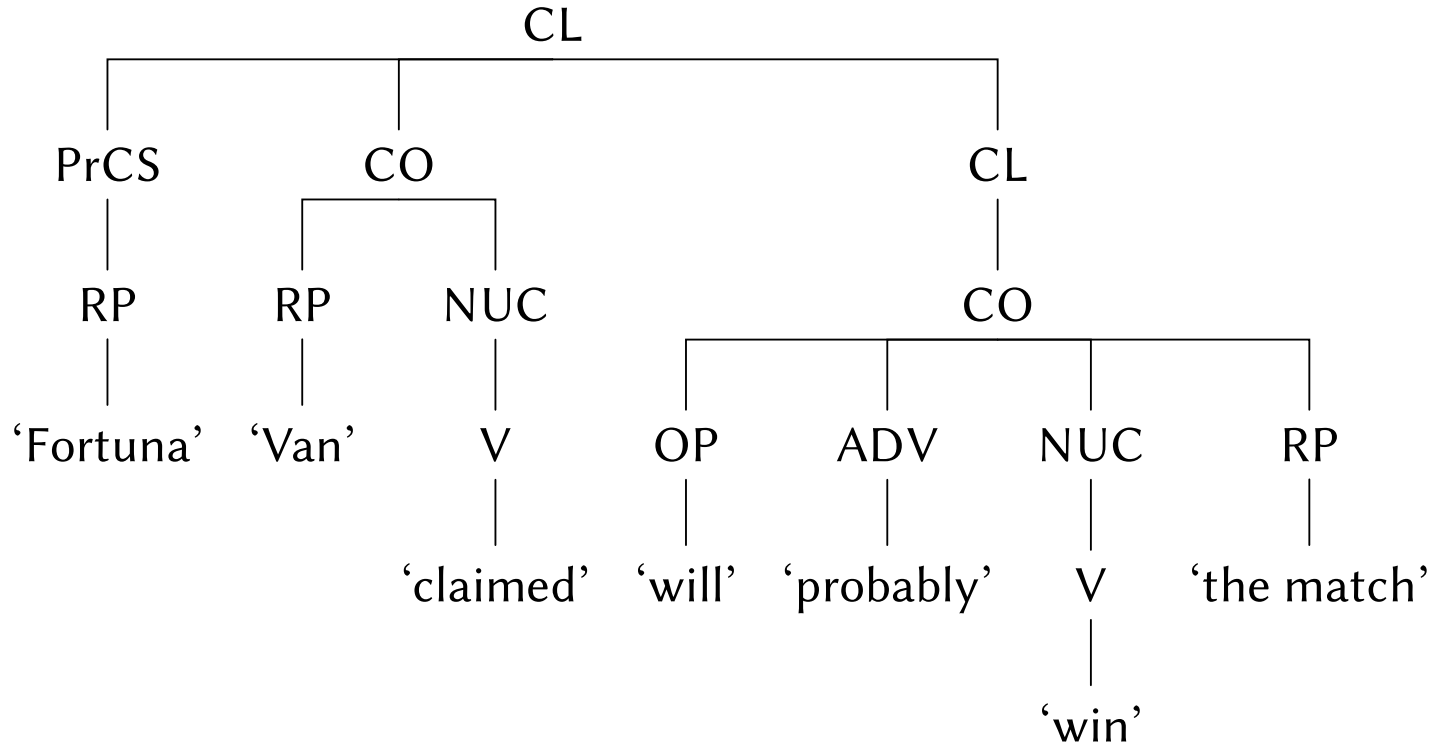

(The operator projection as well as modifier scope is modeled in the features.)

Example: Features

- Features on nodes take care of agreement, case assignment, tense etc.
- Features between edges express constraints on possible adjunctions in between.

