Abstract: The use of *would* in its *past-futurate* sense is a powerful trigger of free indirect discourse in English. Taking into consideration the interaction of *will* and tenses (*PRESENT, PAST*), I propose that the openness of the future, as lexicalized in the English *will*-future, should be captured as an instance of the epistemic uncertainty of the speaker. As a result, the perspectivization effects of *would* can be treated as a shift of epistemic center from speaker to protagonist.

1. Future and perspective taking

Assertions about the future are open in a way that assertions about the past are not. Consider the following contrast.

(1) *The coin came up heads.*
(2) *The coin will come up heads.*

(1) is about a past event of throwing a coin. It is either true or false. The facts are settled, even if the speaker may not know the actual result. (2) is about a future throwing of the coin. There are two possible results that are equally likely, hence nobody can truthfully and reliably assert or deny (2). In some possible courses of events the coin comes up heads, and in other possible courses it comes up tails.

While *will*-sentences talk about facts that are yet to come, *past-futurate* sentences with *would* can report what is safely known, yet from a viewpoint where it is yet to happen. The modal *would* is the past tense counterpart of present tense *will*. Example (2) is about a future throwing of the coin, seen from now. The past tense example in (3) is about a throwing of the coin that is in the future, as seen from the salient reference time (Reichenbach 1966, Kamp + Reyle 1991).

(3) *The coin would come up heads.*

This becomes clearer when a story is added that provides a reference time.

(4) *Rob and Bo decided the question who had to clear the table by throwing a coin. They quarreled for quite some time over heads and tails. Eventually, the coin would come up heads but this they didn’t know yet.*

The story in (4) is told by someone who already knows the outcome, the narration stops at a time before the event of tossing the coin. The narrator offers the reader a glimpse into the future. The same form can also convey a prediction by a protagonist. This is illustrated in (5).

(5) *When everyone asked her about her wings, and they always did, she simply said that she was Santa’s special elf and sprinkled them with pixie dust, to their utter delight. Maybe she would do that later, when they went out. Today, to her sheer enjoyment, she and Lance were going to pick out their Christmas tree (...).*

The word “Maybe” starts free indirect discourse by the protagonist (Kira), marked by epistemic *maybe* (it is Kira, not the narrator, who wonders), by temporal adverbs (it is Kira, not the narrator, who defines “today”), and by *would do*. The future is open for Kira and typically, events develop differently from what the protagonists believe in the early parts of a story.

The paper has two aims: (a) to offer a linguistically tenable analysis of *will* future and *would* past-futurate, and (b) to analyse the perspectival shift in examples such as (5). Section 2 lays the basis for the analysis of *will/would* futures. It reviews data about *will/would* futures that an analysis has to capture; most importantly data that will be called *Juliet’s paradox*. I show how a long-standing problem in philosophy turns into a puzzle for semantic analysis. Section 3 argues that neither a purely temporal nor a modal analysis of *will* carries over to *past-futurate* in a satisfactory way. Section 4 proposes a modular analysis of the *will*-future. I argue that the verb *woll* has a purley temporal semantics, and that assertions S about the future, like all other assertions, are always made with the epistemic hedge “*As far as I know, S*”. This analysis is superior to all earlier proposals in the treatment of *Juliet’s paradox*. It also extends nicely to shifted perspective uses such as example (5): These can be treated by the shift of epistemic background from narrator to protagonist; a standard move in free indirect discourse.

The presented analysis of future *will* and *would* is modular, as it combines a purely temporal semantics of *woll* with a general epistemic operator in assertions. Treatments along this line were suggested earlier (Abusch 1997, von Stechow 1995, Kissine 2008) and compete against modal analyses and hybrid analyses of *will*-future (Thomason 1970, Copley 2002, Condoravdi 2003, del Prete 2013, Giannakidou and Mari 2013, 2015). The paper shows that the modular account is more appropriate for *would* past-futurates and covers perspectival shifts in a natural fashion.

2. Some Facts about Future Tense

2.1 The future is open

Formal semantic research on future tenses starts with Prior’s work on tense which, in its most widely used version, does not account for the openness of future (Prior 1967). The intuition that sentences like (2) might lack a truth value was modelled in semantics by Thomason (1970) who proposed that (2) expresses universal quantification over *future branches of the world after the speech time* $t_0$ as in (6).

\[
\forall w ( \text{FUTURE}(w, w_0, t_0) \rightarrow \exists t' (\text{HEADS}(w, t') \land t_0 < t' ))
\]

We assume that $\text{FUTURE}(w, w_0, t_0)$ is true iff $w$ is a future continuation of world $w_0$ after $t_0$. The world $w$ is exactly like $w_0$ up to $t_0$ and continues in some possible manner after $t_0$. Given that there might be many ways in which $w_0$ can continue after $t_0$, there could be many future branches $w$. If the coin comes up heads in some of them, and
tails in others, we can predict the diagnosed truth value gap. The negation of (2) likewise expresses a universal quantification over future branches.

\[ (7) \quad \text{The coin will not come up heads.} \]
\[ \forall w \left( \text{FUTURE}(w, w_0, t_0) \rightarrow \neg \exists' \left( \text{HEADS}(w, t') \land t_0 < t' \right) \right) \]

Neither (6) nor (7) are true in an open-future scenario, which appears an adequate prediction. Since Thomason (1970), most semanticists assume that the openness of the future should be captured in terms of a modal analysis of some sorts.

2.2 Futurates and tenses are orthogonal

English has several forms to express future, among which are will and be going to. Both combine with PRESENT and PAST in a semantically transparent way, as the following pairs illustrate.

\[ (8) \]
\[ a. \quad \text{Later, Romeo will kill Tybalt.} \]
\[ b. \quad \text{Later, Romeo would kill Tybalt.} \]

\[ (9) \]
\[ a. \quad \text{Romeo is going to marry Juliet.} \]
\[ b. \quad \text{Romeo was going to marry Juliet.} \]

(8a) is a present tense statement about a killing event later than the utterance time. (8b) is a past tense statement about a killing that happened later than the time of interest. In a Reichenbachian analysis, we’d assume that PAST contributes that the reference time R is before speech time t, and we can moreover assume that untensed will states that the event at stake happens later than R. The PRESENT in (8a) states that R=S, which together with untensed will turns (8a) into a statement about the future. This analysis was first proposed in Abusch (1997). I adopt her convention to use will for untensed form that underlies would and will. (9a) and (9b) illustrate that the going-to future likewise can combine with PRESENT and PAST in a transparent manner. (9a) is about a present inclination to marry Juliet, whereas (9b) is about a past inclination to marry Juliet. English future forms can systematically be combined with the tenses PRESENT and PAST. Ideally, a semantic analysis of tense and aspect should reflect these data.

