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Embedding Illocutionary Acts[1]

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Speech acts have sometimes been considered as not embeddable, for principled reasons. In this paper, I argue that illocutionary acts can be embedded under certain circumstances. I provide for a semantic interpretation of illocutionary acts as functions from world/time indices to world/time indices, which provides them with a semantic type, and allows for operators that take them as arguments. I will illustrate this with three cases: First, with illocutionary acts as arguments of verbs like *tell*, second, as semantic objects modified by speech act adverbials like *frankly* and third, with Austinian conditionals. By these exemplary cases, I show that illocutionary acts (or rather, speech-act potentials) become part of the recursive structure of language.

1. Introduction

The literature on recursion typically focuses on syntactic aspects of recursion. Syntactic rules are recursive if they generate structures in which an expression β occurs within an expression α of the same category c, either directly or indirectly. Adjectival modification as in [$_{N}$ *old* [$_{N}$ *man*]] is a case of direct recursion; clausal complements as in [$_{S}$ *John* [$_{VP}$ *thinks* [*that* [$_{S}$ *Mary left*]]]] are cases of indirect recursion. As the elements of a syntactic category have the same label and the syntactic rules that combine syntactic categories cannot look into their internal syntactic composition, unlimited recursion is allowed by default, as in [$_{N}$ *dirty* [$_{N}$ *old* [$_{N}$ *man*]]], or [$_{S}$ *Bill* [$_{VP}$ *suspects* [*that* [$_{S}$ *John* [$_{VP}$ *thinks* [*that* [$_{S}$ *Mary left*]]]]]]. If such structures are to be excluded from the generative capacity of the language, recursion would have to be blocked explicitly, leading to a more complex grammar.

Now, syntax is there for a purpose: to guide the construction of semantic representations. This is done compositionally, following the Frege principle: The meaning of a complex expression is derived from the meaning of their immediate syntactic parts and the syntactic rule that combines them.[2] Interpretation must be compositional, given that the number of possible expressions is very

1 This paper had a long gestation period. It is part of ongoing work on the nature of speech acts and the interaction of It profited tremendously from comments of audiences on presentations of related material at Stanford University, University of California at Santa Cruz, the World Congress of Linguists in Seoul, the recursion conference in Amherst in 2009, the conference on sentence types and illocutionary acts at ZAS Berlin in 2010, and a talk at New York University, April 2013. The current paper focuses in particular on the issue of recursion of speech acts within the more general topic. There are too many colleagues that, in one way or other, had influence on the points to be presented here, but I should at least mention Chris Barker, Arik Cohen, Hans-Martin Gärtner, Andreas Haida, Sophie Repp, Anna Szabolcsi, Hubert Truckenbrodt, and Tom Roeper. Work on this topic is supported by a grant of the Bundesministerium für Bildung und Forschung (BMBF, Förderkennzeichen 01UG0711) to the Zentrum für Allgemeine Sprachwissenschaft; the responsibilities remain with the author.

2 There are additional factors that influence the meaning of a complex expressions. First, the meaning of the constituents may be shifted by semantic operators, e.g. the type shift of names to quantifiers in cases like *John and every girl* (cf. Partee 1987), the aspectual type shift of semelfactives to iterative activities in *the light blinked for hours* (cf. Moens & Steedman 1988), and metonymic type shifts as in *begin the book* discussed in Pustejovsky (1995) or *the ham sandwich* discussed in Nunberg (1977). Second, the linguistic and extra-linguistic context may influence the meaning, as in suppressing implausible interpretations of ambiguous expressions and in specifying the values of variables and indexical expressions. Third, the availability of other expressions in the language may lead to pragmatic optimization, also ruling out certain interpretations that otherwise would be available; e.g. an indefinite

large or (in case of recursive rules) infinite, and speakers must be able to learn, in a finite and actually quite short time, how to interpret these expressions. If the syntactic rules are recursive, the corresponding compositional semantic rules must be recursive as well. For direct recursion we must allow for functions of a type[3] **(σ)σ** that take arguments of type **σ** and deliver values of type **σ**. For example, for attributive adjectives we assume functions of type **(et)et** like λPλx[P(x) ∧ OLD(x)], that can be applied to arguments of type **et** like λx[MAN(x)], and deliver values of type **et** like λx[MAN(x) ∧ OLD(x)]. This kind of recursivity is standardly assumed in semantics.

Recursive syntax does not mean that every syntactic category is recursive, in the sense that every syntactic category can contain expressions of the same category, directly or indirectly. One kind of systematic exceptions are lexical categories, the categories employed in terminal rules in phrase-structure grammars. Semantically, these are expressions whose meanings have to be learned (which does not preclude that the meanings of some syntactically complex expressions, like idioms, have to be learned as well). But it also has been claimed that certain complex categories are systematically excluded from recursive syntax. We will consider here so-called root clauses.

While clauses can be embedded as complement clauses, adverbial clauses, or relative clauses, it has been claimed by Emonds (1969) and Ross (1970) that there are clauses that allow for certain syntactic configurations, so-called root transformations, that are not available for other clauses, and do not occur embedded in other clauses, except perhaps in coordinations. As an example for such root transformations that lead to clauses that cannot be embedded, consider a clause that underwent Left Dislocation:

(1) a. *This room, it really depresses me.*

b. *They put so much furniture in here that*

(i) **this room, it really depresses me*.

(ii) *this room depresses me.*

Why should there be such a systematic restriction of recursion? Certainly, this would not be due to a conceptual necessity of syntax, as in the case of the terminal categories. In traditional phrase-structure grammars, there is no need that the starting symbol S cannot occur as the output of a rule. But we may be able to find a reason for this systematic exception of embeddability in semantics, as suggested in Hooper & Thompson (1973): Root clauses are independent assertions – more generally, speech acts – and speech acts generally cannot be embedded. This is corroborated by those cases in which root clauses actually do embed, as in the following example:

(2) *Carl told me that* [*this book, it has recipes in it*].

In such cases, Hooper & Thompson claim, it is the embedded clause that constitutes the main assertion, whereas the embedding clause has the role of a parenthetical expression, in spite of the complementizer *that*. In a sense, there is a mismatch between overt syntax and function; the embedded clause is not embedded after all.

The phenomenon of restrictions of embeddability of clauses and their exceptions grew into an important topic over the years; cf. the survey in Heycock (2006). More syntactic phenomena that characterize root clauses were found (e.g., modal particles that are specific for root clauses, or verb-second syntax in Germanic languages), and additional types of exceptions where identified.

It is quite likely that the various root transformations of early generative grammar actually are a mixed bag, that is, that the various restrictions and their exceptions do not fall under a uniform description. But at least for a substantial subset of cases, a version of Hooper & Thompson's explana-

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noun phrase suggests non-uniqueness as otherwise a definite noun phrase would be used.

3 In naming semantic types, I follow the convention that **(σ)τ** denotes the type of functions from meanings of type **σ** to meanings of type **τ**; if **σ** is a simple type, parentheses are omitted. Simple types are **e** for entities and **t** for truth values; see below for additional simple types.

tion seems to be right. According to this, root clauses have a feature that allows them to express assertions, or perhaps also other kind of speech acts, and due to this feature they cannot be embedded, if it were not for those exceptional cases that do allow for the syntactic embedding of speech acts. This view is supported by a widespread assumption in natural language philosophy, that speech acts are of a nature that makes it impossible that they become part of semantic recursion (e.g. Stenius 1967, Green 2000, to be discussed below).

In this paper, I will try to argue that this line of argument is semantically sound. In particular, I will try to show what speech acts are, from which it follows that they typically cannot be embedded. But the main focus will be on those cases that have been treated as exceptions, for which I will argue that they involve the embedding of speech acts. I will propose a model-theoretic reconstruction of speech acts, leading to a framework in which both truth-conditional semantics and speech-act theory can be expressed. This theoretical reconstruction will allow for the embedding of speech acts in certain cases. I will be able to discuss this with a few examples only, and within a fairly simple, stripped-down semantic theory. Nevertheless, I hope that in this I will go beyond a mere proof-of-concept, and that some of the proposed analyses will be insightful in their own right.

In section (2) I will develop a representation for truth-conditional semantics and for speech acts. The crucial idea, which goes back to Szabolcsi (1982), is that illocutionary acts are not propositions that are evaluated at word-time indices. Rather, they trigger a change in the world in which they are performed; hence they map world-time indices to other world-time indices. In this they generate events, a point also stressed by Recanati (1988). In particular, they change the commitments of the participants of conversation. Such changes are modeled by restricting the possible continuations in a branching-time model. I will show how assertions can be treated within this framework, and I will show how it allows for the representation of speech act reports and of explicit performatives. In section (3), I will turn to two exemplary cases of speech act embedding: First, a case of indirect recursion, the embedding of an assertive act under *tell*, and secondly, a case of direct recursion, the embedding of an assertive act under *frankly*. Section (4) concludes this paper with an outlook on other kinds of embeddings.