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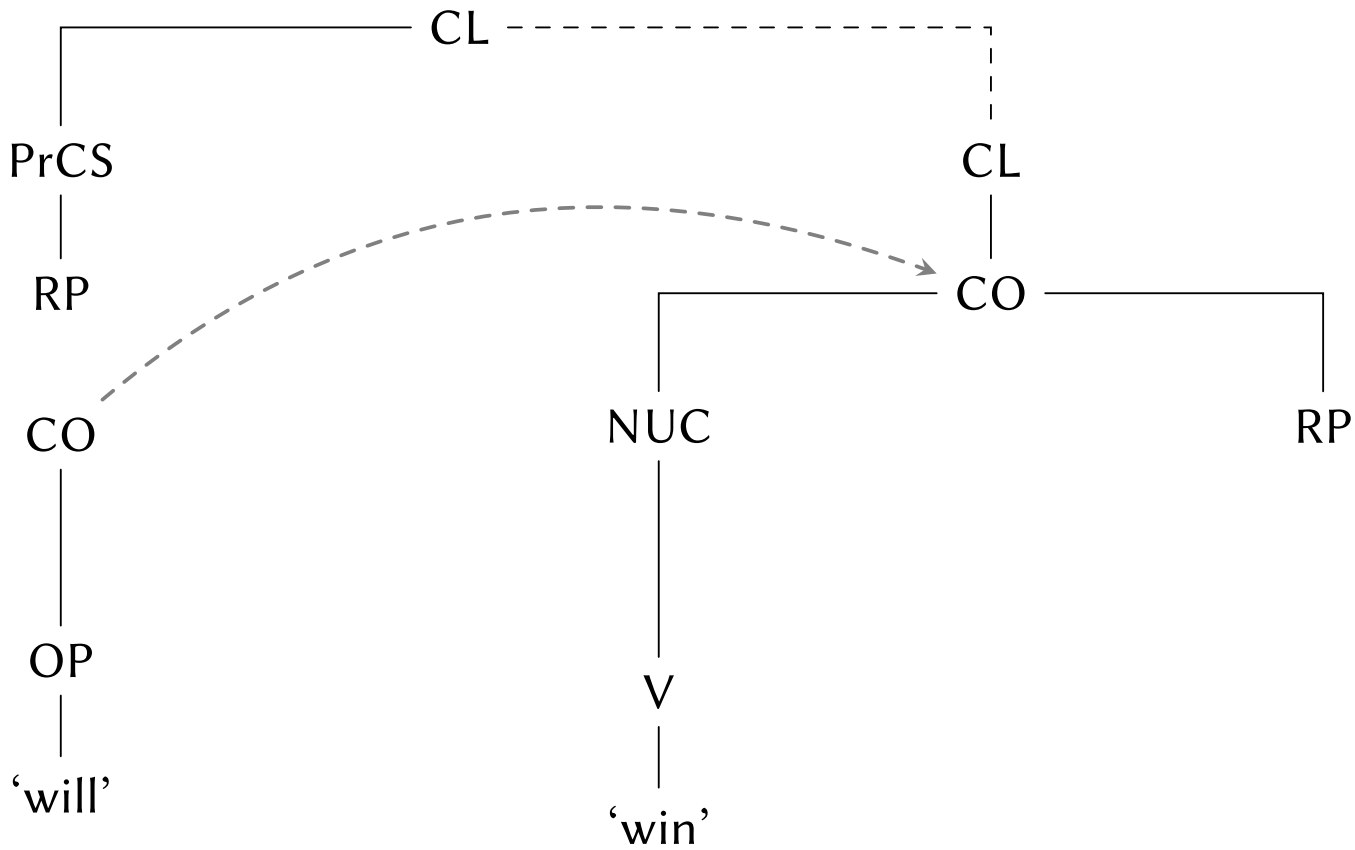

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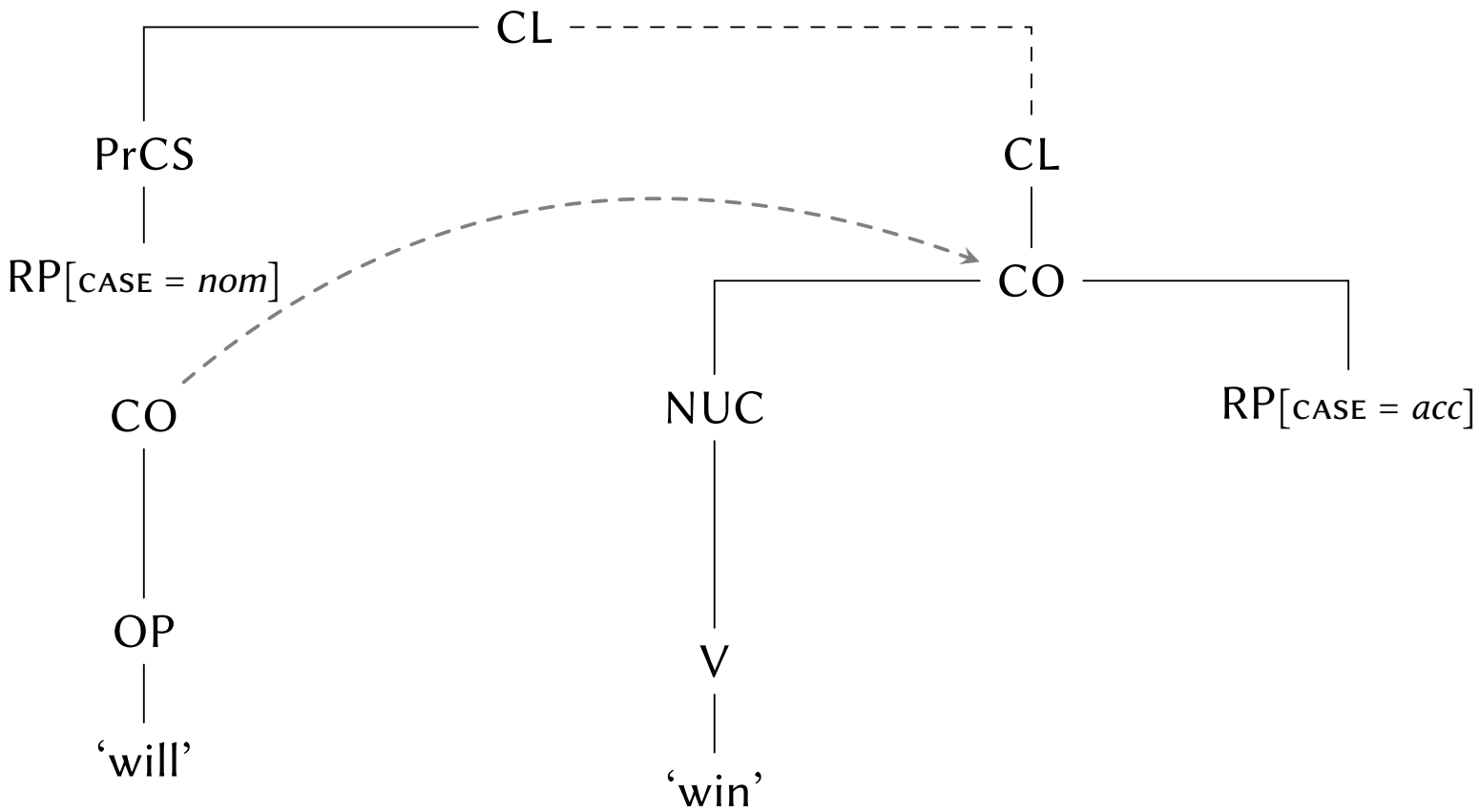