2.3 Imperfective paradoxe vs. re-assessment

Past futurate sentences allow us to test intuitions for future statements in worlds where things developed differently. Consider the following example.

\[ (10) \quad \text{Romeo was going to kill Tybalt when Juliet stopped him.} \]

It is a coherent sentence about the past and states that Romeo had the firm intention to kill Tybalt but that some unforeseen event — Juliet’s plea — held him back. This kind of interruption scenarios is similar to those that give rise to the imperfective paradox (Dowty 1979, Landmann 1992, Portner 1998). The will-future, in contrast, does not give rise to the imperfective paradox. The following example does not have a coherent interpretation.
Given that Juliet prevented the killing, the statement “Romeo would kill Tybalt” does not seem true in the first place. Therefore, the example has a ring of incoherency or markedness to it (first noted by Stowell, as reported in Copley 2002). Even though the most likely continuations of the actual world \( w_o \) at reference time \( R \) may have been worlds where Tybalt gets killed, this is not sufficient to make the past-futurate statement in (11) true. What counts alone is what happened.

2.4 Juliet’s paradox

Several parts of the sentence contribute information about tense and aspect. Following standard proposals (e.g., von Fintel & Heim 2010, Beck & Gergel 2013, in a somewhat different notation also von Stechow 2009, Beck and von Stechow 2014) I assume that the sentence core denotes a property of events. Aspect serves to spell out a temporal perspective on the event (relation \( E, R \)), whereas tense spells out the position of reference time \( R \) relative to the time of utterance. We will maintain this simple architecture as long as possible, but the reader should be prepared to generalize the theory and allow for several layers of aspectual information (in part anticipated in Beck & Gergel’s treatment of past perfect progressive). The example in (12) hence has the parts in (13).

(12) Romeo will visit Juliet.
(13) \[
\begin{align*}
\text{PRESENT} & \text{ woll } \text{ Romeo visit- Juliet } \\
\text{ [ } & \text{ [ Romeo visit- Juliet ] } = \lambda \epsilon [ \text{ VISIT} (\text{ROMEO, JULIET, } \epsilon, w_o) ] \\
\text{ woll & ] } &= ? \\
\text{ [ } & \text{ [ PRESENT ] } = \lambda Q_{<1,>}[\text{ Q}(R)]; \text{ Presupposition: } R=S
\end{align*}
\]

The sentence core Romeo visit- Juliet contributes a set of visits. Present tense states that the time of interest \( R \) is at speech time \( S \) (Reichenbach 1966, in linguistic terms Partee 1973). The contribution of woll is left open. According to the modal analysis, we’d expect a universal modal. In a single time-line analysis (e.g. Abusch 1997), woll simply states that event \( E \) happens later than reference time \( R \). The advantages and disadvantages of either proposal will be discussed in section 4.

Consider the following scenario. It is 9 am, and Romeo has to accompany his father on a business trip. They plan to be out of town till late at night. It is highly unlikely that Romeo can visit Juliet during the day. Hence, at \( 9^{oo} \), the following sentence could not be truthfully asserted.

(14) Juliet’s sorrow
Romeo will visit Juliet.
Sentence can not truthfully be uttered at time \( S=9^{oo} \) about reference time \( R= 9^{oo} \)

However, matters develop differently. Romeo’s father gets ill and they have to return home. While the father calls a doctor and goes to bed, Romeo manages to sneak away and visits Juliet. Hence, the following sentence can truthfully be uttered at \( 18^{oo} \).
(15) Juliet’s delight
(At 9oo, Juliet was very depressed.) Later, Romeo would visit her and save her day.
Sentence is true at utterance time S=18oo about reference time R=9oo

The first sentence in (15) was added to make reference time R=9oo salient.

If we disassemble the two sentences, we get a surprising result that I will refer to as Juliet’s paradox.¹

(16) \[[ \text{woll} ] \] ( \[[ \text{Romeo visit Juliet} ] \])
is true about R=9oo, at utterance time S=18oo.
(17) \[[ \text{woll} ] \] ( \[[ \text{Romeo visit Juliet} ] \])
appears not true about R=9oo, at utterance time S=9oo.

In a sense, it is unsurprising that a speaker at 18oo knows more about things that happen after 9oo than a speaker at 9oo. However, it is not easy to reconcile this data with the initial intuition that future tenses are about all possible futures. The example suggests that the property “w is a possible future of wo at 9oo” changes over time—and this is surprising. If the possible futures of a world wo are determined by the laws and facts in wo before t, then they should stay possible options at that point, even in retrospect. The next section reviews accounts of future will and their predictions about Juliet’s paradox.

3. Earlier semantic analyses of the will-future

Semantic accounts of the will-future can be divided into modal analyses and single-branch analyses (Copley, 2014).

Modal analyses assume that there is more than a single future for world wo at time t, and that the will-future expresses universal quantification over these future branches. Different authors have proposed different further restrictions on the future branches that we quantify over, in part also to account for different future tenses in English (Kaufmann 2005, Copley 2002, 2008). I will gloss over these further restrictions because they do not make a difference with respect to the data under discussion.

Single-branch analyses rest on Prior’s view that the future is about just one world: the actual world and its course after the time of utterance. The single-branch analysis has been in linguistic use since Abusch (1997) and has recently been defended in Kissine (2008). He investigates the felicity of discourses such as It will rain. And it might not rain. and argues that the intuitions of speakers cannot be captured consistently in a multimodal system. In brief, either the modal base of will is one shared with a second modality (say, epistemic modality). Then It will rain and It will necessarily rain should mean the same, which they do not. Or we see different modalities at work.

¹ We will later refine these judgements to „S sounds true/false“ when it has become clear that the openness of future tense sentences is always an epistemic openness, never a metaphysic one. The technically correct way to describe the empirical facts is „stating S does / does not violate the Maxim of Quality“. 
Then the discourse *It will rain. And it might not rain.* should be coherent, which it is not. The openness of the future is not treated in detail in Kissine (2008), and I therefore class his proposal as a single-branch analysis.

Finally, there are hybrid accounts that combine temporal and modal components, as in Condoravdi (2003), Giannakidou and Mari (2013, 2015) and del Prete (2014). I take a detailed look at del Prete (2014) which implements these components in a very lucid fashion. As it stands, del Prete fails to account for free combination with PRESENT and PAST, but a modified version will bring us closer towards a solution and remains a point of comparison in section 4.2

Before moving to the data, I’d like to comment on one technical aspect of modal analyses. While some of them adopt a “branching worlds” view of future worlds, others rest on what I will call the spaghetti model. In a “branching worlds” view, a world $w_j$ up to time $t_1$ can branch off into two or more continuations after $t_1$. These can branch again, such that the domain of worlds is in fact a tree structure of times and worlds (del Prete 2014 for an implementation). Maximal branches in the tree cover all times and represent full worlds, from the first to the last of days. In the “spaghetti model” view, the ontology of worlds consists of distinct worlds, each one separate from the others, and all covering the time line from the first to the last of days. These worlds can be identical up to time $t_1$, and we can hence represent the future possibilities of world $w_j$ at time $t_1$ by $\{ w \mid w_j \equiv w \text{ up to time } t_1 \}$. The two views are interchangeable, because the sets can be mapped isomorphically to one another, given the actual facts about worlds and their future options.