2. The Formal Representation of Speech Acts

2.1. The Nature of Speech Acts

The literature on speech acts is huge, and I cannot begin to do it justice in this paper. Here, I will concentrate on the nature of speech acts and on the ways how it should be modeled formally.

It is safe to say that there are two broad perspectives on speech acts, as exposed in Lewis (1970). One view, most clearly expressed in Stenius (1967) but already present in Frege's distinction between thoughts and judgements (Frege 1879), considers speech acts as communicative actions. Speech acts make use of semantic objects like propositions, but transform them to something of a different nature. This view distinguishes between sentence radicals, which denote propositions, and illocutionary acts that are formed when illocutionary operators are applied to sentence radicals. Speech acts are moves in a language game in the sense of Wittgenstein (1958). For example, if a speaker asserts *Mary has left* to an addressee, the speaker uses the proposition 'Mary has left' for a particular game. Stenius called this the Report Game which follows the rule "Produce a sentence in its indicative mood only if its sentence-radical is true." Under this view, speech acts are actions, not propositions.

Lewis himself favors another view, which he calls "paraphrased performatives."[4] This view considers both sentence radicals and speech acts to be propositions. In our example, if the speaker asserts *Mary has left* to the addressee, then this can be captured by 'the speaker tells the addressee that Mary has left', which is itself a proposition, hence a semantic object. This leads to the problem that the assertion *Mary has left* would necessarily be true whenever uttered by a speaker to an addressee, and so for all performative sentences. For this reason, Lewis assumes the method of paraphrased performatives only for speech acts other than assertions ("declaratives"), and disregards that non-assertive speech acts have spurious truth values – e.g., the questions *Has Mary left?,* analyzed as 'the speaker asks the addressee whether Mary has left', is true as soon as the speaker asks the question. If we want to treat speech acts in a homogenous way, we might assume the method of paraphrased performatives for assertions as well, and simply disregard the truth value of the whole paraphrase, as it is always true. The method of paraphrased performatives is related to the performative hypothesis of Katz & Postal (1964) and Ross (1970), which assigns the sentence *Mary has left* a deep structure of the form *I tell you* [*Mary has left*], which would be interpreted as a paraphrased performative in Lewis' sense. Hence, such deep structures can be seen as syntactified versions of paraphrased performatives.

The two perspectives on speech acts differ in their consequences concerning the role of semantic representations in syntactic recursion. According to Stenius, speech acts are distinct from regular semantic objects. As regular semantic recursion is defined over entities, truth values, worlds, times, contexts and the functions one can build from that, we should not expect that speech acts can themselves be arguments of semantic operators. Once an illocutionary operator has been applied and has transformed a semantic object into a speech act, there is no chance for it to be embedded again. According to Lewis' method of paraphrased performatives, on the other hand, speech acts are propositions, regular semantic objects, and there is no intrinsic reason to assume that speech acts cannot be embedded.

What we find is that speech act embedding occurs, but in a restricted way. We can take this as indicating that the Stenius view is right: speech acts are not just propositions, otherwise they would participate more fully in recursion. But then we must explain how the Stenius view can be reconciled with the embedding of speech acts that we do find. For this, we first have to develop a theory of speech acts in which they differ from regular semantic objects, but still can be folded back into semantic meanings.

2.2. A dynamic interpretation of illocutionary acts

In this and the next two subsections, a semantic framework will be developed that is able to account for standard semantic phenomena, and which is designed to accommodate speech acts.

For the denotational part of the semantics of natural language, the model-theoretic approach of Richard Montague has proved to be extremely fruitful. It is the natural choice of a semantic theory on which to build a more general theory of communication that encompasses speech acts. Montague (1973) provided a framework which allows for evaluating the truth value of a sentence with respect to an index (a world and a time). Kaplan (1978) extended this framework by introducing contexts, thus allowing for a principled treatment of deictic expressions referring to the speaker, the addressee, and the world and time of the utterance. The basic explanandum remained the same: the derivation of the truth values of sentences. This static picture changed with Stalnaker (1974) and

4 The only argument that Lewis gives is that the sentence-radical view would not allow for a treatment of constituent questions like *Who came?*, and encouragements like *Hurrah for Mary!* But this is clearly not the case. Constituent questions can be treated like polarity questions if we assume that their sentence radical denotes a set of propositions or a structured propositions. Encouragements can be seen as speech acts that require a person-denoting referential expression as radical; in our example, *hurrah* can be treated as an illocutionary operator applied to *Mary*.

Karttunen (1974), who modeled the communicative impact of expressions as a change of the common ground of speaker and addressee. Smaby (1979), Kamp (1981), Heim (1982), Staudacher (1987) and Groenendijk & Stokhof (1987) extended this dynamic view, allowing a treatment of pronouns referring to entities mentioned in the prior discourse. The resulting picture is one of a dynamic conversation and a static world: a sentence changes the common ground and the set of available discourse referents, but the world and time of the utterance stay the same. This contrasts with the notion of speech acts as seen by Stenius: Speech acts are not true or false at a world and a time, but rather create new facts, after which the world is different. Communication does not just change the common ground of interlocutors, it changes the world itself. It turns out that this view is not quite novel. Szabolcsi (1982), in a paper ahead of its time that was not taken up by semanticists or speech act theorists, sketches exactly this view of speech acts as an index changing device.[5] What follows can be seen as an execution of her idea.

In the following subsection, I will introduce a model frame that provides for an interpretation of regular semantic expressions, but also accommodates speech acts as world changers. This model frame will be minimal in the sense that it should illustrate how a dynamic representation of speech acts works. I will not attempt to integrate discourse referents, or events, or even all aspects of speech acts, like the utterance act (part of the locutionary act) and the perlocutionary act (the achievement of what the speaker intended by the speech act). Rather, I will concentrate here on the essence of speech act, the illocutionary act.

What do illocutionary acts change? Speech-act theory has been characterized from two distinct perspectives (cf. Harnish 2005): First, the idea that the speaker expresses some attitude, like a belief or desire; for example, in an assertion, the speaker expresses a desire that the addressee believe the content. This Gricean view is prominent in Bach & Harnish (1979). Secondly, the idea that in an illocutionary act the speaker takes on certain commitments; for example, in an assertion, the speaker takes on the liability that the asserted proposition is true, which involves, for example, the obligation to provide evidence for the truth of the proposition (cf. Alston 2000).

I will follow here the second approach, for which I think there is convincing evidence. In particular, certain speaker intentions can be derived from the commitment view of speech acts, but not vice versa. First, if a speaker commits himself to a proposition, then it is likely that he has reasons to believe it to be true, otherwise it would be difficult for him to come up with evidence to support it. Secondly, public commitment to a proposition can also be construed as indicating an intention to make the addressee believe that proposition. This is due to the intersubjectivity of reasoning; if one person (the speaker) considers himself to have sufficient evidence to express public liability for a proposition, then this often can be construed as evidence for another person (the addressee). It is important to see that these attitudes concerning beliefs and intentions of the speaker are not necessary for a successful assertion. First, there are lies (the speaker knows that the asserted proposition is false), and there is bullshit (cf. Frankfurt 1986; the speaker does not have evidence for the asserted proposition). This is perhaps not a serious problem for the intentional view of assertions, as one could explain this as the speaker giving a false impression that he believes that a proposition is true. Secondly, there are assertions that explicitly express that the speaker declines interest in whether the addressee forms a belief about the proposition, cf. (3):

(3) *Believe it or not, I never cheated on you*.

(4) *#I don't believe it, but I did not cheat on you*.

One might ask, then, why assertions like (4) are self-defeating (Moore's paradox), if the expression of speaker's belief is secondary. The reason is that in this case, the speaker indicates that he does not have any grounds for the public commitment to the proposition, thus defeating this commitment itself.

5 Thanks to Hans-Martin Gärtner who directed me towards that paper.

So we take it that with an assertion, the speaker takes on commitment. This change of a commitments is momentaneous – it doesn't take time. In terms of aspectual classes (cf. Vendler 1957) it is an achievement, just as the events expressed by the verb *arrive*. A linguistic reflex of this is that explicit performatives do not occur in the progressive form, which would express ongoing events. But this refers to the illocutionary act only. The utterance act, which is part of the locutionary act, does take time. We can see the utterance act as an event by which the speaker brings about the state change, using the rules of language. Here, I will disregard utterance acts, and concentrate on illocutionary acts, which are seen as changes of commitment states.