case on nodes for case assignment

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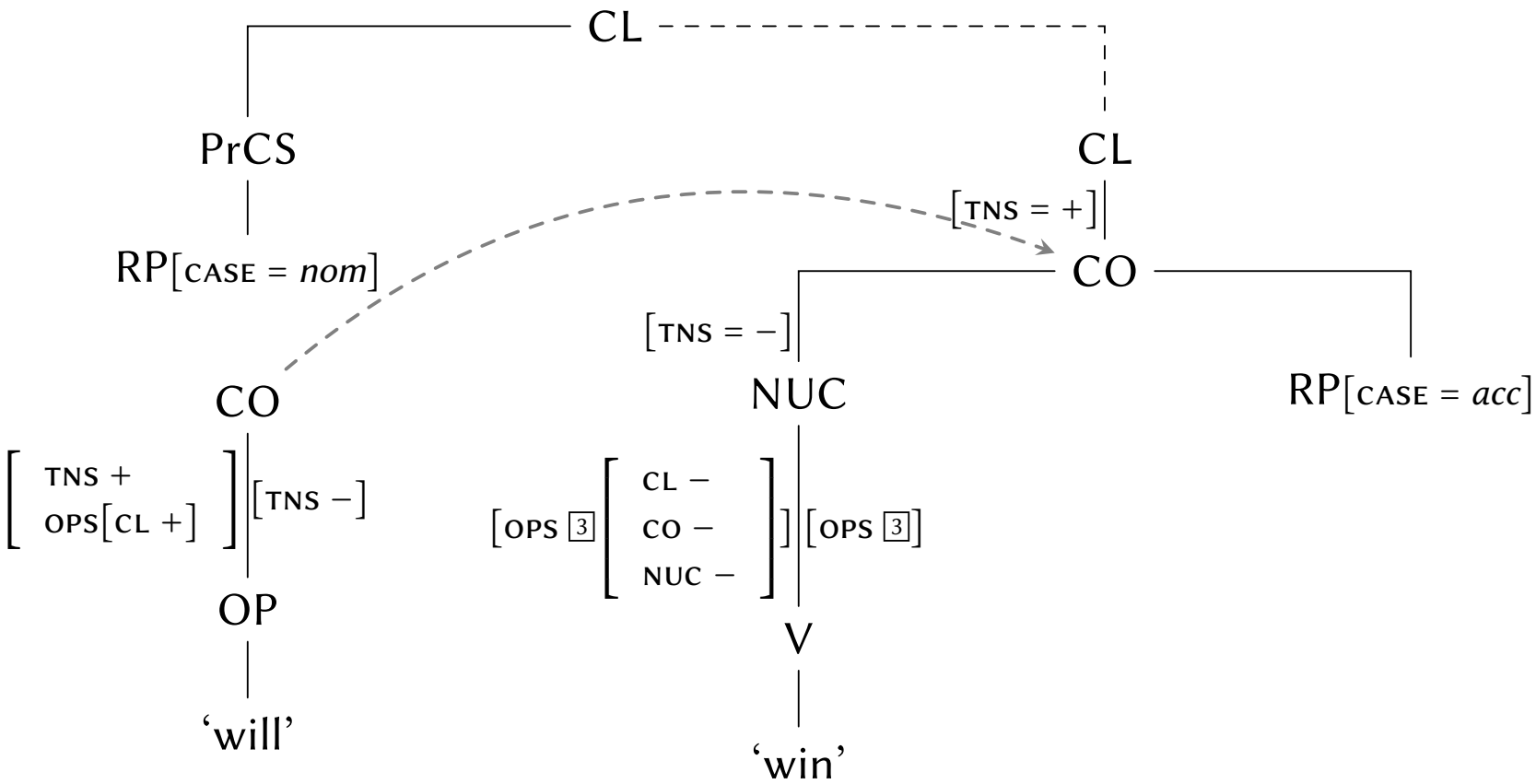

TNS on edges for obligatory adjunction of a single tns operator

OPS on edges to keep track of the the correspondence between surface order and operator hierarchy