Let us then turn to Juliet’s paradox and the predictions of a modal analysis. I assume that the relation FUT.ALT($w_o$, $t_o$, $w$) holds true iff $w$ is exactly like $w_o$ up to time $t_o$. We will call $w$ a possible future for $w_o$ at $t_o$. In order to capture *Juliet’s sorrow* in the modal analysis, we have to assume that there are possible futures of $w_o$ at $9^{oo}$ in which the root clause *Romeo visit- Juliet* does not become true. $\tau(e)$ is the run time of event $e$.

\[ \exists w ( \text{FUT.ALT}(w_o, 9^{oo}, w) \land \neg \exists e ( \text{VISIT}(\text{ROMEO}, \text{JULIET}, e, w) \land 9^{oo} < \tau(e)) ) \]

The time $9^{oo}$ enters the representation as the reference time $R$ which in the example is identical to speech time $S$, as the sentence is in the present tense. Let us next turn to *Juliet’s delight*. In a modal analysis, it has the following denotation:

\[ \forall w ( \text{FUT.ALT}(w_o, 9^{oo}, w) \rightarrow \exists e ( \text{VISIT}(\text{ROMEO}, \text{JULIET}, e, w) \land R < \tau(e))) \]

Presupposition: $R < S$

In the above scenario, $S = 18^{oo}$ and $R = 9^{oo}$. In order to predict *Juliet’s delight* in (15), we have to claim that

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2 The other accounts can be shown to fail on Juliet’s paradox. I leave the details to the reader. Del Prete implements modal and temporal component particularly clearly and allows to study their interaction.

3 I chose the term „spaghetti model“ because the many possible futures of $w_j$ at $t_1$ look like spaghetti that are boiled at one end and still hard at the other end: The hard ends all look alike while the soft ends meander in this or that direction.
Juliet’s delight: (‘Romeo would visit Juliet’ is true, uttered at 18\(^0\)o)  
\[ \forall w (\text{FUT. ALT}(w, 9^{00}, w) \rightarrow \exists e (\text{VISIT}(\text{ROMEO, JULIET}, e, w) \land 9^{00} < \tau (e) ) ) \]  
Presupposition: 9\(^0\)o<18\(^0\)o (valid)

Given that (18) and (20) contradict each other, the modal analysis cannot capture the intuitions of Juliet’s sorrow and Juliet’s delight.

The predictions of the single-branch analyses for Juliet’s paradox are equally inadequate. The single-branch analysis assumes that a future statement is true at \(t_0\) iff the described kind of event takes place in \(w_0\) at some later time \(t\). Given that we know that Romeo in fact does visit Juliet between 9\(^0\)o and 18\(^0\)o, the actual world \(w_0\) is one where a visit takes place.

The account predicts that “Romeo will visit Juliet”, uttered at 9\(^0\)o is true (= 21.a) and that “Romeo would visit Juliet”, uttered at 18\(^0\)o is also true ( = 21.b). The latter prediction is adequate, but the former does not match our intuitions in the Juliet case.

Let us finally set up Juliet’s paradox in terms of the analysis by del Prete (2014). His model rests on a domain < \(D, \leq\) > of situations with a partial ordering that sorts situations \(s\) into trees. Each maximal branch \(h\) in a tree corresponds to a full world. Sentence meanings are computed relative to contexts of utterance, which are among these situations \(s\). Contexts \(c\), as usual, comprise an utterance situation \(c_t\), a speaker and an addressee, and likewise the world \(c_w\) in which the utterance takes place. Unlike in the standard models, these worlds \(c_w\) are not single lines but include all possible continuations of the world up to situation \(c_t\). In other words, each utterance is interpreted relative to a world that has a single past and branches into many futures at and after the utterance situation \(c_t\). Del Prete assumes that sentences can be interpreted relative to an utterance context \(c_t\) and a single world \(h\), but also relative to an utterance context \(c_t\) and its full range of possible futures \(c_w\). The difference is crucial in the interpretation of sentences about the future. In brief, these are del Prete’s definitions (del Prete 2014, p. 63). As before, \(S\) is the sentence root; in his case a function that maps situations \(s\) to \(\{0, 1\}\).

4 Interpretation in a single world branch \(h\) in (22) is

\[ [[ \text{will } S ]]^{c, g, h} = \text{true} \text{ iff the maximal branch } h \text{ contains a situation } s' \text{ later than } c_t \text{ where } S \text{ holds true.} \]

\[ [[ \text{will } S ]]^{c, g, c_w} = \text{true} \text{ iff } \forall h \left[ h \approx_{c_t} h_o \rightarrow [[ \text{will } S ]]^{c, g, h} = \text{true} \right] \]

The relation \(h \approx_{c_t} h_o\) states that the two maximal worlds \(h\) and \(h_o\) are equal up to the utterance context situation \(c_t\). This does not entail that del Prete assumes a “known actual world” \(h_o\) even though the notation suspiciously looks like it. Del Prete assumes that each situation is part of maximally one world-tree \(w\).
purely temporal whereas interpretation relative to a world \( w \) with branching futures follows the modal analysis. In its present form, del Prete’s analysis can not decompose \textit{will}/\textit{would} as \textit{woll} + \textit{PRESENT/PAST}. He treats the \textit{will} future in paradigmatic opposition with \textit{PRESENT} and \textit{PAST} and therefore does not make any predictions about Juliet’s paradox. Let us tentatively remedy this shortcoming. The simplest way to combine \textit{woll} and past tense could be (24).

\[
\begin{align*}
(24) \quad & \left[ [ \text{PAST } \Phi ] \right]^{c,g,cw} = \left[ [ \text{PAST } \Phi ] \right]^{c,g,h} = \text{true iff} \\
& \text{there is some (salient) situation } c_1 \text{ before } c \text{ such that } \left[ [ \Phi ] \right]^{c_1,g,cw} = \text{true}
\end{align*}
\]

This yields the following analysis for (15).

\[
\begin{align*}
(25) \quad & \left[ [ \text{PAST } ( \text{woll} ( \text{Romeo visit- Juliet} ) ) ] \right]^{c,g,cw} = \text{true in context } c = 18^{oo} \text{ iff} \\
& \text{there is a salient situation } c_1 \text{ before } c \text{ where} \\
& \left[ [ \text{woll} ( \text{Romeo visit- Juliet} ) ] \right]^{c_1,g,cw} = \text{true} \\
& \forall h \left[ h \approx_{c_1} h_o \rightarrow \left[ [ \text{Romeo visit- Juliet} ] \right]^{c_1,g,h} = \text{true} \right] \\
& \text{iff} \\
& \text{all continuations of } c_1 \text{ (} c_1 = \text{utterance situation at } 9^{oo} \text{) contain a visit by Romeo after } 9^{oo}.
\end{align*}
\]

But the world at \( 9^{oo} \) was still open as to whether this visit could take place. The analysis hence falsely predicts that (15) should be wrong in the given scenario.