With this exclusive representation of the illocutionary act understood as a change of commitment states, there comes one problem: What about if a speaker utters a speech act when the commitments that it could have created about already hold? One way to deal with this is to say that the repeated act has no illocutionary effect at all, as it does not entail a change of commitments. Repeated speech acts may also increase the strength of the commitments; on saying, falsely, *I did not cheat on you* several times, the speaker would commit several lies, and hence face more serious consequences. A speech act may also increase the salience of existing commitments, just as it has been proposed for discourse referents. There are various ways for dealing with this situation; here I will simply assume that speech acts that would create commitments that obtain already have no effect.

2.3. Model frames of interpretation, and the semantic interpretation language

I will assume a minimal model frame, for the purpose of a transparent exposition. We will assume four basic types, and one rule to build up complex types:

(5) Simple types:
e: entities (objects, kinds, events)
t: truth values (True and False)
s: indices (world-time-points)
c: contexts (specifying speaker c_s, addressee c_a, world-time index c_t).
Complex types:
If **σ**, **τ** are types, then **(σ)τ** is a type (functions from **σ**-entities to **τ**-entities);
if **σ** is a simple type, parentheses will be omitted.

A model contains a set of entities **E**. Entities come in different sorts, like objects, kinds, or events. The world-time indices **I** are ordered with respect to a relation ≤ of precedence. This relation is transitive and reflexive, but not total (or linear). Rather, it is left-linear (if $i' \leq i$ and $i'' \leq i$, then either $i' \leq i''$ or $i'' \leq i'$), which captures the intuition that the past is fixed but the future allows for different developments. We take < to be the corresponding irreflexive order: $i < i'$ iff $i \leq i'$ and $\neg[i' \leq i]$. We also assume for simplicity that ≤ is a discrete order, that is, for any $i < i'$ there is an i'' with $i < i'' \leq i'$ such that there is no i''' with $i < i''' < i''$; we will call i'' an immediate successor of i, and write $i \multimap i''$.

I will assume a semantic representation language with constants and variables of various semantic types, with the usual Boolean operators, with existential and universal quantifiers, and with lambda abstraction and lambda conversion.

The constants of this language will usually be specified in SMALLCAPS. The meaning of the constants of the semantic representation language is specified by an interpretation function F that assigns them to functions belonging to a type as specified in (5). For example, RUN may be a constant of type **set**, which means that F(RUN) is a meaning of this type, a function from indices to a function from entities to truth values. There are also variables of every type, whose meaning will be specified by variable assignments g, as usual. Complex expressions of this semantic representation language are assigned a meaning representation recursively. For example, if SUE is a constant of type **e**, and if i* is an index, then the expression RUN(i*)(SUE) is assigned a meaning relative to an interpreta-

tion function F and a variable assignment g, namely F(RUN)(g(i*))(F(SUE)), which informally should capture the truth value of the proposition that Sue runs, at the index i*.

Expressions of type **t** can be combined by Boolean operators ∧, ∨, ¬, →, ↔, and variable assignments can be modulated by the quantifiers ∃, ∀ and by the lambda abstractor λ, in the usual way. The interpretation function F and the set of indices **I** as structured by ≤ should be considered as interdependent, in the following sense: If one index i succeeds another one i′, then the two indices i, i′ must differ in assigning meanings to certain expressions. That is, if i′ ⊶ i, then it must hold that for at least one constant α, F(α)(i′) ≠ F(α)(i). The change from i′ to i must manifest itself in at least one semantic change, otherwise the set of indices I and the relation ≤ would be too fine-grained.

The order relation ≤ is related to a temporal order, insofar as it holds that whenever i temporally precedes i′ within one history, then it also holds that i < i′. But the other way does not hold; there may be indices i, i′ such that i < i′, but i and i′ indicate the same clock time. That is, clock time is a coarser relation than the relation <. For example, an illocutionary act may change an index i′ to an immediately succeeding index i without elapsing time. In the following, I will use the symbol ≪ to express temporal precedence, e.g. i ≪ i′

2.4. Denotational meanings: Propositional relations

We can distinguish between denotational meanings, specifying the reference and truth conditions of expressions with respect to an index (individuals and propositions), and actional meanings, resulting in the change of indices and option spaces.

Denotational meanings are generally functions from contexts to functions from indices, where pure indexicals depend only on the context, and pure non-indexicals depend only on the index of interpretation. If two such meanings ⟦α⟧, ⟦β⟧ are combined, with ⟦α⟧ the functor category, the standard extensional meaning combination rule for non-intensional constructions is λcλi[⟦α⟧(c)(i)(⟦β⟧(c)(i))], that is, the context and the index of the combined meanings are passed down to the constituent meanings. For intensional operators ⟦α⟧, the argument is the intension, ⟦β⟧(c). We can give a general type-driven rule for functional applications, as follows:

(6) ⟦α⟧(⟦β⟧) = λcλi[⟦α⟧(c)(i)(⟦β⟧(c)(i))] or λcλi[⟦α⟧(c)(i)(⟦β⟧(c))],
whichever is well-formed.

Let me illustrate the construction of denotational meanings with a simple example, the sentence *I admired Sue*. I assume that the thematic roles of the verb *admire* are filled within a constituent vP, and that temporal information is located in a category TP, where the subject moves out of the vP to SpecTP, and the verb moves to T, where it combines with the tense operator:

(7) [$_{TP}$ I_1 [$_{T'}$ [$_{T}$ *admire*$_2$-PAST [$_{vP}$ t_1 [$_{VP}$ [$_{V}$ t_2] *Sue*]]]]]

This structure is interpreted compositionally, where the moved constituents are interpreted in their underlying positions.

(8) a. ⟦*admire*⟧ = λcλiλyλx[ADMIRE(i)(y)(x)], type **cseet**
b. ⟦*Sue*⟧ = λcλi[SUE], type **cse**
c. ⟦[$_{v'}$ *admire Sue*]⟧ = λcλiλx[ADMIRE(i)(SUE)(x)], type **cset**
d. ⟦*I*⟧ = λcλi[c_s], type **cse**
e. ⟦[$_{vP}$ *I admire Sue*]⟧ = λcλi[ADMIRE(i)(SUE)(c_s)], type **cst**
f. ⟦PAST⟧ = λcλpλi′λi[i ≪ i′ ∧ p(i)], type **c(st)sst**
f. ⟦[$_{TP}$ PAST [$_{vP}$ *I admire Sue*]]⟧ = λcλi′λi[i ≪ i′ ∧ ADMIRE(i)(SUE)(c_s)], type **csst**

The result is a function from contexts c to a propositional relation between two indices i and i′, where i temporally precedes i′, and the speaker admires Sue at i. Notice that the index i′ is not set to the time c_t of the context yet, to accommodate the interpretation of tense in embedded clauses such

as *I said that I admired Sue.* The identification of i′ with c_t in assertions like *I admired Sue* will happen when the semantic object in (8) is used to perform a speech act.

2.5. Actional meanings: Assertions.

So far, we have derived a regular semantic object, a propositional relation of type **csst**. To express assertional mood, we will make use of an assertion operator, ASSERT. It takes an index i, an addressee variable y, a proposition p and a speaker variable x, and yields the value True iff at i, x is liable for the truth of the proposition p to the addressee y.

(9) ASSERT(i)(p)(y)(x)
⇔ at i, the speaker x is liable for the truth of p at the index i towards the addressee y.

Notice that ASSERT is a state predicate; it denotes the state of being liable for the truth of a proposition. The assertion of a proposition involves a change of state, namely a change from an index at which the state of having assertive commitments does not hold to one at which it does hold. The following definition introduces an operation that expresses such index changes. Here F[i] and G[i] are formulas denoting truth values depending on a free index variable i in it.

(10) i′⊸•i [F[i]]
⇔$_{def}$ i′⊸•i ∧ ¬F[i′] ∧ F[i] ∧
for all formulas G such that F and G are logically independent: G[i′] ↔ G[i]

The condition i′⊸•i [F[i]] can be rendered as: i follows i′ immediately, and i′ differs from i only insofar as the condition F holds of i′. This expresses a minimal change from i′ to i, consisting in the change of truth value of the condition F[i]. – Performing an assertion now can be described as follows:

(11) λi∃i′[i′⊸•i [ASSERT(i)(p)(y)(x)]]

This proposition is true for all indices i that differ from the immediately preceding i′ only insofar as at i, x is liable towards y for the truth of the proposition p at i. This means that the transition from i′ to i consists in the illocutionary act of assertion of the proposition p by the speaker x to the addressee y. That is, at i′, the speaker x was not liable towards the addressee y for the truth of p at i, and at i, x is liable for it.

