Speech Acts and Pragmatics in Sentence Generation

by

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Abstract

A fundamental advance in recent theories about natural language pragmatics involves the realization that people use language not just to describe propositions, but also to perform actions. This idea can be taken as a given starting point for investigating the questions: how are linguistic actions, or *speech acts*, performed and understood? How far can descriptions, as locutions, be used as speech acts? What role does inference play in the performance and understanding of speech acts?

Many previous theories of speech acts have taken speech acts to be independent and primitive units of communication, implicit in, but separate from, description and inference. In this thesis, I argue for an alternative model of speech acts. I propose that speech acts can be explained by a combination of description and inference, without the requirement of separate conventions. This explanation relies instead on an account of explicit linguistic units, including clausal moods and performative verbs, in addition to the inferential mechanism provided by Gricean conversational implicature.

In addition to outlining a model for the description and comparison of speech acts, I present a small sentence generator that partially implements the model, and discuss how it can be enhanced in future. Also, I illustrate the relevance of this model for a current computational theory of syntactic style. My model of speech acts suggests how this computational stylistic theory can be extended into the areas of semantic style and lexical style.

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Chapter 1

Introduction

Conversation, *n.* A fair for the display of the minor mental commodities, each exhibitor being too intent upon the arrangement of his own wares to observe those of his neighbor.

Ambrose Bierce, The Devil's Dictionary

1.1 Motivation

A theory of speech acts, simply put, is a theory about what people set out to accomplish when they choose to speak. A convenient way to think about such accomplishments is to think about the acts people perform when they utter a sentence. However, it is difficult to see how such acts could be described. Yet a description of these acts seems necessary to model what occurs in natural language communication, and to allow computer programs to participate in natural language communication.

A folk model of linguistic communication views conversation as the transmission of ideas. Such a view is expressed in the metaphors of communication like: *putting one's thoughts into words*, *getting one's ideas across*, and *putting one's thoughts down on paper.*[1] This view would seem to make any linguistic communication solely the act of transmitting information, or making statements. In fact, this was the view held earlier in this century in the philosophy of logical positivism.[2] If this were the case, then a description of a speech act would be a description of what makes the meaning of the sentence uttered true or false.

Austin (1962) argued that such a model of speech acts is inadequate. While a sentence like (1-1) can be judged true or false by perhaps looking out a window, a sentence like (1-2) is more problematic.

(1-1) It is raining.

(1-2) I promise to come.

It is trivially true, Austin contended, that the meaning of an utterance of (1-2) is a promise. Thus, saying that such a sentence is true fails to say anything significant about the meaning of a promise. To address this problem, Austin noted the similarity of utterances like (1-2) to utterances like (1-3).

(1-3) I now pronounce you man and wife.

The utterance of (1-3) only performs the act of marrying if it is uttered by a minister presiding at a wedding ceremony. That is to say, it is only effective,

[1] See Bach and Harnish (1979, pp. xiii–xiv), Leech (1983, p. 57), and Sperber and Wilson (1986, p. 1).

[2] See Levinson (1983, p. 227).

or *felicitous*, if performed under the correct conditions. Austin referred to such conditions as *felicity conditions*. For Austin, the description of a speech act would be a description of its felicity conditions.

In this thesis, my goal is to examine the interaction between a speech act and its context, and in particular how this interaction determines the description of a speech act in terms of felicity conditions.[3] Prominent work within speech act theory in computational linguistics[4] has relied to a large extent on the speech act theory of Searle.[5] However, there has been considerable criticism of Searle's approach in the linguistics and natural-language pragmatics literature. If this criticism can offer a better motivated and more linguistically accurate description of speech acts, then it is worthwhile taking the earliest opportunity to examine it and assess its usability for future computational work.

A linguistically valid description of speech acts could well prove to be of increasing interest in future computational work. In particular, speech act theory could provide desirable sophistication in computer-aided language instruction (CALI) and machine translation (MT). In the case of CALI, speech act theory might not help in developing the grammatical competence of a learner, but it would help in teaching the appropriate conditions for various communicative acts. As Widdowson (1979, p. 90) notes:

> In many parts of the world the teaching of English has assumed the crucial auxiliary role of providing the means for furthering specialist education, and here it becomes plain that a knowledge of how language functions in communication does not automati-

[3] By *context* I mean the set of speaker and hearer's beliefs within a discourse.

[4] For example, Allen and Perrault (1979), Cohen and Perrault (1979), Appelt (1985), Cohen and Levesque (1985), and Cohen and Levesque (1990a).

[5] For instance, Searle (1969), (1975), (1976), and Searle and Vanderveken (1985).

> cally follow from a knowledge of sentences. This role for English requires a new orientation to its teaching.

In the case of MT, speech act theory would help in increasing the felicity of translated text. An instructive, if possibly apocryphal, story about the mistranslation of a speech act is given by Pei (1965, p. 404):

> Our [American] State Department is said to have been at one time vastly disturbed by a note received from the French government which began: *Nous demandons*. "What right do they have to demand that?" said the irate officials. Then it was pointed out that the French expression had the more modest meaning of "we request." If the account is true, it was the fault of the original translator that we almost had a diplomatic break with France.

If MT systems are to be trusted in mediating important communications in the future, then an accurate description of speech acts would be very helpful in keeping translations faithful to their intended communicative purpose.[6]

The contribution of this thesis will be: a review of linguistic literature relevant to speech act theory (and consequently an extensive bibliography of this literature); the proposal of a model of speech acts based on the results of the review—a model that justifies pragmatic variation in speech acts by what I define as the *scale of contextuality*; a small sentence generator that implements some of the model proposed; and proposals of the applicability of this work to a current theory of computational stylistics.

The further sections of this chapter each preview the following chapters of this thesis.

[6] See also Widdowson (1979, pp. 101–11).

1.2 Conventionalism

A central issue in speech act theory is the nature of the felicity conditions of speech acts. The views on this issue can be divided roughly into two kinds: *conventionalist* and *anticonventionalist.*[7] The conventionalist view, argued most prominently by Searle,[8] holds that the felicity conditions of speech acts are neither semantic nor pragmatic (in the sense of Grice's maxims of conversation). Rather, conventionalist theory holds that felicity conditions are arbitrary rules, or conventions, separate from other rules or mechanisms of language.[9]

The anticonventionalist view holds that the felicity conditions of speech acts are epiphenomenal and result from the interaction of semantics with rational or Gricean cooperative conversational behaviour.[10] Anticonventionalist theory explains speech acts on the basis of more general linguistic mechanisms without assuming separate speech act conventions. I argue that the anticonventionalist approach gives a more linguistically accurate description of speech acts.

Computational work in speech act planning and representation has placed great emphasis on Searle's work. Even computational work that questions Searle's conventionalist assumptions, such as Cohen and Levesque (1985), has not made much use of the anticonventionalist literature. There are two possible problems arising from this oversight. One problem is that, in continuing to rely on Searle's theory, the difficulties in his conventionalist approach will be incorporated into computational models and representations. The other problem is that, in criticizing Searle's

[7] I take these terms from Recanati (1987).

[8] See Searle (1969), (1975), (1976), Searle and Vanderveken (1985), and Searle (1989).

[9] This should not be confused with the idea that speech acts or speech act types can become *conventionalized*, or idiomatic. I do not address the conventionalization of speech acts in this thesis. See Morgan (1977) and Gibbs (1986).

[10] See Bach and Harnish (1979), Leech (1983), Levinson (1983), and Recanati (1987).

theory, computational work may duplicate previous efforts in other related fields of study.

To consider both problems, I present a critical review of speech act theory in chapter 2. In order to emphasize the contrast between the two approaches, each section of the review characterizes a conventionalist position on an issue of speech act description, which is then followed by an anticonventionalist critique. My aim is to establish some of the important properties that an anticonventionalist theory of speech acts should have. The spelling out of these properties leads to my proposal of an anticonventionalist model of speech acts in chapter 3.

1.3 Anticonventionalism

Chapter 2 shows that an anticonventionalist theory should describe speech acts not in terms of special conventions but in terms of general linguistic mechanisms. These mechanisms include clausal moods, lexical semantics, and Gricean pragmatics. In chapter 3, I use these concepts to propose a model that accounts for speech act phenomena. I outline a model of clausal mood and corresponding propositional modality and show how these are related to Grice's maxim of quality. I then show how this model explains the meaning of primary performatives, explicit performatives, and indirect speech acts. I also use these explanations to define a scale of contextuality by which these various kinds of speech acts can be compared.

The scale of contextuality proposed in chapter 3 relates the literal meaning of an utterance to its intended meaning.[11] I place primary performatives at the center of the scale, because their literal meaning corresponds directly to their intended meaning. The literal meaning of a primary performative is indicated by the mood

[11] Although it is a good question, I do not consider how to define or arrive at a literal meaning.

of the clause in which it occurs. Since, as Sadock and Zwicky (1985) argue, the declarative, interrogative, and imperative moods are the only ones common to most, if not all, human languages, I am concerned only with these. However, I do also deal briefly with the subjunctive mood, as it is predicted by my proposal.

Explicit performatives, such as *I order you to leave*, depart from the center of the scale of contextuality because, while they are literally statements, their intended meaning often is not to make an assertion. For example, *I order you to leave* is intended to communicate the proposition *You leave* in the context of an imperative. Because the intended meaning of explicit performatives is deduced from their main verbs, they are placed at the 'lexical' end of the scale of contextuality.

Indirect speech acts, such as a request to actually pass the salt by asking *Can you pass the salt?*, depart from the center of the scale of contextuality differently than explicit performatives. While the expression *Can you pass the salt?* can be taken to have the intended meaning *Pass the salt*, there is no specific lexical item that necessarily signals this. I argue that this means that the intended meaning of an indirect speech act must be inferred inductively from the literal meaning by using Gricean maxims of conversation. Because the intended meaning of indirect acts must be inferred in this way, they are placed at the 'inferential' end of the scale of contextuality.

Thus, the scale of contextuality describes how the context, or speaker's and audience's beliefs, affect the interpretation of utterances. This scale, in turn, is the basis of the computational work I discuss in chapter 4.

1.4 Sentence generation

While the proposal of a more accurate linguistic description of speech acts is important, it is also important to show that this proposal can be useful in computational applications. In chapter 4, I discuss my work on a small sentence generator, the Contextual Speech Act Generator (CoSAG). This system demonstrates how the structural variations in speech acts described by the scale of contextuality can be represented and used in a sentence generator. In addition to CoSAG, I also discuss how the variation of speech acts along the scale of contextuality interacts with other facets of sentence variation described by DiMarco's (1990) computational theory of style. I then briefly consider how the theory of speech acts I present suggests future extensions of DiMarco's stylistic theory in the areas of semantic style and lexical style.

CoSAG uses feature structures[12] to represent the functional structure of expressions. I give examples of CoSAG's input, in the form of feature structures, and output, in the form of English expressions. These examples show the variation of speech acts described by the various positions along the scale of contextuality.

I then discuss the data structures and procedures of my implementation of CoSAG. CoSAG is written in Prolog and uses partially-instantiated Prolog lists[13] to represent feature structures. Operations on CoSAG's partially-instantiated lists are all defined in terms of the `apply` operation. CoSAG is divided into two main components: the grammar component that declaratively specifies the constraints on valid feature structures, and the parsing component that uses the rules given in the grammar component to manage feature structures in the generation of an

[12] See Shieber (1986).

[13] See Gazdar and Mellish (1989, pp. 228–30) and Pitt and Cunningham (1991, pp. 6–7).

expression.[14]

I also examine the relationship between the scale of contextuality and DiMarco's[15] computational theory of style. I give an example of how the stylistic variation described by DiMarco's theory could be applied in concert with the speech act model presented here to produce linguistically motivated variations in expressions. In addition, I briefly discuss how my model of speech acts and DiMarco's theory of style could be extended to cover semantic style and lexical style.

In the following chapter, I present a critical literature review that motivates the anticonventionalist theory of speech acts I outline later. Throughout this thesis, I assume that the reader has some acquaintance with both speech act theory and Grice's theory of cooperative conversational behaviour.

[14]The code for both components is given in appendix B.
[15]See DiMarco (1990) and DiMarco and Hirst (1993).

Chapter 2

Speech act theory

Intention, *n.* The mind's sense of the prevalence of one set of influences over another set; an effect whose cause is the imminence, immediate or remote, of the performance of an involuntary act.

Ambrose Bierce, THE DEVIL'S DICTIONARY

2.1 Introduction

A large amount of work has been published in speech act theory since Austin's *How to do things with words* (1962). My goal in this chapter is not to review all or even a majority of this work, but to review the literature that helps to distinguish between the conventionalist and anticonventionalist theories of speech acts.[1]

In making this distinction, I wish to investigate what properties the representations and algorithms for understanding and generating speech acts should have.

[1] See section 1.2.

A large amount of current computational work on speech acts has been based on the conventionalist approach of Searle.[2] If Searle's approach to speech act theory is not tenable, then computational work based on it could be better spent elsewhere. My concern in criticizing Searle's work in this thesis is to examine its weaknesses in order to propose a better theory. In turn, this will benefit future work in speech acts by computational linguists.

Searle's approach holds that speech acts are only explainable by special conventions that are neither semantic nor pragmatic (in the sense of Grice's maxims of conversation). There has been significant criticism of this approach in the linguistics and pragmatics literature,[3] that points out some of its serious shortcomings. For instance, the exact nature of Searle's conventions is unclear, and his assertion that explicit performatives are not declarative sentences (statements of fact) is questionable. Therefore, it is worthwhile to examine an anticonventionalist position, so that future computational work could take advantage of this alternative theory. The anticonventionalist explanation of speech acts is that they are accountable by particular use of already-available linguistic mechanisms: the dictionary meaning of performative verbs and the principles of cooperative behaviour outlined by Grice (1975). This account, among other things, correctly allows explicit performatives to be truth-functional, or statements of fact.

In this chapter, I contrast the conventionalist and anticonventionalist views. To make this process clear, I use a contrastive organization, dividing each section into a conventionalist argument for a position followed by an anticonventionalist argument against it. In section 2.2, I introduce and then question Austin's conventionalist view of speech acts. The main point of contention is Austin's claim that explicit

[2]See, for example, Cohen and Perrault (1979), Perrault and Allen (1980), and Cohen and Levesque (1985).

[3]See, for example, Bach and Harnish (1979), Leech (1983), and Levinson (1983).

speech acts cannot be truth-functional. In section 2.3, I describe Searle's representation of illocutionary force and the felicity conditions he gives for the appropriate making of a promise. I point out that Searle's analysis of performative verbs to characterize illocutionary acts is not sound and that a different characterization is possible. In section 2.4, I show how Searle uses a taxonomy of performative verbs to carry out his analysis described in section 2.3. The taxonomy indicates how Searle views the nature of performative conventions. I argue that this fails to take account of sentence type, or mood, which is the starting point for an anticonventionalist theory. Finally, in section 2.5, I present Searle's account of indirect speech acts and suggest that his account of felicity conditions fails to match the linguistic data. This leads to the rejection of the conventionalist approach as a general explanation of speech acts.

The work I present in this chapter outlines the motivations and properties of the anticonventionalist theory I propose in chapter 3.

2.2 Austin's theory

My goal in this section is to introduce Austin's speech act theory and show how it is conventionalist. In the first subsection, I describe primary performatives and explicit performatives and the relationship that appears to hold between them. This leads to a consideration of Austin's contention that explicit performatives are not truth-functional. Next, Austin's assertion that any utterance corresponds to some explicit performative is used to show how his theory claims to be applicable to all utterances. Finally, Austin's speech act hierarchy is reviewed.

In the second subsection, I argue that Austin's position does not account for the fact that explicit performatives are always in the declarative mood. His position is

not consistent with the usage of declarative sentences to convey statements of fact. Rather, I believe that performative verbs are a subset of verbs that report verbal processes.[4] For this reason, an anticonventionalist theory would not require explicit performatives or performative verbs to be exceptions to their usual linguistic uses.

2.2.1 How to do things with words

Austin (1962) identified what he called *primary performatives*, simple sentences conforming to such basic types as *declarative*, *interrogative*, and *imperative*, as in the following examples:

(2-1) I'll be back.

(2-2) Are you Sarah Connor?

(2-3) Get out.

While examples (2-1) and (2-2) can be appropriately analyzed according to their truth conditions, Austin noted that imperatives like (2-3) are not readily analyzed in the same fashion. Rather, Austin proposed that such utterances could be analyzed by trying to specify the act the speaker is attempting to perform in making the utterance. For example, the act attempted in sentence (2-3) could be classified by relating it to the following paraphrases:

(2-4) I order you to get out.

(2-5) I suggest that you get out.

[4] See Halliday (1985).

(2-6) I request that you get out.

Many similar paraphrases are also possible.

Because the main verbs in sentences like (2-4), (2-5), and (2-6) appear to name the act performed in expressing the sentence, Austin called them *performative* verbs. The use of a performative verb in the first person, simple present tense, as in the above examples, Austin called the *performative formula.*

Austin felt that utterances of sentences in the performative formula, such as (2-4), (2-5), and (2-6) could not possibly be false, and therefore could not be legitimately described as true either. For instance, it would be very unusual for someone to reply to the order *I order you to get out* with *Yes, you do* or even *No, you don't.* For this reason, Austin concluded that utterances using the performative formula are not statements, but that they explicitly name the act they perform. This effectively means that the mood of the uttered sentence would be replaced with some aspects of its main verb. These aspects are the *felicity conditions* of the utterance, which are discussed in section 2.3. Because expressions using the performative formula make the act they perform explicit, Austin called such expressions *explicit performatives.* By contrast, any utterance which is not an explicit performative (*i.e.,* primary performatives such as (2-1), (2-2), and (2-3)), Austin labelled an *implicit performatives.*

Austin viewed implicit performatives as ambiguous with regard to the acts they are used to perform. However, implicit performatives can be paraphrased by explicit performatives, as (2-3) can be paraphrased by any of (2-4), (2-5), or (2-6). Thus, Austin concluded that occurrences of implicit performatives could be analyzed by relating them to the correct explicit performative.

While this proposed method of utterance analysis is interesting, it would be of

limited interest if it could be applied only to a subset of utterances, such as imperatives. But Austin observed that both declarative and interrogative expressions have explicit counterparts as well. For instance, sentences (2-1) and (2-2) can be explicitly paraphrased as follows:

(2-7) I claim that I'll be back.

(2-8) I inform you that I'll be back.

(2-9) I promise you I'll be back.

(2-10) I ask you whether you are Sarah Connor.

(2-11) I inquire whether you are Sarah Connor.

(2-12) I request that you tell me whether you are Sarah Connor.

If Austin's belief that all primary (or implicit) performatives have explicit counterparts, then an account of explicit performatives, and therefore performative verbs, becomes very important for any general theory of utterance interpretation.

So far, I have reviewed Austin's claims about implicit and explicit performatives and the connection between them. At this point, it appears that Austin's theory of speech acts is based on the interpretation of performative verbs. However, it seems reasonable to expect speech acts to be independent of any particular language, while performative verbs clearly vary from language to language. To accomplish the separation of verbs from acts, Austin proposed the *speech act hierarchy*, in

which the *illocutionary act* is the act to which performative verbs refer. The speech act hierarchy is summarized below:[5]

> **Locutionary act**: the act of saying something; the act of conveying an expression;
>
> **Illocutionary act**: the act performed in communicating a verbal expression; the act typically named by a performative verb;
>
> **Perlocutionary act**: the act carried out by performing an illocutionary or locutionary act; the act intended as the result of committing an illocutionary act.

Perlocutionary acts constitute the reason for performing an illocutionary and locutionary act. For example, if the speaker wishes to accomplish the perlocutionary act of convincing the hearer of the fact that "I'll be back", the speaker may perform the illocutionary act of asserting, claiming, or even promising that proposition, and therefore perform the locutionary act of saying *I'll be back*, *I claim that I'll be back*, or *I promise that I'll be back*.[6]

The final necessary piece of terminology introduced by Austin is *illocutionary force*. An illocutionary force is the type of function that is fulfilled by performing an illocutionary act.[7] For example, the utterances *Get out* and *I order you to get out* are separate illocutionary acts, but both might represent the same illocutionary force of *ordering*.[8]

[5] Austin's definitions can be found in Austin (1962, (1971, pp. 561–4)). I use the preceeding citation format to refer to pages 561–4 in the reprint of Austin (1962) by Rosenberg and Travis (1971). I use this format for citing reprints throughout the thesis.

[6] I do not deal further with perlocutionary acts. See Cohen (1973) and Davis (1980) for further discussion.

[7] This is essentially a *type/token* distinction.

[8] Because the conventionalist position holds that explicit performatives literally convey an illocutionary force (as opposed to a declarative mood), Gazdar (1981) and Levinson (1983) use the term *literal force hypothesis* to describe conventionalist theory.

In this subsection, I have reviewed Austin's speech act theory and shown why he considered explicit performatives to not be statements. This is a conventionalist theory in that it requires special rules or conventions for Austin's interpretation of explicit performatives to work. I have also reviewed the theory of speech acts and speech act hierarchy that Austin built around this idea. In the following subsection, I briefly present arguments that question Austin's beliefs about speech acts.

2.2.2 Conventionalism in Austin's theory

Austin believed that performative verbs directly name illocutionary forces. He also believed that uttering an explicit performative constituted the performance of an illocutionary act. One difficulty with this view is that Austin believed an explicit performative could not be judged true or false. This view is not easy to reconcile with the fact that explicit performatives invariably occur in sentences of the declarative mood, which are normally used to convey statements of truth. Austin's solution was to suppose that performative verbs carry special conventions that, when the verb is used in the performative formula, cancel the usual significance of the declarative mood. In this subsection, I argue why this view might not be acceptable because it requires special linguistic exceptions that may not be necessary.

