# ±INTERPRETABLE FEATURES: TENSE ±INTERPRETED

## 1. Plot

**Theses:**
- The features person, number, gender, negation, tense, aspect and possibly others have interpretable and uninterpretable counterparts (i-F, u-F).
- Stem: A u-feature is licensed by an interpretable feature via agreement (SS = S0)
- LF: Features are deleted.
- PF: i-features and u-features of overt material are pronounced.
- In this talk I will focus on tense. Tense inflection is semantically vacuous and licensed by agreement. **Separate the morphology from the semantic operator.**
- SOT-phenomena exhibit multiple agreement (MA). Other temporal constructions, especially conditionals, require MA as well.
- Complication: Certain environments license the insertion of covert tense, FUT and PERF, which have no morphological reflex.
- Agreement is constrained syntactically. There are different ways of implementing that.

## 2. INTERPRETABLE & UNINTERPRETABLE FEATURES: EXAMPLES

### 2.1. Uninterpreted \(\phi\)-features

(Heim, 1994), (Heim, 2001), (Kratzer, 1998), (Schlenker, 1999), (Stechow, 2003), (Heim, 2005)

- \(\phi\)-features restrict the reference of variables. The \(\phi\)-features of bound pronouns are not interpreted.


(2-2) Only you[i-2nd] have[u-2nd] a job you[u-2nd] like[u-2nd]. MA

(2-4) Interpretation of (2-1)  
\[ \forall x [x \text{ is a person} \& x \text{ did } x^\prime \text{s homework } \rightarrow x = I] \]

The “x” in “x’s homework” is not correferential with I. It is a bound variable.

- (Kratzer, 1998) & (Heim, 2005): Bound pronouns come into the syntax without features. For the pronunciation the features of the bound pronoun are somehow copied from the antecedent via co-indexing.

- (Stechow, 2003): Bound pronouns come into the syntax with features. The features are deleted at LF.

- Here: Features come in pairs i-F, u-F. Bound pronouns have u-F in the syntax. The distribution is determined by Agreement. Inflected heads have u-F. Their distribution is also governed by Agr. The first theories don’t speak of head features.

2.2. Uninterpreted neg-features: Negative Concord

Strict Negative Concord: Russian

- The negated verb and the negated indefinites are n-words and hence have the feature \text{u-neg}. These features must be licensed by semantic NEG, which carries \text{i-neg}, in Russian covert.

(2-5) Nikto ne skazal nichego.  
\text{neg-somebody neg-said}^{\mathrm{pf}} \neg \text{neg-something}  
‘No one said anything’

(2-6) Multiple Agree (cf. (Zeijlstra, 2004))

(2-7) Interpretation  
\[ \neg (\exists x)(\exists y)[\text{person}(x) \& \text{thing}(x) \& \text{say}(x,y)] \]

- None of the overt negation features is interpreted at LF. The sentence has only one semantic negation, which is covert.

2.3. Uninterpreted tense and aspect features: The English auxiliary system

Syntax in the style of (Chomsky, 1957):

(2-8) Ede will have been calling
• Checking via agreement. The Agr-lines are precisely Chomsky’s Affix-Hopping.
• Present, Perfect, and Progressive are manifested twice each.

(2-9) Rough Interpretation
$$\exists t [ t = s^* \land \exists t' [ t' > t \land (\forall w' \in \text{Acc}(w,t')) \exists t'' [ t'' \subseteq t' \land \text{call}(Ede)(t'')(w')] ] ]$$

3. **Feature Theory**

Every feature is interpretable either at PF or LF. Most features are interpretable at LF (Zeijlstra, 2004). Uninterpretable means that this occurrence of the feature is not interpretable at LF.

(3-1) Features of the system
a. \( \phi \)-features (person, number, gender): the hosts are nouns and verbs. A \( \phi \)-feature of a noun is either interpretable or uninterpretable. A \( \phi \)-feature of a verb is always uninterpretable.

b. The negation features: \( i/u \text{-neg} \)
   The host of \( i \text{-neg} \) is the semantic negation \( \text{NEG} \).
   The host of \( u \text{-neg} \) is the verb or an n-word (e.g. Russ. ne skazal, nikto, nichego...)