However, del Prete’s definition of “truth in a world of branching futures” could be adjusted so as to yield more adequate predictions. Instead of testing truth in all those worlds that contain \( c_t \) and all its past, we can instead test truth in all branches that are contained in the context-world \( c_w \). Sloppily put, \( c_t \) is the world tree that starts branching at \( t = \text{reference time} \), whereas \( c_w \) is the world tree that starts branching at \( S = \text{speech time} \). If speech time is later than reference time, \( c_w \) starts branching off later than \( c_t \). We operate on basis of better information.

The outcome for present \textit{will} is the same as in del Prete’s original definition, but in past-future \textit{would}, we get more adequate results.

\[
\begin{align*}
(26) \quad & \text{del Prete (2014), modification of (37), p. 63.} \\
& \left[ [ \text{will } S ] \right]^{c,g,cw} = \text{true} \\
& \text{iff } \forall h \left[ h \text{ maximal branch in } c_w \rightarrow \left[ [ \text{will } S ] \right]^{c,g,h} = \text{true} \right]
\end{align*}
\]

If we compute (15) with the modified definition, \textit{woll} (\textit{Romeo visit- Juliet}) at \( R=9^{oo} \) can only “see” the future branches that remain options for the speaker at \( 18^{oo} \). All these branches have an event where Romeo visits Juliet, and the sentence is predicted to be true.

\[
\begin{align*}
(27) \quad & \text{Modified computation of (15):} \\
& \left[ [ \text{PAST } ( \text{woll} ( \text{Romeo visit- Juliet} ) ) ] \right]^{c,g,cw} = \text{true in context } c = 18^{oo} \text{ iff} \\
& \text{there is a salient situation } c_1 \text{ before } c \text{ where}
\end{align*}
\]

\( h \approx_{c_1} h_o \) presupposes that \( c_t \) is part of both \( h \) and \( h_o \), no matter whether any one of them is the „actual“ world in retrospect.
\[
[[ \text{woll (Romeo visit-Juliet)} ]]^{c_1,g,c_w} = \text{true (salient: } c_I = 9^{oo})
\]

iff

\[
\forall h [ h \text{ maximal branch in } c_w \rightarrow [[ \text{Romeo visit-Juliet} ]]^{c_1,g,h} = \text{true}
\]

iff all maximal branches in the world as the speaker knows at 18^{oo} contain a visit by Romeo after 9^{oo}.

This prediction is adequate.

The modification takes advantage of the fact that speech time in del Prete’s analysis is coded twice, once via the utterance situation \(c_t\) and once in the branching world \(c_w\): The speech time is the situation right after which \(c_w\) starts branching into different future options.

Even though the modified del-Prete analysis can deal with Juliet’s paradox, two important questions remain open.

Firstly, the added PAST semantic is not, as it stands, part of a systematic treatment of tense and aspect. Del Prete deals with the sentence event with the assignment function \(g\) (I left out details for the sake of simplicity) while the parameter \(c\) in (24) originally served to store utterance time. We abused it for a Prior-type tense semantics, but a systematic tense-aspect semantic remains to be detailed. This is necessary for an analysis of shifted perspective, because the reference time provides the crucial link between “time of the protagonist thinking” and “time where the narrative has stopped” (Doron 1991, Eckardt 2014).

Secondly, we got a very useful parameter, \(c_w = \text{the world’s futures as seen by the speaker}\), that helped us out in the analysis. But it is still unclear what kind of information is stored in this parameter and, eventually, what kind of notion of future openness is lexified in the English will-future.

- Metaphysic future openness: At time \(t_o\) the world \(w_o\) can develop in a number of objectively possible ways, all equally licensed by the physical laws and facts of \(w_o\).
- Epistemic future openness: At time \(t_o\), the world \(w_o\) as far as the speaker knows can develop in a number of possible ways. The speaker doesn’t know (or care) which of them are objective options and which of them rest on his/her ignorance.

Juliet’s paradox rests on the fact that the world looks less open in retrospect. The possible futures \(c_w\) at 18^{oo} are fewer than the possible futures at 9^{oo}. Reduction of options would be strange if we talk about possibilities in terms of laws and facts of nature. Reduction of options is natural when we think about epistemic alternatives. The more we learn, the less remains open. In the next section, I argue that the will-future in English is an instance of epistemic uncertainty.

4. A modular analysis of future and openness

4.1 The semantic backbone
[[ woll ]] maps sets of events to sets of times, as proposed by Abusch (1997). I use $\epsilon$ and $\tau$ as new types for events and times.

$$[[ \text{woll} ]] = \lambda P_{<\epsilon,\tau} \lambda t. \exists e ( P(e) \land t < \tau(e) )$$

$P$ can depend on a world parameter, as meanings generally do, but the world parameter is not relevant for the meaning of $\text{woll}$.

Sentence roots denote sets of events. At the aspectual level, these are turned into sets of times $<\tau, N>$. The tenses instantiate such functions of type $<\tau, N>$ with reference time $R$ and contribute a tense presupposition ($\text{Past}: R < S$, $\text{Present}: R = S$) as is standardly assumed in the literature.

To avoid misunderstandings, it should be added that the analysis is oversimplified in one respect. English allows to combine the $\text{will}$ future with more aspects, such as in the examples in (28).

(28) Romeo will have killed Tybalt.
    Romeo will be sleeping.

This stacking is, however, not restricted to $\text{will}/\text{would}$. There are other combinations of several aspects or, more generally, operators between sentence root and tense.

(29) Romeo has been dating Juliet for 3 weeks.
    Romeo is going to be talking to the public for hours.

Therefore, a comprehensive account of tense/aspect in English has to offer a recursive way to combine aspects. The present analysis can be generalized if necessary, and the treatment of $\text{perfect progressive}$ in Beck + Gergel (2013) demonstrates how. Examples such as (29) are not a reason to suggest that $\text{will}$ “is a modal, because modals can be combined with aspects” (an argument that is mentioned in von Fintel + Heim 2010). There may be morphosyntactic reason to call $\text{will}$ a modal in a morphological sense, but examples such as (28) do not prove that $\text{will}$ is modal in the semantic sense.