Austin makes the argument that explicit performatives cannot be considered truth-functional because they cannot be false. It does not follow, however, that they cannot therefore be true either. In saying *I order you to get out*, it is almost certainly true that the speaker is ordering the hearer to get out, as he says he is. Because the speaker is describing his own act, it seems that the truth condition of the sentence uttered is reflexive, or self-referential. If so, then explicit performatives are

essentially tautologies, and are true because they are uttered by the speaker. This would mean that explicit performatives do have truth values, and would explain why they always occur in the declarative mood.[9]

Another difficulty of Austin's conventionalist theory in defining the meaning of performative verbs. It would seem to require such verbs to have a very different significance in the performative formula than they do in other expressions. And yet, performative verbs are used in very similar ways to the performative formula, but without requiring any special conventions. Consider the following sentences with performative main verbs, but in the simple past tense:

(2-13) I claimed that I'll be back.

(2-14) I asked her whether she is Sarah Connor.

(2-15) I ordered you to get out.

These examples certainly can be evaluated as true or false and differ very little from explicit performatives. In fact, performative verbs appear to be a subset of what Halliday (1985, pp. 128–31) calls verbs that report verbal processes, by which he means verbs that describe "any kind of symbolic exchange of meaning" (1985, p. 129). Halliday includes such non-performative verbs as *say* and *tell* in this class. It seems possible then that explicit performatives, using these verbs, simply report the occurrence of their own verbal process, as suggested in the last paragraph, and therefore do not require any conventions to explain their significance.[10]

[9] See Bach and Harnish (1979, pp. 203–208). Sadock and Zwicky (1985, p. 158) note that many other languages also express explicit performatives in their equivalent of the declarative mood.

[10] See also Palmer (1976, p. 142), Katz (1977, pp. 30–1), and Leech (1983, pp. 184–9).

In order to do away with conventions, it appears that an anticonventionalist theory of speech acts should start with an appropriate analysis of sentence moods, especially the declarative, and performative verbs. This critique of Austin's theory does not question the value of his observations, but does suggest a different method of accounting for actual utterances. In the next section, I look at an example of Searle's felicity conditions for speech acts and suggest how they might be handled from an anticonventionalist point of view.

2.3 Felicity conditions

In the previous section, I reviewed Austin's theory of speech acts and pointed out its conventionalist basis. My goal in this section is to give an example of Searle's proposed felicity conditions and to suggest how the requirements Searle refers to could be handled without his special conventions.

In the first subsection, I describe Searle's notation for illocutionary acts and then his account of the felicity conditions for the act of promising. I also describe his identification of extended performatives. In the second subsection, I argue that this basis for Searle's analysis of illocutionary acts, the principle of expressivity, is unsound. It also seems to contradict Searle's analysis of extended performatives. Instead, I note Katz's (1977) suggestion that Searle's felicity conditions can be divided into features of lexical meaning and Gricean principles of cooperative behaviour.

2.3.1 Searle's theory

In this subsection, I describe Searle's approach to speech act representation and felicity conventions. This consists of presenting his functional notation for speech acts and his proposed felicity conditions for promising. The felicity conventions he proposes are clearly based on an analysis of performative verbs. I also give Searle's example of what has been called an 'extended performative'. This leads me to question Searle's conventions in the next subsection.

Searle (1968) proposes a functional notation for representing illocutionary acts. His notation aims to separate the force of a speech act from its content. In an explicit performative, this essentially means separating the performative verb from the proposition that it takes as a complement. Searle explains his representation as follows (1968, (1971, pp. 272–3)):[11]

> Symbolically, we might represent the sentence as containing an illocutionary force-indicating device and a propositional content indicator. Thus:
>
> **F(p)**
>
> where the range of possible values for **F** will determine the range of illocutionary forces, and the **p** is a variable over the infinite range of possible propositions.
>
> Not all illocutionary acts would fit this model. *E.g.,* "Hurrah for Manchester United" or "Down with Caesar" would be of the form **F(n)**, where **n** is replaceable by referring expressions.

With this notation, Searle carries out Austin's desire to separate an expression into its truth-conditional part, the proposition *p*, and its non-truth-conditional part, the

[11]The second paragraph is actually a footnote made at the end of the first one in the original text.

force indicator F. For example, the sentence *I promise I'll be back* can be divided into a proposition p = *I will be back* and an illocutionary force component F = *promise*.[12]

If we adopt Searle's notation, then the problem for speech act theory becomes one of specifying the meaning of the range of illocutionary forces F. For Searle, this meaning is expressed by the conventional felicity conditions for using a particular illocutionary force.[13] Searle (1969) gives an example of the felicity conditions he proposes for the act of promising. I present his results here to make the conventionalist (and consequently anticonventionalist) views more concrete (P is the illocutionary force of *promising*, S is the *speaker*, H is the *hearer*, and A is an *act*) (Searle, 1968, (1971, p. 627)):

> The semantical rules for the use of any function indicating device P for promising are:
>
> 1. P is to be uttered only in the context of a sentence (or larger stretch of discourse) the utterance of which predicates some future act A of the speaker S.
> 2. P is to be uttered only if the hearer H would prefer S's doing A to his not doing A, and S believes H would prefer S's doing A to his not doing A.
> 3. P is to be uttered only if it is not obvious to both S and H that S will do A in the normal course of events.
> 4. P is to be uttered only if S intends to do A.
> 5. The utterance of P counts as the undertaking of an obligation to do A.
>
> These rules are ordered: Rules 2–5 apply only if Rule 1 is satisfied, and Rule 5 applies only if Rules 2 and 3 are satisfied as well.

[12] For an implicit speech act, the force indicator F is not given in the text of the utterance. I address this issue in section 2.4.

[13] See section 2.2.1.

So, an utterance like *I promise to come* is felicitous if: (1) it addresses a future act of the speaker, (2) the speaker believes the hearer would prefer the act to be done, (3) the speaker does not believe the act would be done otherwise, (4) the speaker intends to come, and (5) the speaker intends that he be obliged to do the act.

Searle's rules appear to give a reasonably intuitive account of the occasions when a promise may be made. However, the performative use of the verb *promise* in English does not always conform to Searle's conditions. For example, the following performative uses of the verb *promise* appear to really be examples of warning and swearing respectively:[14]

(2-16) I promise I will fail you if your paper is late.

(2-17) I promise that I was there yesterday.

Sentence (2-16) is not a promise because the hearer would presumably rather not be failed, contravening felicity condition (2), and sentence (2-17) is not a promise because it does not address a future act, contravening felicity condition (1). Searle (1969, (1971, p. 624)) notes that it would be unusual to describe utterances like (2-16) and (2-17) as promises, but does not provide a means of reconciling the non-literal use of *promise* in the performative formula. Such non-literal uses of performative verbs are called *extended* performatives by Fraser (1974, pp. 14–5) because they extend the normal meaning of a verb.[15] However, the possibility of extended performatives does seem to weaken the connection between the meanings of performative verbs and the felicity conditions for the illocutionary acts they are typically used to convey.

[14]The examples are from Fraser (1974, p. 14).
[15]See also Recanati (1987, pp. 160–2).

From the discussion of a 'promise' in this subsection, it might appear that the conventionalist account of speech acts could proceed from the analysis of performative verbs. Searle's felicity conditions of the speech act of promising seem to agree with the use of the verb *promise*, and uses that don't agree with his felicity conditions might be accounted for as extended performatives. However, in the next subsection, I argue that if the connection between performative verbs and illocutionary acts is not well-defined, then the correctness of the proposed felicity conditions for illocutionary acts cannot be guaranteed.

In the following subsection, I also suggest how a connection between performative verbs and illocutionary acts could be unsound, and how an anticonventionalist theory would approach the problem of felicity conditions.

2.3.2 The principle of expressivity

Searle's account of the felicity conditions of promising are clearly based on what he considers to be the normal use of the verb *promise*. It would seem that a complete account of the conventions of illocutionary acts relies on a complete account of the meaning of performative verbs. An account of performative verbs also requires a means of distinguishing the normal use of performatives from the extended uses. In this subsection, I critique Searle's account of the relation between performative verbs and illocutionary acts—the principle of expressivity. I also suggest how the problem of felicity conditions could be handled in an anticonventionalist theory by using only lexical semantics and Gricean pragmatics.

In order to evaluate the felicity conditions of illocutionary acts, Searle (1968) proposes that a performative verb corresponding to each possible act must exist. Searle calls this claim the *principle of expressivity* and stated it as follows (1968,

(1971, p. 271)):

> Whenever one wishes to make an utterance with force F, it is always possible to utter a sentence the meaning of which expresses exactly force F, since if it is possible to mean (intend) that force it is possible to say that force literally.

What this appears to say is that for every possible illocutionary force F, there corresponds a performative verb that can be used literally (*i.e.,* not extended) in the performative formula to perform an act with force F. If this were true, it would mean that a complete analysis of performative verbs would provide a complete analysis of illocutionary acts.

There are several problems with this position. For one, since Searle's claim is not ostensibly language-specific, it seems to require all languages to have the same inventory of performative verbs to cover all the possible illocutionary acts. This is not an intuitive prediction. Also, the presence of extended performatives would seem to indicate that no satisfactory performative verb exists for literally expressing an illocutionary force—at least in some situations. Otherwise, what is the motivation for not using a more precise verb? The direct correspondence between performative verbs and illocutionary acts is later weakened by Searle (1976, p. 2), who says: "Differences in illocutionary [performative] verbs are a good guide but by no means a sure guide to differences in illocutionary acts". But this leaves open the question of how performative verbs are systematically related to illocutionary forces. In the next section, I show that Searle abandons any direct connection between performative verbs and illocutionary acts, and instead develops an illocutionary-act taxonomy.

From an anticonventionalist perspective, it is worthwhile pointing out that the felicity conditions for the illocutionary act of promising proposed by Searle could

be dealt with in another way. Specifically, the idea of an atomic or primitive illocutionary act could be laid aside. The conventional felicity conditions Searle attributes to such acts could instead be attributed either to the meaning of the verb *promise* or to Gricean conversational maxims. This proposal is made very succinctly by Katz (1977, pp. 33–6):

> Rules 1, 2, and 5 are about the kind of information a dictionary would give about the lexical meaning of "promise". Rules 3 and 4 provide the kind of information given in principles about how highly structured behavioural interactions are coordinated by their participants... It seems reasonable to think that Searle's rules for illocutionary acts parcel out into the two categories of semantic rules and rules of use.

Thus, rather than attributing the felicity conditions of promising to a primitive illocutionary force *F*, they could be divided into the meaning of the verb *promise* and Gricean conversational implicature. In this account then, there would be no need of special illocutionary conventions. In general, the effects of speech acts would be accounted for by a theory of the interaction of Gricean pragmatics and lexical semantics. This is the approach I pursue in the next chapter.

In this section, I have reviewed an example of the felicity conditions Searle has proposed as special illocutionary conventions. I have argued that the account of felicity conditions based on the meaning of performative verbs is not as direct as Searle's analysis suggests. I have also argued that one method for dealing with the problem of felicity conditions is to give up the idea of primitive illocutionary acts and instead analyze illocutionary force by the interaction between lexical semantics and Gricean pragmatics. In the next section, I review how the problems raised here have been dealt with by Searle, and how an anticonventionalist theory would deal with them.

2.4 A speech act taxomony

The difficulty in extracting the felicity conditions of illocutionary acts from an analysis of performative verbs has been discussed in the previous section. In the following subsection, I show how Searle has sought a solution to this problem in the form of a taxonomy of illocutionary acts. Searle's taxonomy evaluates illocutionary acts according to several dimensions of meaning and arrives at five basic, distinct, categories. The idea behind this effort appears to be that the taxonomic categories would predict the felicity conditions of the acts in each category. Searle's selection of important dimensions is not claimed to be based on an analysis of performative verbs, but is arbitrary, which seems equally difficult to justify.

Also, to defend the idea that explicit performatives are conventional and not truth-functional, Searle and Vanderveken (1985, pp. 2–3) have argued that explicit performatives are all declarations—one of the taxonomic categories.[16] I argue that this does not help to clarify the conventions Searle proposes.

In the second subsection, I also argue that the taxonomy does not have the desired effect of clarifying the meaning of illocutionary forces and that an anticonventionalist theory would replace a taxonomy with an analysis of sentence moods. Sentence moods, unlike taxonomic categories, are easily observable and therefore easier to evaluate.

2.4.1 Searle's taxonomy

Searle (1976) proposes a taxonomy of speech acts to avoid the difficulty of reliably connecting illocutionary acts to performative verbs and to account for the ambiguity

[16] Searle (1989, pp. 540–1) reiterates this position.

of implicit performatives.[17] Searle proposes, and then reduces, twelve possible dimensions of analysis and arrives at a taxonomy with five categories. In this subsection, I give Searle's taxonomy and examine two of the dimensions of meaning it is based on. I also look at Searle's proposal that all explicit performatives are declarations.

Searle's taxonomy of illocutionary forces is summarized here (each category is named and followed by a definition and a sample explicit speech act):[18]

> **Representatives**: Commit of the speaker to the truth of the expressed proposition, *e.g., I state that it is raining*;
>
> **Directives**: Attempts by the speaker to get the hearer to do something, *e.g., I order you to leave*;
>
> **Commissives**: Commit the speaker to some future course of action, *e.g., I promise to pay you the money*;
>
> **Expressives**: Express the speaker's psychological attitude towards a state of affairs, *e.g., I apologize for stepping on your toe*;
>
> **Declarations**: Attempts to bring about the correspondence between the propositional content and reality, *e.g., I appoint you chairman.*

Two of the most important dimensions of analysis Searle uses are *illocutionary point* and *direction of fit.* To help evaluate Searle's taxonomy, I examine these dimensions here.

[17] See section 2.2.1.

[18] See Searle (1976, pp. 10–20) and also Leech (1983, pp. 105–107).

The basis of Searle's taxonomy is illocutionary point, which comes in five varieties, one for each category. Searle's definition of illocutionary point is as follows (1976, p. 3): "The point or purpose of a type of illocution I shall call its *illocutionary point.*" It is difficult to see how this definition gives an objective means of verifying Searle's taxonomic categories. The situation is not greatly improved by Searle and Vanderveken (1985, p. 14): "In general we can say that the illocutionary point of a type of illocutionary act is that purpose which is essential to its being an act of that type." Both these definitions appear circular and therefore ill-suited to enable others to reproduce Searle's classification.[19]

Searle's use of direction of fit is somewhat easier to examine. Direction of fit has two values: *word-to-world* and *world-to-word.* If an utterance has the word-to-world direction of fit, that means that its propositional content is meant to be an accurate description of something in the world. In representatives, such as *It is raining*, the words are meant to convey something true about the world. If an utterance has the world-to-word direction of fit, that means that its propositional content is meant to describe something that *should* be the case in the world. In commissives and directives, such as *I order you to leave*, the words are meant to convey something that the speaker thinks should be true about the world (the hearer's leaving), but isn't at the time of utterance.[20] As I show in the next chapter, essentially this idea has been in linguistic analysis for some time and is much more open to evaluation than illocutionary point.

Also, Searle (1976) is unable to show how the taxonomic categories predict the

[19]In fact, reproducibility is a general difficulty of speech act taxonomies. Several, other than Searle's, have been proposed. See Hancher (1979) for a comparison of several different proposed taxonomies.

[20]Actually, Searle admits two further values of direction of fit: the null direction of fit, for expressives, and the double direction of fit, for declarations. See Searle (1976) and Searle and Vanderveken (1985, pp. 52–4).

felicity conditions he proposes elsewhere for illocutionary acts. Although Searle and Vanderveken (1985) do give some examples of felicity conditions derived from this taxonomy, the connection between Searle's taxonomic categories and his proposed illocutionary felicity conditions remains unclear. As I discuss in the following subsection, there is no connection between Searle's taxonomy and any observable linguistic object, such as performative verbs or sentence moods, and so it is unlikely that his taxonomy of illocutionary acts could ever be empirically verified.

To defend the claim that their taxonomy has a factual basis, Searle and Vanderveken (1985, pp. 2–3) also argue that all explicit performatives are declarations, in the sense of the above taxonomic category.[21] The reasoning is that since both explicit performatives and declarations, such as *I now pronounce you man and wife* as said by a minister presiding a marriage, occur in the performative formula, they must be interpreted in roughly the same manner. For example, Searle (1989, p. 541) proposes that the representation of the expression *I order you to leave the room* is as follows:

Declare(that I order (that you leave the room))

For Searle, the whole sentence "I order you to leave the room" is the propositional content of an implicit declaration. This is evidently an attempt to explain why explicit performatives appear to be in the declarative mood, but are not truth-conditional. However, this seems to confuse the semantic idea of a *proposition* with the textual feature of the declarative sentence mood.[22] Also, it seems to require that explicit performatives have two directions of fit simultaneously. For example, the directive *I order you to leave the room* must have both the world-to-word direction

[21] See also Searle (1989, pp. 540–1).

[22] These terms are resolved in section 3.2.1.

of fit, since it is directive, and the double direction of fit, since it is also a declaration. Searle does not explain how this system might work. I discuss this difficulty further in the next subsection.

In this subsection, I have reviewed Searle's proposed taxonomy of illocutionary acts. The idea behind the taxonomy is to categorize the felicity conditions of illocutionary acts without a direct appeal to the meaning of performative verbs. But there is no observable system to Searle's proposed dimensions of analysis, and his definition of illocutionary point, which is the basis for his classification, is circular.[23] In fact, Searle is unable to completely connect his taxonomy of acts with the felicity conditions he proposes elsewhere.[24] Also, Searle appears to use the taxonomic category of declarations to explain the declarative mood of all explicit performatives. In the following subsection, I critique Searle's proposals and suggest an anticonventionalist approach to his ideas.

2.4.2 A non-taxonomic approach

In the previous subsection, I have already argued that Searle's taxonomy does not have a principled basis. In this subsection, I argue that the basic problem with the taxonomy is that it does not take the significance of sentence mood into account. In particular, it is difficult to see why, if the taxonomic categories are fundamental units of communication, sentence moods do not correspond to them.[25] I argue that an anticonventionalist theory would be based on an analysis of sentence mood, which I pursue in chapter 3.

[23] See also Katz (1977, p. 198).

[24] See Levinson (1983, pp. 239–42).

[25] Recall that primary performatives, discussed in section 2.2.1, are simple sentences ostensibly conveying an illocutionary act corresponding to one of the taxonomic categories. The question is essentially: Why are illocutionary-act types not also sentence types?

It was pointed out in section 2.2.1 that conventionalist speech act theory treats primary performatives as being implicit. This means that the illocutionary force of a primary performative may be ambiguous. For example, the expression *I'll be back* could be either a prediction (a representative) or a promise (a commissive). As this seems to be true of many declarative primary performatives, it then seems odd that English does not provide separate moods to disambiguate these two forces. Sadock and Zwicky (1985) have argued from empirical evidence that all languages have the same basic inventory of declarative, interrogative, and imperative moods. Thus, it appears that most languages have the same basic ambiguity of force as English.

This obscure relationship of illocutionary forces to moods also makes Searle's taxonomic categories difficult to examine empirically for either explicit or implicit performatives. For an explicit performative, the illocutionary act performed is completely specified by the performative verb, so that relating the act to the taxonomy does not further clarify its interpretation.[26] In a primary (or implicit) performative, the illocutionary act performed is ambiguously specified by the sentence mood, so its taxonomic category cannot be known with certainty. In the case of explicit performatives, the taxonomic category of speech act does not add anything to the utterance's interpretation. In the case of implicit performatives, the taxonomic category of speech act does not uniquely identify the utterance's interpretation. It seems therefore that Searle's taxonomic categories of speech acts do not correspond to any particular linguistic object, neither verb nor mood. This makes empirical verification of the proposed categories very difficult.[27]

Searle's attempt to avoid the declarative mood of explicit performatives, discussed in the previous section, is also unconvincing. Altogether, the difficulty with

[26] See section 2.3.2.

[27] See Miller and Johnson-Laird (1976, pp. 636–8) and Sperber and Wilson (1986, p. 244).

Searle's approach seems to be that it only accounts negatively for sentence mood. That is, Searle's proposal of taxonomic categories and explicit performatives as declarations both specify what sentence mood *isn't*, but the theory does not account for what mood *is*. In the next chapter, I propose an anticonventionalist theory of speech acts beginning with a proposal of the significance of sentence mood. By proceeding in this way, an anticonventionalist theory will avoid the conventionalist problems I have discussed in this section. In the next section, I close my review of speech act theory by presenting and critiquing Searle's approach to indirect speech acts.

2.5 Indirect speech acts

Not all speech acts are taken to directly represent the proposition they contain. For instance, the question *Can you pass the salt?* literally appears to be a question about the hearer's *ability* to pass the salt. Yet, in most contexts, this utterance would be taken as a request simply to *pass* the salt.[28] Furthermore, such expressions as *Do you have a watch?* and *It's cold in here* can actually be requests for the time and for someone to close a window, respectively.

In the following subsection, I give Searle's account of *indirect speech acts*, such as those given above. Searle hypothesizes that indirect speech acts consist of a literal speech act from which an intended speech act can be inferred.

In the next subsection, I criticize Searle's theory for the reason that it breaks Searle's own proposed felicity conditions for illocutionary acts. As there appears to be no way to retain Searle's felicity conventions, I conclude that a theory of indirect speech acts should be anticonventionalist—a theory I outline in the next chapter.

[28] See also Pencil (1976).

2.5.1 Searle's theory of indirect speech acts

Searle (1975) proposes that an account of indirect speech acts should be based on his theory of speech acts, Gricean principles of cooperative conversation, common background knowledge, and a general ability of a hearer to make inferences. In this subsection, I adapt one of Searle's examples of the interpretation of an indirect speech act. This example illustrates Searle's general theory that indirect speech acts are a relationship between a literal speech act and an inferred speech act.