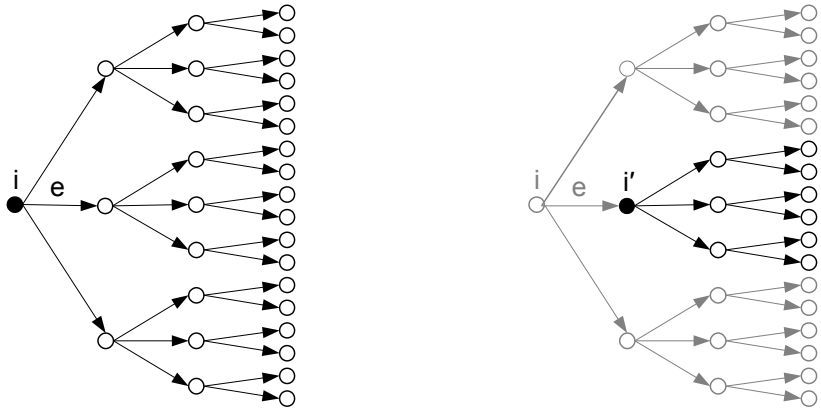
Several remarks are in order at this point. Notice, first, that this is a momentaneous transition, as i follows i′ immediately. This is similar to achievement verbs like *arrive*, which also denote momentaneous changes of states. This reflects the fact that the illocutionary act does not take up any time; a grammatical indication of this is that explicit performatives do not occur in the progressive tense (cf. **I am promising you hereby that I will come to your party*). This is different from the locutionary act, or utterance act, which may take up time, as it involves an utterance event, and to which we can refer with progressive tense – as in *I was just promising you that I will come to your party when I received an phone call from my boss.* In the current paper, I will not attempt to model utterance events, and so we can be silent about the precise causal and temporal relation between the locutionary act and the illocutionary act.

Second, as with index changes in general, the change in (11) spawns an event. This event may be referred to later in discourse – for example, it can be referred to by a pronoun, as in *That's a lie.*

Third, the definition (10) implies that the assertive commitments did not hold at i′ already. At the end of section 2.2 I have discussed possibilities to construct a change even if the assertive commitments obtained before i – as a change of saliency of the commitment, or by referring to a corresponding utterance act. Here, I just assume that in typical cases where formula (11) appears, an implicature is generated that i′ ≠ i, as otherwise the simpler formula ASSERT(i)(p)(y)(x) would have been used.

The following diagram illustrates this index change in a discrete model frame. The left-hand side shows the possible courses of history at an index i. In particular, there is one course at which an event e occurs (recall that events are not explicitly represented in the current model, but implicitly as changes between states). The right-hand side shows the possible courses of history after that event e has occurred.

(12) Possible courses at an index i Possible courses after event e has occurred



We now consider as an example the assertion of the propositional relation derived in section 2.4. I assume with Rizzi (1997) that assertion has a syntactic reflex, a category ForceP. This is the category of root clauses discussed in section 1. I assume that the ForceP is headed by a syntactic speech-act operator ASSERT and has a TP as its complement. The subject is moved to the specifier position of ForceP but is interpreted within the TP, and the tensed verb is moved to the ASSERT head but is interpreted at the head of TP. This leads to the following structure:

(13) $[_{\text{ForceP}}\ I_1\ [_{\text{Force}'}\ [_{\text{Force}}\ [\textit{admire}_2\text{-PAST}]_3\text{-ASSERT}]\ [_{\text{TP}}\ t_1\ [_{\text{T}'}\ t_3\ [_{\text{vP}}\ t_1\ [_{\text{VP}}\ t_2\ \textit{Sue}]]]]]]$

The ASSERT operator is interpreted as an operator that takes a propositional relation and changes an input index i′ to an output index i so that at the output index, there are assertive commitments of the speaker c_s towards the addressee c_a with respect to the proposition $R(c_t)$. In addition, the input index i is the index of the context c at which the sentence is interpreted.

(14) $[\![\text{ASSERT}]\!] = \lambda c \lambda R \lambda i' \iota i[c_t{=}i' \wedge i' \multimap i\ [\textsc{assert}(i)(\lambda i'' \exists i'''[R(i'')(i''')])(c_a)(c_s)]]$, type **c(sst)ss**

After plugging in the propositional relation that stands for the TP meaning, e.g. the one derived in (8), we get the following interpretation:

(15) $\lambda c[[\![\text{ASSERT}]\!](c)([\![[_{\text{TP}}\ I_1\ [\textit{admire}_2\text{-PAST}]\ [_{\text{vP}}\ t_1\ [t_2\ \textit{Sue}]]]]\!](c))]$
$= \lambda c \lambda i' \iota i[c_t{=}i' \wedge i' \multimap i\ [\textsc{assert}(i)(\lambda i'' \exists i'''[i''' \ll i'' \wedge \textsc{admire}(i''')(\textsc{sue})(c_s)])(c_a)(c_s)]]$, type **css**

For a given context c, this can be applied to the index of the context i′ and changes this minimally to the index i that differs from i′ only insofar at i′, the speaker c_s is liable towards the addressee c_a for the truth of the proposition $\lambda i'' \exists i'''[i''' \ll i'' \wedge \textsc{admire}(i''')(\textsc{sue})(c_s)]$ at i. And this proposition is true at the index i iff there was a temporally preceding index i‴ before i such that at that index i‴, Sue admired the current speaker.

It is worthwhile to have a closer look at the temporal relation between the index at which the assertive commitments arise, and the index at which the asserted proposition is said to be true. Recall that with the condition $i' \multimap i$, the change from i′ to i is momentaneous, hence i′ does not temporally precede i – it does not hold that $i' \ll i$. This means that the index i‴ in (15) at which the speaker actually admires Sue must temporally precede i′, the index representing the state of the world just before the assertive commitments arise.

One might wonder how this works out for the assertion of present tense propositions. Let us simply assume that present tense requires the identity of the two indices (cf. (16) in contrast to (8)):

(16) $[\![\text{PRES}]\!] = \lambda c \lambda P \lambda i' \lambda i [i = i' \wedge P(i)]$, type **c(st)sst**

We then get the following interpretation for the assertion *I admire Sue*:

(17) $\lambda c \lambda i' \iota i [c_t = i' \wedge i' \multimap i\ [\text{ASSERT}(i)(\lambda i''[\text{ADMIRE}(i'')(\text{SUE})(c_s)])(c_a)(c_s)]]$, type **css**

In this case the assertive commitment that arises at i is that the proposition 'the speaker admires Sue' is true at i. Now, recall that according to (10) the only proposition in which i′ and i differ is that in i, the speaker has the assertive commitment that the proposition that he admires Sue is true at i. The proposition that the speaker admires Sue is logically independent from that, and hence it has to be true already at i′.

There are other illocutionary operators besides ASSERT, e.g. for commands and for questions. They differ in the semantic type of function that they take as an argument. For example, the question operator can be analyzed as taking sets of propositions as arguments, the Hamblin meaning of questions. Hence, the sentence radical of a a question is not a proposition, but a set of propositions. With a question, the speaker puts the addressee under the obligation to make an assertion that identifies one of the propositions in the meaning of the sentence radical. In spite of such differences, speech acts can, in general, be assumed to have the same semantic type, css, contextualized functions from indices to indices.

2.6. Speech act reports

We have seen how the ASSERT operator, which expresses assertive commitments, can be used to formulate the illocutionary operator of assertion. It also can be applied to express the report of assertions. We can assume that ASSERT is part of the meaning of speech-act verbs like *tell* in examples like *I told you that I admired Sue.* (18) gives the essential meaning component of *tell*, with three arguments, a proposition p, a direct object y for the addressee, and a subject x for the speaker of the reported assertion.

