

## 0. Introduction

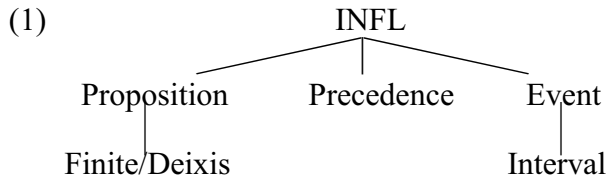
This paper proposes a new semantic account of the English tense/aspect/mood system, drawing on:

- Feature-geometric treatment of INFL (Cowper 1998)
- Articulated structure for tense and aspect (Travis 1993; Cowper to appear)
- Formal semantics of tense and aspect (e.g. Prior 1967, 1968; Davidson 1967; Bach 1979; Bennett and Partee 1978; Parsons 1990; Ogihara 1996)

We provide the elements of Cowper's (1998) feature geometry with denotations from which the order of their composition follows automatically; no further syntactic articulation of INFL is needed.

In order to do this, we will need to enhance the set of basic semantic types (Montague 1974), but will employ fewer higher-order types.

## 1. The Feature Geometry of INFL in English

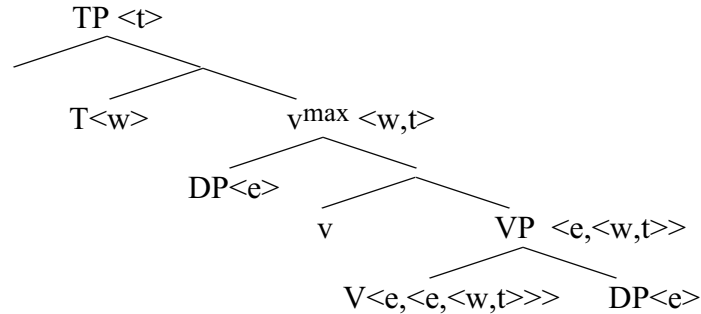


'Mary was laughing.'

## 2. Semantic types and semantic composition

- (2)
- $\langle e, t \rangle$  An intransitive predicate, that is, a function that takes an entity as an argument, and returns a truth value.
  - $\langle e, \langle e, t \rangle \rangle$  A transitive predicate, that is, a function that takes an entity as an argument, and returns an intransitive predicate.
- (3)
- Mary lives in Toronto.
  - Mary lived in Toronto.
  - If Mary had her way, she would live in Toronto.
- (4)  $\langle e, \langle w, t \rangle \rangle$  ( $w$  is to be read as an abbreviation for a pair consisting of a time and a possible world)

- (5) Traditional semantic types for the constituents of TP:



### 3. The Elements of INFL - an informal view

- (6) a. **EVENT:** When present, causes the IP to be interpreted as eventive. When absent, it is interpreted as non-eventive. See Cowper (to appear b) for arguments that the event/state distinction is independent of the choice of verb.
- b. **INTERVAL:** As a dependent feature of EVENT, appears only when the clause is eventive. Modifies the event, giving it internal temporal structure. Corresponds essentially to imperfective viewpoint aspect. When absent, the event is taken as a temporally unanalyzed whole, corresponding to perfective viewpoint aspect.
- c. **PRECEDENCE:** Establishes a marked temporal relation (precedence) between the IP and its temporal anchor. When absent, the IP bears the unmarked relation of coincidence.
- d. **PROPOSITION:** When present, causes the IP to be interpreted as a conceptual representation of either an event or a state. When absent the IP is interpreted as a bare event or state. Such things can be experienced or perceived by the senses, but are not conceptually represented.
- e. **FINITE/DEIXIS:** This dependent feature of the PROPOSITION node is less fully articulated in English than in many other languages. It provides an English IP with the following two properties:
- i. Structural case and phi features are checked with the subject (FINITE)
  - ii. The IP is linked to the temporal discourse anchor, normally the moment of speech (DEIXIS)

These elements fall into two classes:

- Viewpoint aspect: Event, Interval
- Tense and finiteness: Precedence, Proposition, Finite/Deixis

Aspectual elements appear to compose with VP before tense. Travis expresses this fact by dividing tense and aspect into two projections, Tense Phrase and Event Phrase. However, the order of composition may be inherent in the semantics.