Searle's example of the interpretation of an indirect speech act analyzes the following exchange between two students:

(2-18) Student X: Let's go to the movies tonight.

(2-19) Student Y: I have to study for an exam.

While (2-18) is a direct proposal, (2-19) is not a direct rejection, although it would be understood as such in many circumstances. To understand (2-19) as a rejection, student X must reason through something like the following steps (the bracketed comment give the justification for each step):[29]

1. I have made a proposal to Y, and in response he has made a statement to the effect that he has to study for an exam (facts about the conversation);

2. I assume that Y is cooperating in the conversation and that therefore his remark is intended to be relevant (principles of conversational cooperation);

[29] Adapted from Searle (1975, p. 63).

3. A relevant response must be one of acceptance, rejection, counterproposal, further discussion, *etc.* (theory of speech acts);

4. But his literal utterance was not one of these, and so was not literally relevant (inference);

5. Therefore, his primary illocutionary point must differ from his literal one (inference);

6. I know that studying for an exam normally takes a large amount of time relative to a single evening, and I know that going to the movies normally takes a large amount of time relative to a single evening (factual background information);

7. Therefore, he probably cannot both go to the movies and study for an exam in one evening (inference);

8. A preparatory condition on the acceptance of a proposal is the ability to perform the act predicated in the propositional content (theory of speech acts);

9. Therefore, I know that he has said something that has the consequence that he probably cannot consistently accept the proposal (inference);

10. Therefore, his primary illocutionary point is probably to reject the proposal (inference).

Although this does not show how such reasoning may be represented (or how step 3 is internal to the theory of speech acts), it is nevertheless intuitively plausible. The

fundamental aspect of Searle's account is revealed by steps 5 and 10, which illustrates his contention that indirect speech acts are a mapping (series of inferences) from a literal speech act to a non-literal one.[30]

In the following subsection, I criticize Searle's theory of indirect speech acts on the basis that it violates the felicity conditions he proposes for illocutionary acts.

2.5.2 Indirection without convention

In the previous subsection, I gave an example of Searle's theory of indirect speech acts. He proposes that indirect speech acts consist of a literal illocutionary act from which an intended, but non-literal illocutionary act can be inferred. In this subsection, I argue that Searle's account calls his notion of conventional felicity conditions into question. In dealing with indirect speech acts, it becomes difficult to tell apart Searle's proposed felicity conditions from Gricean principles of cooperative conversation. This consideration leads to the conclusion that an anticonventionalist theory should not use any special conventions in interpreting indirect speech acts, but rather use a theory of lexical semantics combined with a Gricean theory of conversational implicature.

The first issue raised by Searle's account is how a general inference mechanism should interact with his speech act conventions to produce his results. Searle notes that utterances like *Salt is made of sodium chloride* and also (I assume) utterances like *Do you exist?* are not good ways of requesting a salt shaker to be passed, despite the fact that they are preconditions of that action. Searle argues that the hearer's ability to carry out an action is a felicity condition for requesting that action.[31] Searle claims that the hearer can therefore directly infer that a question

[30] See section 2.4.1 on Searle's definition of illocutionary point.

[31] See step 8 in the previous subsection.

about the felicity condition of an act is actually meant as a request to perform that act. Yet, it is difficult to see how this form of indirection can be reliably distinguished from the form inherent in using *It's cold in here* to request that the hearer shut a window—broader contextual information is certainly required in the latter case. In the salt-passing case, it appears that the interpretation of the indirect speech act relies on Searle's special conventions for requesting. However, in the window-shutting case, the interpretation of the indirect speech act relies instead on general knowledge and Gricean implicature. But both are indirect requests. It seems superfluous to suppose that some cases of indirect requests rely on special conventions while others do not.

A second, and fundamental, problem with Searle's theory is his requirement that two separate illocutionary acts are simultaneously performed in an indirect utterance. As Gazdar (1981, pp. 74–5) points out, the indirect expression in (2-20) cannot be explained according to Searle's theory.

(2-20) May I remind you that your account is overdue?

If Searle's theory is correct, then (2-20) has the literal meaning of a request for permission to remind. However, it cannot actually be such a request because the reminding is performed in uttering the expression without the permission being granted. This violates Searle's proposed felicity condition for requesting which, in this case, is that the act of requesting counts as an attempt to get the addressee to grant permission.[32]

This problem might be fixed by allowing Searle's felicity conditions to be violated under certain circumstances, but Searle does not give any limitations for

[32]Searle's felicity conditions for requesting *etc.* are summarized by Miller and Johnson-Laird (1976, p. 637).

such a process. In any case, allowing controlled violations of the felicity conditions makes their separate existence from Gricean conversational maxims difficult to justify, as in the first point in this subsection. It would seem that a preferable method of dealing with indirect speech acts would be to abandon any conventional felicity conditions and account for indirect speech acts as a pragmatic (Gricean) relationship between a literal and non-literal interpretation of an utterance.[33]

A final issue raised by Searle (1976, p. 77) is the non-occurence of expressions like *Do I want you to pass the salt?* and *You want to pass me the salt.* I wish to mention this here because, although Searle cannot explain these facts, the theory I propose in the next chapter does. Searle explains that he believes it is "odd" for a speaker to ask others about his own psychological state, and "odd" to assert the existence of other's psychological states when addressing them. In the next chapter, I present a theory of mood which, I believe, helps to explain this observation.

My conclusion in this section is that, although Searle's theory of indirect speech acts is an improvement over its predecessors,[34] it cannot be reconciled with Searle's conception of conventional felicity conditions for illocutions. An anticonventionalist approach seems preferable: one that uses Gricean pragmatics to relate the literal interpretation of an utterance to its intended, non-literal interpretation. I present such a model of indirect speech acts in the next chapter.

2.6 Summary

In this chapter, I have given a review of speech act theory with the aim of distinguishing between the conventionalist and anticonventionalist approaches to speech

[33] See also Bach and Harnish (1979, pp. 183–92) and Levinson (1983, pp. 273–6).
[34] See Leech (1977).

acts. I have contrasted conventionalist views on primary performatives, explicit performatives, and indirect speech acts. The conventionalist approach, which relies on the existence of special, conventional felicity conditions for the performance of illocutionary acts, presents several difficulties.

The exact nature of the conventions is unclear. This is particularly so for indirect speech acts, for which Searle's proposed conventions are difficult to distinguish from Gricean principles of cooperative discourse. The conventionalist position that explicit performatives are not declarative statements is also difficult to reconcile with their consistently declarative syntax. Searle's attempt to derive a taxonomy of illocutionary acts from potential felicity conditions is unsystematic. Also, the taxonomic categories cannot be empirically examined. Finally, the negative approach to defining sentence mood taken by conventionalist theory does not appear to offer a good account of those moods.

In the next chapter I propose an anticonventionalist theory that takes advantage of the criticisms I have advanced in this chapter. The theory I propose should, in turn, form a basis for linguistically and pragmatically valid computational work. In chapter 4, I investigate the implications that the theory I propose might have in current and future work in computational linguistics.

Chapter 3

Speech acts and pragmatics

"No kill I." Is that a plea for us not to kill it, or a promise that it won't kill us?

Captain Kirk, STAR TREK: *Devil in the Dark*

3.1 Introduction

In chapter 2, I reviewed and criticized Searle's conventionalist theory of speech acts. The conventionalist approach presents significant difficulties; in particular, the conventions proposed are unclear and insufficiently motivated. In criticizing conventionalist theory, I have argued for an anticonventionalist position, in which special felicity conditions for illocutionary acts are not assumed. Rather, anticonventionalist theory would rely on a theory of sentence mood, an account of lexical semantics, and a Gricean system of pragmatics. These replace the functions performed by special felicity conditions in Searle's conventionalist theory.

My criticism of conventionalist speech act theory in chapter 2 is a reaction to the

pervasive influence of Searle's theories on computational research in speech acts.[1] While Cohen and Levesque's work (1985), among others, is anticonventionalist in the sense that it does not take illocutionary acts to be primitives of communication, it still relies on Searle's (1969) speech act theory. If most future work in computational linguistics continues to rely on Searle, then some of the problems in Searle's work would be imported into the computational research.

In this chapter, I outline an anticonventionalist theory that responds to the issues I raised in the previous chapter regarding conventionalist theory. As such, it should provide an alternative to Searle's theory in future computational research into speech acts.

The chapter is organized around my definition of the *scale of contextuality.* This scale represents the degree to which different kinds of speech acts are dependent for proper interpretation on the context in which they occur. Primary performatives are the most dependent on context and are placed in the center of the scale. Both explicit performatives and indirect speech acts supply more of their own context, but in different ways. Therefore, explicit performatives and indirect speech acts are placed at opposite ends of the scale of contextuality. In the following sections, I present an anticonventionalist account of each type of speech act in turn and show how it fits into this scale.

First, I begin with a definition of clausal mood and semantic modality and the link between them. As Sadock and Zwicky (1985) show, the declarative, interrogative, and imperative moods are the only moods common to most, if not all, human languages. Therefore, I am concerned only with these, along with the subjunctive mood which my theory predicts. After offering these definitions, I give a more de-

[1]See, for example Cohen and Perrault (1979), Perrault and Allen (1980), and Cohen and Levesque (1985).

tailed account of how they explain the significance of primary performatives, and how the system of mood and modality relates to Gricean conversational maxims. I conclude the first section by placing primary performatives at the center of the scale of contextuality, because they rely the most on context for correct interpretation.

Second, I give an anticonventionalist algorithm for the analysis of explicit performatives, which I contrast with a previous algorithm. This algorithm, proposed by Bach and Harnish (1979), does not distinguish between explicit speech acts[2] and indirect speech acts.[3] I argue that this does not adequately account for the meaning of performative verbs.[4] Therefore, I present an algorithm that does distinguish between explicit performatives and indirect speech acts, and does rely properly on the lexical meaning of performative verbs. I conclude the second section by placing explicit performatives along the 'lexical' end of the scale of contextuality, since performative verbs are lexical items that supply the context for their interpretation.

Finally, I define indirect speech acts. My definition here is negative, in that indirect speech acts are simply speech acts that cannot be adequately interpreted as primary or explicit speech acts. Indirect speech acts can be understood by an algorithm such as that of Bach and Harnish (1979). I finish the section by placing indirect speech acts along the 'inferential' end of the scale of contextuality, since they encode context by forcing the hearer to make inferences to recover their intended meaning.

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[2]See section 2.2.1.
[3]See section 2.5.
[4]See section 2.3.2.

3.2 Primary performatives

In the previous chapter, I argued that an anticonventionalist theory of speech acts should start with a theory of sentence mood. In this section, I present a theory of mood and show how this theory explains the interpretation of primary performatives. I use the concepts of direction of fit and orientation (given below) to define mood to be a textual feature of a clause that indicates the semantic modality by which the clause is to be interpreted. If this literally-indicated modality provides an acceptable interpretation of the utterance, then that utterance can be considered a primary performative. I then place primary performatives at the center of the scale of contextuality.

In the following subsection, I begin with my definitions of mood and modality. This leads to the consideration of primary performatives in the next subsection.

3.2.1 Mood and modality

Clausal mood indicates how the propositional content of an utterance is to be related to the context in which the utterance occurs. In fact, I argue, mood indicates the intended modality of the proposition communicated in an utterance. Modality, in turn, represents how the speaker relates the uttered proposition to his own beliefs. My argument here is that each clausal mood corresponds directly to a propositional modality. It is then a proposition's modality that indicates how the speaker wishes the proposition to be understood. In this subsection, I briefly discuss how mood and modality correspond to Searle's idea of illocutionary force and then define *direction of fit* and *orientation* in order to describe mood and modality more clearly.

Sadock and Zwicky (1985) have given convincing empirical evidence that all

languages share a basic inventory of clausal moods. This inventory consists of the *declarative*, *interrogative*, and *imperative* moods.[5] Thus, it is necessary for any general theory of mood to account for at least these three. Corresponding to each of these clausal moods is a propositional modality: the *statement*, *question*, and *mand* modalities respectively.[6] In an anticonventionalist theory, the mapping from these moods to their respective modalities plays the same role as relating an utterance to a taxonomic category of illocutionary acts does in Searle's theory.[7] This relationship between the concept of modality and the concept of illocutionary force is also noted by Miller and Johnson-Laird (1976, p. 206) and James (1986, p. 18).

I use the idea of 'direction of fit' essentially as it is described by Searle (1976),[8] except that I need only the *word-to-world* and *world-to-word* values. As a reminder, I repeat the definitions here. If a proposition has the word-to-world direction of fit, then the proposition is meant to be a truthful description of the world. If a proposition has the world-to-word direction of fit, then the proposition is meant to describe something that the speaker feels should be the case in the world. One difficulty with this definition is how to interpret the term *world*. While reference to an objective state of affairs would be ideal, it is very likely in practice that both a speaker and audience would have different views of the world, and would be aware of this possibility. It is more accurate, therefore, to refer to *a (one) state of affairs* rather than *the world*. At this point, the question of *which* state of affairs is being referred to arises. This is answered by the concept I define as *orientation*.

Orientation, like direction of fit, has two values: *speaker orientation* and *audi-*

[5]Mood may be formally marked by any of syntax, morphology, prosody, and punctuation. I assume only that the relevant information is available from the text of an utterance.

[6]The term *mand* is taken from words such as *command*, *demand*, and *reprimand*.

[7]See section 2.4.

[8]See section 2.4.1.

Direction of fit	Orientation	Mood
factual	speaker	declarative
factual	audience	interrogative
counterfactual	speaker	subjunctive
counterfactual	audience	imperative

Table 3.1: Correspondence of *fit*, *orientation*, and *mood*.

ence orientation.[9] Speaker orientation means a reference to the speaker's view of the state of affairs, while audience orientation means a reference to the audience's view of the state of affairs. This is meant to capture the frequent observation that imperatives and interrogatives, which have the audience orientation, are directly used to provoke an action from the audience while declaratives, which have the speaker orientation, are not.

Since the properties of direction of fit and orientation are both binary-valued, their permutations are easily summarized in tabular form. In order to relate Searle's term *direction of fit* to more usual linguistic usage, I use the term *factual* to refer to the word-to-world direction of fit and the term *counterfactual* to refer to the world-to-word direction of fit.[10] Each row in table 3.1 presents a permutation of direction of fit and orientation with the corresponding mood. The subjunctive mood is in table 3.1 because it is predicted by this system—I briefly discuss it in this section.[11]

These textually signified moods, when used in primary performatives, corre-

[9]The term *orientation* is taken from Halliday (1985, pp. 342–5).

[10]Searle uses the up-arrow symbol "↑" for the word-to-world direction of fit, and the down-arrow symbol "↓" for the world-to-word direction of fit, but I find this too cryptic. The terms "factual" and "counterfactual" are taken from Leech (1983, p. 118). See also Lyons (1977, p. 750).

[11]See James (1986).

spond directly to semantically signified modalities. The factual direction of fit corresponds to the *epistemic* type of modality, and the counterfactual direction of fit to the *root* modality. In linguistic usage, epistemic modality characterizes propositions as referring to necessity, probability, or possibility in reasoning, while root modality characterizes propositions as referring to obligation, permission, or ability in the real world.[12] Root modality is very similar to deontic modality in formal logic. Effectively, epistemic modality, due to its factual correspondence, allows the evaluation of the truth conditions of a proposition, while root modality, due to its counterfactual correspondence, does not allow a proposition to be evaluated as truth-conditional.

In table 3.2, the terms I have used to define modality are given in the same row as the textual mood to which they directly correspond.[13] In the following subsections, I clarify the meaning of the definitions I have given here by showing how this account of mood and modality allows for the proper interpretation of primary performatives. I also show how this theory relates to Gricean conversational maxims, particularly the *maxim of quality.*

3.2.2 Declaratives

In this subsection, I show how the system of mood and modality I have just outlined can be used to interpret a primary performative in the declarative mood. Consider the declarative primary performative in example (3-1).

[12] See James (1986), Palmer (1990, pp. 5–8), and Sweetser (1990, p. 49). The epistemic/root distinction is not new; Sapir (1921, pp. 38–9) describes this as a cognitive/volitional distinction of modality.

[13] See Lyons (1977) and Leech (1983). No modality is given for the subjunctive mood in particular since it does not occur in independent clauses in modern English, and because none is provided in the literature.

Type of modality	Modality	Mood
epistemic	statement	declarative
epistemic	question	interrogative
root	—	subjunctive
root	mand	imperative

Table 3.2: Correspondence of modality to mood.

(3-1) I'll be back.

Since example (3-1) is in the declarative mood, it has the factual direction of fit and the speaker orientation. Taken literally, it is therefore a statement and to be interpreted in the epistemic modality. This signifies that the propositional content *I will be back* is intended by the speaker to be judged as true or false against the speaker's view of the state of affairs.

This situation is depicted in figure 3.1. In the figure, the large oval represents the set of beliefs that is the audience's view of the state of affairs. This is, effectively, the context in which the proposition is to be judged. The smaller oval within the larger one represents what the audience regards as the speaker's view of the state of affairs. The utterance (3-1) is represented at the bottom of the figure. The dashed upward arrow shows how the utterance is taken as a primary speech act in the declarative mood, and points to the propositional content understood from the utterance. Since the mood of the utterance is declarative, the modality of the proposition is taken as a statement, with the factual direction of fit and speaker orientation. For this reason, the solid arrow indicates that the propositional content is to be compared to what the audience believes is the speaker's view of the state

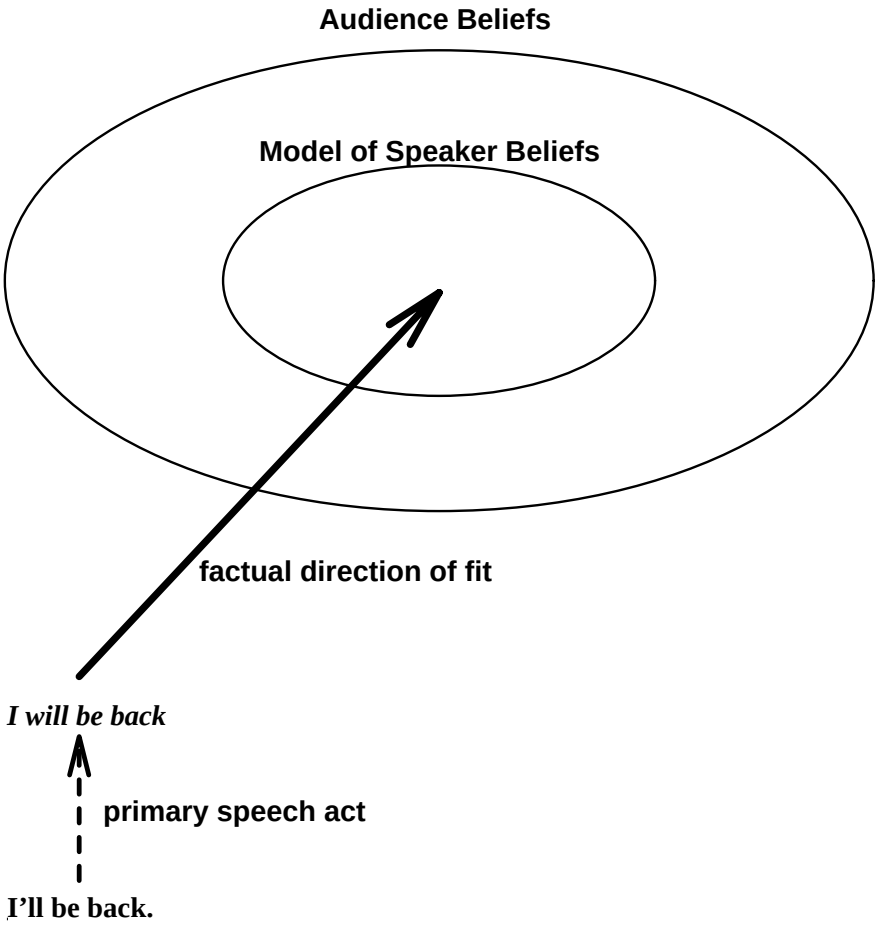


Figure 3.1: A declarative primary speech act.

of affairs.

Having understood the modality of the proposition, the audience can judge the proposition as being true or false. If the proposition is found to conflict with the audience's model of the speaker's beliefs, then the audience can conclude that the speaker is lying and will not be back. Otherwise, the audience can conclude that the speaker truthfully believes that he will be back.[14]

[14] Actually, interpretation of any communicative utterance also depends on its being interpreted as a deliberate attempt to communicate. This self-referential property is usually referred to as a *reflexive intention*. An adequate study of this intention is beyond the scope of this thesis, although

In the following subsection, I give an analysis of interrogative primary performatives similar to the analysis of declaratives given here.

3.2.3 Interrogatives

In this subsection, I show how the system of mood and modality can be used to interpret a primary performative in the interrogative mood. Consider the declarative primary performative in example (3-2).

(3-2) Are you Sarah Connor?

Since example (3-2) is in the interrogative mood, it has the factual direction of fit and the audience orientation. Taken literally, it is therefore a question and to be interpreted in the epistemic modality. This signifies that the propositional content *You are Sarah Connor* is intended by the speaker to be judged as either true or false against the audience's view of the state of affairs.