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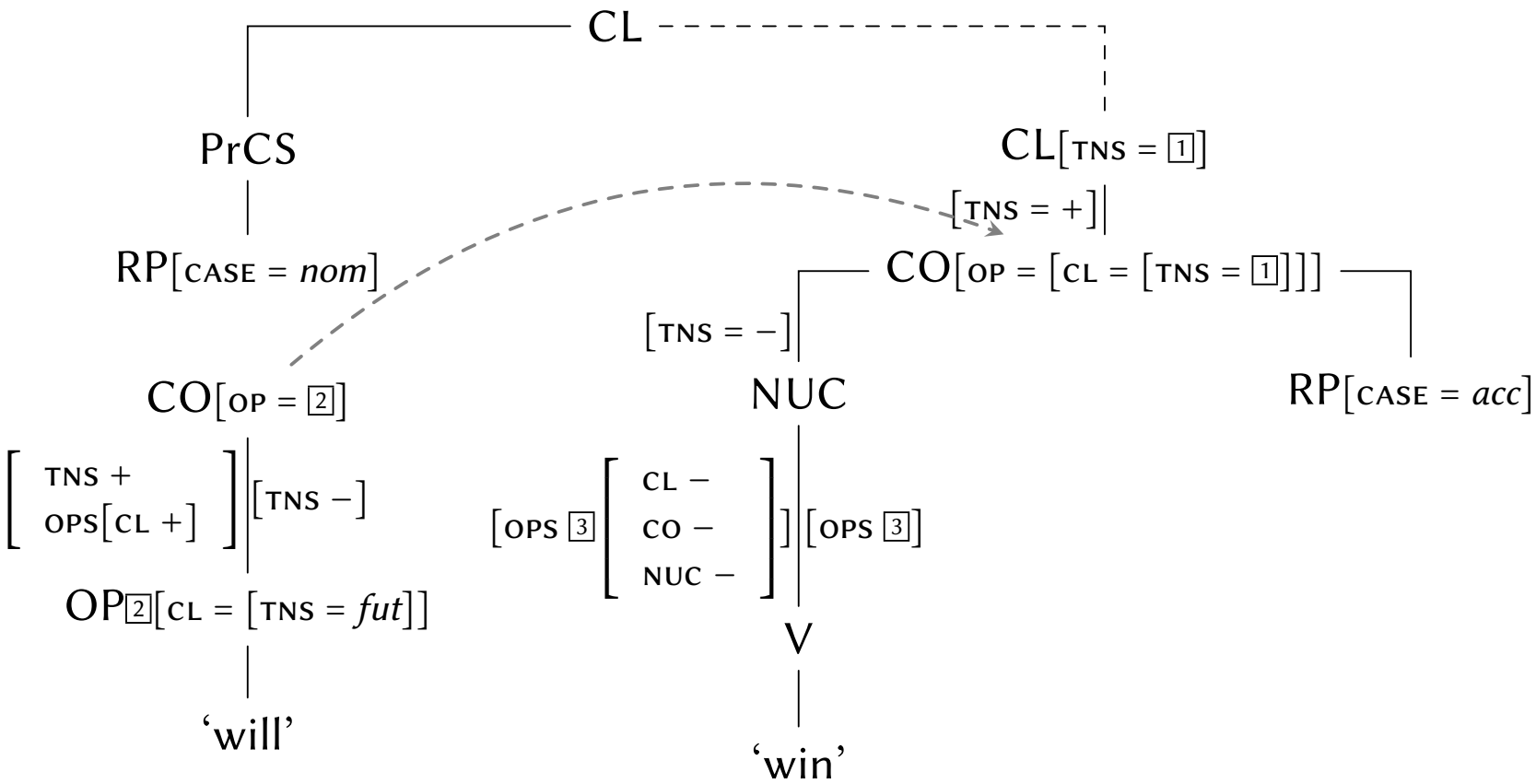
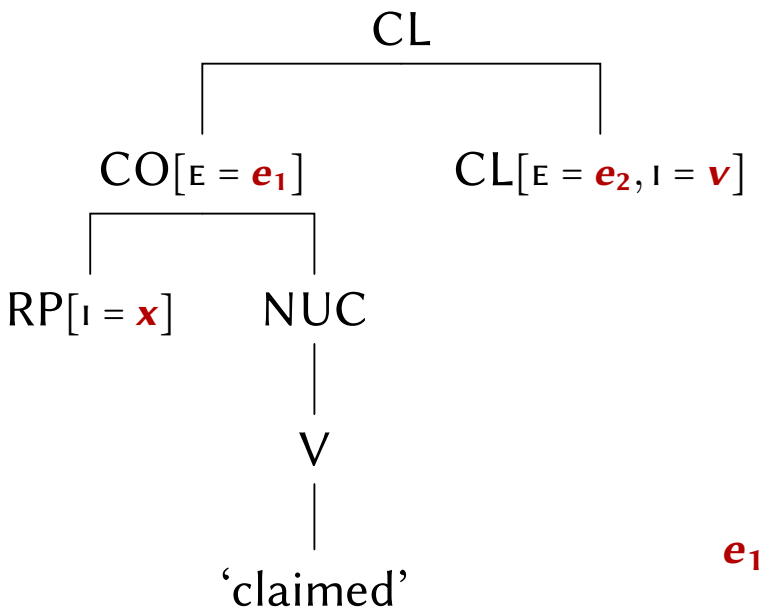


OP on nodes that lists the operators of the entire layered structure
TNS etc. on the corresponding layer nodes
CL, CO, NUC on OP nodes that characterize the operator's contribution

Example: Interfacing syntax and semantics

- Interface features link frame nodes to syntactic nodes.
- Their unification during syntactic composition triggers semantic frame unification.



$$e_1 \begin{bmatrix} \textit{statement} \\ \text{ACTOR} \quad x \\ \text{SPEAKER} \quad x \\ \text{MESSAGE} \quad v \begin{bmatrix} \textit{prediction} \\ \text{ABOUT} \quad e_2 \end{bmatrix} \end{bmatrix}$$