c. The tense features: \( i/u \text{-pres}, i/u \text{-past} \)
   The host of \( i \text{-pres} \) is the semantic \( \text{PRES} \)-operator. The host of \( i \text{-past} \) is \( \text{PAST} \)-operator. The host of \( u \text{-pres/past} \) is the finite verb.
   The Perfect features: \( i/u \text{-perf} \)
   The host of \( i \text{-perf} \) is the semantic \( \text{PERF} \)-operator.

d. The aspect features \( i/u \text{-pf}, i/u \text{-progr} \)
   The host of \( i \text{-pf} \) is the semantic \( \text{PERFECTIVE} \)-operator, the host of \( u \text{-pf} \) is a verb.
   The host of \( i \text{-progr} \) is the semantic \( \text{PROG} \)-operator, the host of \( u \text{-progr} \) is an \textit{ing}-participle (Engl.), a perfective verb (Russ.)

e. The counterfactual features \( i/u \text{-cf} \) (counterfactual or \( \text{conditionalis} \))
   The host of \( i \text{-cf} \) is a counterfactual modal like ‘WOULD’, ‘COULD’ and perhaps others such as OUGHT, SHOULD. The exponent of \( u \text{-cf} \) are verbs with Konjunktiv II/\( \text{Conditionalis} \) morphology

f. The subjunctive feature \( i/u \text{-konj} \). The host of \( i \text{-konj} \) is any functor that requires an intensional argument, i.e., a functor of type (sa)b. The exponent of \( u \text{-konj} \) is any verb in Konjunktiv I.

(3-2) Feature checking
a. Features are checked under (multiple) agreement (SO): (Hiraiwa, 2005).
   LF: u-features are deleted, if checked (FI)
   c. Every u-feature requires the presence of n i-feature. There might be empty operators with an i-feature that do not check a u-feature (Germ. FUT and Russ. PERF).
   d. Phonetically overt operators with an i-feature optionally check a u-feature.
   e. The i-feature c-commands the u-feature; some generalised concept of c-command (Kayne)
   f. Certain LF-barriers may break the checking relation, e.g., COMP with particular features.

• Not discussed: formal features like Case, WH or relative, anaporic, promonominal etc.

(3-3) Full Interpretation (FI)
An LF contains only interpretable material.
• LFs with unchecked u-features are ungrammatical.
• Direction of feature checking: Chomsky on formal features: the probe (u-feature) checks the goal (i-feature).
• Here: one i-feature checks possibly several u-features.

4. **Semantics**

I will assume an intensional typed language. (Intensional: expressions with type a express meanings of type (sa), i.e., a-intensions).

(4-1) Logical types
Basic types e,s,t,i,v.
If a and b are types, then (ab) is a type.

(4-2) Semantic domains
D_e = the individuals
D_t = \{0,1\}, the truth-values
D_s = the worlds (= world histories)
D_i = the time intervals
D_v = the events

D_{ab} = the partial functions from D_a into D_b

(4-3) Contexts: c, c', ...
ac is the speaker of c, tc the time of c etc.

Tenses

(4-4) Zero Tense (Kratzer, 1998), (Kusumoto, 1999)
Øj a variable of type i without interpretable features.
\[[Øj]\]_{g,c} = tc, if free, g(Øj) otherwise.

- Not clear, whether these are needed in this system.

(4-5) Relative tenses are symbols of type it
a. \[[PRES_C]\]_w = \lambda t.\exists t'. t = t' feature: [i-pres]
b. \[[PAST_C]\]_w = \lambda t.\exists (t') & t' < t feature: [i-past]
c. English Perfect
\[[PERF_C]\]_w = \lambda t.\exists (t') & t' < t feature: [i-perf]
t' \supset t iff no part of t' is after t;
d. German Perfect = Priorian Past
\[[PERF_C]\]_w = \lambda t.\exists (t') & t' < t feature: [i-perf]
e. Priorian Future
\[[FUT_C]\]_w = \lambda t.\exists (t') & t > t feature: [i-fut]

The contextual restriction C is mostly omitted.

(4-6) Absolute tenses, type (it)t (holes)
a. \[[PRES*]\]_w = \lambda P_s: P(w)(s*).P(w)(s*)
b. \[[PAST*]\]_w = \lambda P_t: \exists [t < s* & P(t)(w)].\exists [t < s* & P(t)(w)]

Presuppositions in the style of (Heim and Kratzer, 1998).

Viewpoint aspects: (Klein, 1994) and many others.