This situation is depicted in figure 3.2. The utterance (3-2) is represented at the bottom of the figure. The dashed upward arrow shows how the utterance is taken as a primary speech act in the interrogative mood, and points to the propositional content understood from the utterance. Since the mood of the utterance is interrogative, the modality of the proposition is taken as a question, with the factual direction of fit and audience orientation. For this reason, the solid arrow indicates that the propositional content is to be compared to the audience's view of the state of affairs. Because the proposition's truth value is not represented as being known in the speaker's beliefs, the speaker is not taken to have communicated a truth value with the proposition.[15]

I assume a characterization can be made. See section 2.2.2, Strawson (1964), Bach and Harnish

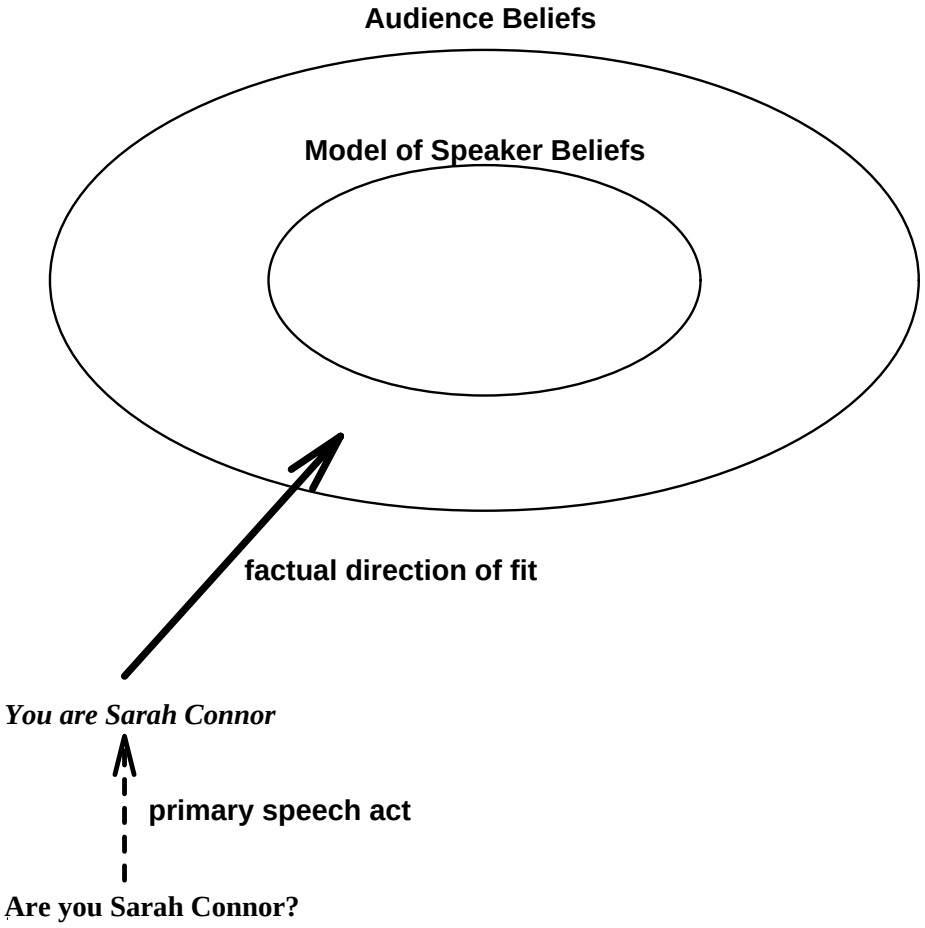


Figure 3.2: An interrogative primary speech act.

The audience's response to the question depends on whether the audience believes that the speaker is obeying Grice's maxim of quality.[16] If the audience believes that the speaker is obeying the maxim of quality in asking the question, then the audience can conclude that the speaker really does not know the answer. In this case, the most cooperative response is probably to inform the speaker of the answer, saying perhaps *Yes, I am* or *No, I'm not.* If the audience believes that the speaker is not obeying the maxim of quality, then the audience can conclude that the speaker really does know the answer to his question. In this case, the audience can interpret the speaker's question rhetorically, as if it were meant only to bring the answer into the discourse. The most appropriate response might be to say *What do you want this time?*[17,18]

In the next subsection, I give an analysis of imperative primary performatives similar to the analysis of declaratives and interrogatives given so far.

3.2.4 Imperatives

In this subsection, I show how the system of mood and modality can be used to interpret a primary performative in the imperative mood. Consider the imperative primary performative in example (3-3).

(3-3) Get out.

(1979), Bierwisch (1980), and Recanati (1987).

[15]For this reason, questions can be regarded as defective, in that the proposition they refer to contains a free variable. In *yes-no* questions, this is simply the truth value, while in *wh*-questions, it is a free variable within the proposition that results in the lack of a truth value. See Kiefer (1980) and Leech (1983, pp. 115–6).

[16]The relationship between modalities and Grice's maxim of quality is further discussed in section 3.2.6.

[17]In fact, this makes the question an indirect speech act. See section 3.4.

[18]See Hudson (1975) for a congruent but broader examination of interrogatives and questions.

Since example (3-3) is in the imperative mood, it has the counterfactual direction of fit and the audience orientation. Taken literally, it is therefore a mand and to be interpreted in the root modality. This signifies that the propositional content *You get out* is intended by the speaker to be judged as a state to which the audience's view of the state of affairs should conform.[19]

This situation is depicted in figure 3.3. The utterance (3-3) is represented at the bottom of the figure. The dashed upward arrow shows how the utterance is taken as a primary speech act in the imperative mood, and points to the propositional content understood from the utterance. Since the mood of the utterance is imperative, the modality of the proposition is taken as a mand, with the counterfactual direction of fit and audience orientation. For this reason, the solid arrow indicates that the audience's view of the state of affairs is to be compared with the propositional content of the utterance. Because it is not the speaker's view of the state of affairs that is referred to, it is not the speaker himself who is taken to intend to act so that the state of affairs conforms to the proposition.

The audience's response to the mand depends on whether the audience believes the speaker is being sincere. In example (3-3), the speaker is being sincere if he intends the audience to get out, but is doubtful of the audience's own intention to do so. The audience can conclude that the most cooperative response would be to conform to the proposition and get out. If the speaker is believed to be insincere, then he might already know of the audience's intention to get out, so that the imperative could be interpreted to mean that the speaker believes the audience's intention to be uncooperative.[20]

[19] Whether or not an imperative refers to a desired state, *e.g., Be quiet*, or the means of achieving that state, *e.g., Shut up*, I take to be irrelevant for my purposes.

[20] This is much like the analysis of *Are you Sarah Connor?* as a rhetorical question in section 3.2.3. See also section 3.2.6.

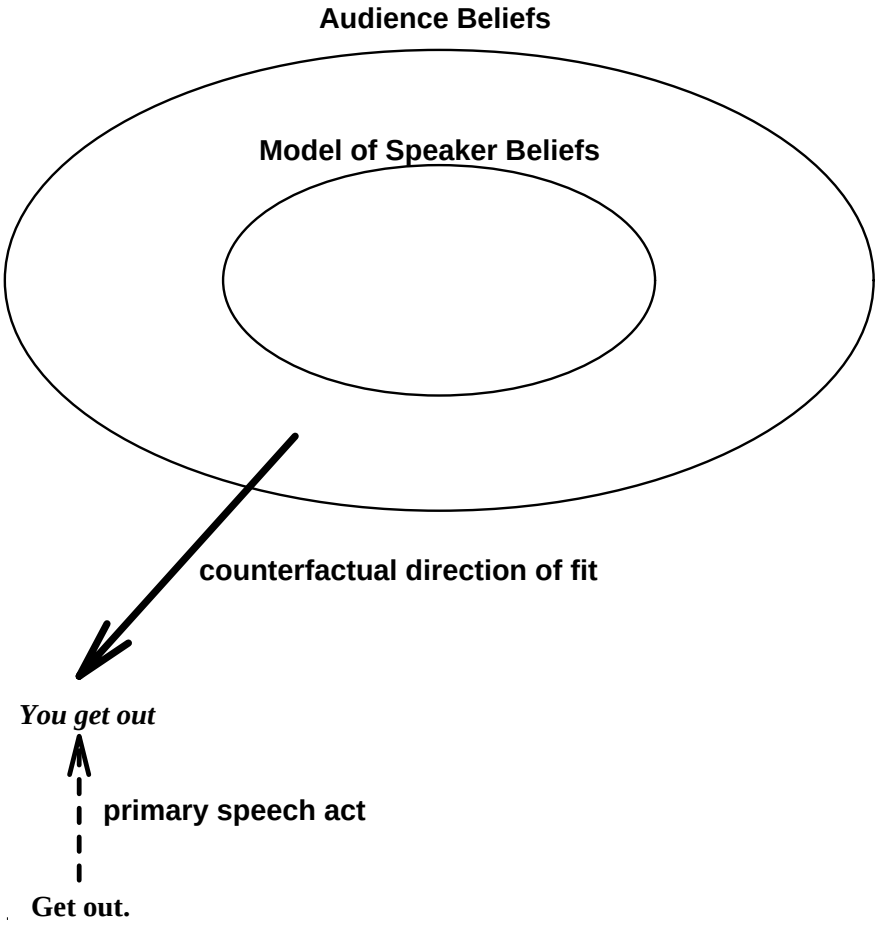


Figure 3.3: An imperative primary speech act.

In the next subsection, for the sake of completeness, I give a brief analysis of subjunctive primary performatives similar to the other analyses given so far.

3.2.5 Subjunctives

In this subsection, I show how the system of mood and modality can be used to interpret a primary performative in the subjunctive mood. Consider the subjunctive primary performative in example (3-4).

(3-4) God bless you.

Since example (3-4) is in the subjunctive mood, it has the counterfactual direction of fit and the speaker orientation. Taken literally, it is to be interpreted in the root modality. This signifies that the propositional content *God blesses you* is intended by the speaker to be judged as a state to which his own view of the state of affairs should conform.

This situation is depicted in figure 3.4. The utterance (3-4) is represented at the bottom of the figure. The dashed upward arrow shows how the utterance is taken as a primary speech act in the subjunctive mood, and points to the propositional content understood from the utterance. Since the mood of the utterance is subjunctive, the modality of the proposition is taken as root, with the counterfactual direction of fit and speaker orientation. For this reason, the solid arrow indicates that the audience's model of the speaker's view of the state of affairs is to be compared with the propositional content of the utterance. Because of this, the audience can conclude that the speaker intends to act so that God blesses the audience. In fact, the speaker's utterance itself is that action.

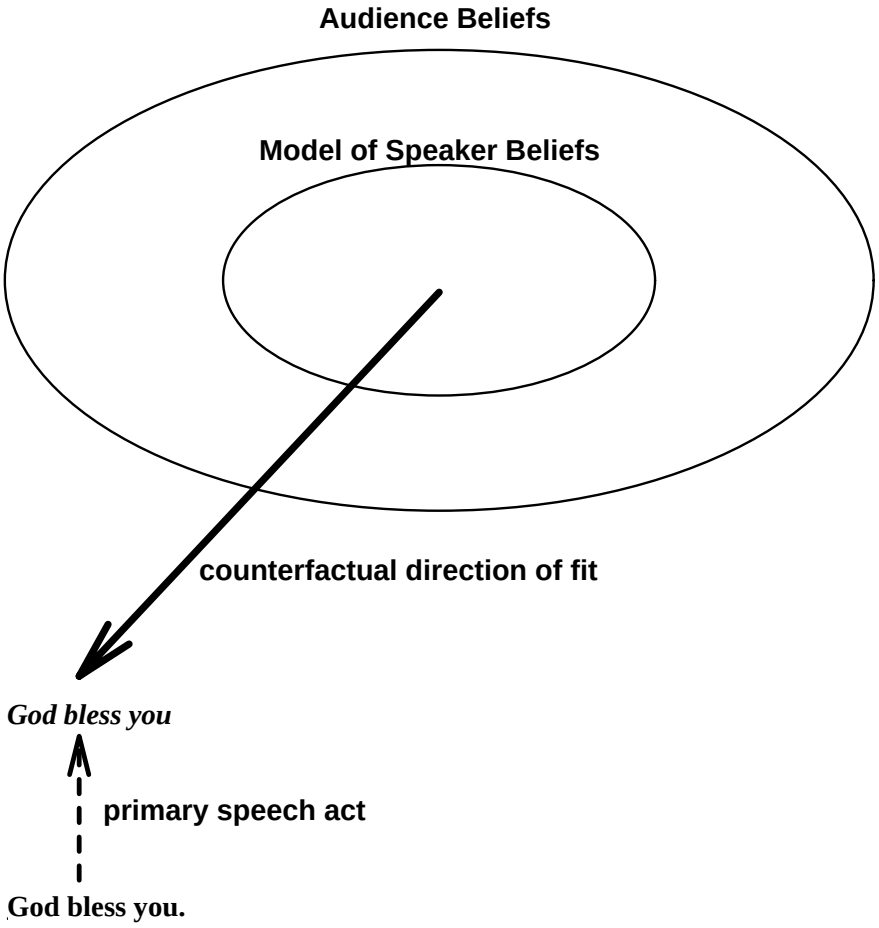


Figure 3.4: A subjunctive primary speech act.

As subjunctives are no longer current as primary performatives in modern English, I say no more about them here.[21] In the next section, I show how the model of primary performatives I have outlined is related to Gricean conversational principles, specifically, to the maxim of quality.

3.2.6 The maxim of quality

In the preceding sections, I have defined clausal mood and modality and shown how they model the interpretation of primary performatives. I complete my discussion of primary performatives by showing how the interpretation of primary performatives is related to Grice's maxim of quality. Grice's (1975) maxim of quality is part of his proposed principles of cooperative conversation, and applies to the truthfulness of a speaker's utterances. Because of this, it is well suited to the analysis of propositions in the epistemic modality. However, it does not cover propositions in the root modality. I therefore propose extending Grice's maxims with a parallel maxim of sincerity that can be applied to the root modality. In this subsection, I discuss how the maxim of quality is related to epistemic propositions and how the proposed maxim of sincerity is related to root propositions. I can then conclude this section by placing primary performatives in the scale of contextuality in the subsequent subsection.

Grice (1975) described, as part of the principle of cooperative conversation, the *maxim of quality*. This maxim enjoins speakers to make their utterances truthful. The maxim consists of two related submaxims that can be given as follows:[22]

In trying to make your utterances true:

[21] See James (1986) for more discussion.
[22] See Grice (1975) and Levinson (1983, p. 101).

(i) Do not claim to be true what you believe to be false;

(ii) Do not claim to be true that for which you lack adequate evidence.

While these maxims are usually discussed in relation to conversational implicature, because of their attention to truthfulness, they are also relevant to the description of the factual moods.

Indeed, as Grice (1977, p. 114) notes, the declarative mood does not so much conform to the maxim of quality as it expresses that maxim.[23] In other words, a declarative utterance does not imply or implicate that a proposition is true, it directly expresses the claim that a proposition is true.

More specifically, the declarative mood appears to express submaxim (i) of the maxim of quality because it expresses both that the speaker is not uttering what he believes to be false (following submaxim (i)) and that he has sufficient evidence for this belief (following submaxim (ii)).[24] The interrogative mood appears to express only submaxim (ii) because it expresses only that the speaker himself lacks the evidence to make a statement about the proposition.[25]

The maxim of quality is inadequate to describe counterfactual moods because those moods do not allow for truth-functional judgment. Levinson suggests that this may be remedied by generalizing the interpretation of the maxim of quality "as the injunction to produce non-spurious or sincere acts" (1983, p. 103).[26] Therefore, in parallel with Grice's maxim of quality, I propose a *maxim of sincerity* that regulates counterfactual utterances:

[23] See also Levinson (1983, p. 105).

[24] Submaxim (i) depends on submaxim (ii) because a valid truth evaluation depends on sufficient evidence.

[25] See section 3.2.3, and also Hudson (1975, pp. 6–8).

[26] See also Leech (1983, p. 80).

In trying to make your utterances sincere:

(i) Do not propose to bring about what you intend should not happen;

(ii) Do not propose to bring about that which you are not in a position to bring about.

The imperative mood appears to express only submaxim (ii) of the maxim of sincerity because it expresses only that the speaker himself lacks the position to bring about some state of affairs. Essentially, an imperative utterance expresses that the speaker wishes something to happen, but is unable to bring it about himself. If the audience is cooperative, then the audience can adopt the intention to bring about what the speaker apparently wishes to happen.[27] The subjunctive mood appears to express submaxim (i) of the maxim of sincerity because it expresses both that the speaker is proposing what he does indeed intend to bring about (following submaxim (i)) and that he has the means to do so (following submaxim (ii)).[28]

The phrasing used here is not completely precise as it is not within the scope of this thesis to propose a complete theory of conversational sincerity and intention. Nevertheless, it should be reiterated that the maxims presented in this section are not the definition of clausal moods, but rather the principles of cooperative conversation that follow from the definitions of those moods.

In the following subsection, I conclude my discussion of primary performatives with a discussion of where they fit in the scale of contextuality.

[27] See section 3.2.4.
[28] See section 3.2.5.

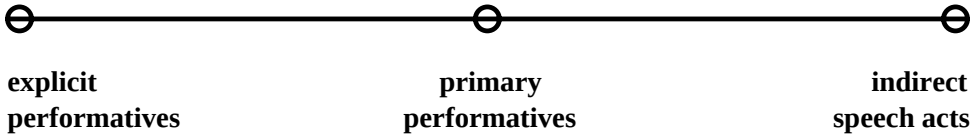


Figure 3.5: The scale of contextuality—version 1.

3.2.7 Primary performatives in the scale of contextuality

The *scale of contextuality* defines how much of the context of an utterance is referred to in the utterance, and how this reference is achieved. The scale presented in this chapter is somewhat crude, but could be refined through further research.

I place primary performatives at the center of the scale. This is because, as I showed in the previous section, they make a minimal commitment to how they conform to Gricean principles of cooperative conversation.[29] As I demonstrate in the following sections, this is not true of explicit performatives or indirect speech acts, because they cannot be adequately interpreted in context as just primary performatives. Explicit performatives, as I show in section 3.3, encode part of their context of interpretation lexically in the form of a performative verb. Indirect speech acts, as I argue in section 3.4, encode part of their context of interpretation in the form of the inferences necessary for the hearer to analyze their intended meaning. I give a preliminary version of the scale of contextuality in figure 3.5.

3.2.8 Summary of primary performatives

In the preceeding subsections, I have given a definition of clausal mood and semantic modality and shown the link between them. Since the declarative, interrogative, and imperative moods are the only moods common to most, if not all, human

[29] See Hudson (1975, p. 7) and also Leech (1980, pp. 86–7).

languages, I have been primarily concerned with these. However, the theory I present also predicts the presence of the subjunctive mood. I have then shown how these definitions offer an account of the analysis of primary performatives. Also, I have argued that the system of moods and modalities proposed here are related in a simple way to Grice's maxim of quality and my proposed maxim of sincerity. And since primary performatives make only this reference to Gricean conversational principles, I have argued that they belong at the center of the scale of contextuality.

Before proceeding, I would like to summarize how the theory proposed here follows the points I raised in the previous chapter. As I pointed out in section 2.4.2, an anticonventionalist theory should proceed from an account of clausal moods and primary performatives. The theory I have presented in this section, which addresses this point, therefore has several benefits. For one, the ambiguity inherent in some primary performatives[30] is explained by context rather than convention. According to Searle's conventionalist approach,[31] utterances such as *I'll be back* are ambiguous because they can be either representatives (predictions) or commissives (promises). In the account given here, such an utterance is simply an expression in the declarative mood, so that any remaining difficulty in interpretation is due to an inadequacy of contextual information.[32]

Also, by beginning with an analysis of clausal moods, the model captures the similarity between interrogatives and imperatives without conflating the two categories. As noted by Lyons (1977, pp. 753–7) and Recanati (1987, p. 158), many current theories of speech acts hold that questions are a subtype of mands, so that, for example, the question *Are you Sarah Connor?* is equivalent to the mand *Tell*

[30] See section 2.4.2.

[31] See section 2.4.1.

[32] See, for example, the analysis of *Are you Sarah Connor?* as a rhetorical question in section 3.2.3.

me whether you are Sarah Connor. Taken to its logical conclusion, this would fail to explain the universal distinction between interrogative and imperative moods. In the account given here, interrogatives and imperatives are similar in that both convey the audience orientation and therefore provoke similar behaviour in a cooperative audience, but they are not identical because they have opposite directions of fit.[33]

Finally, the account of primary performatives I have given lends support to Searle's observation[34] that it is "odd" for a speaker to ask others about the existence of his own psychological states and to assert the existence of others' psychological states. The interrogative mood has the audience orientation and therefore typically refers to the audience's beliefs,[35] making utterances like *Do I want you to pass me the salt?* difficult to interpret. In this case, the audience orientation conflicts with the speaker's reference to himself in the subject of the proposition about a psychological state. Similarly, the declarative mood has the speaker orientation and therefore typically refers to the speaker's beliefs.[36] This makes utterances such as *You want to pass me the salt* difficult to interpret because the speaker orientation conflicts with the speaker's reference to his audience in the subject of the proposition about a psychological state.

In the next section, I present an algorithm for the analysis of explicit performatives, and I place explicit performatives along the scale of contextuality.

[33] Sadock (1990) suggests taking declaratives to be true, interrogatives ambiguously true or false, and imperatives false. I believe this will prove hard to reconcile with the non-epistemic nature of mands, as well as the connection between moods and the maxim of quality.

[34] See section 2.5.2.

[35] See section 3.2.3.

[36] See section 3.2.2.

3.3 Explicit performatives

In this section, I give an anticonventionalist algorithm for the analysis of explicit performatives, which I contrast with a previous algorithm proposed by Bach and Harnish (1979). Their algorithm does not distinguish between explicit speech acts[37] and indirect speech acts.[38] I argue that this does not adequately account for the meaning of performative verbs.[39] Therefore, I present an algorithm that does distinguish between explicit performatives and indirect speech acts, and does take account of the lexical meaning of performative verbs.