Principle of Non-Simultaneity of Points (Cowper 1998: 10):

- (7) No tense morpheme or other functional element in any language can impose simultaneity on two temporal points.
- (8) a. Mary eats the cookie.  
b. We believed Mary to eat the cookie.

#### 4. The Elements of INFL in a Formal Semantics

New semantic type:  $\theta$ -saturate ( $\theta$ )

- This is the semantic type of a thematically saturated  $VP/V^{\max}$ .
- In the absence of further specification, a  $\theta$  is interpreted as a bare state.

New semantic type: R (temporal manifestation of a  $\theta$ -saturate)

- R is an ordered pair consisting of a  $\theta$ -saturate and a set of one or more moments.
- In the absence of further specification, an R is interpreted as a bare event.

- (9) a.  $[[\text{EVENT}]] = \lambda x \in D_{\theta} . [y \in D_R : \exists! m \in D_j : y = \langle x, \{m\} \rangle]$   
b.  $[[\text{INTERVAL}]] = \lambda f \in D_{\langle \theta, R \rangle} . [\lambda x \in D_{\theta} . [z \in D_R : f(x) = \langle a, b \rangle \ \& \ z = \langle a, c \rangle \ \& \ c \supset b]]$
- EVENT maps from a  $\theta$ -saturate to an R with singleton a set of moments.
  - INTERVAL modifies EVENT so that it creates a non-singleton set of moments.

Events vs. Propositions:

- (10) a. We heard [the band playing a piece by Telemann].  
b. We heard [that the band played a piece by Telemann].
- (11) a. \*Two plus two was seen equalling four.  
b. Two plus two was seen to equal four.
- (12) a.  $[[\text{PROPOSITION}]] = \lambda x . [y \in D_P : y = \langle x, c \rangle]$   
b.  $[[\text{DEIXIS}]] = \lambda f \in D_{\langle \theta, UR, P \rangle} . [\lambda x \in D_{\theta, UR} . [y \in D_P : f(x) = \langle a, b \rangle \ \& \ y = \langle a, g_D \rangle]]$

New semantic type: P

- P is an ordered pair linking an event (R) or state ( $\theta$ ) with a consciousness (c).
- PROPOSITION maps from R or  $\theta$  (or, potentially, other types) to P.
- DEIXIS modifies PROPOSITION so that the consciousness is indexed to D, the deictic centre of the utterance.

Direct anchoring to D accounts for SOT and dual-access readings (Cowper 1996):

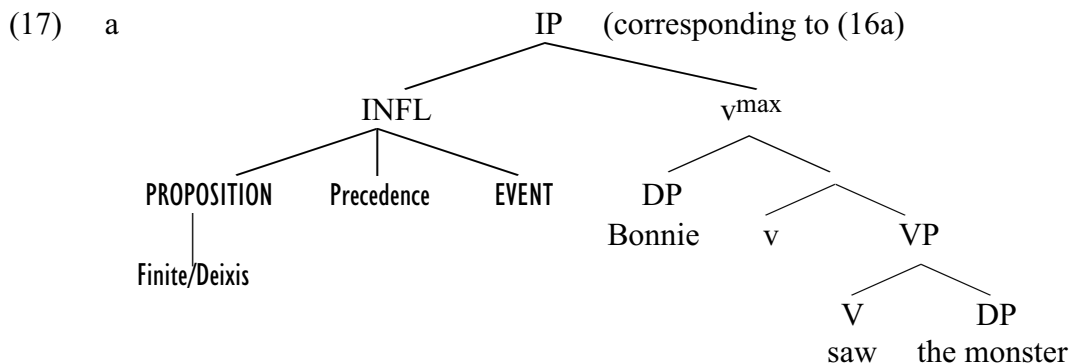
(13) Tony said that Alex has the answer.