(18) $[\![\textit{tell}]\!] = \lambda c \lambda i \lambda p \lambda y \lambda x \exists i'[i' \multimap i\ [\text{ASSERT}(i)(p)(y)(x)]]$, type **cs(st)eet**

The proposition p is specified by a *that* clause, which turns a propositional relation like (8) into a proposition:

(19) a. $[\![\textit{that}]\!] = \lambda c \lambda R \lambda i \exists i'[R(i)(i')]$, type **c(sst)st**

b. $[\![[_{\text{CP}}\ \textit{that}\ [_{\text{TP}}\ I_1\ [\textit{admire}_2\text{-PAST}]\ [_{\text{vP}}\ t_1\ [t_2\ \textit{Sue}]]]]]\!]$
$= \lambda c[[\![\textit{that}]\!](c)([\![[_{\text{TP}}\ I_1\ [\textit{admire}_2\text{-PAST}]\ [_{\text{vP}}\ t_1\ [t_2\ \textit{Sue}]]]]\!](c))]$
$= \lambda c \lambda i \exists i'[i' \ll i \wedge \text{ADMIRE}(i')(\text{SUE})(c_s)]$, type **cst**

This contextualized proposition can fill the p argument of (18), as illustrated below:

(20) $[\![[_{\text{vP}}\ \textit{John}\ [_{\text{VP}}[_{\text{V'}}\ [_{\text{V}}\ \textit{tell}]\ \textit{Mary}]\ [_{\text{CP}}\ \textit{that}\ [_{\text{TP}}\ \textit{I admired Sue}]]]]]\!]$
$= \lambda c \lambda i[[\![\textit{tell}]\!](c)(i)([\![\textit{Mary}]\!](c)(i))([\![\textit{that I admired Sue}]\!](c))([\![\textit{John}]\!](c)(i))]$
$= \lambda c \lambda i \exists i'[i' \multimap i\ [\text{ASSERT}(i)(\lambda i'' \exists i'''[i''' \ll i'' \wedge \text{ADMIRE}(i''')(\text{SUE})(c_s)])(\text{MARY})(\text{JOHN})]$

The resulting proposition applies to indices i that originate from an immediately preceding index i′, where i differs from i′ insofar as John is liable towards Mary for the truth of the proposition that there is an index i‴ preceding i such that at i‴, the current speaker admires Sue. Notice that applying tense, like past tense, will shift the index i to the past of the context time for *John told Mary that I admired Sue*, and that the resulting propositional relation can itself be asserted.

The current analysis captures the reading under which John told Mary something like *He admired Sue*, referring with *he* to the speaker of c in (20). For the reading in which John said something like *He admires Sue*, past tense just shows agreement with past tense in the main clause (cf. Ogihara 2007). This can be expressed by the past tense variant in (21) that forces the two indices i and i′ to

be identical, and restricts them to being past the context index c_t. This results in (22) as the interpretation of (20).

(21) $[\![\text{PAST}_{agr}]\!] = \lambda c \lambda P \lambda i' \lambda i . i \ll c_t [i = i' \wedge P(i)]$, type **c(st)sst**

(22) $\lambda c \lambda i \exists i' [i' \multimap i\ [\textsc{assert}(i)(\lambda i'' \exists i''' . i''' \ll c_t [i''' = i'' \wedge \textsc{admire}(i''')(\textsc{sue})(c_s)])(\textsc{mary})(\textsc{john})]$

Now this proposition applies to i iff i results from an i′ by John expressing assertive commitments towards Mary that the proposition that the speaker admires Sue is true at the index i itself.

2.7. Explicit performative speech acts

Speech-act verbs like *tell* can also be used in explicit performative speech acts, as in *I hereby promise to come*, or – to stick with one example – in (23):

(23) I hereby tell you that I admired Sue.

One analysis of such cases is to assume an illocutionary operator PERFORM as the operator of the ForceP that applies to a propositional relation R. Just like other operators, it changes the commitments of participants; the type of change is expressed by the proposition, here 'speaker tells addressee that speaker admired Sue'. We have the following structure:

(24) $[_{\text{ForceP}}\ I_1\ [_{\text{Force}'}\ [_{\text{Force}}\ [\textit{tell}_3\text{-PRES}]_2\ \text{PERFORM}\ ]\ [_{\text{TP}}\ t_1\ [_{\text{T}'}\ [_{\text{T}}\ t_2]\ [_{\text{vP}}\ t_1\ [_{\text{VP}}\ [_{\text{V}}\ t_3]\ [_{\text{DP}}\ \textit{you}]$
$[_{\text{CP}}\ \textit{that I admired Sue}]]]]]]]]$

The PERFORM operator is similar to the ASSERT operator defined in (14), except that it does not specify the nature of the commitment of the speaker. Rather, this is given by the propositional relation R that it expresses: It states that the input index i′ changes minimally to i such that the embedded propositional relation holds.

(25) $[\![\text{PERFORM}]\!] = \lambda c \lambda R \lambda i' \iota i [i' = c_t \wedge i' \multimap i\ [\exists i'' R(i)(i'')]]$

The propositional relation expressed by the TP *I tell you that I admired Sue* should be rendered as follows, where present tense is expressed by identity of the indices i and i′, as in (16):

(26) $\lambda c \lambda i \lambda i'' [i = i'' \wedge \exists i''' [i''' \multimap i''\ [\textsc{assert}(i'')(\lambda i'''' \exists i'''' [i'''' \ll i'''' \wedge \textsc{admire}(i'''')(\textsc{sue})(c_s)])(c_a)(c_s)]]]$

After application of the meaning of PERFORM to that propositional relation we get the following result, simplified due to the condition $i = i''$:

(27) $\lambda c \lambda i' \iota i [i' = c_t \wedge i' \multimap i\ [\textsc{assert}(i)(\lambda i'''' \exists i'''' [i'''' \ll i'''' \wedge \textsc{admire}(i'''')(\textsc{sue})(c_s)])(c_a)(c_s)]]]$

Notice that this is the same function as the simple assertion, (15). Hence, the explicit performative based on the assertive verb *tell* in (23) and the assertion lead to the same result.

The PERFORM operator can be used for explicit performatives in general, for example in cases like *I promise you to come*, or *I ask you whether you were at home*, but also *The meeting is hereby opened.* A general precondition is that the context is such that the required index change can be performed by a simple utterance. To take up an example by Searle, this is not possible for *I hereby fry an egg.* A full account of explicit performatives would also have to make reference to the locutionary act as a cause of the index change, as expressed by *hereby*.

2.8. Illocutionary acts in conversation

The notion of an illocutionary act that we have derived so far should properly be called an "illocutionary act potential" – a function that, relative to a context, maps the index of the context to an index. What happens when such an illocutionary act potential of type **css** as in (15) is applied to, or performed at, a particular context.

Contexts specify a speaker, an addressee, and a world-time index of the utterance. Hence, contexts c can be modeled as triples $\langle c_s, c_a, c_t \rangle$. A speech act applied to such a context results in a new context in which the speaker and the addressee are the same (we do not model turn-taking here), but the

world-time index is changed by the speech act. We write c + A for the update of a context by the speech act A:

(28) $c + A = \langle c_s, c_a, A(c)(c_t)\rangle$

For example, the performance of (15) at a context c will have the following result:

(29) $c + (15) = \langle c_s, c_a, (15)(c)(c_t)\rangle$

The resulting context differs from c insofar as its world/time index $(15)(c)(c_t)$ differs from c_t minimally insofar as c_s is liable towards c_a for the truth of the asserted proposition that c_s admired Sue at the index c_t (which means in this case that the proposition must have been true already immediately before c_t).

The suggested way of modeling does not capture that the asserted proposition becomes part of the common ground of the participants. One way to model common grounds is to assume, as context, a triple $\langle c_s, c_a, C_t\rangle$, where C_t is a set of world-time indices that are candidates for the actual world/time index at the current point of conversation. Update of a context by a speech act A then is pointwise update:

(30) $\langle c_s, c_a, C_t\rangle + A = \langle c_s, c_a, \{\langle c_s. c_a, i\rangle + A \mid i \in C_t\}\rangle$

In this way, the common ground C_t captures the liabilities for propositions, not the propositions themselves that may become part of the common ground if the addressee does not object against an assertion. As the focus of this paper is on embedded speech acts, I will not develop a model here to capture such aspects of common ground development.

This concludes the overview of a semantic account of speech acts. One important addition, argued for in Cohen & Krifka (to appear), is to consider as common grounds not just the candidates for the actual index c_t, but also the possible future developments. This is because certain speech acts cannot be expressed as transitions from an index to another index, but rather as excluding possible transitions in the future. One example is denegation of speech acts, as in *I don't promise to come*, which is properly analyzed as an elimination of promises to come in the future. However, for the purpose of this paper we will disregard such types of speech acts, and concentrate on those that can be modeled by a simple change of commitments.

3. Embedding of speech acts

3.1. Preliminaries

In the preceding sections, we differentiated between describing situations in which speech acts occurred, and the performance of speech acts. In particular, we distinguished between context-dependent propositions, type **cst**, which are evaluated at an index i, yielding a truth value, and illocutinary act potentials, type **css**, which map an index to another index. In terms of dynamic semantics, propositions test an index whereas illocutionary acts change an index.