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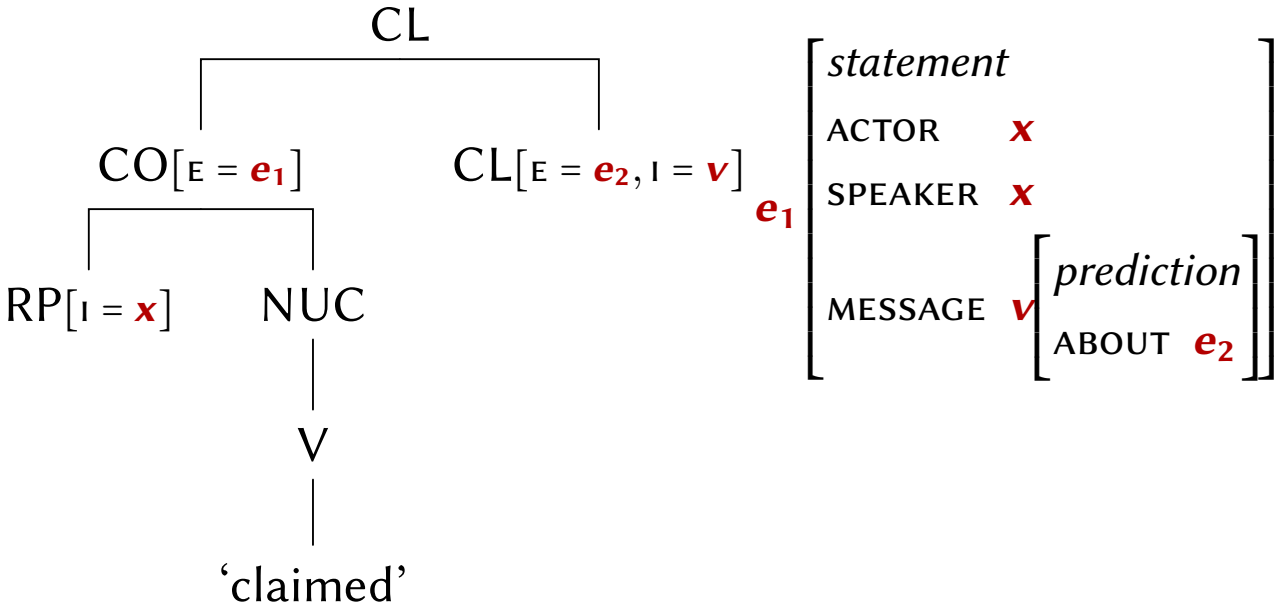

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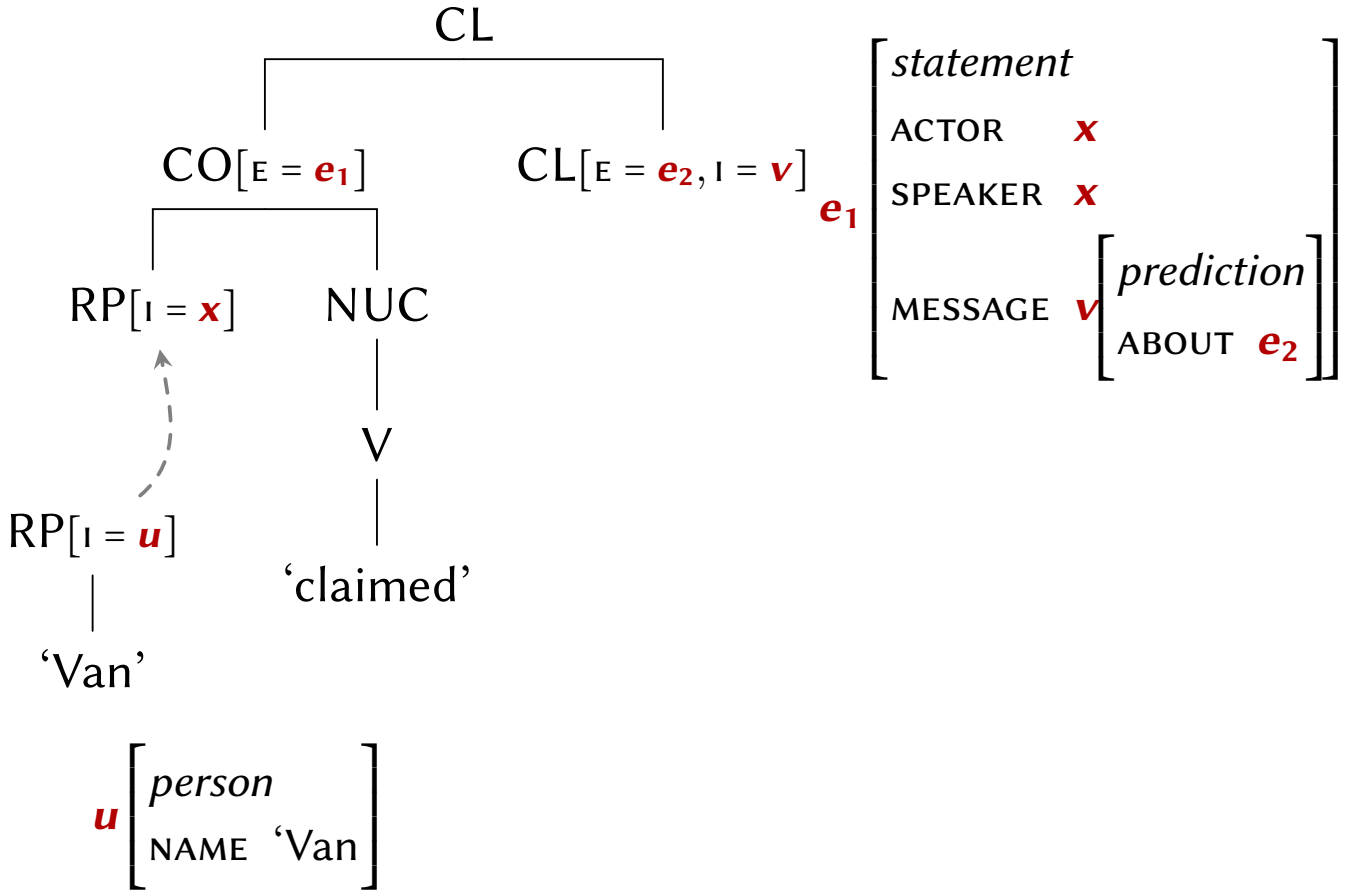