In order to more clearly present my algorithm, I discuss the inductive algorithm proposed by Bach and Harnish (1979, pp. 169–75) in the next subsection. I then proceed to contrast it with my deductive algorithm in the following subsection. I believe this is worth doing because deductive algorithms are typically more accurate cognitively and computationally.[40] I then briefly present an appropriate representation for performative verbs, based on Leech (1983, pp. 207–12), in the subsequent subsection. In the final subsection, I place explicit performatives at the 'lexical' end of the scale of contextuality, since performative verbs are lexical items that supply the context for their interpretation.

[37] See section 2.2.1.

[38] See section 2.5.

[39] See section 2.3.2.

[40] This is because deductive algorithms are deterministic—given the same input, they always produce the same output. Inductive algorithms are non-deterministic and do not have this property. For present purposes, this means that an inductive algorithm will require the use of Gricean implicature, while a deductive algorithm will not.

3.3.1 An inductive account of explicit speech acts

Bach and Harnish (1979, pp. 206–7) deny that performative verbs play a direct role in determining the speech act performed by an explicit speech act. Rather, they suggest that the illocutionary force of an explicit speech act can be determined indirectly by Gricean conversational implicature. Their algorithm is anticonventionalist in that it takes explicit performatives to be statements of fact. However, their algorithm is inductive in that it requires the hearer to form an inductive hypothesis to understand the speaker to have made a true statement. This makes Bach and Harnish's analysis less accurate than a deductive one. It also means that their analysis does not distinguish between explicit speech acts and indirect speech acts.[41] While Bach and Harnish (1979, p. 208) regard this as a positive feature, I wish to distinguish between explicit performatives and indirect speech acts so that I can place them separately on the scale of contextuality.

An example of Bach and Harnish's analysis will make this point clearer. Bach and Harnish (1979, p. 208) believe that a hearer would interpret the expression *I order you to leave* in roughly the following manner:

1. The speaker has said *I order you to leave*;
2. Since this expression is in the declarative mood, it is a statement;
3. Since I assume the speaker is being truthful (by Grice's maxim of quality), it follows that he must be ordering me to leave;
4. Since nothing else the speaker has done is an order for me to

[41] This is illustrated in section 3.4.1.

leave (let's assume), it must be this particular utterance that constitutes the order;

5. Therefore, in stating that he is ordering me to leave, the speaker *is* ordering me to leave.

This form of reasoning is anticonventionalist because it relies on the fact that the explicit utterance is declarative and therefore to be considered true (see steps 2 and 3). The hearer uses Gricean maxims to infer that if the speaker's statement is true, it must be simultaneously meant as the order it describes.

The problem with this account is that the performative verb in the speaker's statement seems to only confirm the hearer's hypothesis that the expression is an order, rather than directly implying that it is. Thus, any description by the speaker of his own action would be acceptable in step 3, meaning the speaker could attribute the performance of almost any action to his utterance. As Sadock (1990, p. 269) notes, Bach and Harnish's proposal would make such utterances as *I am ordering you to leave* and *I represent myself as ordering you to leave* explicit speech acts, because they also describe the speaker as performing such an order. But interpreting such utterances as orders does not appear as intuitively direct as canonical explicit speech acts.[42] Although Bach and Harnish's approach does produce correct interpretations of explicit speech acts, it does not discriminate them from other kinds of speech acts. But I do not believe this is an inherent limitation of the anticonventionalist position.

The reason Bach and Harnish's model only uses the main verb indirectly is because it is inductive in nature. Inductive reasoning is required when the initial

[42]Searle (1989, p. 543) argues that Bach and Harnish's reasoning could also be used to infer that a speaker, in saying *I am the King of Spain*, is being the King of Spain. I suspect more careful phrasing of Bach and Harnish's account would solve this problem.

conditions and desired result of a problem are known, but the operations necessary to derive the result from the initial conditions are not. In this case, when the speaker utters *I order you to leave*, he is providing the initial condition that the hearer uses in interpreting his utterance (step 1). Because the hearer assumes that the speaker is being truthful, he concludes that the desired result of the speaker's utterance is to order the hearer to leave (steps 2 and 3). However, no means of connecting this initial condition to the result is explicitly given in the utterance (step 4). The hearer can provide such a connection by inductively hypothesizing that the speaker's utterance itself is not only the description of an order to leave, but also the actual order (step 5). Therefore, Bach and Harnish's account is inductive.

In the following subsection, I propose a deductive algorithm for analyzing explicit speech acts. I have discussed Bach and Harnish's inductive algorithm because it appears to be fairly simple and possibly attractive for use computationally. However, its inductive nature would make explicit performatives possibly harder to model than they need to be. Also, its inability to distinguish between explicit performatives and indirect speech acts does not allow for their separate placement on the scale of contextuality.

3.3.2 A deductive account of explicit speech acts

In this subsection, I present my deductive analysis of explicit speech acts along similar lines to the inductive analysis of Bach and Harnish (1979), discussed in the previous subsection. A deductive analysis is to be preferred since deduction is generally a more accurate process than induction. Also, the ability to distinguish between explicit performatives and indirect speech acts allows for greater refinement of the scale of contextuality. A deductive analysis also relies on the lexical meaning

of the performative verb, which I discuss further in the next subsection.

Deductive reasoning is possible when the initial conditions and means for solving a problem are known, but the conclusion remains to be drawn. For explicit performatives, the whole statement made is the initial condition, while the performatively-used main verb provides the means necessary for figuring out the act the speaker is performing. For example, the steps taken by a hearer in interpreting *I order you to leave* can be summarized as follows:[43]

1. The speaker has said *I order you to leave*;

2. Since this expression is in the declarative mood, it is a statement of fact;[44]

3. In the statement, the speaker says that he presents the proposition *You leave* as being in a situation in which he can authoritatively expect me to conform to that proposition (definition of the verb "order");

4. I believe the time of the situation he proposes (in step 3) is now (default assumption);[45]

5. Therefore, the speaker's statement that the situation in which he orders me to leave is the current situation is true, and he has ordered me to leave.

[43] Regarding step 4, see Leech (1983, pp. 184–9). Regarding step 5, see Recanati (1987, pp. 184–216).

[44] See section 3.2.2.

[45] This assumption can be confirmed by use of adverbs like *hereby* and *now* and cancelled by adverbs like *often* and *usually*. Compare the performative meaning of *I hereby/now order you to leave* with the habitual meaning of *I often/usually order you to leave* (when someone tells me to).

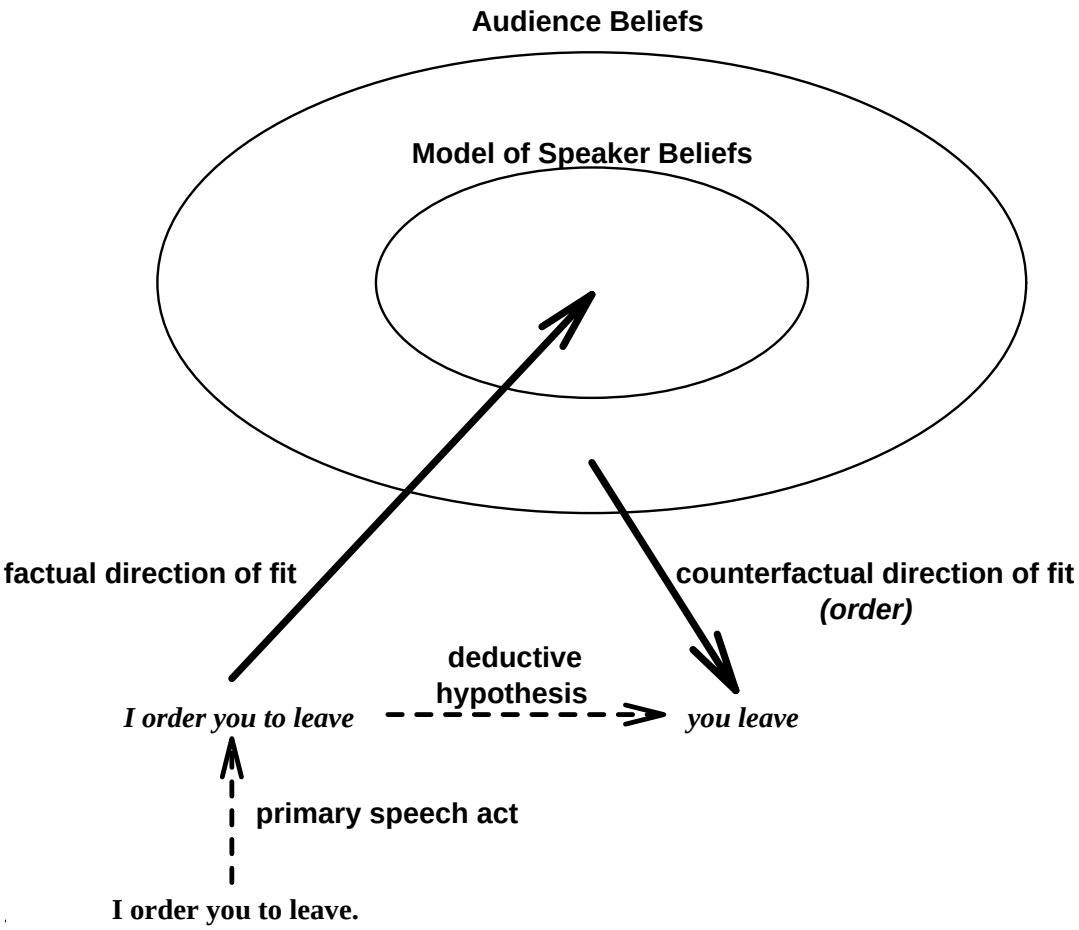


Figure 3.6: A deductive model of an explicit speech act.

This analysis is deductive because the performative verb in the speaker's statement (step 3) provides the means necessary for properly interpreting the proposition *You leave.* This, in turn, provides the grounds for the hearer to conclude that the speaker's statement (the explicit speech act) is true.

The effect of my algorithm on the audience's beliefs is depicted in figure 3.6. The propositional content of *I order you to leave* is first understood as a statement. Then, analysis of the proposition, and specifically the verb "order", shows that the speaker is referring to the proposition *You leave* roughly as if it were an imper-

ative to the audience. This is represented in figure 3.6 by the dashed, rightward arrow pointing to the propositional content of the order: *You leave.* Because that proposition is given as an order, it has the counterfactual direction of fit, like an imperative.[46] All things being equal, the speaker assumes that the time in which the proposition *You leave* is meant as an imperative is the time of the primary performative, *i.e.,* now (step 4). Therefore, the audience deduces that the speaker's statement that he is ordering the audience to leave is true (step 5).

Because this account is deductive, it is more accurate than the inductive account and produces the correct result. Unlike Bach and Harnish's account, this model does not allow the interpretation of expressions like *I am ordering you to leave* or *I represent myself as ordering you to leave* as explicit speech acts. The use of the progressive aspect in *I am ordering you to leave* means that the hearer must additionally assume that the time (or duration) of the situation proposed in step 3 is actually complete by step 4. The terms "I represent myself" in *I represent myself as ordering you to leave* do not refer to a communicative situation at all, so that step 3 is not possible without additionally assuming that "representing" is being used as a metaphor for uttering.

The model I have presented in this subsection fulfills the conditions I set for it previously. In section 2.3.2, I suggested that because performative verbs are a subset of verbs that report verbal processes, their use in explicit performatives could be explained on general principles rather than by special conventions. This is true for my model since it simply relies on deduction using the lexical meaning of the main verb. Consequently, my model allows for the fact that explicit performatives are statements. It also produces the correct interpretation of explicit performatives without allowing the interpretation of non-explicit speech acts. Finally, since it is

[46] See section 3.2.4.

deductive, this account should provide a procedurally accurate means of analyzing explicit performatives in computational work which I discuss in the next chapter.

In the following subsection, I briefly present a notation for performative verbs, adapted from Leech (1983), that is compatible with the model of explicit speech acts I have presented here.

3.3.3 Performative verbs

In the previous subsection, I claimed that the lexical meaning of performative verbs includes a reference to the modality[47] in which a proposition is intended to be interpreted. For instance, the verb "order" in the expression *I order you to leave* represents the context in which the proposition *You leave* is meant as an imperative to the hearer. To make my presentation complete, I briefly describe an adaptation of the notation for performative verbs, suggested by Leech (1983), because it is complementary to the analysis of performative verbs implied in the previous subsection.

Leech (1983, pp. 207–13) argues that performative verbs can be classified according to which modality they impose on the propositions they govern. My adaptation of this proposal is summarized in table 3.3. In each row, the name of each verb category is given along with the corresponding proposed representation (S is *statement* modality; M is *mand* modality; Q is *question* modality; X is *expressive*, discussed in appendix A).[48]

The category names are related to the categories of illocutionary acts proposed by Searle.[49] The class of assertive verbs includes verbs like *claim*, *assert*, and *state*.

[47] See section 3.2.1.
[48] See Leech (1983, p. 209).
[49] See section 2.4.1.

Verb category	Representation
Assertive	**F(S)**
Directive and Commissive	**F(M)**
Rogative	**F(Q)**
Expressive	**F(X)**

Table 3.3: The representation of performative verbs.

The class of directive and commissive verbs includes verbs like *order*, *demand*, and *promise*. The class of rogative verbs includes verbs like *ask*, *inquire*, and *question*. The expressive category is the same as that described by Searle.[50] Expressive verbs, like *apologize*, take a referring expression as an object rather than a proposition, *e.g.,I apologize for stepping on your toe.*[51]

It should be noted that the representation presented here refers more specifically to verb *senses*, as some performative verbs have senses that fit into more than one of the above categories. For example, consider the uses of the verbs *insist*, *suggest*, and *warn* in sentences (3-5), (3-6), (3-7), (3-8), (3-9), and (3-10). In the first of each pair of these sentences, the modality conveyed by the main verb is epistemic, while it is root in the second of each pair.[52]

(3-5) I insist that he is there.

(3-6) I insist that he be there.

[50] See section 2.4.1.

[51] The referring expression is *stepping on your toe*. Expressives do not yet fit cleanly into the model of explicit speech acts I propose in this thesis. See appendix A for further discussion.

[52] On root and epistemic modalities, see section 3.2.1. See also James (1986), Leech (1983, p. 208), and Sweetser (1990, p. 69).

(3-7) I suggest that your contribution is useless.

(3-8) I suggest that your contribution be useful.

(3-9) I warn you that travel is expensive.

(3-10) I warn you to take enough money.

In the first of each pair of examples, the hearer is to interpret the governed proposition as in the statement modality—something the speaker believes is true. In the second of each pair of examples, the hearer is to interpret the governed proposition as in the mand modality—something the speaker doubts that the hearer will do otherwise.

In this subsection, I have presented a representation of performative verbs compatible with the analysis of explicit performatives given in the previous subsection. The classification given here does not exhaust the differences among performative verbs,[53] but it does indicate how the lexical meaning of performative verbs allows for the analysis of explicit speech acts, as suggested in section 2.3.2. In the following subsection, I conclude my discussion of explicit performatives by placing them along the scale of contextuality.

3.3.4 Explicit performatives in the scale of contextuality

I place explicit performatives along the scale of contextuality so that their distance from the center varies with the extent to which context is embodied lexically by

[53] See Fillmore (1971), and Wierzbicka (1987) for a broader analysis of English performative verbs.

the performative verb used. In this subsection, I review each type of explicit performative and give its placement along the scale. The scale is depicted in figure 3.7.

The closest form of explicit performative to a primary performative is the *modal performative*—one which uses a modal verb to convey either the epistemic or root modalities. I have not discussed modal performatives in this thesis as an examination of the English modal verbs is outside the scope of this work. However, Palmer (1990) and Sweetser (1990) note that such verbs are often used to convey modality, as I have used the term here. For example, consider the root meaning of *must* in sentence (3-11) against its epistemic meaning in (3-12).

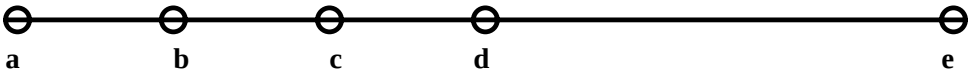
(3-11) You must leave the room.

(3-12) You must be insane.

These explicit performatives are closest to the center of the scale of contextuality because they convey a minimum of modal information and can do so ambiguously.

The next form of explicit performative is the 'canonical' type I have concentrated on in this section. In the explicit performatives I have covered here, the performative verb conveys a complete context for the interpretation of the proposition it governs. Since the supplied context is complete, these explicit performatives are placed further away from the center of the scale of contextuality in figure 3.7.

The final form of explicit performative considered here is the extended performative, discussed in section 2.3. Recall that an extended performative involves a performative verb being used in a non-literal or extended manner. Since the interpretation of extended performatives appears to require a departure from the usual



KEY:
a) extended performatives
b) explicit performatives
c) modal performatives
d) primary performatives
e) indirect speech acts

Figure 3.7: The scale of contextuality—version 2.

lexical meaning of the performative verb, the extended performative is placed furthest away from the center of the scale of contextuality, as depicted in figure 3.7.[54]

3.3.5 Summary of explicit speech acts

In this section, I have given an algorithm for the analysis of explicit performatives. In contrast to the previous algorithm proposed by Bach and Harnish,[55] which is inductive and does not distinguish between explicit performatives and indirect speech acts, the algorithm I propose is deductive and does distinguish explicit performatives from indirect speech acts.[56] My algorithm is an improvement over Bach and Harnish's because it is deductive and therefore should be more accurate to use computationally, and because it allows for the refinement of the scale of contextuality by separating explicit performatives from indirect speech acts. I have also presented an appropriate representation of performative verb senses that fulfills the

[54]This placement must remain contingent on further research into extended performatives—little has been done to date.
[55]See section 3.3.1.
[56]See section 3.3.2.

conditions I set out in section 2.3.2.[57] Finally, I have placed explicit performatives on the scale of contextuality.[58]

In the following section, I complete my anticonventionalist model of speech acts by discussing the interpretation of indirect speech acts and their placement along the scale of contextuality.

3.4 Indirect speech acts

In this section, I complete my proposed anticonventionalist theory of speech acts with a discussion of indirect speech acts. My definition here is negative, in that I take indirect speech acts to be speech acts that cannot be adequately interpreted as primary or explicit speech acts. Indirect speech acts can be understood by an algorithm such as that of Bach and Harnish (1979), discussed in section 3.3.1. I finish the section by placing indirect speech acts along the 'inferential' end of the scale of contextuality, since they encode context by forcing the hearer to make inferences to recover their intended meaning.

I first examine how indirect speech acts can be analyzed by a system of Gricean conversational maxims.

3.4.1 A Gricean model of indirect speech acts

Searle's theory that an indirect speech act is an inferential relation between a literal illocutionary act and a non-literal one was reviewed in section 2.5.1. In criticizing Searle's theory in section 2.5.2, I proposed that an anticonventionalist theory would

[57] See section 3.3.3.
[58] See section 3.3.4.

only use Gricean conversational maxims to analyze indirect speech acts. In this subsection, I give a sample Gricean analysis of an indirect speech act, to show how such a theory would work.[59] The number of inferences necessary to analyze an indirect speech act provides the criterion for placing indirect speech acts along the scale of contextuality.

In the model presented in this chapter, an indirect speech act is a relation between two or more propositions and their modalities. This relationship can be thought of abbreviating an entire segment of conversation.[60] For example, consider the following conversation between participants *A* and *B*:[61]

A. Can you answer the phone?

B. OK.

This conversation can be considered an abbreviated version of the following conversation between the same two people:[62]

A. Can you answer the phone?

B. Yes.

A. In that case, please answer it.

B. OK.

[59] See also the rhetorical question discussed in section 3.2.3 and the rhetorical mand discussed in section 3.2.4.

[60] See Leech (1983, pp. 97–9) and Levinsion (1983, pp. 356–64).

[61] See Leech (1983, p. 97).

[62] See Leech (1983, p. 97).

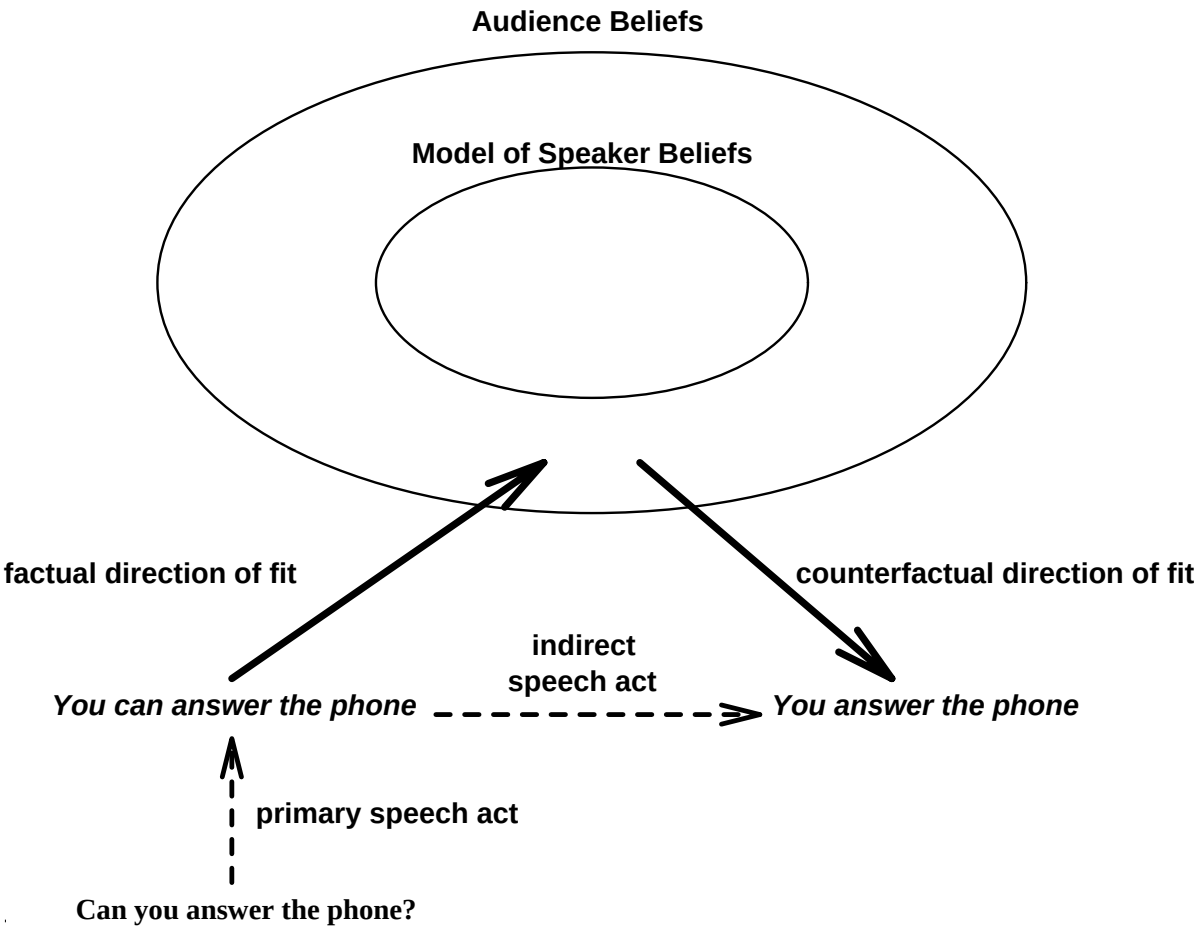


Figure 3.8: An inferential model of an indirect speech act.