(4-7) Aspects are of type (vt)(it)
a. Perfective: \[[PF]\]_w = \lambda E_v. \lambda t.\exists\tau(e,w) \subset t & E(w)(e)]
b. Imperfective: \[[IP]\]_w = \lambda E_v. \lambda t.\exists\tau(e,w) \subset \tau(e,w) & E(w)(e)]
(not a very serious semantics; PROG would be better)
\tau(e,w) is the running time of event e in w.

States don’t have aspects. They are temporal predicates (Katz, 1997)

(4-8) Verbal entries
a. call is of type e(vt).
    \[[\text{call}]_w = \lambda x.\lambda e.\lambda w.e\] is a calling done by x in w.

b. sick is of type e(it).
    \[[\text{sick}]_w = \lambda x.\lambda t.\lambda i.x\] is sick in w at t.

(4-9) Temporal adverbs have the type it
    \[[\text{tomorrow}]_w^c = \text{TM}^c = \text{the day after the day that contains } t_c\]
    similar for yesterday and today

Modals and Attitudes

Holes

(4-10) Negation: \[[\text{not}]_w\] = \lambda w.\lambda P_{sit}: \lambda t.s \in \text{dom}(P(t)).\neg P(t)(w)

(4-11) 1-place indicative modals:
    \[[\text{must}]_w = \lambda w.\lambda P_{sit}.\lambda t.s \in \text{dom}(P(t)):(\forall w' \in \text{Acc}(w,t)) P(t)(w')

(4-12) 2-place indicative modals
    \[[\text{must}]_w = \lambda w.\lambda P_{sit}.\lambda Q_{sit}.\lambda t.s \in \text{dom}(P(t)) & (\forall R_{sit})(\text{dom}(Q(t)) \subseteq R(t) & \neg P(t) \subseteq R(t)) \rightarrow R(t)(w) \].(\forall w' \in \text{Acc}(w,t) & P(w')(t)) Q(t)(w')

Counterfactual modals: See below

(4-13) Aspectual verbs
    \[[\text{stop smoking}]_w = \lambda w.\lambda x.\lambda t: (t') t' > < t \& x\] smokes in w at t'.x doesn’t smoke in w at t.

(4-14) Factive
    \[[\text{know}]_w = \lambda w.\lambda P_{sit}.\lambda x.\lambda t: (P(w)(t)) x believes P in w at t
    \[[\text{regrets}]_w = \lambda w.\lambda P_{sit}.\lambda x.\lambda t: P(w)(t) x sadly believes P in w at t

Plugs

(4-15) Attitudes
    \[[\text{says}]_w = \lambda w.\lambda P_{sit}.\lambda x.\lambda t: x says P in w at t
    \[[\text{believes}]_w = \lambda w.\lambda P_{sit}.\lambda x.\lambda t: x believes P in w at t

(4-16) Filters
    \[[\text{and}]_w = \lambda w.\lambda P_{sit}.\lambda Q_{sit}.\lambda t.s \in \text{dom}(P(t)) & (\forall R_{sit})(\text{dom}(Q(t)) \subseteq R(t) \& \neg P(t) \subseteq R(t)) \rightarrow R(t)(w) \].P(t)(w) = 1 = Q(t)(w)

(4-17) Konjunktiv (tentative)
    \[[\text{KONJ}]_w^c = \lambda w.\lambda P_{sit}.\lambda t: w \neq w_c \& t \neq s^*.P(w)(t)

(4-18) Principles of composition (see (Heim and Kratzer, 1998))
    • FA: Functional application (to branching)
    • PM: Predicate Modification/Intersection (applies to second branching)
    • IFA: Intensional Functional Application (applies to lowest branching)

Presupposition projection requires special additions. See chapter 11 and 12 of my intro to semantics.
5. SIMPLE TENSES AND ASPECT

(5-1) Ede is happy.
   Ede ist glücklich.
   PRES*[i-pres] Ede is[u-pres] happy

(5-2) Ede is calling.
   Ede ruft an.

LF after deletion of uninterpretable material.

(5-3)

German could be like this with covert PROG, or with a slightly different PRES, which says that the speech time is included in the reference time, or that the speech time overlaps the reference time.