4.2 The pragmatics: Meaning and assertion

Formal semantics captures the meaning of sentences in terms of truth conditions. To know the meaning of a sentence is to know under which circumstances the sentence is true. When speaker A asserts sentence $S$, she is committed to the belief that the truth conditions of $S$ are met in the actual world. Given that we never know which world is the actual world, assertion is modelled as “speaker A believes to be in a world $w$ where $S$ is true” (Stalnaker 1978). An assertion embeds the sentence content under an epistemic modal.

(30) $\forall w [ \text{Epist.Alt}( A, t_o, w_o, w) \rightarrow S(w) ]$
    “in all epistemic alternatives of speaker A at speech time $t_o$ and world $w_o$, $S$ holds true”
The epistemic embedding is semantic part of any assertion, unless the speaker uses an epistemic possibility modal (perhaps, possibly ...). In this case, necessity is replaced by possibility, as we will see in examples in 4.3. I will refer to this modal level as “epistemic hedging”.

It is natural to extend epistemic hedging to utterances about the future. The epistemic alternatives \( w \) for speaker A at time \( t_o \) in \( w_o \) are worlds that cover the past and future of \( t_o \). The alternatives include all worlds that have a future that the speaker considers possible. This includes all worlds that have been discussed as “possible futures of \( w_o \) in \( t_o \)” in the previous sections, and in addition worlds that may differ from \( w_o \) somewhere in the past (because A has imperfect knowledge about the past, too). If speaker A asserts a will-future sentence, the assertion—as any other assertion—is made with the understood hedge “as far as I know”. The epistemic alternatives are determined at the time of utterance. This leads to an adequate prediction for Juliet’s delight.

(31) Sentence denotation
\[
[[ \text{Past} (\text{woll (Romeo visit-Juliet)}) ) ]] \\
= [[[ \text{Past} ]] ( [[ \text{woll} ]] ( \lambda e[ \text{Visit} (\text{ROMEO, JULIET, e, w}) ] ) ) \\
= [[[ \text{Past} ]] ( \lambda t. \exists e[ \text{Visit} (\text{ROMEO, JULIET, e, w}) \land t< \tau (e) ] ) \\
= \exists e[ \text{Visit} (\text{ROMEO, JULIET, e, w}) \land R< \tau (e) ] ; \text{psp: R}<\text{S}
\]

(32) Modal hedging; instantiation with \( R=9^o, S=18^o \)
\[
\forall w [ \text{Epist.Alt}(A, 18^o, w_o, w) \\
\rightarrow \exists e[ \text{Visit}(\text{ROMEO, JULIET, e, w}) \land 9^o < \tau (e) ] ]
\]
uttered at \( 18^o \)

(32) is true iff all worlds that A considers possible at \( 18^o \) include a visit by Romeo later than \( 9^o \). In our model situation, the speaker A at \( 18^o \) knows that this visit took place, and so it is part of all epistemic alternatives. We hence predict that A can confidently assert (15) and the audience will accept his assertion as backed up by sufficient evidence. Hence, Juliet’s delight is correctly analysed.

Juliet’s sorrow is likewise treated adequately. It is predicted that in the situation hand, the sentence “Romeo will visit Juliet” can not be asserted at \( 9^o \) with sufficient evidence, i.e. without violating the Maxim of Quality.

(33) Sentence denotation
\[
[[ \text{Present} (\text{woll (Romeo visit-Juliet)}) ) ]] \\
= [[[ \text{Present} ]] ( \lambda t. \exists e[ \text{Visit} (\text{ROMEO, JULIET, e, w}) \land t< \tau (e) ] ) \\
= \exists e[ \text{Visit} (\text{ROMEO, JULIET, e, w}) \land R< \tau (e) ] ; \text{psp: R}=\text{S}
\]

(34) Modal hedging; instantiation with \( R=9^o=S \)
\[
\forall w [ \text{Epist.Alt}(A, 9^o, w_o, w) \\
\rightarrow \exists e[ \text{Visit}(\text{ROMEO, JULIET, e, w}) \land 9^o < \tau (e) ] ]
\]
uttered at \( 9^o \)

The speaker should not commit to (34) because, in fact, most worlds \( w \) that s/he considers possible do not include a visit by Romeo that day: Matters do not look as if
this would happen. If the speaker asserted that *Romeo will visit Juliet (today)*, s/he would make a claim for which she lacks sufficient evidence, and hence violate the Maxim of Quality. For analogous reasons, the speaker refrains from asserting the negation “*Romeo will not visit Juliet*”. We can therefore account for the seeming truth value gaps of future sentences. They receive a pragmatic analysis: No matter whether the visit does or does not take place, *no human speaker ever has sufficient evidence to make the respective assertion*. Lack of evidence in such cases is structural, not personal. We could call this an assertibility gap, instead of truth value gap.

The analysis automatically predicts that *negation* always takes scope below the modal “component” of the future. In the present analysis, epistemic hedging is added after computing the sentence denotation. Given that negation is part of the sentence denotation, it automatically receives low scope. This accounts for the absence of the following reading:

\[(35) \quad \text{Romeo will not visit Juliet.} \]

*nonexistent reading*: “Not all future branches of the world contain a visit by Romeo”, i.e. there are future developments of the world where he does not visit Juliet.

Finally, the analysis accounts for re-assessment in retrospect. In spite of the unpredictability of the future, the Maxim of Quality allows *guesses, premonitions* and *predictions* for future sentences. Epistemic hedging is then restricted to *the most likely of my epistemic alternatives*. These are in play when Juliet makes the following assertion in the morning of the crucial day.

\[(36) \quad \text{Romeo will not visit me.} \]

Even if she and everybody around her may judge (36) as very likely true at the time, the judgment must be corrected in retrospect. In the evening, Juliet will think: “My utterance was wrong”. This is in the nature of epistemic hedging. Epistemic hedging is not part of the commitment of the speaker but part of the circumstances under which a more specific commitment is made. Put more simply, the speaker does not commit herself to “*I believe that S*”, but to the content of S. The difference is subtle but important. In retrospect, *Juliet believed that Romeo would not visit her* is still true. What turns out false is “*Romeo will not visit Juliet*”, as of reference time R=9<sub>oo</sub>.

Other future forms in English differ in this respect. The *going-to* future is not corrected in retrospect. The sentence in (37) will stay true even though Romeo’s father eventually did not leave Venice.

\[(37) \quad \text{Romeo’s father is going to leave Venice for a business trip.} \]

*true at 9<sub>oo</sub>, still true at 18<sub>oo</sub>*)

Therefore, the *going to* future should best be captured in a modal analysis along the lines proposed in Copley (2009) which does, among other things, predict imperfective paradox data and disallows retrospective reassessment.