We can now see why illocutionary act potentials often resist syntactic recursion. Linguistic expressions typically denote functions that, when their arguments are supplied, refer to entities (then their type ends in **e**) or describe state of affairs (then their type ends in **t**). Only rarely do they change the world. If we disregard ancient magical spells or modern speech-driven user interfaces, the ability for utterances to change the world is limited to expressing commitments and obligations in the right circumstances. As Searle once remarked, the speech act *I hereby fry an egg* does not work; what might work is to commit an addressee to fry an egg by *I hereby order you to fry an egg.*

Creating commitments can be seen as the ultimate goal of typical linguistic activity, and linguistic rules are typically used to define these commitments, with the help of expressions that are interpreted as functions on object-related or truth-related expressions. So, it is not astonishing that these

ultimate goals, the creation of commitments, are typically not fed back into the rules to form even more complex expressions.

However, this does not exclude that linguistic expressions that create commitments are sometimes used to build up more complex expressions. And the model developed in the previous section 2 allows us to explain how semantic operators can be applied to illocutionary acts. Crucially, illocutionary act potentials are meanings of a particular type, **css**, and it should be possible, in principle, that operators take such functions as arguments. In the current section, I will turn to such functions as illustrative examples to make this point. First, I will discuss the embedding of speech acts by speech act denoting predicates like *tell*. Secondly, we will discuss speech act adverbials like *frankly*. Finally, we will have a look at conditionals of the type *In case you are hungry, there are biscuits on the counter.*

3.2. Speech acts as arguments: Direct speech

We can distinguish between different subtypes of embedding speech act related meanings. First, there is direct speech. Direct speech often is understood as a verbatim representation of what has been said, with a full shift of first and second person pronoun and other context-sensitive expressions from reference to the current speaker and addressee to the speaker and addressee of the reported speech act. However, verbatim representation is not required for direct quotes – for example, direct speech can be translated:

(31) a. John, to Mary: *Ich bewundere Sue.*
b. *John said to Mary "I admire Sue."*

This liberal use of direct speech is defended in Thucydides' *Peloponnesian War*: "... so my habit has been to make the speakers say what was in my opinion demanded of them by the various occasions, of course adhering as closely as possible to the general sense of what they really said." So, it seems that there are two conventions for direct speech, one literal, and one liberal. For the liberal use it is sufficient that the utterance cited would result in the same commitments as the original utterance. The embedding predicate may favor one or the other interpretation; for example, verbs of manner of speaking like *whisper* specify properties of the utterance act, hence their direct speech argument will be interpreted more literally.

Direct speech should be treated as embedding a locutionary act. In the current paper, I focus on illocutionary acts, and so I will not provide for a model of locutionary or utterance acts that are related to illocutionary acts. As a consequence, I can provide just for a rough sketch of how direct speech can be treated. I will concentrate here on the more liberal variety of direct speech; for the literal variety, we must simply assume that the linguistic form of the original utterance is reproduced.

Liberal direct speech can be understood in the following way. Assume that there is a type **u** of utterance types (as contrasted to utterance tokens). The objects in type **u** are related to illocutionary acts of type **css** by the rules of a language. For example, the utterance types *Ich bewundere Sue* and *I admire Sue* are related to the illocutionary act derived in (15) by the rules of German and English, respectively. If the assertion reported in (31)(a) happened, then John assumed liability with respect to Mary for the proposition that he, John, admires Sue. This assumption of liability can be reported by (31)(b), which has to be analyzed as follows: John performed a speech act towards Mary as the addressee which leads to the commitment that is conventionality associated by the utterance of the token *I admire Sue*, with John as a speaker and Mary as an addressee. So, the utterance type that is the complement of *said* is just a way to identify the illocutionary act that is denoted by that utterance type.

3.3. Speech acts as arguments: Indirect speech

Putting direct speech aside, there are two further uses of *tell* to be considered. In one, *tell* subcategorizes for a *that*-clause, in the other, for a root clause:

(32) a. *John told Mary that he admired Sue.*
b. *John told Mary he admires Sue.*

In the case of (32)(a), *tell* simply embeds a proposition; we have dealt with this case in section 2.6. We concentrate here on (b). It might be argued that this is nothing but a simplified form of (a) that lacks an overt complementizer. But the root property is evident in German, where we find verb-second syntax characteristic for root clauses (cf. Reis 1996):[6]

(33) a. *John sagte zu Mary, dass er Sue bewunderte.*
b. *John sagte zu Mary, er bewundert Sue.*

I would like to propose that the embedded clause *he admires Sue*, or German *er bewundert Sue*, differs semantically from both direct speech, *"I admire Sue"* and from a *that*-clause, *that he admired Sue.* It neither denotes an utterance type, nor a proposition, but an illocutionary act of type **css** that can be taken as an argument by *tell* (or *sagen*, in German).

Embedded illocutionary acts require a slight formal modification, as speaker and addressee of the embedded act are specified by way of the embedding clause, and not as the speaker and addressee of the complex sentence. For this reason we assume instead of (14) the meaning (34) for the assertion operator of embedded clauses, where x stands for the speaker and y for the addressee.

(34) $[\![\text{ASSERT}']\!] = \lambda c\lambda R\lambda y\lambda x\lambda i'\iota i[i' \multimap i\ [\textsc{assert}(i)(\lambda i''\exists i'''[R(i'')(i''')])(y)(x)]]$,
type **c(sst)eess**

When applied to the meaning of the TP *he admires Sue*, with an agreeing present tense operator, the propositional relation in (35), we get the interpretation in (36), where binding of the subject pronoun *he* to the speaker of the speech act x is assumed without specification of an explicit mechanism, for simplicity.

(35) $[\![[_{\text{TP}}\ he_1\ [_{\text{T}'}\ admire_2\text{-PRES}\ [_{\text{vP}}\ t_1\ [t_2\ Sue]]]]]\!] = \lambda c\lambda i'''\lambda i''[i''=i''' \wedge \textsc{admire}(i'')(\textsc{sue})(x)]$, type **csst**

(36) $[\![[_{\text{ForceP}}\ he_1\ [_{\text{Force}'}\ [_{\text{Force}}\ [admire_2\text{-PRES}]_3\text{-ASSERT}']\ [_{\text{TP}}\ t_1\ [_{\text{T}'}\ t_3\ [_{\text{vP}}\ t_1\ [t_2\ Sue]]]]]]]\!]$
$= \lambda c[(34)(c)((35)(c))]$
$= \lambda c\lambda y\lambda x\lambda i'\iota i[i' \multimap i\ [\textsc{assert}(i)(\lambda i''[\textsc{admire}(i'')(\textsc{sue})(x)])(y)(x)]]$, type **ceess**

The verb *tell*, in the version that takes an illocutionary act type as an argument, specifies the y and x argument as identical to its direct object and its subject. It does not do much else than that except that it restricts the embedded illocutionary act to assertions (forms like *John told Mary to come* and *John told Mary who came* do not embed illocutionary acts). The meaning of *tell* as taking an illocutionary act can be represented as in in (37), where the sortal restriction to assertions is expressed as a restriction for the illocutionary act argument A. When combined with its arguments and a past tense operator, we get the propositional relation (38).

(37) $[\![tell]\!] = \lambda c\lambda i\lambda A{:}\text{Assertion}\ \lambda y\lambda x\exists i'[i = A(y)(x)(i')]$, type **cs(eess)eet**

(38) $[\![[_{\text{TP}}\ John_4\ [_{\text{T}'}\ tell_5\text{-PAST}]\ [_{\text{vP}}\ t_4\ [_{\text{VP}}\ t_5\ Mary\ [_{\text{ForceP}}\ he\ admires\ Sue]]]]\!]$
$= \lambda c\lambda i\lambda i'''[i \ll i''' \wedge \exists i'[i = \iota i[i' \multimap i\ [\textsc{assert}(i)(\lambda i''[\textsc{admire}(i'')(\textsc{sue})(\textsc{john})])(\textsc{mary})(\textsc{john})]]]]$

The index i (which temporally precedes the index i‴, due to the past operator) qualifies for this description if there is an index i′ such that i is that index that minimally differs from i′ insofar John takes on liability with respect to Mary that the proposition that he, John, admires Sue is true at the index i. That is, the index i results from an assertion of John to Mary that he, John, admires Sue.

6 In addition, there is a subjunctive form (Konjunktiv I) with special morphology that can be used: *Maria sagte, dass sie John hasse* and *Maria sagte, sie hasse John.* It generally indicates a speaker different from the speaker of the utterance context.

The resulting meaning is similar to the meaning of the proposition-embedding clause *John told Mary that he admired Sue* derived in (20). In that use, the verb *tell* expresses that an illocutionary act of the type of assertion happens. In the speechact-embedding form (37), the verb *tell* does not denote such a speech act, but subcategorizes for this kind of speech act as its argument.