This analysis indicates that *A*'s expression *Can you answer the phone?* indirectly refers to the proposition *Answer the phone* as a mand.[63] This situation is depicted in figure 3.8.

The propositional content of *Can you answer the phone?* is understood in the question modality.[64] However, posing this question would, in most circumstances, be taken as violating Grice's maxim of relation because the answer is probably

[63] See section 3.2.4 on mands.
[64] See section 3.2.3.

well-known by both A and B.[65] In order to analyze A's expression as relevant, B would have to inductively hypothesize that the literal question about his ability to answer the phone is meant non-literally as a request that he actually do so.[66] This is represented in figure 3.8 by the dashed, rightward arrow pointing to the propositional content of the request: *Answer the phone.* Because that proposition is given as a request, it has the counterfactual direction of fit, like an imperative.[67]

The model of indirect speech acts outlined here is anticonventionalist since it relies only on inferring a non-literal proposition and modality from a literal proposition and modality. The inferential mechanism used is Gricean conversational implicature. The analysis of indirect speech acts given here is not yet formal and complete enough to implement computationally. However, the model proposed by Grice (1975) has been expanded by Bach and Harnish (1979, pp. 211–19), Leech (1983, p. 79–151), Sperber and Wilson (1986), and in section 3.2.6 of this thesis. Future work in this area should improve the accuracy of the inferential model, so that it will become more useful in computational work.

In the following subsection, I use the model I have proposed in this subsection to provisionally distinguish different forms of indirect speech acts according to the difficulty of their interpretation. This allows me to appropriately place these different forms along the scale of contextuality.

3.4.2 Indirect speech acts in the scale of contextuality

It is difficult, without a more formal and complete model of conversational implicature, to evaluate the difficulty of analysis of an indirect speech act. In particular,

[65] See Leech (1983, p. 97).
[66] See section 3.3.1.
[67] See section 3.2.4.

the model discussed in this section does not determine exactly how many inferences are necessary to interpret an indirect speech act. This is problematic because the distance of an indirect speech act from the center of the scale of contextuality depends on the number of contextual inferences that must be made to interpret it. However, some reasonable distinctions can be made that allow for a provisional refinement of the scale of contextuality. In this subsection, I conclude my discussion of indirect speech acts by distinguishing among several forms of indirectness and placing them along the scale.

Some relatively easy forms of indirection to interpret are *whimperatives*[68] and *hedged performatives*.[69] Whimperatives are indirect requests of the form *Can you ... ?* and *Will you ... ?*. For example, sentences (3-13) and (3-14) would often be understood not as questions about the hearer's ability or willingness to close the door, but as actual requests to do so.[70]

(3-13) Can you shut the door?

(3-14) Will you shut the door?

The inference from the literal meaning of these expressions and their intended, non-literal meaning does not seem too difficult. In fact, the proposition of the intended meaning, *Shut the door*, is conveyed within the literal expressions themselves. Hedged performatives are similar to whimperatives in this regard, but they have the form of explicit performatives with a modal verb in the main clause. For example, sentences (3-15), (3-16), and (3-17) appear to be a request, a promise, and a suggestion respectively.[71]

[68] See Sadock (1974).
[69] See Fraser (1975).
[70] See also section 2.5 and Bach and Harnish (1979, pp. 174–98).
[71] See also Bach and Harnish (1979, pp. 211–9).

(3-15) I must ask you to leave.

(3-16) I can promise you I'll be back.

(3-17) I would suggest you try some.

Each of these expressions, like whimperatives, seems to refer to an immediate precondition for performing a speech act.[72] In this case, the explicit speech acts indirectly used are *I ask you to leave*, *I promise you I'll be back*, and *I suggest you try some*, which are all contained within the text of the literal expressions. Because of this closeness between the literal and non-literal meanings of whimperatives and hedged performatives, they are placed closest to the center of the scale of contextuality in figure 3.9.

Somewhat more difficult to interpret than whimperatives and hedged performatives are *embedded performatives*.[73] Like whimperatives and hedged performatives, embedded performatives contain the proposition to which they refer indirectly, but that proposition may be embedded arbitrarily deep within the literal expression. For example, sentences (3-18), (3-19), and (3-20) indirectly perform the acts of informing, reminding, and congratulating respectively.[74]

(3-18) I regret that I must inform you of your dismissal.

(3-19) May I remind you that your account is overdue?

(3-20) I would like to congratulate you.

[72] For example, having to ask you to leave is a possible precondition for actually asking in sentence (3-15).

[73] See Sadock (1974).

[74] See also section 2.5.2 and Bach and Harnish (1979, pp. 209–11).

The intended, non-literal meaning of these expressions, *I inform you of your dismissal*, *I remind you that your account is overdue*, and *I congratulate you* respectively, are contained within their literal texts. However, the intended meaning may be arbitrarily embedded in the literal text, as sentence (3-21) demonstrates.

(3-21) I regret that I am forced to conclude that your actions have warranted that you must now be recommended for outplacement.

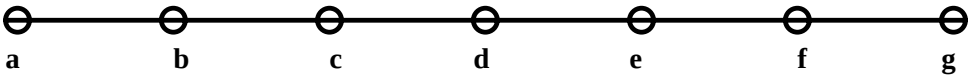
Because embedded performatives contain their intended meaning within the text of their literal expressions, they are placed near the center of the scale of contextuality. But because they may arbitrarily increase the number of inferences necessary to arrive at their intended meaning, embedded performatives are placed further from the center than whimperatives and hedged performatives in figure 3.9.

The indirect speech acts farthest from the center of the scale of contextuality are *indefinite* indirect speech acts. These are indirect speech acts in which the intended meaning is not expressed literally within the text of the literal expression. For example, the intended meaning of the indirect speech act in sentence (3-22), *Close the window*, can only be arrived at through an indefinite number of common sense inferences.[75]

(3-22) It's cold in here.

Because the number of inferences necessary to interpret these speech acts is indeterminate at present, I place them at the end of the 'inferential' end of the scale of contextuality in figure 3.9.

[75] See section 3.3.2.



KEY:

a) extended performatives
b) explicit performatives
c) modal performatives
d) primary performatives
e) whimperatives and hedged performatives
f) embedded performatives
g) indefinite indirect speech acts

Figure 3.9: The scale of contextuality—final version.

This concludes my discussion of the position of various forms of indirect speech acts along the scale of contextuality. This placement is provisional since the exact number of inferences necessary in each case cannot be determined without a more precise model. However, the placement of whimperatives, hedged performatives, embedded performatives, and indefinite indirect speech acts seems at least reasonable.

3.4.3 Summary of indirect speech acts

In this section, I have completed my proposal of an anticonventionalist theory of speech acts with a discussion of indirect speech acts. My definition here is negative, in that I take indirect speech acts to be speech acts that cannot be adequately interpreted as primary or explicit speech acts. Indirect speech acts can be understood by an inferential algorithm such as that of Bach and Harnish (1979).[76] This theory is anticonventionalist in that it makes use only of the literal

[76] See section 3.3.1.

meanings of expressions and Gricean maxims of conversational cooperation. I have placed indirect speech acts along the 'inferential' end of the scale of contextuality, on the basis of a rough estimate of the number of inferences are required to determine their intended meaning.

3.5 Summary

In this chapter, I have outlined a model of an anticonventionalist theory of speech acts that responds to the issues I raised in the previous chapter regarding conventionalist theory. Because of the anticonventionalist nature of my model, I believe it should provide an alternative to Searle's theory in future computational research in speech acts.

In section 3.2, I presented a definition of clausal mood and semantic modality and the link between them. As Sadock and Zwicky (1985) show, the declarative, interrogative, and imperative moods are the only moods common to most, if not all, human languages. Therefore, I have been primarily concerned with these, as well as the subjunctive mood which my theory predicts. My definition of mood relies on the concepts of *direction of fit* and *orientation*.[77] Along with these concepts, I have given a detailed account of how they explain the significance of primary performatives,[78] and how the system of mood and modality relates to Gricean conversational maxims.[79] I have placed primary performatives at the center of the scale of contextuality, because they rely the most on context for correct interpretation.[80]

In section 3.3, I presented an anticonventionalist algorithm for the analysis of

[77] See section 3.2.1.
[78] See sections 3.2.2, 3.2.3, 3.2.4, and 3.2.5.
[79] See section 3.2.6.
[80] See section 3.2.7.

explicit performatives, which I contrast with a previous algorithm. This earlier algorithm, proposed by Bach and Harnish (1979), does not distinguish between explicit speech acts and indirect speech acts. I have argued that this does not adequately account for the meaning of performative verbs.[81] Therefore, I have presented an algorithm that does distinguish between explicit performatives and indirect speech acts, and does rely properly on the lexical meaning of performative verbs.[82] I have placed explicit performatives along the 'lexical' end of the scale of contextuality, since performative verbs are lexical items that supply the context for their interpretation.[83]

In section 3.4, I discussed indirect speech acts. My definition of indirect speech acts is negative, in that I define indirect speech acts to be speech acts that cannot be adequately interpreted as primary or explicit performatives. Indirect speech acts can be understood by an inferential algorithm similar to that of Bach and Harnish (1979). The model of indirect speech acts I outlined is anticonventionalist as it relies only on the literal meaning of expressions and Gricean maxims of cooperative conversation for drawing inferences. I have placed indirect speech acts along the 'inferential' end of the scale of contextuality, since they encode context by forcing the hearer to make a varying number of inferences to recover their intended meaning.[84]

In the next chapter, I show how the work I have presented here, particularly the scale of contextuality, might be implemented computationally. I also examine what effect the theory I have presented here could have on a theory of computational stylistics.

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[81] See section 3.3.1.
[82] See section 3.3.2.
[83] See section 3.3.4.
[84] See section 3.4.2.

Chapter 4

Speech acts in sentence generation

All grammars leak.

Edward Sapir, LANGUAGE, p. 31

4.1 Introduction

In the previous chapter, I proposed an anticonventionalist theory of speech acts. This theory is based on the interaction among clausal moods, performative verbs, and Gricean maxims of cooperative conversation. No special illocutionary felicity conditions are required in the theory. In this chapter, I discuss how the theory I proposed can be used in computational work. Specifically, I discuss the small sentence planner I have implemented, the Contextual Speech Act Generator (CoSAG), and how it can be expanded in future. I also discuss the relationship between my theory, more specifically the scale of contextuality, and current work in computational stylistics.

In the following section, I give a few examples of the input and output of CoSAG to show how it is related to the model of speech acts presented in the previous chapter. I then discuss the procedures and data structures used in CoSAG that show how it is both similar to and different from previous sentence planners based on speech act theory.[1] Since an extensive implementation of my model has proven to be outside the scope of this thesis, I then discuss how CoSAG could be modified to cover more of the theory I presented earlier.

In a subsequent section, I examine the relationship between my model of speech acts and the scale of contextuality, and current work in computational stylistics.[2] Computational stylistics investigates how choices in the presentation of an expression affect its impact on the audience. I argue that the control of sentence form provided by the theory of computational stylistics is necessary to allow for important linguistic variations in speech acts. I also discuss how the theory of speech acts proposed here suggests future directions for work in computational stylistics. Specifically, my theory suggests how computational stylistics might be expanded to include semantic style and lexical style.

4.2 The CoSAG system

The CoSAG sentence generator takes the functional description of an expression as input and produces a string of words, and its syntax tree, as output. In the following subsection, I give a few examples of the input and output of CoSAG to show how it is related to the model presented in the previous chapter. The functional description

[1] See Cohen and Perrault (1979), Perrault and Allen (1980), and Appelt (1985).

[2] See DiMarco (1990), Mah (1991), Makuta-Giluk (1991), BenHassine (1992), Green (1992a) and (1992b), DiMarco and Hirst (1993), and Hoyt (1993).

that CoSAG uses as input is a *feature structure*.[3] The examples I give show the differences in structure among speech acts types that vary in location on the scale of contextuality.

In the subsequent subsections, I discuss the procedures and data structures used in CoSAG to show how they are both similar to and different from previous sentence planning structures based on speech act theory. CoSAG uses partially-instantiated Prolog lists to implement its feature structures.[4] This data structure and the procedures that operate on it have been chosen specifically to allow CoSAG to be extended in a manner similar to previous computational work in speech act planning.[5]

4.2.1 Examples from CoSAG

CoSAG uses *feature structures* as its basic representation of linguistic expressions. The feature structures it takes as input are then processed to produce a string of words representing the corresponding expression. In this subsection, I briefly describe feature structures and then show examples of primary performatives[6], explicit performatives,[7] whimperatives, hedged performatives, and embedded performatives[8] generated from feature structures by CoSAG. This serves to demonstrate the structural variations in speech acts described by the scale of contextuality.[9]

A feature structure is a partial function that maps features to their values, or,

[3] See Shieber (1986).
[4] See Gazdar and Mellish (1989, pp. 228–30) and Pitt and Cunningham (1991, pp. 6–7).
[5] See Cohen and Perrault (1979), Perrault and Allen (1980), and Appelt (1985).
[6] See section 3.2.
[7] See section 3.3.
[8] See section 3.4.
[9] Described in chapter 3.

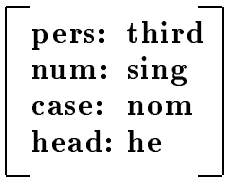


Figure 4.1: A feature structure for *he*.

in other words, is a list of feature-value pairs.[10] For example, the feature-value pair mapping the grammatical *number* of the pronoun *he* to its value, *singular*, could be represented by `[num:sing]`, where `num` is *number* and `sing` is *singular*. A more complete grammatical description of the pronoun *he* is given in figure 4.1. In figure 4.1, `pers` is *person*, `num` is *number*, `case` is *case*, and `head` is *head lexical item*. This feature structure signifies that the pronoun *he* is in the third person, singular number, and nominative case.

However, the values of feature-value pairs can be feature structures themselves, not just atoms. For example, the sentence *He runs* could be described by a feature structure like that in figure 4.2. This feature structure indicates that the sentence *He runs* is in the declarative mood, has the third person, singular, nominative pronoun *He* for a grammatical subject, and has the verb *run* also in the third person, singular. Since CoSAG prints out feature structures in the form of vine diagrams, figure 4.3 shows the same feature structure as figure 4.2 but as a vine diagram.

In the remainder of this subsection, I give examples of the feature structures used as input by CoSAG, and the consequent output produced. To demonstrate the structural variation in speech acts along the scale of contextuality,[11] I show the generation of a primary performative, an explicit performative, a whimperative, a

[10] See Shieber (1986, p. 12).
[11] See section 3.4.2.

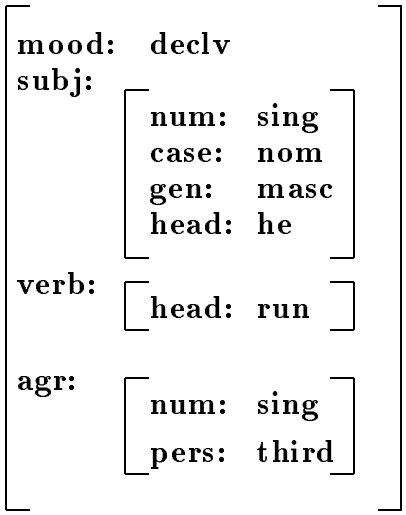


Figure 4.2: A feature structure for *He runs.*

```
[
   mood:declv
   subj:[
      num:sing
      case:nom
      gen:masc
      head:he
   ]
   verb:[
      head:run
   ]
   agr:[
      num:sing
      pers:third
   ]
]
```

Figure 4.3: A vine diagram feature structure for *He runs.*

hedged performative, and an embedded performative.

CoSAG takes feature structures similar to those in figure 4.3 as input and produces an appropriate expression as output. More specifically, CoSAG outputs a sentence in the form of a string of words, as well as the syntax tree of the sentence. For example, given the following feature structure, CoSAG produces the primary performative *Leave*. The expression is in the imperative mood,[12] and has the second person, singular, nominative subject *You* elided. The verb *leave* is intransitive and occurs in the infinitive form.[13] The feature `e` stands for an empty value.

```
Feature structure:
[
   pred:[
      mood:impv
      subj:[
         case:nom
         det:e
         head:you
         gen:e
         num:sing
      ]
      verb:[
         trans:iv
         head:leave
      ]
   ]
   agr:[
      pers:second
      num:sing
      form:inf
   ]
]
```

[12] See section 3.2.4.

[13] The syntactic description used in CoSAG is *ad hoc*, but is influenced by GPSG. See Gazdar *et al.* (1985).

```
Syntax structure:
                                    s
                                    |
                                    .
                                    |
                                  vbar
                                    |
                                    .
                                    |
                                  verb
                                    |
                                    .
                                    |
                                  leave

Output sentence:
[leave]
```

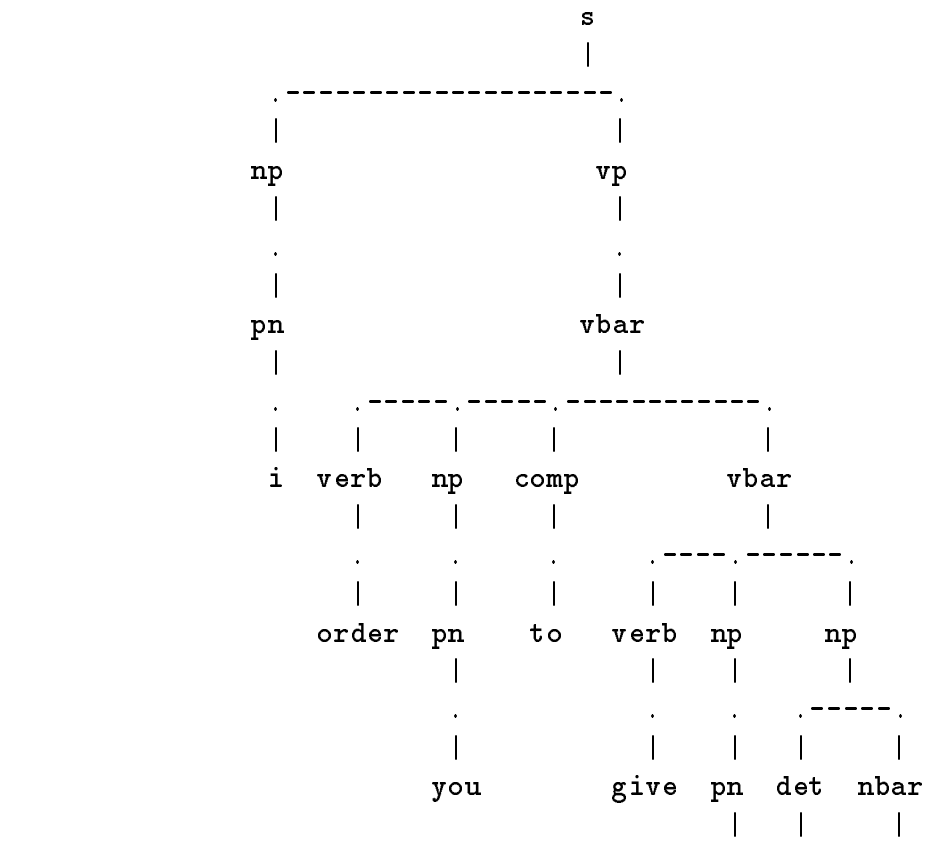
Given the following feature structure, CoSAG produces the explicit performative *I order you to give me the book.* The expression is in the declarative mood,[14] and has the first person, singular nominative pronoun *I* as the subject. The performative verb[15] is *order* and is a *raise-object verb* (`rov`), meaning that, in its surface form, it takes the subject *You* out of the proposition *You give me the book* and places that subject in its own object position, followed by the remainder of the proposition in a *to* complement. The feature structure shows how the entire proposition *You order me to leave* is functionally a complement of the verb *order.*

```
Feature structure:
[
   pred:[
      mood:declv
```

[14] On declaratives, see section 3.2.2; on explicit performatives being declarative, see section 3.3.2.
[15] See section 3.3.3.

```
subj:[
   case:nom
   det:e
   head:i
   num:sing
   gen:e
]
verb:[
   trans:rov
   head:order
]
comp:[
   pred:[
      mood:declv
      subj:[
         case:obl
         det:e
         head:you
         num:sing
         gen:e
      ]
      rel:to
      verb:[
         trans:dv
         head:give
      ]
      iobj:[
         case:obl
         det:e
         head:i
         num:sing
         gen:e
      ]
      dobj:[
         case:obl
         det:the
         mods:e
         head:book
         num:sing
```

```
               gen:neut
            ]
         ]
         agr:[
            num:sing
            pers:second
            form:inf
         ]
      ]
   ]
   agr:[
      num:sing
      pers:first
      form:fin
   ]
]
Syntax structure:
```



```
.    .      .
|    |      |
i   the   noun
            |
            .
            |
          book
```