In sum, the modular analysis, which treats the openness of the *will*-future as epistemic openness makes the following predictions:
• some will-future sentences can not be confidently asserted—nor can their negations—without violating the Maxim of Quality (truth value gaps, openness)
• will-future sentences in the past rest on fewer possible worlds than those in the present (Juliet’s paradox)
• the truth of a will-future assertion can be re-assessed in retrospect
• negation in will-future sentences always takes scope below the level of openness

4.3 Further support: Interaction of the will-future and epistemic modals

This section discusses data that offer further support for the modular analysis of the future. The analysis itself does not change, and readers interested in perspective can move to section 5 without loss.

The analysis in 4.1 and 4.2 treats the modality in will-future sentences as an instance of epistemic uncertainty. Alternatively, one could insist that future alternatives are not the same as epistemic alternatives and that the two modalities should be treated as separate levels. We could interpret the modified del Prete analysis in section 3 in this manner. Remember that del Prete integrated a single-branch analysis and a modal analysis; our amended analysis in section 3 made correct predictions for Juliet’s paradox. Epistemic uncertainty could still be independent of future modality. Let us pursue this line of thinking somewhat further.

Given that all assertions are made with the reservation “as far as I know…”, epistemic hedging must also be added to assertions in the will-future. If we adopt the modified del Prete analysis, then the utterance content will contain two levels of modality. We would therefore expect to see these two modalities independently at work, at least in some examples. This can be tested against the data.

The present section looks at data that combine the will-future and epistemic modals such as It is possible, that ... and It is certain, that. These make the epistemic quantification explicit (universal) or overwrite the default interpretation (existential), similar to adverbials in conditionals.\(^5\) The clause it is impossible that in (38) hence explicates that epistemic hedging can be paraphrased as “what no epistemic alternative of the speaker at \(t_o\) in \(w_o\) makes true”.

(38) It is impossible that Smith will win.

We assume, with del Prete, that the will-future introduces a modality in its own right, hence the embedded clause (that) Smith will win receives a modal interpretation. It is true (in utterance context \(c_r\), assignment \(g\) and world-tree \(c_w\)) iff none of the world branches of \(c_w\) contains Smith’s victory. It is false otherwise. — The modal “It is

---

\(^5\) Given that the default interpretation of assertions already includes an epistemic universal, the explication It is certain that... may give rise to further implicatures which I leave aside. The case is comparable to if-clauses. The default interpretation of conditionals is universal. This can be explicated (always if ... then ...) or overwritten (sometimes if ... then ...) , see Kratzer 1981.
impossible (that)” states that the embedded clause is false in all epistemic alternatives of the speaker. We predict the following truth conditions.

(39) All epistemic alternative world-trees \( w_i \) of the speaker at time \( t_o \) contain at least one maximal branch \( h_i \) in which Smith does not win.

This seems too weak. Intuitively, (38) entails that the speaker firmly believes that Smith will lose. (39) does not predict that Smith will lose, it only allows that Smith might lose. This is inadequate.

Let us next look at a possibility statement.

(40) It is possible that Smith will win.

Assuming that will introduces its own modality, we predict the following truth conditions (remember that \( w \) are world-trees in del Prete’s sense, not single worlds).

(41) \( \exists w[ \text{EPIST.ALT}( A, w_o, t_o, w) \land \forall h( h \text{ maximal branch in } w \rightarrow \exists s( \text{WIN}(\text{SMITH}, s) \land s \text{ later than } t_o ) ) ] \)

The speaker maintains at least one possible world \( w \) in which there is no conceivable future in which Smith loses. This might be a world, for instance, where Smith trained very hard and all his opponents are sick. If the speaker maintains such a possibility, s/he could justly utter (40), but intuitively the truth conditions should be much weaker, as the following sentence shows.

(42) It is possible that the coin comes up heads.

The envisaged analysis would predict that I only assert (42) in case I maintain a world \( w \) where the coin comes up heads in all possible future branches. This must be a world where the coin is severely biased. But this prediction is false. I can truthfully assert (42) even if I believe that the coin is perfectly fair and the future branches into options where the coin comes up heads, and options where the coin comes up tails. Hence, the two-modal levels analysis is problematic for (40)/(42).

The predictions for combinations of epistemic necessity and will are unproblematic.

(43) It is certain that Smith will win.

The predicted utterance meaning is “in all possible futures of all conceivable worlds, Smith wins”. This is intuitively correct, but also equivalent to the predicted utterance meaning under the simpler analysis with only one modal.

Negated necessity statements receive an analysis that predicts the correct range of felicitous utterance situations. But certain desirable equivalences get lost underway.

(44) It is not certain that Smith will win.
This is predicted to be felicitously utterable iff the speaker maintains an epistemic alternative \( w \) such that there is at least one future branch \( h \) of \( w \) where Smith does not win.

\[
\neg \forall w \ [ \text{EPIST.ALT}( A, w, t_o, w) \rightarrow \forall h ( h \text{ maximal branch in } w \\
\rightarrow \exists s ( \text{WIN(SMITH, s)} \land s \text{ later than } t_o ) ) ]
\]

\[
\equiv \exists w[ \text{EPIST.ALT}( A, w, t_o, w) \land \\
\exists h ( h \text{ maximal branch in } w \land \neg \exists s( \text{WIN(SMITH, s)} \land s \text{ later than } t_o ) ) ]
\]

This prediction is correct, but the range of predicted felicitous utterances is not the same as for the following sentence (46).

(46) \text{It is possible that Smith will lose.}

(46) is analysed like (40)/(42) and the two modal levels render the truth conditions in (47).

\[
\exists w[ \text{EPIST.ALT}( A, w, t_o, w) \land \\
\forall h ( h \text{ maximal branch in } w \rightarrow \neg \exists s( \text{WIN(SMITH, s)} \land s \text{ later than } t_o ) ) ]
\]

It is predicted that a speaker could assert (44) and still refuse to commit to (45). This, again, is inadequate.

In summary, the predictions of the two-modals analysis are best when they are equivalent to the analysis under the account with only epistemic modality. The combination of modal \textit{will}-readings and \textit{impossible} predicts too many felicitous utterances. The combination with \textit{possible} predicts too few felicitous utterances. The combination with \textit{not necessary} predicts the correct range of felicitous utterances, but fails to capture the equivalence of \textit{possibly not} and \textit{not necessary}.

If we treat future openness as epistemic modality, as proposed by the modular analysis in Section 4.1 and 4.2, none of these problems arises. The predicted utterance meanings of (38), (40), (42), (43), (44) and (46) delimit the correct range of utterance contexts in which a speaker has sufficient evidence to assert the respective sentence. Therefore, the data stand against treating future modality as distinct from epistemic modality.