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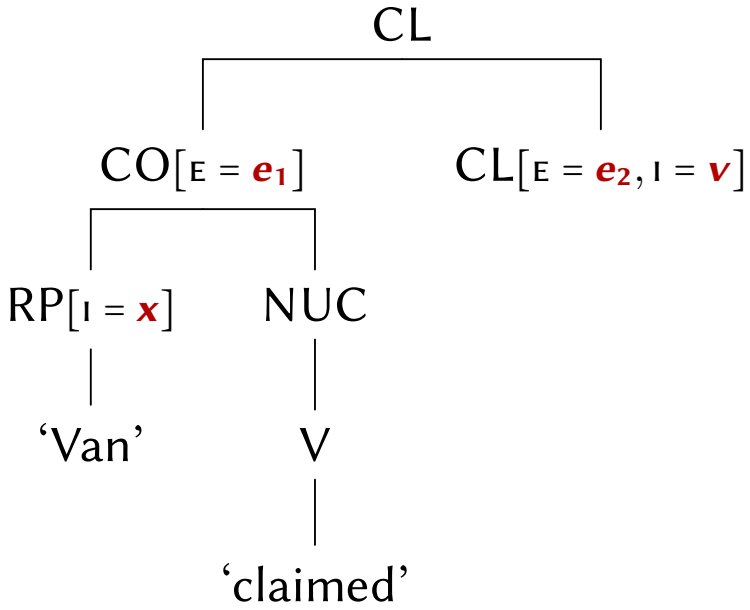

$$e_1 \begin{bmatrix} \textit{statement} \\ \text{ACTOR} \quad x \begin{bmatrix} \textit{person} \\ \text{NAME} \quad \text{'Van} \end{bmatrix} \\ \text{SPEAKER} \quad x \\ \text{MESSAGE} \quad v \begin{bmatrix} \textit{prediction} \\ \text{ABOUT} \quad e_2 \end{bmatrix} \end{bmatrix}$$

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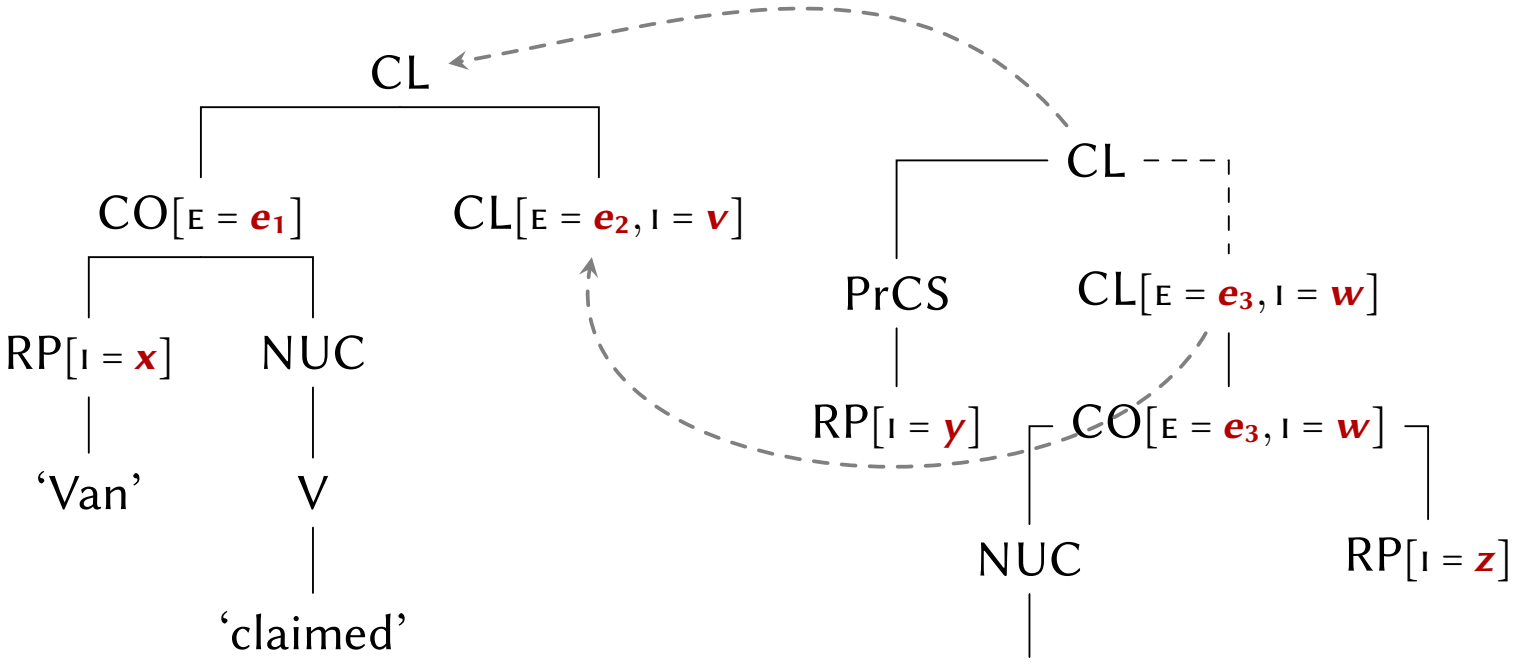