(5-4) a. PAST*[i-past] Hubert hörte[u-past] auf zu rauchen.
    b. Hubert hörte nicht auf zu rauchen.
    c. PAST* [nicht [Hubert h-a-z-r]]

6. TENSE IN SUBORDINATE CLAUSES

6.1. SOT-phenomena

- Tense under attitudes is not interpreted. (Stechow, 1984), (Ogihara, 1989), (Abusch, 1994), (Kratzer, 1998),
- SOT-languages = languages with multiple temporal agreement
- Non-SOT-languages = languages that have no multiple temporal agreement

German is SOT

(6-1) Maria sagte, dass sie in der Oper war. (simultaneous/backward-shifted)
   ‘Mary said that she was in the opera’
   PAST*[i-past] Maria said[u-past] she was[u-past] in the opera. sim, MA
   ________________
   *PAST[i-past] Maria said[u-past] PAST [i-past] she was[u-past] in the opera.
   ________________
   backward-shifted, SA

Interpretation: See below

(6-2) Maria sagte, dass sie in der Oper ist (present). (simultaneous, SA)
   PAST*[i-past] Maria said[u-past] PRES[i-pres] she is[u-pres] in the opera.
   ________________
   Not possible in English!

English is SOT
• E. has deictic and relative PAST but no relative PRES. Therefore the sim-reading for PAST/PRES is blocked.

(6-3) John believes Mary is sick. MA
PRES*[i-pres] John believes[u-pres] Mary is[u-pres] sick

(6-4) *John believed Mary is sick (DA possible)
PAST* John believed[u-past] Mary is[u-pres] sick.

• [u-pres] is not checked.

(6-5) John believed Mary was sick.
a. Simultaneous reading
PAST* John thought[u-past] Mary was[u-past] sick (sim, MA)
b. Backward-shifted reading
PAST* John thought[u-past] Mary PAST was[u-past] sick (ant, 2X SA)

The ambiguity of the construction is derived by applying MA vs. SA.

(6-6) John will say that he is sick.

PRES* John will[u-pres] say that he is[u-pres] sick (MA)

Russian is non-SOT

• In non-SOT languages Agreement across COMP is not possible.

(6-7) Vanja dumal chto on bolen(present). (sim)
‘Vanya believe that he was sick’
PAST* Vanya thought[u-past] chto PRES IS[u-pres] sick SA, sim

• The MA-analysis is barred by COMP for some reason.

(6-8) Vanja skazal chto on vyplatil dolgi. SA, backward-shifted
‘Vanya said that he paid the debts’
PAST* Vanya said[u-past] chto PAST [i-past] he paid[u-past] the debts

• A finite in past perfective has the feature [u-past].

(6-9) Vanja skazal chto on vyplatit (3. sing) dolgi. SA, forward-shifted
‘Vanya said that he would pay the debts’
PAST* Vanya said[u-past] PRES FUT he pays[u-pres, u-fut]

• A verb in present perfective has the feature [u-fut] or even [u-fut, u-perf].

Research program: Why does COMP block MA in non-SOT languages?

A possible answer: Movement of the u-feature to the i-feature in the style of (Fischer, 2004). In any case: A problem for phase theory in view of the non-locality of the Agr-
6.2. **Tense in embedded relative clauses**

- **English:** The tense in a relative clause may always be deictic. But it may be semantically vacuous. In the later case we observe shifting.

No simultaneous reading, because “will” is the semantic FUT.

(6-10) PRES* John will[u-pres,i-fut] buy a fish that is[u-pres] alive.

\[
\text{MA, the R-time of the RC is in the future}
\]

- **Descriptive generalization:** Indicative auxiliaries carry an i-feature. For non-indicatives, see below.

(6-11) Forward-shifted Present

PRES* John will[u-pres,i-fut] buy a fish that is[u-pres] alive.

\[
\text{PRES* (FUT (John buy a fish that be alive))}
\]

\[
\exists [t > s^* \& \exists [\text{fish(x,w) & alive(x)(t)(w) & buy(John)(x)(t')(w)]]
\]

The principles of compositions must be applied in a way that the following equations hold:

\[
[[\text{John buy a fish that be alive}]]_w =
\lambda t. \exists [\text{fish(x,w) & alive(x)(t)(w) & buy(John)(x)(t)(w)}]
\]

\[
[[\text{FUT John buy a fish that be alive}]]_w = \text{(by PM)}
\lambda t. \exists [t' > t \& \exists [\text{fish(x,w) & alive(x)(t')(w) & buy(John)(x)(t')(w)]]]
\]

\[
[[\text{PRES* FUT John buy a fish that be alive}]]_w = \text{(by FA)}
\exists [t' > s^* \& \exists [\text{fish(x,w) & alive(x)(t)(w) & buy(John)(x)(t)(w)]]]
\]

The analysis via MA is possible in these cases. More complicated cases may require temporal anaphora via Zero-tenses. Cf. (Kusumoto, 1999: chap. 2) for possibly relevant examples.