It should be stressed that my extension of del Prete (2014) was used for purely expository purposes—to have some kind of working account that captures Juliet’s paradox, allows free combination with tenses and offers a modal interpretation for \textit{will}-sentences. The original account would also allow to interpret the alternatives in \( c_w \) in an epistemic sense. And this, in turn, leaves it open whether those worlds are simply a subset of all epistemic alternatives of the speaker or some more circumscribed domain of worlds that follow their own logic. Yet, the respective theory remains to be developed.

5. Perspective taking
Now that we have a justified analysis of the will-future we can extend the analysis to free indirect discourse. I assume a context-based treatment of free indirect discourse (Sharvit 2008, Schlenker 2004, Eckardt 2012, 2014). Sentences $S$ can be interpreted relative to one context $C$ or two contexts $<C,d>$. Interpretation based on two contexts $<C,d>$ is triggered if (a) the content of the simple semantic evaluation is implausible otherwise and (b) it is plausible to accommodate a second utterance context $d$ where a protagonist of the narrative is thinking or speaking. $d$ takes place at the current reference time $R$ of the story. Implausibility can be due to several factors including implausible attributions of emotions, intentions or knowledge. The following example illustrates this briefly.

(48)  *Lea left the café. Where was Sue? My God, it was raining.*

The interesting part in this textoid are the second and third sentence: who is supposed to voice them? In a $C$-based interpretation, we understand that the narrator wonders where Sue is, and shows frustration about the rain. The reader will probably find this implausible given that narrators usually know the whereabouts of their protagonists and do not get wet themselves. An interpretation as Lea’s utterance, on the other hand, makes sense. The protagonist Lea *can* fail to know where Sue is at this point, and Lea does get wet and therefore is entitled to react emotionally to the rain. Hence the reader will go for the $<C,d>$ based interpretation. This interpretation mode has two effects. Firstly, all shiftable indexicals will be oriented to the internal context $d$ (= Lea’s thinking as part of the story) instead of the external context $C$. In sentence (48), these include the epistemic background for questioning (who asks) and the emotive *my god*. Secondly, the denoted proposition $p = [[S]]^{<C,d>}$ does not directly contribute to the story. Instead, the story is updated with “the speaker in $d$ believes / thinks that $p$”.

Let us return to our example in the past-futurate in (5), repeated in a slightly simplified form in (49), taken from a story with the protagonist Kira.

(49)  *She would do that.*

Our so-far analysis starts by computing the meaning of the sentence root *she do that* (namely, sprinkle people with Pixie dust) and we get $\lambda e.\text{DO-THAT}(x,e,w)$. If we resolve pronoun *she* to Kira, we get:

(49)  a. $\lambda e.\text{DO-THAT}(\text{Kira},e,w)$.

Future *woll* locates this event relative to time $t$.

(49)  b. $\lambda t. \exists e \ [ t < \tau(e) \land \text{DO-THAT}(\text{Kira},e,t,w) ]$

Next, the PAST makes its usual semantic contribution. The predicate in (49.b) is instantiated with reference time $R$ and we include the presupposition that $R$ is before the time of context now($C$) (i.e., the time of speech). In the interpretation based on $<C,d>$, the time of $d$—Kira’s thinking—is the same as $R$ (Doron 1991, Eckardt 2014: Ch.4). The temporal localization of the event $e$ of “doing that” turns out, correctly, later than Kira’s thinking. By abstracting over $w$, we get the following proposition.
(49) \[ \lambda w. \exists e [ R < \tau(e) \land P(Kira, e, R, w) ]; R < now(C) \]

The propositions in free indirect discourse must standardly be included in the story as a belief of the respective protagonist (Eckardt, 2014). The story at hand tells that (49.c) is a belief of Kira. (Eckardt 2014) uses a BELIEF relation between subject and proposition, but this can be spelled out in terms of the epistemic alternatives of the subject Kira, for better fit with the overall discussion.

(50) \[ \forall w [ \text{EPIST.ALT}(Kira, w, R, w') \rightarrow \exists e [ R < \tau(e) \land P(Kira, e, R, w) ]; R < now(C) \]

“In all epistemic alternatives of Kira at time R in world w, an event of Kira doing that happens later than R.”

The analysis correctly captures the modal character of Kira’s thought about the future. If Kira was undecided, she would not commit to “I will do that” nor to “I will not do that”. The analysis also correctly captures the fact that it is Kira’s epistemic background that counts, not the external speaker’s. The story remains consistent if the narrator later reports that Kira did not do that after all. Kira, in any case, is entitled to believe or assert I will do this, because the event depends on her own plans. Judging by the weakened Maxim of Quality for future statements, the eavesdropping reader decides that Kira has sufficient evidence to justify her thought.

The process of (careful) story update by the content of free indirect speech automatically integrates epistemic hedging (Eckardt, 2014). Epistemic hedging is, as I argued in section 4, sufficient to capture the modal character of future will. The semantics of the future and the interpretation of free indirect discourse dovetail nicely.

Our example in (49) was slightly simplified. The original in (5) includes stacked modals. Example (51) repeats the original Kira example and allows us to take up the topic of stacked modals from section 4.3. (I refrain from a detailed discussion of “later”.)

(51) Maybe she would do that (later).

Let us see how the stacked modals play out. The content of assertion in (51) is the folllowing.

(52) \[ \lambda w. \exists w'_1 [ \text{EPIST.ALT}(Kira, w, R, w'_1) \land \exists e [ R < \tau(e) \land \text{DO-THAT}(Kira, e, w'_1)] \]

“In some epistemic alternatives of the speaker, there is a future event where she (=Kira) does that.”

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6 It could be argued that Kira’s beliefs should more adequately be modelled by doxastic alternatives. This, however, leads to the question whether any speaker can do more than assert that according to their beliefs something is the case. In this case, all instances of epistemic alternatives must be replaced by doxastic alternatives. My discussion rests on a single modal base for all cases which I continue to refer to as EPIST.ALT for simplicity’s sake. The discussion whether beliefs and knowledge should be separated requires a paper in its own right.
We want to avoid stacked modal quantification, not justified by intuitions. At first sight, then, an update of the story by “Kira believes that (52)” looks problematic. This is what the story update amounts to.

\[ \lambda w. \forall w_2[ \text{EPIST.ALT}(\text{KIRA}, w, R, w_2) \rightarrow \exists w_1[ \text{EPIST.ALT}(\text{KIRA}, w_2, R, w_1) \]
\[ \quad \land \exists e (R < \tau(e) \land \text{DO-THAT}(\text{KIRA}, e, w_1) ] ] \]

“In all conceivable worlds of Kira, she can conceive of at least one world where there is a future event where she does that.”