3.4. The range of embedding predicates

Hooper & Thompson (1973) discuss five types of clause-embedding predicates, three of which allow for embedded root clauses. Meinunger (2006) lists four (or five) classes of verbs that allow for embedded V2 in German, and five classes that do not. It is not possible here to discuss the full range of these predicate types in the current paper.

One class that definitely allows for embedded root clauses are verbs of saying. Hooper & Thompson do not mention *tell*, but they have verbs like *say, announce, exclaim, vow* etc. They can be treated similar to *tell*, and differ insofar as they express subtypes of assertions with different restrictions on the asserted proposition, on the kind of commitments, and perhaps other aspects (cf. Searle & Vanderveken 1985 and Vanderveken 1990 for one theory on the dimensions in which verbs expressing speech acts can differ). These verbs can be used with the same meaning in explicit performatives, as in *I hereby vow that...*

We would now have to go through other clause-embedding predicates and check whether the idea that subcategorized root clauses denote speech acts makes sense. Not every case discussed in Hooper & Thompson (1973) will qualify for that. For example, they also list predicates like *it's true* or *it's obvious* in their "A" class, which do not report on speech acts. One could perhaps propose that *it's true* subcategorizes for an assertion A expressed by a root clause, with the meaning that the speaker considers A to be assertable because its sentence radical is obviously true. As another example, in German verbs like *glauben* 'believe' and *denken* 'think' allow for verb-second embedded clauses (and also for root-clause phenomena in English). As these verbs do not express speech acts but propositional attitudes, this is in conflict with the idea that root clauses always express speech acts. However, we may say that a propositional attitude can be characterized by a speech act that an agent would utter if the agent has that propositional attitude. If Mary believes that Bill is at school, then she is willing to assert that Bill is at school, and hence *believe* can subcategorize for such an assertion.

One interesting class are question-embedding predicates. In Krifka (1999), I have argued that they fall into two classes: Those that embed question sentence radicals, like *know* and also *tell*, and those that embed question speech acts, like *wonder*.[7] This distinction corresponds to the distinction of predicates that embed question extensions vs. intensions in Groenendijk & Stokhof (1984). McCloskey (2005) has pointed out that *wonder*, *ask* and certain other question-embedding verbs, but not verbs like *know* or *find out*, allow for main clause syntax, at least in some varieties of English, especially Irish English. As an example, consider the following quote of James Joyces *Dubliners*:

(39) *The baritone was asked what did he think of Mrs. Kearney's conduct*.

In German, verbs like *sich fragen* 'wonder' allow for root modal particles like *denn*:

(40) a. *John weiß, wen Maria* (**denn*) *getroffen hat.*
b. *John fragt sich, wen Maria* (*denn*) *getroffen hat.*
'John knows / wonders whom Maria PART met'

7 In Krifka (2001) I assumed that both types of verbs embed question acts, but that verbs like *know* type-shift this question act to the set of true answers. This was designed to handle certain phenomena relating to quantification into embedded questions. Now, and even in 2001, I see advantages of the proposal of Krifka (1999); cf. also McCloskey (2005).

This can be taken as evidence that predicates like *ask* and *wonder* embed interrogative illocutionary acts, just as *tell* can embed assertive illocutionary acts.

3.5. Other uses of indirect speech: Proxy speech acts

The current proposal differs from Meinunger (2006), who assumes that in cases with root clauses as arguments to predicates, the embedding clause and the embedded clause are paratactically combined, and that this combination forms the sentence radical of an illocutionary operator. With this, Meinunger wants to express that in cases like (41) the proposition of the embedded clause, 'Laura is pregnant', is asserted to be part of Dirk's belief world, but is also asserted by the speaker.

(41) *Dirk meint, Laura ist schwanger.*
'Dirk claims, Laura is pregnant'
a. Asserted: Dirk made the claim that Laura is pregnant.
b. Asserted: Laura is pregnant.

With his interpretation, Meinunger captures the intuition of Hooper & Thompson (1973) that such sentences have a reading in which the embedded clause expresses the main assertion of the sentence, and the embedded clause is interpreted like a parenthetical clause. This interpretation is particularly obvious with first person subjects as in (42), which does not report a thought but rather an assertion with a somewhat reduced commitment for the proposition, by specifying the kind of evidence for the truth of the asserted proposition.

(42) *I think it just started to rain.*

But this interpretation also obtains for sentences with third person subjects, as in (43):

(43) *The weather report said there will be rain.*

I would like to propose that the intuition that the embedded clause expresses the main assertion derives from a plausible pragmatic inference, and is not part of the semantic representation of such sentences. What (43) says can be expressed according to the lines developed for (38): *say* embeds an assertive speech act that is ascribed to the weather report, and the proposition that the weather report made this assertion is itself asserted by the current speaker. But the impact of this, if the subject of the sentence is a trusted source, is that the content of the embedded assertion becomes part of the common ground. Of course, the speaker assumes that he himself is a trusted source, and hence this effect obtains in particular with first person subjects. With third person subjects, it is as if the speaker invites another person into the communication; the speaker acts as a proxy for that other source. The reason for this move is that otherwise it would not be relevant to add the commitments of third person sources to the common ground.

We have seen that cases with embedded root clauses and cases with embedded *that* clauses end up having a similar meaning. As a consequence, we should expect such proxy speech act uses also for embedded *that* clauses. And indeed, it is possible to insert *that* in (42) and (43) without necessarily changing the conditions under which these sentences can be used.

3.6. Adverbials modifying illocutionary acts

We now turn from illocutionary acts as arguments of predicates to illocutionary acts as targets of modifiers, like *frankly*. One of the main arguments for the performative analysis were adverbials that appear to attach to the performative prefix, as the following example and its paraphrase suggest (cf. Schreiber 1972, Davison 1973, Sadock 1974 for early literature on the phenomenon, and Mittwoch 1977 for an early critical view).

(44) *Your tie and shirt frankly don't go together.*
'I tell you frankly [that your tie and shirt don't go together].'

Such adverbs can be used in a descriptive way, as in the following example:

(45) a. *Mary told Bill frankly that his tie and shirt didn't go together.*
b. *Mary frankly told Bill that his tie and shirt didn't go together*.

The two possible positions in the descriptive use lead to meaning differences, the lower position expressing that the way the act was carried out was frank, and the higher position expressing that the choice to carry out the act was carried out was frank (cf. McConell-Ginet 1982, Shaer 2003). These two positions have been captured by differentiating within the VP between an outer layer with a DO phrase that relates the agentive subject to an inner vp that expresses a property change. The structures in question then would be syntactically represented as follows:

(46) a. [$_{vP}$ *Mary* [$_{v'}$ DO [$_{VP}$ [$_{VP}$ *tell Bill*] *frankly* ...]]]]
b. [$_{vP}$ *Mary* [$_{v'}$ *frankly* [$_{v'}$ DO [$_{VP}$ *tell Bill* ...]]]]

It is the second sense that parallels the speechact-related use. In the following, I will not assume a DO in semantic representations and assume that *frankly* is a modifier of VP even in the reading of (45)(b).

We start with an example of the descriptive use of *frankly*, which has the interpretation (47), where FRANK(i)(R)(x) states that to carry out the action denoted by R is a frank action by x. As this information is presupposed, it appears as a restriction of the function.

(47) $[\![\textit{frankly}]\!] = \lambda c \lambda R \lambda i \lambda x{:}\,\text{FRANK}(i)(R)(x)[R(i)(x)]$, type **c(set)set**

After applying this meaning to the meaning of the VP in (48) and the meaning of the subject DP, *John*, we arrive at the non-tensed proposition (49).

(48) $[\![[_{VP}\ \textit{tell Mary}\ [_{CP}\ \textit{that I admired Sue}]]]\!]$
$= \lambda c \lambda i \lambda x \exists i'[i' \multimap i\ [\text{ASSERT}(i)(\lambda i'' \exists i'''[i''' \ll i'' \wedge \text{ADMIRE}(i''')(\text{SUE})(c_s)])(\text{MARY})(x)]$, type **cset**

(49) $[\![[_{vP}\ \textit{John}\ [_{VP}\ \textit{frankly}\ [_{VP}\ \textit{tell Mary}\ [_{CP}\ \textit{that I admired Sue}]]]]]\!]$
$= \lambda c \lambda i{:}\,\text{FRANK}(i)((48)(c))(\text{JOHN})[(48)(c)(i)(\text{JOHN})]$, type **cst**

This maps contexts c and indices i to truth values provided that the assertion by John to Mary that the speaker at c was frank at i – e.g., because it violates certain norms of secrecy or politeness. Notice that if this act is considered frank at i, then it also must already be considered frank at the index i′ immediately preceding i, the index at which the assertion is uttered. If defined, it maps c and i to truth iff i is the resulting index after John asserted to Mary that the speaker in C admired Sue.