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$$e_3 \begin{bmatrix} \textit{winning} \\ \text{ACTOR} \quad y \\ \text{THEME} \quad z \end{bmatrix}$$

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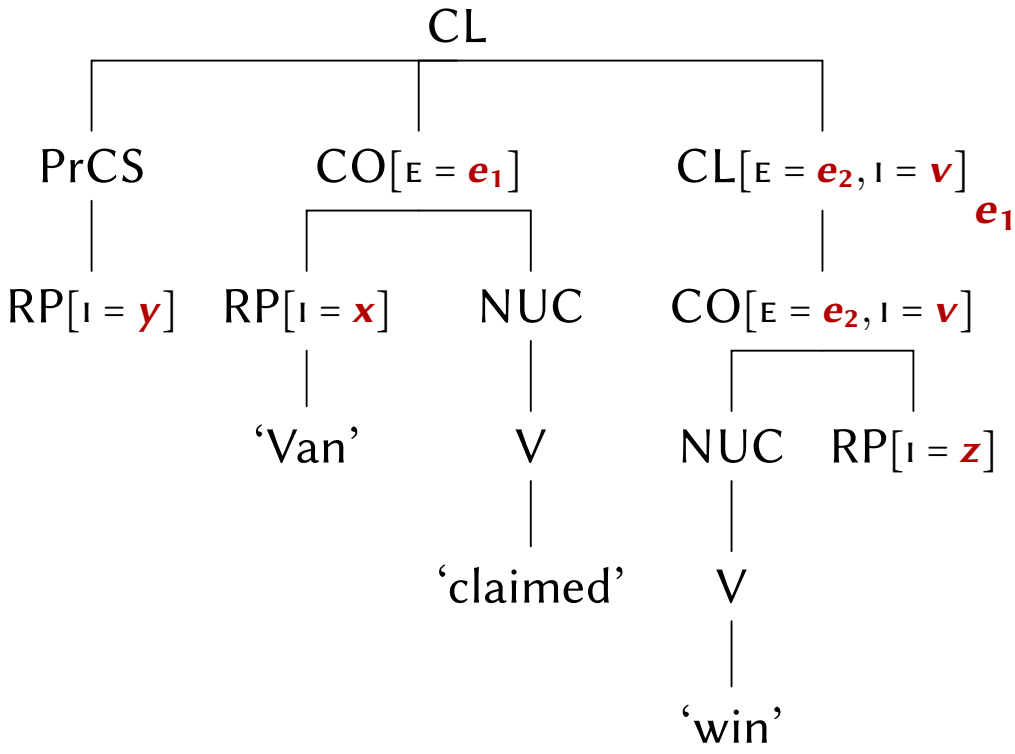

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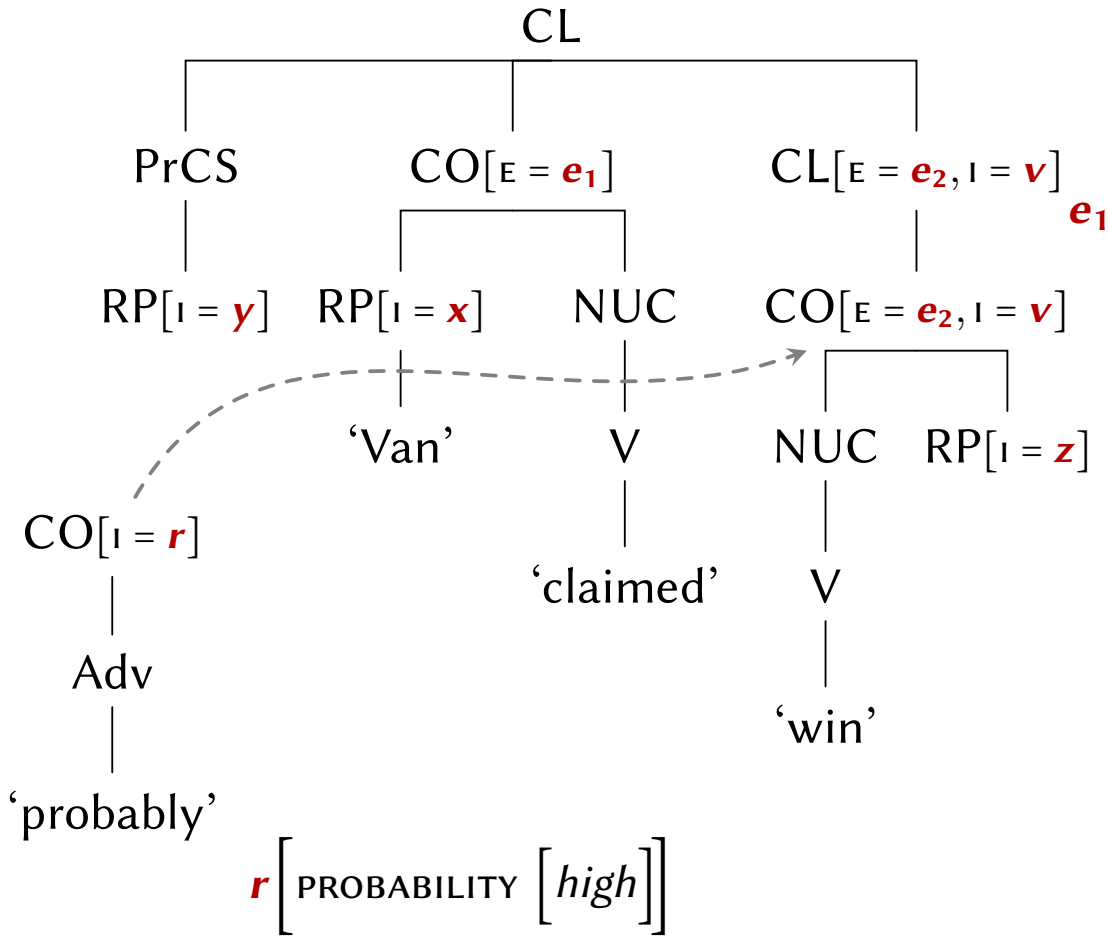