It is hard to get intuitions about what Kira knows she could know. Yet, there is a logical way out of this. All quantifications are within the same modal base. We can therefore use standard assumptions about the accessibility of epistemic alternatives to simplify the proposition in (54). The first assumption is that accessibility relations can be transitive (see Hughes + Cresswell 1981, 1996, Kripke 1963).

\[ \forall w. \forall w_2 \forall w_1[ \text{EPIST.ALT}(\text{KIRA}, w, R, w_2) \land \text{EPIST.ALT}(\text{KIRA}, w_2, R, w_1) \]
\[ \rightarrow \text{EPIST.ALT}(\text{KIRA}, w, R, w_1) ] \]

“If Kira in \( w \) thinks that \( w_2 \) could be possible, and if Kira in \( w_2 \) thinks that \( w_1 \) is possible, then Kira in \( w \) will also hold \( w_1 \) possible.”—or, more simply, Kira doesn’t believe that she believes different things from those she believes.

If we consider this a plausible assumption about think, the principle allows us to derive (52) from (53). In other words, the semantic content of the story update in (53) entails the proposition in (52).

A second assumption about belief makes the two updates equivalent. This can explain why we intuitively judge that (51) means (52): It is the simpler one of two logically equivalent ways to render the same proposition. The second assumption is something like a “triangle view” principle about epistemic alternatives.

\[ \forall w. \forall w_2 \forall w_1[ \text{EPIST.ALT}(\text{KIRA}, w, R, w_2) \land \text{EPIST.ALT}(\text{KIRA}, w, R, w_1) \]
\[ \rightarrow \text{EPIST.ALT}(\text{KIRA}, w_2, R, w_1) ] \]

“If Kira in \( w \) thinks that \( w_2 \) is possible, and that \( w_1 \) is possible, then Kira in \( w_2 \) should also hold \( w_1 \) possible”

The properties of accessibility relations are (I believe) difficult to justify on basis of introspective judgements, and a strong branch in philosophical logic occupies itself with weighing the pros and cons of such axioms. We can clearly not settle this debate here beyond the observation that the two assumptions can elegantly explain why the general epistemic hedge (“I believe that…) does not strengthen or change a possibility statement as the one in (51). It should be noted that the same neutralizing of epistemic modalities is welcome in examples that do not involve the future. The critical reader should keep in mind that the problem of stacked epistemic modality arises in past- and present tense examples as well, as illustrated by (54).

(54) It was raining, perhaps.

As a content of free indirect thought, (54) renders the proposition \( p = \text{‘in some epistemic alternatives of \text{sp}, it is raining’} \). Standard story update adds the proposition
'the speaker in d believes that in some epistemic alternatives of sp, it is raining’. With
the above assumptions about the accessibility of epistemic alternatives, this is
equivalent to ‘In some epistemic alternatives of sp it is raining.’ And this seems an
appropriate way to render the speaker’s frame of mind.

Summing up, the modular analysis of the will future in English extends to
perspectivization effects in free indirect discourse in a natural way. Whereas future
sentences in direct speech rest on the speaker’s epistemic background, future
sentences of the protagonist rest on the protagonist’s epistemic background. The
semantics of tense in free indirect discourse determines when this epistemic
background is probed. And an analysis of FID that provides different story updates
for assertions by the narrator and assertions/thoughts of the protagonist will naturally
capture the fact that it is the protagonist’s epistemic background, not the narrator’s.
The combination of epistemic adverbs in the sentence (‘maybe’, ‘surely’) and
epistemic hedging as part of the utterance (‘according to the speaker’s beliefs…’) is a
challenge for all kinds of utterances in free indirect discourse. I discussed how further
assumptions about the nature of accessibility reduces the levels of modal
quantification. These assumptions only make sense if we stay within the same modal
base. Therefore, this type of simplification is generally not available for the problems
discussed in section 4.3.

6. Summary

The present semantic analysis of will proceeds in the following steps.

- The basic verb will makes a purely temporal contribution. It denotes
  λP<ϵ,t> λ t. ∃ e( P(e) ∧ t<τ(e) ) and is computed above the sentence root and
  below tense.
- will is will in the PRESENT. Would is will in the PAST.
- All assertions are made with epistemic hedging “as far as the speaker knows”.
  This epistemic modal also takes routinely scope over sentences that contain
  will. It accounts for the openness of the future, the so-called truth value gaps.
  They are analysed as “assertability gaps” rather than truth value gaps.
- This explains why the modality of future sentences always takes scope over
  negation.
- Epistemic modals might, may, must serve to explicate the strength of the
  epistemic level. They are integrated into epistemic hedging rather than adding
  further (void) levels of epistemic modality. The process is similar to the
  interpretation of modal adverbs in conditionals (Kratzer 1991).
- While will/would in direct speech refers to the epistemic background of the
  speaker, will/would in free indirect discourse refer to the epistemic alternatives
  of the protagonist. This prediction is the natural net result of an account of
  story update in free indirect discourse, and the modular analysis of will/would.
- Sentences with will/would and epistemic modals lend further evidence in
  favour of the modular analysis. If there were a future modality that is
  independent of epistemic modality, we’d expect to see the two modalities at
  work in relevant examples. The predicted readings are not met by the data.
  Hence, there is no extra future modality independent of epistemic modality.
• The analysis is compatible with the possible empirical finding that there are many possible futures for \( w_o \) at \( t_o \) in an objective sense. The working semanticist can assume that among the epistemic alternatives in play, some remain live options because the speaker is too uninformed to know better, and some remain live options because the laws and facts of physics do not predetermine which option will make it.

The proposed analysis has precedents both in the philosophical and semantic literature. It is, however, the first analysis that integrates a fully working tense/aspect system in the Reichenbach sense with a \textit{woll-future}, including adequate predictions for \textit{past-futurate}. It is also the first semantic treatment of what I called \textit{Juliet’s paradox}, known in the philosophical literature as the problem of future contingents since classical times (see Øhrstrøhm+Hasle, 2011). Its most recent treatment (MacFarlane 2003, 2008) is in fact presented as a “semantic analysis”, although the notions of semantics of MacFarlane and the one used here diverge too much to allow for a direct comparison. The present analysis is modular: the semantics of \textit{woll} contributes temporal information and the pragmatics of assertion adds the modal component. This architecture extends to examples in free indirect discourse in a natural manner and captures perspectivization effects. One mayor remaining open question concerns the pragmatics of stacked epistemic modals which we encountered as \textit{will possibly, would maybe, not necessarily will … etc.} These call for an analysis not only in our cases but also overtly, as in \textit{Peter thinks that she will do that, perhaps or I believe that maybe, she will come}. A general analysis of such stacked epistemic marking remains to be undertaken.

References