The use of *frankly* as speech act adverbial can easily be derived from its descriptive use in (47). Recall that we derived for the assertion *I admired Sue* the following meaning, cf. (15):

(50) $[\![[_{\text{ForceP}}\ I_1\ [[\textit{admire}_2\text{-PAST}]_3\ \text{ASSERT}\ [_{TP}\ t_1\ [t_3\ [_{vP}\ t_1\ [t_2\ \textit{Sue}]]]]]]]\!]$
$= \lambda c \lambda i' \lambda i[c_t{=}i' \wedge i' \multimap i\ [\text{ASSERT}(i)(\lambda i'' \exists i'''[i''' \ll i'' \wedge \text{ADMIRE}(i''')(\text{SUE})(c_s)])(c_a)(c_s)]]$, type **css**

The meaning of the speech act adverbial *frankly* then can be specified as in (51). It restricts the input index i′ of the illocutionary act A to those for which it is frank to perform A by the speaker of the context, c_s. When combined with the illocutionary act in Error: Reference source not found we get the result in (52), which contains the presupposition that it is frank for the speaker to assert that he admires Sue. Otherwise, the meaning of the illocutionary act Error: Reference source not found stays the same.

(51) $[\![\textit{frankly}']\!] = \lambda c \lambda A \lambda i'{:}\,\text{FRANK}'(i')(A)[A(i')]$, type **c(ss)ss**

(52) $[\![[_{\text{ForceP}}\ \textit{frankly}'\ [_{\text{ForceP}}\ \textit{I admire Sue}]]]\!]$
$= \lambda c[[\![\textit{frankly}']\!](c)([\![[_{\text{ForceP}}\ \textit{I admire Sue}]]\!](c))]$
$= \lambda c \lambda i'{:}\,\text{FRANK}'(i')(\text{Error: Reference source not found}(c)))[\text{Error: Reference source not found}(c)(i')]$

Thus, the speech act adverbial *frankly* is essentially similar to the adverb *frankly* in its descriptive use. The descriptive adverbial takes a VP meaning **set** and yields another VP meaning; the speech

act adverbial takes an illocutionary act meaning **ss** and yields another act meaning. In either case, the non-at-issue meaning is expressed that the action performed was a frank one.

3.7. Conditional Speech Acts

We will finally look at illocutionary acts that are dependent on a conditional clause, a type of conditionals that Austin (1961) drew attention to.

(53) *If you want biscuits, there are some on the side board.*

This type of conditional does not relate to truth conditions; the biscuits would be on the side board even if the addressee did not want them. Such examples have been analyzed as involving speech acts in the consequent of the conditional, e.g. by DeRose & Grandy (1999), or by Siegel (2006), who assumed a quantification over "potential" speech acts. The example can be taken to mean 'For all indices at which you have the desire for biscuits, the speaker asserts that there are some on the sideboard'. Conditional speech acts are not restricted to assertions, as the following examples with conditionalized questions, commands and explicit performatives show:

(54) a. *If I want biscuits, where can I find them?*
b. *If she wants biscuits, give her some.*
c. *If you want biscuits, I promise you that there are some on the side board.*

In the present format, Austinian conditionals can be treated as a straightforward combination of the semantics of *if* clauses and the semantics of illocutionary operators.

We assume a standard semantics of conditional clauses, as expressing a quantification over indices that are accessible via a particular accessibility relation. To be specific, the conditional clause expresses a modal quantification over indices, and the *if* clause specifies the restrictor of this quantifier. The essential steps in a truth-related conditional are given in (55): (a) specifies the meaning of the propositional relation *it is warm*, and (b) the constituent C′ that contains a non-overt universal modal quantifier (which can be expressed overtly, by *must*). Here, AR stands for the accessibility relation, here an epistemic relation based on general meteorological knowledge. The next line, (c), gives the meaning of the *if* clause, a proposition, and (d) gives the full structure of a conditional CP, where the *if* clause expresses a condition for the indices i″ to be quantified over. The resulting propositional meaning can be asserted.

(55) a. $[\![[_{TP}\ \textit{it is warm}]]\!] = \lambda c \lambda i' \lambda i[i' = i \wedge \textsc{warm}(i)]$
b. $[\![[_{C'}\ \text{MUST}\ [_{TP}\ \textit{it is warm}]]]\!] = \lambda c \lambda p \lambda i' \lambda i \forall i'' \in \text{AR}(i).p(i'')[\textsc{warm}(i'')]$
c. $[\![[_{CP}\ \textit{if}\ [_{TP}\ \textit{the sun shines}]]]\!] = \lambda c \lambda i[\textsc{sunshine}(i)]$
d. $[\![[_{CP}\ [_{CP}\ \textit{if the sun shines}]\ [_{C'}\ \text{MOD}\ [_{TP}\ \textit{it is warm}]]]]\!]$
$= \lambda c \lambda i' \lambda i \forall i'' \in \text{AR}(i).\textsc{sunshine}(i'')[\textsc{warm}(i'')]$

With Austinian conditionals, the conditionalization does not happen at the propositional level (TP and CP), but at the illocutionary level, FP. We assume here that Austinian conditionals do not express a modal quantification, but that the *if* clause just expresses a restriction on the input index.

(56) a. $[\![[_{FP}\ \text{ASSERT}\ [_{TP}\ \textit{there are biscuits}]]]\!]$
$= \lambda c \lambda i' u i[i' \multimap i\ [\textsc{assert}(i)(\lambda i''[\textsc{there-are-biscuits}(i'')])(c_a)(c_s)]]]$
b. $[\![[_{F'}\ [_{FP}\ \text{ASSERT}\ [_{TP}\ \textit{there are biscuits}]]]]\!]$
$= \lambda c \lambda p \lambda i'.p(i')\ u i[i' \multimap i\ [\textsc{assert}(i)(\lambda i''[\textsc{there-are-biscuits}(i'')])(c_a)(c_s)]]$
c. $[\![[_{CP}\ \textit{if you are hungry}]]\!] = \lambda c \lambda i[\textsc{hungry}(i)(c_a)]$
b. $[\![[_{FP}\ [_{CP}\ \textit{if you are hungry}]\ [_{FP}\ \text{ASSERT}\ [_{TP}\ \textit{there are biscuits}]]]]\!]$
$= \lambda c \lambda i'.[\textsc{hungry}(i')(c_a)]\ u i[i' \multimap i\ [\textsc{assert}(i)(\lambda i[\textsc{there-are-biscuits}(i)])(c_a)(c_s)]]]$

The resulting illocutionary act can be applied only to those indices i′ at which the condition holds that the addressee c_a is hungry. If applicable, it changes that index to one in which the speaker c_s has assertive commitment towards the proposition that there are biscuits (which can be constructed as

an indirect speech act that the addressee may eat them). If not applicable because the addressee happens to be not hungry, then nothing will change, that is, the assertion is not made. If, as discussed in section 2.8, an illocutionary act is performed with respect to a set of indices, a common ground, then the assertion will only hold at those indices of the common ground at which the addressee is hungry. This is because at other indices, the assertion that there are biscuits would violate the pragmatic conditions of relevance.

4. Conclusion

To sum up: The goal of this paper was to develop a theory that allows for speech acts, and in particular illocutionary acts, to be acted upon by semantic operators, thus folding apparently pragmatic phenomena back into semantics. This is of considerable relevance for the topic of recursion, as it shows how an apparently semantically motivated restriction against recursion – the ban against embedding of speech acts – does not obtain. Once we have found proper semantic types for illocutionary acts, nothing prevents, in principle, the assumption of operators that take such types as arguments. This allows to treat illocutionary acts as arguments of predicates, and as the target of modifiers. It also allows for illocutionary acts to be subject to operations like conjunction, disjunction and negation, but these operators were not in the focus of this paper (cf. Krifka 2001, Cohen & Krifka to appear).

The critical step in designing illocutionary acts as semantic objects was to get away from the static, propositional view in previous literature, e.g. Lewis (1970) and Vanderveken (1990). The dynamic view proposed in Szabolcsi (1982), in which they change indices, was essential to capture their potential as actions, and to make them accessible to semantic operators. To vary a quote that is still displayed, in golden letters, at a prominent place in my university: Semantic operators have hitherto been seen as evaluating the world; the point is that some of them are also able to change it.

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