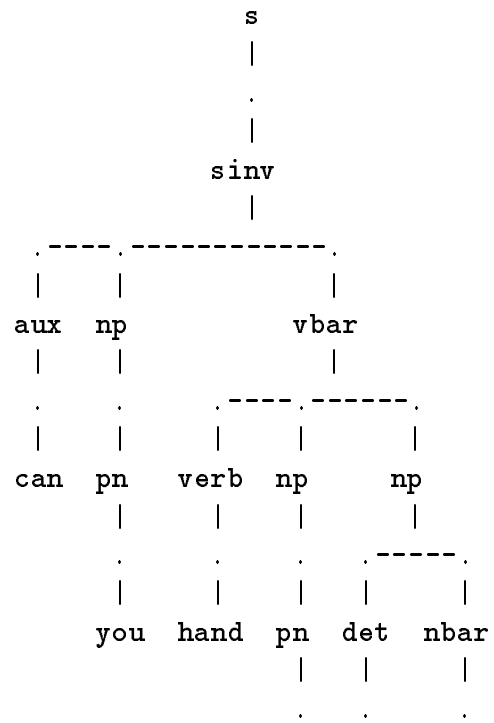
```
Output sentence:
[i,order,you,to,give,me,the,book]
```

Given the following feature structure, CoSAG produces the whimperative *Can you hand me the dog?* The expression is in the interrogative mood,[16] and uses the auxiliary verb *can*, contained in the `verb` feature structure.

```
Feature structure:
[
   pred:[
      mood:interv
      subj:[
         case:nom
         det:e
         head:you
         num:sing
         gen:e
      ]
      verb:[
         aux:can
         trans:dv
         head:hand
      ]
      iobj:[
         case:obl
         det:e
```

[16] On whimperatives, see section 3.4.2, on interrogatives, see section 3.2.3.

```
         head:i
         num:sing
         gen:e
      ]
      dobj:[
         case:obl
         det:the
         mods:e
         head:dog
         num:sing
         gen:neut
      ]
   ]
   agr:[
      form:inf
      pers:second
      num:sing
   ]
]
Syntax structure:
```



```
|   |     |
i  the  noun
          |
          .
          |
         dog
```

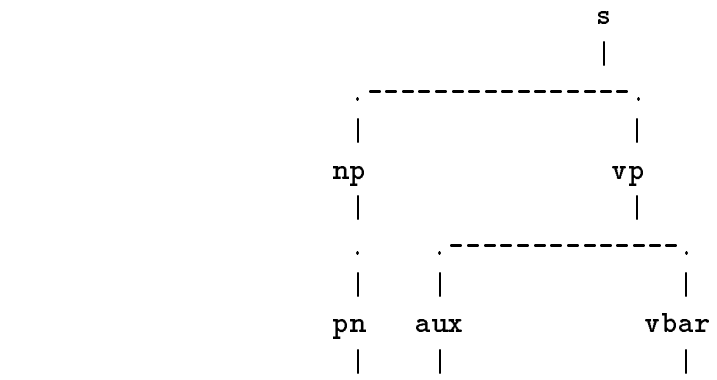
```
Output sentence:
[can,you,hand,me,the,dog]
```

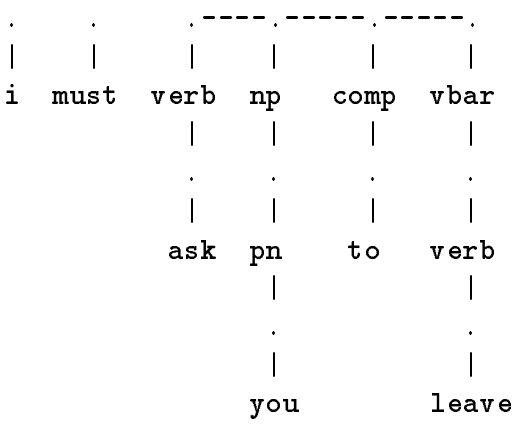
Given the following feature structure, CoSAG produces the hedged performative *I must ask you to leave.*[17] The expression is in the declarative mood,[18] and contains the auxiliary verb *must.* The proposition *you leave* is a complement to the performative verb *ask.*[19]

```
Feature structure:
[
   pred:[
      mood:declv
      subj:[
         case:nom
         det:e
         head:i
         num:sing
         gen:e
      ]
      verb:[
         aux:must
         trans:rov
         head:ask
      ]
      comp:[
```

[17] See section 3.4.2 on hedged performatives.
[18] See section 3.2.2.
[19] See section 3.3.3.

```
         pred:[
            mood:declv
            subj:[
               case:obl
               det:e
               head:you
               num:sing
               gen:e
            ]
            rel:to
            verb:[
               trans:iv
               head:leave
            ]
         ]
         agr:[
            num:sing
            pers:second
            form:inf
         ]
      ]
   ]
   agr:[
      num:sing
      pers:first
      form:inf
   ]
]
Syntax structure:
```






```
Output sentence:
[i,must,ask,you,to,leave]
```

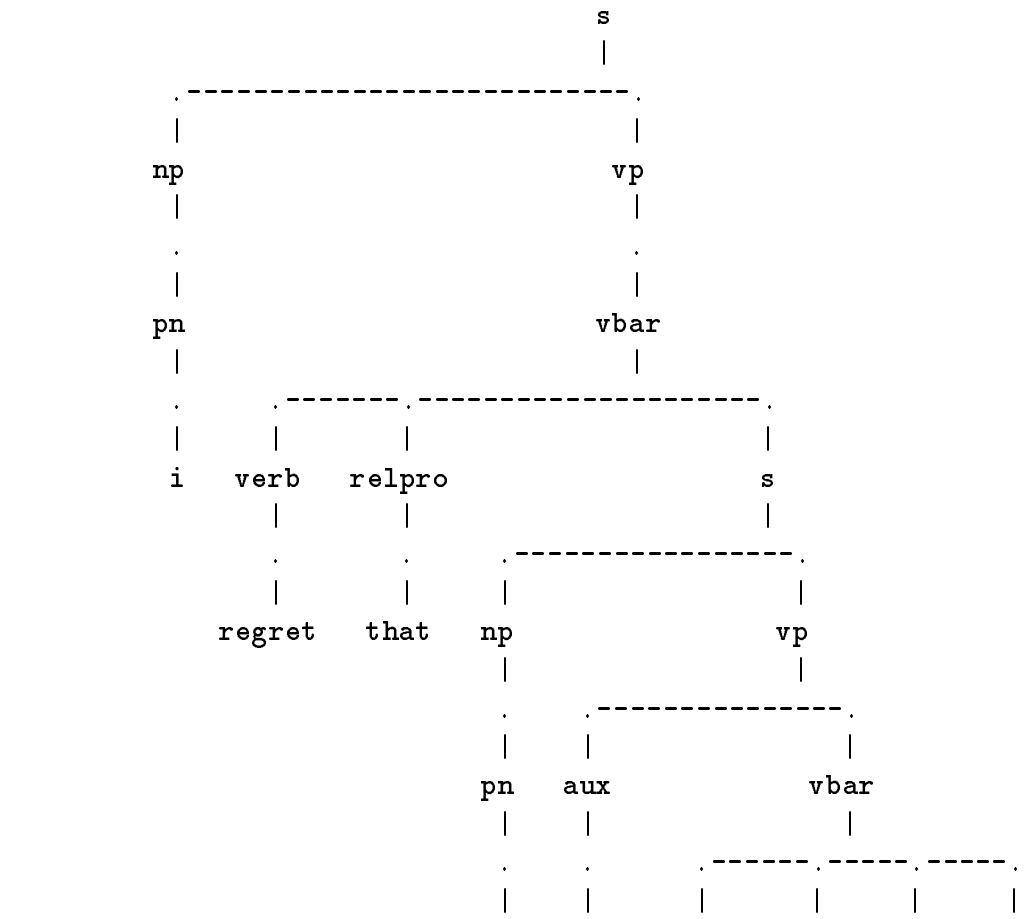
Finally, given the following feature structure, CoSAG produces the embedded performative *I regret that I must command you to quit.*[20] Here, the proposition *You quit* is the complement of the verb *command*, which is, in turn, the complement of the verb *regret*.

```
Feature structure:
[
   pred:[
      mood:declv
      subj:[
         case:nom
         det:e
         head:i
         num:sing
         gen:e
      ]
      verb:[
         trans:rel
         head:regret
```

[20] See section 3.4.2.

```
]
comp:[
   pred:[
      mood:declv
      rel:that
      subj:[
         case:nom
         det:e
         head:i
         num:sing
         gen:e
      ]
      verb:[
         aux:must
         trans:rov
         head:command
      ]
      comp:[
         pred:[
            mood:declv
            subj:[
               case:obl
               det:e
               head:you
               num:sing
               gen:e
            ]
            rel:to
            verb:[
               trans:iv
               head:quit
            ]
         ]
         agr:[
            num:sing
            pers:second
            form:inf
         ]
      ]
```

```
         ]
         agr:[
            num:sing
            pers:first
            form:inf
         ]
      ]
   ]
   agr:[
      num:sing
      pers:first
      form:fin
   ]
]
Syntax structure:
```



```
i  must   verb    np    comp  vbar
            |      |      |     |
            .      .      .     .
            |      |      |     |
         command  pn     to    verb
                  |             |
                  .             .
                  |             |
                 you           quit
```

```
Output sentence:
[i,regret,that,i,must,command,you,to,quit]
```

In this subsection, I have briefly reviewed feature structures as a means of representing linguistic expressions. I have also given examples of the feature structures that CoSAG accepts as input, and the expressions that CoSAG then generates as output. The examples have been chosen to reflect the structural variation in speech acts that arise in connection with the scale of contextuality in chapter 3. Specifically, I have demonstrated examples of primary performatives, explicit performatives, whimperatives, hedged performatives, and embedded performatives.

In the following subsections, I discuss the procedures and data structures implemented in CoSAG. This permits a comparison of CoSAG with other sentence planning systems based on speech act theory.

4.2.2 Implementation of CoSAG

CoSAG is implemented in Prolog, and uses partially-instantiated Prolog lists to implement feature structures. This data structure and the procedures that operate on it have been chosen specifically to allow CoSAG to be extended in a manner similar to previous computational work in speech act planning.[21] In the next sub-

[21] See Cohen and Perrault (1979), Perrault and Allen (1980), and Appelt (1985).

section, I discuss my implementation of feature structures, the operations I defined on those feature structures, and the use of those operations in sentence generation in CoSAG. I also briefly discuss how my implementation is related to other work in speech act planning and how CoSAG can be enhanced in future.

4.2.3 Feature structures in CoSAG

As I noted in section 4.2.1, feature structures can be considered to be partial functions. It is not surprising then that they can be represented by partially-instantiated lists. A partially-instantiated list is, in Prolog, a list whose tail is the uninstantiated variable "_" rather than the empty list `[]`.[22] For example, the feature structure for the pronoun *he*, given in figure 4.1, could be represented by the following partially-instantiated Prolog list:

```
[ pers:sing, num:third, case:nom, head:he | _ ]
```

The feature-value pairs are constructed by the ":" operator.[23] The uninstantiated variable allows further list elements to be added to the list in further operations. As noted in the previous subsection, the values of feature-value pairs need not be just atoms, they can also be feature structures themselves. This is also true of partially-instantiated lists. For example, the feature structure for the expression *He runs*, as given in figures 4.2 and 4.3, could be represented by the following partially-instantiated Prolog list:

[22] See Gazdar and Mellish (1989, pp. 228–30) and Pitt and Cunningham (1991, pp. 6–7).

[23] This operator is defined by the following Prolog command: `op(500,xfy,:)`. See Gazdar and Mellish (1989, p. 228).

```
[
   mood:declv,

   subj:[
      num:sing,
      case:nom,
      gen:masc,
      head:he | _ ],

   verb:[
      head:run | _ ],

   agr:[
      num:sing,
      pers:third | _ ]

| _ ]
```

It is easy to see how feature structures correspond directly to partially-instantiated Prolog lists.

The main operation I defined for feature structures in CoSAG is the `apply` operation.[24] This operation unifies a value with the feature in a certain location within a feature structure. Locations within feature structures are indicated by *paths*. For instance, the location of the `num` feature within the whole feature structure given above can be specified by the path `[agr,num]`. A path essentially provides the directions for traversing a list to arrive at the correct feature-value pair. The `apply` operation unifies a given value with a certain location, specified by a path, within a feature structure. For example, the result of the following `apply` goal on the feature structure given above is shown immediately below (`FStruc` is the feature structure):

[24] See Pitt and Cunningham (1991, p. 7). Gazdar and Mellish (1989) define their operations differently.

```
apply( FStruc, [agr,form], fin ).

[
   mood:declv,

   subj:[
      num:sing,
      case:nom,
      gen:masc,
      head:he | _ ],

   verb:[
      head:run | _ ],

   agr:[
      num:sing,
      pers:third,
      form:fin | _ ]

| _ ]
```

In CoSAG's grammar, this would enforce the condition that the main verb occur in its finite form. In CoSAG, all operations on feature structures are defined in terms of the `apply` operation.

The Prolog implementation of the `apply` predicate is straightforward, and is given in figure 4.4. The `apply` goal takes three arguments: the first is the feature structure in question, the second is the path that gives the desired location within the feature structure, the third is the value to be unified with that location in the feature structure. The first case specifies that if the path is empty, then the current location in the feature structure must be the correct location for the specified value to be unified. The second case specifies that if the feature at the head `H` of the current partially-instantiated list is the next element in the given path, then the value of that head `St` is to be searched for the remainder of the path `Pt`. The third

case simply specifies that if the other cases do not hold, then the remainder of the current partially-instantiated list `St` is to be searched for the given path. The `apply` predicate will fail only if the value at a given path cannot unify with the value specified in the call to `apply`. It is also worthwhile noting that the `apply` predicate will maintain the feature structure as a partially-instantiated list, *i.e.,* it will never completely 'fill in' the uninstantiated variable at the tail of such a list.[25] Further, if the location specified by the path argument does not exist within the feature structure, it is created by the `apply` predicate. In this way, CoSAG can create correct feature structures as required during its operation.

```
apply(Val,[],Val) :- !.

apply([H:St|_],[H|Pt],Val) :- !,
   apply(St,Pt,Val).

apply([_:_|St],Path,Val) :- !,
   apply(St,Path,Val).
```

Figure 4.4: The implementation of `apply` in CoSAG.

Also, because of its use of linear search through a partially-instantiated list, the operation of `apply` on a feature structure is independent of the order of elements in that list.

As for the overall structure of CoSAG, it is divided into two basic components. One is the grammar component that defines the rules and constraints CoSAG imposes on the feature structures it uses. The other is the parsing component that defines the operations that CoSAG performs, including the `apply` operation. In

[25] See also appendix B.

the following subsections, I discuss the important features of each component, relate them to previous work in speech act planning, and suggest how each can be enhanced in future.

4.2.4 The grammar component of CoSAG

The grammar component of CoSAG is completely declarative as it states only constraints to which valid feature structures must adhere. These statements of constraints are in the form of grammar rules similar to the planning operators suggested by Cohen and Perrault (1979). Here, I discuss a few sample grammar rules, the relation of such rules to the operations in Cohen and Perrault's system (1979), and possible future work on CoSAG.

Each grammar rule in CoSAG is a Prolog goal consisting of a head functor such as `s` for *sentence*, a list of dependent functors such as `[np,vp]` for *noun phrase* and *verb phrase*, a list of constraints on the head functor in terms of path-value pairs, and a list of constraints on the dependent functors in the form of path-path pairs.[26] For example, figure 4.5 shows the grammar rule describing a declarative sentence.

The first argument of the head functor `s`, the dependent functor list `[np,vp]`, shows that the sentence described by the grammar rule in figure 4.5 consists of a *noun phrase* and a *verb phrase*. The second argument, the list of head functor constraints, shows that the value in the feature structure at the path `[pred,mood]` must be `declv`, and the the value at the path `[pred,subj,case]` must be `nom`. This means that this version of rule `s` requires a feature structure to be *declarative* and have its subject in the *nominative* case. The third argument, the list of dependent functor constraints, is a list that contains a list of constraints for each dependent

[26] See appendix B.

```
s([np,vp],
  [
    [[pred,mood],declv],
    [[pred,subj,case],nom]
  ],
  [
    [ [[agr],[agr]], [[pred,subj],[npstruc]] ],
    [ [[agr],[agr]], [[pred],[pred]] ]
  ]
).
```

Figure 4.5: CoSAG grammar rule for a declarative sentence.

functor in the dependent functor list of `s`. The first sublist shows that the `agr` feature structure of `s` is to be unified with the `agr` feature structure of the `np`, and that the `[pred,subj]` feature structure of `s` is to be unified with the `npstruc` feature structure of the `np`. The second sublist shows that the `agr` feature structure of the `s` is also to be unified with the `agr` feature structure of the `vp`, and that the `pred` feature structure of `s` is to be unified with the `pred` feature structure of the `vp`. Sharing the same `agr` information in both the `np` and `vp` ensures subject-verb agreement in *person* and *number*.

One interesting property of these grammar rules is that unless feature structures of dependent functors are unified with feature structures of the head functor in the dependent functor list, those feature structures are visible only within the dependent functor. This is exploited in the lexical interface of CoSAG. For example, consider the `adj` (*adjective*) rule in CoSAG, shown in figure 4.6.[27]

In the `adj` rule shown in figure 4.6, the empty dependent functor list `[]` indicates

[27] See appendix B.

```
adj([],
    [ [[npstruc,mods],Lex],[[lex],Lex],[[string],String] ],
    [
      [ [[lex],[lex]],[[string],[string]] ]
    ]
) :- lexadj(Lex,String).

lexadj(big,[big]).
lexadj(little,[little]).
lexadj(nice,[nice]).
lexadj(stupid,[stupid]).
```

Figure 4.6: CoSAG grammar rule for an adjective.

that there are no further dependents and that a lexical item is to be generated. The output string `String` corresponding to the given lexical item `Lex` is retrieved from the list of known adjectives (the `lexadj` Prolog facts). They are associated with the local feature structures `lex` and `string` which are then unified with the dependent `lex` and `string` feature structures, as shown in the dependent functor constraint list in figure 4.6.[28] However, since no rule that calls `adj` refers to either the `lex` or `string` feature structures, they are not visible outside the scope of the `adj` rule. In this way, information can be restricted to only the scope of the rules where it is actually needed.

A final interesting property of the CoSAG grammar rules is that the grammar rules can be dynamically scoped. This means that their exact contents may not be determined until they are called by the procedural component of CoSAG, discussed in section 4.2.5. This can be done by calculating the contents of one or more of

[28] The lexical interface, given in appendix B, places the dependent lexical item at the leaf of the current syntactic tree and appends the dependent string to the string being generated.

the functor's constraint lists in the right hand side of its Prolog goal. For example, consider the `vbar` (*verb* and *objects*) rule in CoSAG, shown in figure 4.7.[29]

```
vbar([verb|Objs],
     [
       [[pred,verb,trans],Trans] |
       FConstraints
     ],
     [
       [ [[agr],[agr]],[[pred],[pred]] ] |
       DConstraints
     ]
) :- trans_frame(Trans,Objs,FConstraints,DConstraints).
```

Figure 4.7: CoSAG grammar rule for *vbar*.

The objects that follow the verb in the dependent functor list are not determined when this rule is compiled. Rather, they are determined when the `vbar` rule is called by the procedural component. The verb's transitivity `Trans` is read from the functional structure, as shown in the head constraint list, and the objects are retrieved by a call to the `trans_frame` rule. This rule returns the appropriate object list `Objs`, the appropriate list of constraints on the head functor `FConstraints`, and the appropriate list of constraints on the dependent functors `DConstraints`. These are appended to the appropriate lists in the rule. For instance, if the verb is transitive, `tv`, then it takes one noun phrase `[np]` as a post-verbal object, so the variable `Objs` is unified with `np` by the `trans_frame` rule.[30] This property is advantageous in that it allows variations of a rule to be calculated according to

[29] The CoSAG program listing is given in appendix B.
[30] See appendix B.

information given in the feature structure, and it allows a similar calculation to be made by several rules without repeating the actual code.[31]

One potential shortfall of this rule format is that it does not easily allow for the statement of negative conditions. The head functor constraint list specifies what must be the case in a valid feature structure, but it is unclear how to specify what must not be the case in a valid feature structure. Any attempt to check the value of a feature at a certain path instantiates the path, whether that is desirable or not. While this issue has not arisen in the development of CoSAG so far, it may do so later. The most general solution to this might be to provide a second head functor constraint list for stating negative conditions.

CoSAG's grammar rules are structured similarly to the speech-act planning rules presented by Cohen and Perrault (1979). Cohen and Perrault's *request* planning operator is shown in figure 4.8.

REQUEST(SPEAKER , HEARER , ACT)

CANDO.PR:HEARER CANDO ACT
WANT.PR: SPEAKER BELIEVE SPEAKER WANT request–instance
EFFECT: HEARER BELIEVE SPEAKER BELIEVE SPEAKER WANT ACT

Figure 4.8: The *request* planning rule.