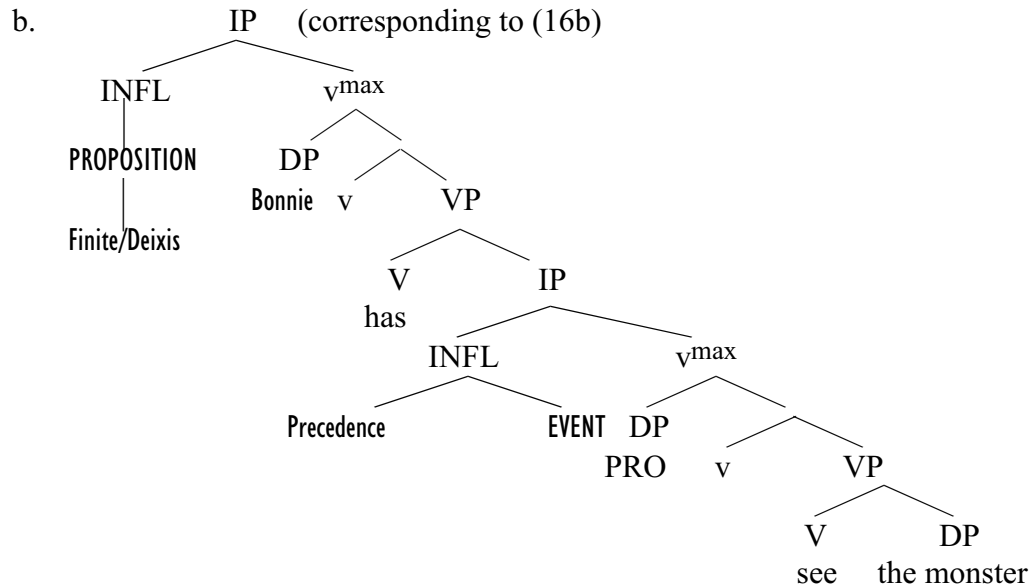
Complications introduced by Precedence:

- (14) a. PRECEDENCE can appear with bare events (R) and states ( $\theta$ ), giving the embedded part of the English perfect tense construction. In such clauses, PRECEDENCE is licensed by the past participial suffix *-en*.  
e.g. Bill has [PRO **eaten** the yogurt]
- b. PRECEDENCE can appear with non-finite propositions (P). In such clauses as well, it is licensed by *en*, while the PROPOSITION node is licenced by the infinitival marker *to*.  
e.g. We believe [ him to have **finished** the work]
- c. PRECEDENCE can appear with finite/deictic propositions (P). In such clauses it, along with the DEIXIS feature, is licensed by the indicative past tense marker *-ed*.  
e.g. We **said** that he **knew** the answer.
- (15) a. We believe [Mary to have been happy].  
(Embedded INFL contains PROPOSITION and PRECEDENCE)
- b. Bill has [PRO resembled his grandfather since he was a child]  
(Embedded INFL contains only PRECEDENCE, clause contains lexical temporal information)
- c. ??Bill has [PRO resembled his grandfather]  
(Embedded INFL contains only PRECEDENCE, clause contains no lexical temporal information)
- d. Bill has [PRO forgotten his grandfather]

Order of composition of Precedence with respect to other elements of INFL:

- (16) a. Bonnie saw the monster.
- b. Bonnie has seen the monster.





(18) a.  $[[\text{INFL}]] = \lambda x. [y \in D_{\text{IP}}: (x = \langle a, b \rangle \vee x = \langle a, b_i \rangle) \ \& \ y = \langle a, b_i \rangle]$

b.  $[[\text{Precedence}]] = \lambda f \in D_{\langle R \cup P, \text{IP} \rangle}. [\lambda x. [y \in D_{\text{IP}}: y = f(x) = \langle a, b_i \rangle \ \& \ i < I]]$

New semantic type: IP

- IP consists of a proposition or event in which the outermost temporal element bears an index to an anchor.
- INFL maps from R or P to IP; if its argument already bears an index (as it does if it is a Finite/Deictic proposition, linked to D), that index is preserved.
- Precedence modifies INFL so that the index *i* indicates the marked relation of precedence with respect to the anchor *I*, rather than the default relation of coincidence.

## 5. Conclusion

- Elements of INFL take the VP/ $v^{\text{max}}$  as arguments rather than vice versa.
- New types reflect conceptually significant categories rather than functions that may or may not receive arguments.
- The order of semantic composition is driven by semantic structures rather than by stipulation in the syntax.
- IPs denote propositions or events rather than truth-values.
- Semantic representations correspond to the morphosyntactic feature geometry.

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