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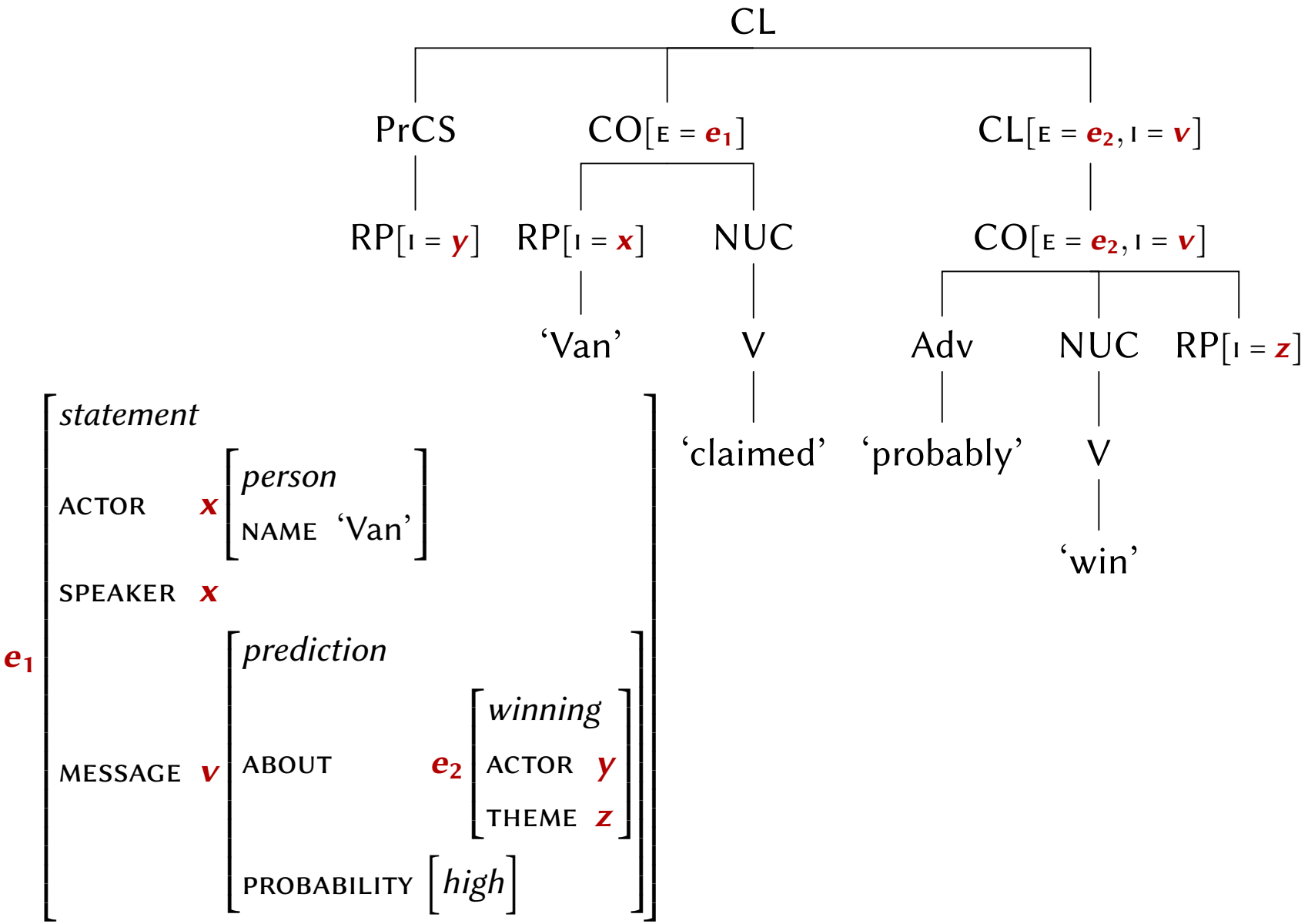

Summary & Conclusion

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- General composition operations for elementary trees/constructions.
- Contraint-based specification of elementary constructions.
- Linking rules as constraints in the metagrammar.
- …

Summary & Conclusion

The good news: RRG can be formalized while retaining its basic outline.

- General composition operations for elementary trees/constructions.
- Contraint-based specification of elementary constructions.
- Linking rules as constraints in the metagrammar.
- …

The even better news: A lot remains to be done!

- Decision about whether to analyze a given structure (e.g., cosubordination) as a construction or as a composition in the syntax.
- General issue: What is the best methodology for formulating constraints in the metagrammar that capture language-specific and cross-linguistic generalizations in the most appropriate way?
- Formalization of RRG's discourse-pragmatic dimension.
- …

Champions League Finalist !

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