- **Russian:** Tense in an embedded relative clause is always deictic, because an u-tense in a RC cannot be licensed from outside by MA.

(6-12) PRES* FUT Vanja vstretitsja[u-pres,u-fut] s devuskoj kotoraja C PRES* plachet[u-pres]

\[
\text{PRES* (FUT (V. meet a girl OPxPRES* x cry))}
\]

\[
\exists [t > s^* \& \exists [\text{girl(x,w,t) & cry(x,w,s*) & meet(Vanja,x,w,t) ]}]
\]

- **Bound tense readings and NC are blocked across COMP.**

(6-13) PRES* FUT Vanja vstretitsja[u-pres,u-fut] s devuskoj kotoraja COMP PRES plachet[u-pres] (No forward-shifted reading)

(6-14) a. *NEG Vanja ne[u-neg] dumal chto Alla skazala nichego[u-neg]
6.3. Konjunktiv I

Speculation:

   b. *Franz wusste/bedauerte, dass Maria komme.

The sentences violate a modal and temporal presupposition: factivity requires that the complement is true in the actual world (and possibly the actual time), and the Konjunktive requires that it is not true true there.

(6-16) a. Fritz denkt/dachte, er sei krank.
   b. Fritz behauptet/behauptete, er sei krank.

7. FUTURE

(7-1) Ede will call tomorrow (LF)

(7-2) Covert FUT
   a. You may insert FUT under PRES* in German.
   b. You may insert FUT between a modal and an infinitival (German/English)

Question: Is there an elegant way to derive this distribution?

(7-3) a. Ich bin morgen in Berlin.
   PRES* FUT morgen [ich in Berlin]
   b. *I am in Berlin tomorrow.

(7-4) a. I have to go to Berlin tomorrow
   PRES* [must [FUT [tomorrow [I go to Berlin]]]]
   b. Ich muss nächste Woche in Berlin sein.
   PRES* [must [FUT [next week [I in Berlin]]]]

(7-5) a. *Fritz glaubt, morgen in Berlin zu sein.
b. Fritz glaubt, morgen in Berlin sein zu können.

8. MODALS

8.1. Temporal Control

Modal verbs in the style of (Kratzer, 1977) can_{MB} and must_{MB} are of type (s(it))(it).

\[
\text{can}_{MB}(w) = \lambda P. \lambda t. \exists w' [w' \in MB(t,w) \rightarrow P(w')(t)]
\]

\[
\text{must}_{MB}(w) = \lambda P. \lambda t. \forall w' [w' \in MB(t,w) \& P(w')(t)]
\]

- Epistemic MB: What is known in w at t
- Deontic MB: What my duty is in w at t
- Circumstantial MB: What the relevant facts are in w at t
- Bouletic MB: What we want in w at t
- etc.

8.2. Infinitives under Simple Modals

Ede might by sick now

Predictions from the semantics
The semantics correctly accounts for modalised states.
The semantics incorrectly rules out telic complements.
The semantics correctly rules out past frame adverbs in the scope of present modals.
The semantics incorrectly rules out future frame adverbs in the scope of present modals.

Ede might be sick.  (OK)

Ede might call  (bad prediction)

Ede might be sick yesterday.  (OK)

Contradiction. The speech time is not in yesterday.

Ede might be sick tomorrow  (bad prediction)

Contradiction. The speech time is not in tomorrow.
• The facts are covered by applying the future principle. The principle might be motivated by the fact that there are no infinitives future in German or English.

Deriving the problematic facts.

(8-8) Ede might call.
\[ \text{PRES* might}_{MB} \text{FUT}_t \text{PF Ede call} \]
\[ (\exists w' \in MB(w,t_c))(\exists t > t_c) \exists e[\tau(e,w') \subseteq t \& \text{call}(w')(Ede)(e)] \quad \text{(OK)} \]

(8-9) Ede might be sick tomorrow.
\[ \text{PRES* MIGHT}_{MB} \text{FUT}_t \text{[Ede be-sick tomorrow]} \]
\[ (\exists w' \in MB(w,t_c))(\exists t > t_c) t \subseteq \text{TM}^c \& \text{sick}(w')(Ede)(t) \quad \text{(OK)} \]

9. CONDITIONALS

9.1. Material conditionals

(9-1) Wenn es regnet, ist die Straße nass.

(9-2) Material conditional
  a. \[ \llbracket \text{wenn}_0 \rrbracket (p)(q) = p \rightarrow q \]
  b. \[ \llbracket \text{wenn}_0 \rrbracket (p)(q) = \forall i.p(i) \rightarrow q(i) \]

(9-3) Two analyses
  a. \[ \text{[wenn PRE}_0 \text{[i-pres] es regnet[u-pres]] PRE}_0 \text{[i-pres] die Straße nass ist[u-pres]} \]
     \[ \text{(SA)} \]
  b. \[ \text{PRE}_0 \text{[i-pres] [wenn es regnet[u-pres]] die Straße nass ist[u-pres]} \quad \text{MA} \]

(9-4) \[ \text{PRE}_0 \text{ PERF [Wenn es damals geregnet[u-perf] hat[u-pres], ist[u-pres] die Straße nass ] gewesen[u-perf]} \]
\[ \text{SIM, MA} \]
\[ \exists t [t = s^* \& (\exists t')(t' < t \& \text{rain}(t') \rightarrow \text{the-street-wet}(t'))] \]

• Covert future needed in the next one:

(9-5) Wenn es morgen regnet, bleiben wir zu Hause.
\[ \text{PRES* FUT wenn es morgen regnet[u-pres], bleiben[u-pres] wir zu Hause.} \]
\[ \exists t [t > s^* \& \text{rain}(t) \rightarrow \text{we-stay-at-home}(t)] \]

• We speak about the same time. MA required.

The facts are more complicated\(^1\)

(9-6) It it rains tomorrow, we will stay at home.

\(^1\) Thanks to Hans Kamp for pointing that out to me.
PRES* will[u-pres, i-fut] [if FUT it rains[u-pres] tomorrow] we go out today

\((\exists t > s^\#)[[(\exists t' > t) t' \subseteq TM \& \text{rain}(t')] \rightarrow t \subseteq TD \& \text{go}(t)]\)

- *will* licences the insertion of covert FUT in the if-clause. It behaves like a modal.

(9-7) If it Ede calls tomorrow, I will answer him.

PRES* will[u-pres, i-fut] [if Ede calls[u-pres] tomorrow] FUT I answer him

\((\exists t > s^\#)[ t \subseteq TM \& \text{rain}(t) ] \rightarrow (\exists t' > t)[ \& I \text{answer}(t')]\)

- *will* licenses a covert FUT in the main clause.

### 9.2. Modalised Indicative Conditionals

(9-8) a. Wenn Ede heute krank ist, kann er auch morgen krank sein.

b. If Ede is sick today, he might be sick tomorrow as well.

PRES* [kann[u-pres] wenn Ede heute krank ist] FUT[w-pres] Ede morgen krank sein

- You find the same distribution as in the English indicative conditionals.

(9-9) a. *Wenn Ede heute krank ist, kann er auch gestern krank sein.

b. *If Ede is sick today, he might be sick yesterday as well.

(9-10) a. OKWenn Ede heute krank ist, kann er auch gestern krank gewesen sein.

b. OKIf Ede is sick today, he might have been sick yesterday as well.

Indicative conditionals are analysed like modals with the difference that the antecedent is added to the modal base.

(9-11) Analysis of (9-8b)

\[
\exists w'[w' \in MB(t_c)(w) \& t_c \subseteq TD^c \& \text{Ede is sick in } w' \text{ at } t_c \& \exists t'[t' > t \& t' \subseteq TM^c \& \text{Ede is sick in } w' \text{ at } t']]\]

- The VP under the modal is an infinitival. Therefore the insertion of FUT is licensed and necessary.
9.3. Counterfactuals

(9-12) PRES[i-pres] Wenn Ede heute trinken würde[u-pres, u-cf], würde/könnte[u-pres, i-cf] er morgen krank sein.
‘If Ede drank today, he would/could be sick tomorrow’

(9-13)

\[ \text{TP} \]

\[ \text{VP} \]

\[ \text{it} \]

\[ \text{VP} \]

\[ \text{it} \]

\[ \text{FUT} \]

\[ \text{Edemorgenkranksein} \]

\[ \text{Edebesicktomorrow} \]

\[ \text{VP} \]

\[ \text{CP} \]

\[ \text{wenn} \]

\[ \emptyset \]

\[ \text{Edeheutetrinkenwürde} \]

\[ \text{∅} \]

\[ \text{∅} \]

\[ \text{TP} \]

\[ \text{it} \]

\[ \text{it} \]

\[ \text{PRES*} \]

\[ \text{it} \]

\[ \text{it} \]

‘The most similar (metaphysically alternative) worlds in which Ede will drink today are worlds in which Ede will be sick tomorrow’.

- The Future Principle allows us to insert FUT between the counterfactual modal and the infinitival. The embedded subjunctive (“würde” in German) is semantically empty. The if-clause is semantically tenseless – like a complement of an attitude.

The following two examples show that counterfactual have the same temporal orientation as indicative modals in the present. Hence they are in the present.

(9-14) a. *Ede würde gestern einen Ausflug machen, wenn das Wetter schön ware.
   b. *Ede would go out yesterday, if the weather was nice.

(9-15) a. *Wenn Ede gestern trinken würde,…..
   b. *If Ede drank yesterday,…..

The following variant of the Germ. CF is less transparent:

(9-16) Wenn Alla das wüsste, wäre sie glücklich.

\[ \text{PRES} \]

\[ \text{[WOULD[i-cf] wenn Alla das wüsste[u-pres, u-cf]]} \]

\[ \text{MA} \]

\[ \text{Alla glücklich wäre[u-pres, u-cf]} \]

\[ (9-17) \] „wüsste“ has [u-cf] and optionally [u-pres].
Counterfactual modals and conditionals are analysed following (Lewis, 1973). For the sake of simplicity, we assume Stalnaker’s limit assumption. Like other subjunctive modals the counterfactual modals have the following properties:

(9-22) Counterfactual modals

wäre, würde, könnte, sollte, ...

would, could, might, ought, ...

a. Are morphological past forms but semantic present forms by default. ("tense transposition")

b. They can be embedded under attitude verbs of any tense

c. They cannot be combined with semantic PAST.

(9-23) a. John would study more, if he had more time.

b. *When he was young, John would study more, if he had more time.

(9-24) a. John thought he ought to study more.

b. John thought he would study more, if he had more time.

The best way to grasp this regularity is to say that subjunctive modals have inherently zero tense. Another problem is the question of how counterfactual modals are tensed. (Lewis, 1973) is concerned almost exclusively with counterfactual relations between standing sentences or with temporally specific propositions. For the would counterfactual, roughly the following truth condition holds:
"If A were the case, then C would be the case" is true in world w iff the A-worlds that as similar to w as they can be are C-worlds.

(Lewis, 1986):

"If A were the case, then C would be the case" is true in world w at time t iff the A(t)-worlds that coincide with w up to t and are as similar to w as they can be are C(t)-worlds.

(Thomason, 1984) and (Condoravdi, 2002) “metaphysical alternatives”

Common Past (an equivalence relation)
\[ w \sim_t w' : \text{iff } w \text{ and } w' \text{ have a common past up to time } t, \text{i.e. for any time } t' < t \text{ and time-dependent proposition } P: P(w)(t') \text{ iff } P(w')(t'). \]

A time dependent Stalnaker choice function.
\[ \text{SIM is of type } s(i((s(it))(st))). \]
\[ \text{SIM}_{w,t}(P) = \{w' : w' \sim_t w \& P(w')(t) \& \neg \exists w''[w'' \sim_t w \& P(w'')(t) \& w'' <_w w']}. \]

\[ <_w \text{ is Lewis’ relation of comparative similarity}. \]

Counterfactual modals with antecedents are of type \(((si)t)(((si)t)(it)).\]
\[ \text{a. } \llbracket \text{würde}, \text{would} \rrbracket (w) = \lambda P_s(t), \lambda Q_s(t), \lambda t. (\forall w') w' \in \text{SIM}_{w,t}(P) \rightarrow Q(w')(t). \text{b. } \llbracket \text{könnte}, \text{could} \rrbracket (w) = \lambda P_s(t), \lambda Q_s(t), \lambda t. (\exists w') w' \in \text{SIM}_{w,t}(P) \& Q(w')(t). \]

In the framework of (Kratzer, 1981), the modal base f would be the function \( \lambda w \lambda t. \{w' : w' \sim_t w\} \) and the ordering relation would be a totally realistic background. We could rewrite the rule appropriately.

Wenn Ede heute tränke, wäre er morgen krank.
If Ede drank today, he would be sick tomorrow.

The AP “er morgen krank/he sick tomorrow” is of type it. This counts as an infinitival for the Future Principle. “wäre” ist a variant of “würde cf”. It must be analysed as “sein + WÜRDE”.

The semantic past version looks morphologically like a pluperfect construction:

Ede hätte gestern siegen müssen, wenn er gesund gewesen wäre.
PRES Ede hätte[i-perf,u-cf] gestern siegen müssen[u-perf,i-cf], wenn er gesund gewesen[u-perf] wäre[u-cf, u-perf]

Cf. (Condoravdi, 2002) and "Ippolito, 2003 #32281% among others.

The rule would be something like this: \( \llbracket \text{would} \rrbracket (w)(P)(Q) = \lambda t. (\forall w' \in f(w,t) (P(w',t) \& \neg \exists w''[P(w''(t) \& w'' <_w.w') \rightarrow Q(w',t)). w'' <_w.w' means that w'' makes more propositions in g(w) true than w. The modal could be written as taking only the argument Q. A modification rule has to intersect the antecedent with the modal base f(w,t) The semantics for counterfactual modals given in Condoravdi, 2002 #32160% assumes only the metaphysical modal base but ignores the ordering source.
Three exceptions:

- u-cf checked by a subordinate verb.
- The auxiliary „wäre“ has no i-feature.
- An infinitive has a perf-feature (= „Ersatzinfinitiv“).

(9-33) Wenn Ede vorgestern getrunken hätte, hätte er gestern krank sein müssen/können.
‘If Ede had drank the day before yesterday, he would/could have been sick yesterday’

(9-34) \( \exists [t < t_c \land (\forall w') w' \in \text{SIM}_{w_c}(\lambda, w' \cdot \lambda t. t \subseteq [Y-1]^c \land \exists e\{\text{drink}(Ede)(e)(w') \land \tau(e)(w') \subseteq t\}) \rightarrow \exists t'[t' > t \land t \subseteq Y^c \land \text{sick}(Ede)(w'))] \)

The main clause contains a covert FUT. The auxiliary “hätte” in the matrix determines a semantic PERF.

( 9-35)

Modals without antecedent are treated alike with the difference that the antecedent comes from the context. (Kaspar, 1987)

(9-36) a. Fritz könnte *gestern/morgen gewinnen.
Fritz might win yesterday/tomorrow.
b. Fritz hätte gestern/morgen gewinnen können.
Fritz might have won yesterday/tomorrow.
c. Fritz könnte gestern/*morgen gewonnen haben.
Fritz might have won yesterday/*tomorrow.

Note: The Germ. contrast (b)/(c) shows the ambiguity of the Engl. *might have*-construction.
Cf. (Stechow, 1995) & (Condoravdi, 2002). (c) is OK if morgen ‘tomorrow’ takes wide scope with respect to the modal. I am not considering this reading.

(9-37) Counterfactual modals with implicit antecedent are of type (s(it))(it).

a. \[
\text{\textit{würde}_cf,\textit{would}_cf} = \lambda Q_{\text{it}(it)}, \lambda t_1. (\forall w') w' \in \text{SIM}_{w_1,5}(g(\alpha)) \rightarrow Q(w')(t).
\]

b. \[
\text{\textit{könnte}_cf,\textit{could}_cf} = \lambda Q_{\text{it}(it)}, \lambda t_1. (\exists w') w' \in \text{SIM}_{w_1,5}(g(\alpha)) \& Q(w')(t).
\]

(9-38) Fritz würde/könnte morgen gewinnen.
Fritz would/might win tomorrow.
PRES* might FUT tomorrow Fritz win (Covert Fut)

(9-39) Fritz hätte gestern/morgen gewinnen können.
Fritz might have won yesterday/tomorrow