The body of this operator allows the speaker SPEAKER to request that the hearer HEARER perform a certain act ACT. The preconditions for making a request are given by the CANDO.PR (ability) and WANT.PR (desire) conditions. The postconditions of the request are given by the EFFECT condition. In this system, generating a speech act is equivalent to planning to meet a goal by chaining operators such as

[31] See, for example, the use of `trans_frame` in the `sinv` rule in appendix B.

the REQUEST operator given in figure 4.8.[32]

CoSAG's grammar rules are structured as planning operators. The body of a CoSAG rule is given by its dependent functor list, the preconditions are given by the head functor constraint list, and the postconditions are given by the dependent functor constraint list. This design is not an accident: the grammar rules of CoSAG are meant to serve as a basis for designing further planning operators in future enhancements of the system. Carrying out these enhancements is outside the scope of this thesis, but future work on CoSAG could include building a component of plan operators. These operators would be similar to those proposed by Cohen and Perrault (1979) but consistent with the theory presented in this thesis. Also, such plan operators would construct the feature structures discussed in section 4.2.1 and this subsection. My current work in CoSAG described here could then be used to realize those feature structures.

In the following subsection, I discuss the procedural component of CoSAG, which actually performs the utterance planning.

4.2.5 The parsing component of CoSAG

The parsing component of CoSAG calls the grammar rules just discussed in order to manage a feature structure, and uses a Prolog Definite Clause Grammar[33] (DCG) to construct the output string. In fact, the parsing component consists of one predicate, `parse`, and a number of utility predicates, such as `apply` (described in section 4.2.4) to generate expressions.[34] Here, I discuss the operation of the CoSAG

[32] See Cohen and Perrault (1979), Appelt (1985) and Hinkelman (1989, pp. 71–7).

[33] See Gazdar and Mellish (1989, pp. 127–31).

[34] Also, because of its restricted coverage, CoSAG makes a reasonable parser. This is very useful in constructing valid feature structures.

`parse` predicate and suggest how CoSAG could be extended to include planning of its feature structures.

The `parse` predicate is a Prolog DCG that takes three arguments: a list of functors remaining to be generated, a list representing the syntax tree of functors to be generated, and the current feature structure that describes the desired output.[35] The `parse` predicate consists of three different Prolog DCG goals: the first applies if the list of functors to be generated is empty, the second applies if the list of functors to be generated has only one element, and the third applies if the list of functors to be generated has more than one element.[36] For the purposes of demonstration, I discuss the situation in which only one functor needs to be generated. This `parse` DCG goal is given in figure 4.9.

In the head of this `parse` goal, `F` is the functor remaining to be generated, `SynList` is part of the syntax tree to be generated (with `F` as the parent node), and `FStruc` is the feature structure that describes the output to be generated. The first action of this `parse` goal is to construct a template CoSAG grammar rule, discussed in section 4.2.3, with a *univ* (`=..`) operation. This template rule `Rule` is then called so that the three list variables, `DList`, `FCL`, and `DCL` are unified with the dependent functor list, the head constraint list, and the dependent constraint list, respectively, of some grammar rule that unifies with `F`. For example, if the functor `F` is "`s`", then when `Rule` is called the three list variables might be unified with the constraint lists shown in figure 4.5.

After retrieving the constraint lists in this way, this `parse` goal uses the `unify` predicate to apply each of the constraints in the head functor constraint list `FCL` to the feature structure `FStruc`.[37] In this way, `parse` ensures that the current feature

[35] See appendix B.
[36] See appendix B.
[37] See appendix B.

```
parse([F],SynList,[FStruc]) -->
   %% construct the rule to be called in standard format
   {Rule =.. [F,DList,FCL,DCL]},

   %% call the rule
   {call(Rule)},

   %% apply the F Constraint List to the F Structure
   {unify(FStruc,FCL)},

   %% resolve Dependent Constraint List with the F Structure,
   %% giving the new Dependent Structures List
   {resolve(FStruc,DCL,DSList)},

   %% parse dependents of current functor
   parse(DList,NList,DSList),

   %% construct syntax node with current constituent as parent
   %% of subconstituents
   {make_node(F,NList,SynList)}.
```

Figure 4.9: CoSAG *parse* predicate for a single functor.

structure complies with the constraints given in the current grammar rule.

Following this, the `parse` goal uses the `resolve` predicate to create a list of functional structures `DSList`.[38] The `resolve` predicate creates a separate functional structure for each functor in the dependent functor list `DList` from the appropriate list of constraints on each dependent functor given in the dependent functor constraint list `DCL`. The dependents of the current functor are then generated, using this new list of dependent feature structures, by a recursive call to `parse`. Having

[38] See appendix B.

a separate functional structure for each dependent functor means that dependent functors are associated only with the segment of the head-functor feature structure relevant to them. This also permits temporary feature structures to exist only within the scope of certain functors, as discussed in section 4.2.4 in relation to the CoSAG grammar rules.

Finally, the `parse` predicate creates the current node of the syntax tree with the current functor `F` as the parent node.[39] Since the syntax tree of functors used in generation is predictable from the functor lists, the tree is built automatically by `parse` and requires no special operations in the grammar component of CoSAG.

The `parse` predicate constitutes the procedural component of CoSAG and, in operation, manages the chaining of grammar rules in order to generate an output string conforming to a given feature structure. In order to generate a sentence, `parse` is called with the following arguments:

```
parse([s],SynList,[FList],String,[]).
```

The first argument specifies that the dominant functor of the output string is to be `s`, a sentence. The variable `SynList` becomes the syntax tree of functors used in the sentence,[40] and `FList` is the feature structure from which the sentence is to be generated. The final two arguments give the output string `String` and the tail of the output string `[]`, as required for a Prolog DCG rule.

A future extension of CoSAG would involve creating a `plan` predicate to manage the use of extended planning operators discussed in section 4.2.4. This `plan` predicate would take as input a feature structure describing a communicative goal

[39] See the syntax trees in the CoSAG examples discussed in section 4.2.1.
[40] See examples in section 4.2.1.

or goals[41] and produce as output a feature structure describing a desired expression, such as those I have discussed in this section.[42] The `plan` predicate could use roughly the same procedures and utilities used by the `parse` predicate. Construction of such a `plan` predicate (and planning operators for its use) is certainly challenging, and is beyond the scope of work in this thesis. However, building such an extension to CoSAG is an interesting consideration for future work on the topic of speech act generation.

4.2.6 Summary of CoSAG

CoSAG uses feature structures in order to represent the linguistic structure of speech acts. CoSAG processes feature structures as input and produces expressions (strings of words) and corresponding syntax trees as output. I gave examples of primary performatives, explicit performatives, whimperatives, hedged performatives, and embedded performatives generated from feature structures by CoSAG.[43] This serves to demonstrate the structural variations in speech acts described by the scale of contextuality.[44]

CoSAG is implemented in Prolog, and uses partially-instantiated Prolog lists to represent feature structures. This data structure and the procedures that operate on it have been chosen specifically to allow CoSAG to be extended in a manner similar to previous computational work in speech act planning.[45] CoSAG's grammar rules consist of a body (a list of dependent functors), a set of preconditions (a list of head functor constraints), and a set of postconditions (a list of dependent functor

[41] See Cohen (1979), Perrault and Allen (1980), and Appelt (1985).
[42] See also Gazdar and Mellish (1989, pp. 386–98).
[43] See section 4.2.1.
[44] See sections 3.2.7, 3.3.4, and 3.4.2.
[45] See Cohen and Perrault (1979), Perrault and Allen (1980), and Appelt (1985).

constraints).[46]

The parsing component of CoSAG calls the grammar rules in order to manage a feature structure and uses a Prolog DCG to construct the output string. The parsing component consists of one predicate, `parse`, and a number of utility predicates, such as `apply` (described in section 4.2.4) to generate expressions.[47]

Future extensions to the CoSAG system would include the creation of a `plan` predicate and the grammar rules for it to operate on. Such a predicate would take as input a feature structure describing the communicative goals of an utterance and would produce as output a feature structure suitable for input to the CoSAG generator described in this section.

In the following section, I discuss the relationship between the theory of speech acts presented in this thesis and a current theory of computational stylistics.

4.3 Speech acts and computational stylistics

In this section, I examine the relationship between my model of speech acts and the scale of contextuality, and current work in computational stylistics.[48] Computational stylistics studies how choices in the presentation of an expression affect its impact on the hearer or reader. Since, as I argued in chapter 3, variation along the scale of contextuality affects the interpretation of an expression by its audience, it is reasonable to think that speech act theory and stylistics are interrelated.

In the following subsection, I argue that the control of sentence form provided by DiMarco's theory of computational stylistics is necessary to allow for important

[46] See section 4.2.4.

[47] See section 4.2.5.

[48] See DiMarco (1990), Mah (1991), Makuta-Giluk (1991), BenHassine (1992), Green (1992a) and (1992b), DiMarco and Hirst (1993), and Hoyt (1993).

linguistic variations in speech acts. I give a brief review of the computational theory of style and show how it contributes to the analysis of the explicit speech act *I protest!* as an example.

Then, I discuss how the theory of speech acts proposed here suggests future directions for work in computational stylistics. Current work in computational stylistics has concentrated on accounting for the effects of variations in syntax. The theory of speech acts presented in this thesis suggests how computational stylistics might be expanded to include semantic style and lexical style.

4.3.1 Stylistic effects in speech acts

Computational stylistics takes a goal-directed view of text—that is, it describes the purpose or desired effect underlying the choices made in presenting a text. Current work in computational stylistics, such as that of DiMarco (1990), Green (1992a) and (1992b), and DiMarco and Hirst (1993), has studied the stylistic effects of syntactic variations in sentence structure. In this subsection, I present a brief overview of the theory of computational stylistics and give an example of how stylistic effects can interact with the scale of contextuality.

DiMarco (1990) constructs a theory of style in terms of a syntactic stylistic grammar consisting of three levels: a top level of *stylistic goals*, an intermediate level of *abstract stylistic elements*, and a base level of *primitive stylistic elements*. The top level of stylistic goals, such as *clarity* and *concreteness*, describes the possible stylistic effects a sentence can be intended to produce. The intermediate level of abstract stylistic elements, such as *resolution* and *dissolution*, is a stylistic metalanguage that groups together stylistically similar whole sentences. The base level of primitive stylistic elements, such as *conjunctness* and *subjunctness*, then

describes the stylistic effects of individual sentence components.[49]

Since a comprehensive description of computational stylistics is outside the scope of this work, I present an example of the stylistic analysis of sentence (4-1). This also shows how the scale of contextuality should interact with stylistics during sentence generation.

Cohen (1964, (1971, p. 584)) draws attention to such sentences as (4-1) which, he claims, show up an incoherency in the theory of speech acts.

(4-1) I protest!

The incoherency is that the verb *protest*, while being used performatively, does not appear to conform to any category of verb discussed in section 3.3.3. This is because it does not have any syntactic object and therefore appears not to govern any proposition. If this were truly the case, then the explicit performative in (4-1) could not be explained by the theory I presented in chapter 3.[50] However, an utterance such as (4-1) is only meaningful when made within a context in which a proposition is understood; indeed Cohen provides one with his example: *I protest that I have not been allowed to speak!*

This suggests that the proposition governed by *protest* has been deleted from (4-1), by the syntactic device of *ellipsis*, for stylistic purposes. And indeed, syntactic devices such as *ellipsis* and *pronominalization* play an important role in determining the primitive stylistic elements of sentence components.

The stylistic analysis of (4-1) is as follows. At the base level of primitive stylistic elements, the personal pronoun *I* is considered moderately conjunctive, $\mathsf{conjunct}^3$

[49] *Conjunctness* refers to the strength of connection, or *cohesiveness*, between intra-sentence constituents. *Subjunctness* refers to the strength of subordination between intra-sentence constituents.

[50] This is, in fact, Cohen's conclusion.

in the formal notation, which means that the referent of the pronoun is reasonably easy to recover from context.[51] The ellipsis of the clause *I have not been allowed to speak* in (4-1) is considered excessively conjunctive, conjunct^5 in the formal notation, which means that the entire clause must be recovered from context—as opposed to only a noun or a verb.[52] The stylistic grammar rules of primitive stylistic elements describing these effects are given below.[53]

conjunct^3 noun $\longrightarrow$

pronoun

conjunct^5 clausal ellipsis $\longrightarrow$

clausal ellipsis

At the intermediate level of abstract stylistic elements, because the stylistic effect of the personal pronoun *I* is moderate, its use is considered *concordant*—not too emphatic. Because the stylistic effect of the elided clause is excessive, its use is considered *discordant*—very emphatic.[54] The stylistic grammar rules of abstract stylistic elements describing this situation are given below.

concord $\longrightarrow$

conjunct^3 noun

discord $\longrightarrow$

conjunct^5 clausal ellipsis

[51] See Green (1992b, pp. 53–4).
[52] See Green (1992b, pp. 50–1).
[53] See Green (1992b, pp. 65–8).
[54] It would be more precise to say that its use deviates from a norm. See Green (1992b, pp. 86–7).

The abstract stylistic description of a sentence is completed by an analysis of how the primitive stylistic elements progress from the beginning of the sentence to its end. Since the pronoun *I* occurs at the beginning of the sentence, it is called an **initial concord**, and since the clausal ellipsis occurs at the end of the sentence, it is called a **final discord**. The progression from an initial concord to a final discord is considered a **dissolution**—an unusual outcome. The stylistic grammar rule describing this abstract stylistic element is given below.

dissolution $\longrightarrow$

initial concord *and* **final discord**

At the level of stylistic goals, the use of a dissolution in a sentence is considered to give it **concreteness**—a specificity achieved by an emphatic or unusual construction. Effectively, sentence (4-1) draws attention to the proposition it governs by deleting it from the place it would be expected to occur. The stylistic grammar rule describing this stylistic goal is given below.

concreteness $\longrightarrow$

dissolution

Thus, the stylistic effect and the use of a clausal ellipsis in sentence (4-1) is summarized by the stylistic goal of **concreteness** in the computational theory of style. From the point of view of sentence generation, the use of ellipsis could be anticipated by planning to use the stylistic goal of **concreteness**.[55]

In view of the above stylistic analysis of sentence (4-1), it is easy to see how the speaker's intent to draw attention to the proposition *I have not been allowed*

[55] In fact, Green (1992b) has incorporated stylistic control into the PENMAN generation system. See also BenHassine (1992).

to speak depends both on stylistics and the scale of contextuality. First, in order to specify directly how the proposition is to be interpreted, the speaker can plan on using an explicit performative and will select the appropriate performative verb *protest*. Second, to continue this specificity into the presentation of the explicit performative, the utterer can also plan on using the stylistic goal of concreteness. This, in turn, gives rise to the final form of the utterance: *I protest!*

In this subsection, I have shown that the control of sentence form provided by the theory of computational stylistics can be used to account for observable linguistic variations in speech acts. This also suggests that the interaction between speech acts, measured along the scale of contextuality, and stylistics should be further studied in the future. This would help both in expanding the flexibility of computational utterance planning and in delimiting the phenomena that speech act theory should be expected to account for. Speech act theory itself should not need to account for clausal ellipsis, for example.

In the next subsection, I discuss how the theory of speech acts proposed here suggests future directions for work in computational stylistics. Current work in computational stylistics has concentrated on accounting for the effects of variations in syntax. The theory of speech acts presented in this thesis suggests how computational stylistics might be expanded to include semantic style and lexical style.

4.3.2 Semantic and lexical style

Current work in computational stylistics is limited to considering the effect of variations in the syntax of sentences. But it also seems reasonable to expect that the choice of semantic and lexical expression has a profound impact on the effect of

a sentence. In this subsection, I discuss what the theory of speech acts presented here has to contribute to theories of semantic style and lexical style.

The scale of contextuality[56] grades utterances according to the relation between their literal meaning and their intended meaning.[57] In primary performatives, at the center of the scale, the literal meaning is the intended meaning. In indirect speech acts, the intended meaning must be inferred by means of Gricean implicatures.[58] In explicit performatives, the intended meaning can be deduced from the meaning of the performative verb.[59] While the theory of speech acts presented here helps to explain how the variations of the scale work, it does not explain the *reasons* for choosing a particular place in the scale over another for generating some expression. Therefore, a theory of semantic style should account for the goals satisfied by the difference, if any, between the intended meaning and literal meaning of an expression.

This is also consistent with the suggestion by Green (1992b, p. 12) that semantic style should account for *tropes*—stylistic devices like *metaphor*, *simile*, and *hyperbole*. Some computational theories of metaphor do attempt to account for the goals achieved by metaphors by explaining the mapping from the literal meaning of an expression to its intended meaning.[60] For example, the expression *Steve is a snake* is probably intended to convey the proposition *Steve is untrustworthy*, but does so nonliterally in order to give a stylistic effect. The work I present in this thesis, and other computational work on tropes, provides a low-level descriptive vocabulary upon which a theory of semantic style could be based, analogous to the

[56] See section 3.4.2.
[57] See section 3.2.
[58] See section 3.4.
[59] See section 3.3.
[60] See Indurkhya (1987), Traum and Hinkelman (1991), and Jones (1992).

current syntactic theory of style.[61]

The 'lexical' end of the scale of contextuality[62] deals with the use of performative verbs. The selection of exactly which verb to use is important to determining the exact effect of any explicit performative because the meaning of the performative verb semantically denotes the pragmatic information (context) for interpreting the proposition it governs.[63] However, as Fraser (1986) points out, lexical items tend to vary in the amount of semantic and pragmatic information they convey. Consider, for example, the following sentences (Fraser, 1986, p. 67):

(4-2) I admit that I could have done better.

(4-3) Frankly, we are lost.

(4-4) Where are the damned coffee filters?

In sentence (4-2), the performative verb *admit* supplies the information necessary to interpret the proposition *I could have done better*, and is thus solely concerned with providing the interpretation of that proposition. In sentence (4-3), the adverb *frankly* comments on the propositional content of the sentence[64] but does not appear to be part of that proposition.[65] Finally, in sentence (4-4), the use of the adjective *damned* seems to have nothing to do with the propositional content of the sentence and more to do with the speaker's attitude at the time of utterance.

[61] For a literary view of speech acts and style, see Petrey (1990).

[62] See section 3.3.4.

[63] See section 3.3 and Wierzbicka (1987).

[64] "*Frankly* ... signals that its utterance may be used to alert the hearer that the message which follows is unexpected and/or unpleasant.", Fraser (1986, p. 67).

[65] Such adverbs are discussed as *style disjuncts* in Quirk *el al.* (1985, pp. 615–8). See also Bach and Harnish (1979, pp. 228–33), Levinson (1983, pp. 255–8), and Wierzbicka (1986).

What this suggests is that the selection of lexical items in a sentence may depend, in varying degrees, on both the semantic and pragmatic information the speaker wishes to convey. In section 3.3.2, I argued that explicit performatives are statements, which means that the performative verb is part of their propositional content. Thus, the information given by the verb *admit* in sentence (4-2) is conveyed semantically. However, at least some of the information given by the adverb *frankly* in sentence (4-3) and all the information given by the adjective *damned* in sentence (4-4) is not semantic in that sense. It appears, then, that lexical items can be used to guide both the literal and nonliteral interpretation of an expression. A theory of lexical style should therefore distinguish between how a word contributes to the literal interpretation of the proposition within which it ocurrs, and how it contributes to its nonliteral interpretation. As the theory of speech acts presented here addresses the relationship between the literal and nonliteral interpretations of expressions, it should provide at least some basis for such a theory of lexical style.

In this subsection, I have outlined what implications the theory of speech acts presented in this thesis might have for theories of semantic and lexical style. Semantic style could be viewed as the relationship between the literal meaning of an expression and its intended meaning in context. Lexical style could be viewed as the relationship an individual lexical item has with both the semantic meaning and pragmatic interpretation of the expression within which it occurs. These theories of style are relevant to speech act theory in that all of them deal with the interaction between semantics and pragmatics. The ideas I have presented on extending the computational theory of style are sketchy, but I expect that they will prove beneficial to both to the theory of style and the theory of speech acts.

4.4 Summary

In section 4.2.1, I gave a few examples of the input and output of CoSAG to show how it is related to the model of speech acts presented in chapter 3. In particular, I concentrated on representing variations along the scale of contextuality within feature structures. I then discussed, in sections 4.2.3 and 4.2.4, the CoSAG procedures and data structures that demonstrate in what ways CoSAG is both similar to and different from previous sentence planners based on speech act theory.[66] I also discussed how CoSAG could be modified to cover more of the theory I presented, since an extensive implementation of my model has proven to be outside the scope of this thesis.

In section 4.3.1, I examined the relationship between my model of speech acts and the scale of contextuality, and current work in computational stylistics.[67] I argued that the control of sentence form provided by the theory of computational stylistics is necessary to allow for important linguistic variations in speech acts, as in the example *I protest!*. In section 4.3.2, I discussed how the theory of speech acts proposed here suggests future directions for work in computational stylistics. Specifically, my theory suggests that both computational stylistics and speech act theory might be extended to account for semantic style and lexical style since these theories all appear to describe a relation between a literal and nonliteral interpretation of an utterance.

[66] Such as that proposed by Cohen and Perrault (1979).
[67] See DiMarco (1990), Green (1992a) and (1992b), and DiMarco and Hirst (1993).

Chapter 5

Conclusions and discussion

Now end I with Archemastrie. This Arte, teacheth to bryng to actuall experience sensible, all worthy conclusions by all the Artes Mathematicall purposed, and by true Naturall Philosophie concluded; and both addeth to them a farder scope, in the termes of the same Artes, and also by hys propre Method, and in peculiar termes, procedeth, with helpe of the foresayd Artes, to the performance of complet Experiences, which of no particular Art are hable (formally) to be challenged.

John Dee, Mathematicall praeface to the elements of geometric of Euclid of Megara, **A iii**, 1570

5.1 Epilogue

In this thesis, I have tried to contribute to both the theory of speech acts and to its applications in computational linguistics. In speech act theory, I have motivated an anticonventionalist view of speech acts and proposed an anticonventionalist theory that permits description of speech acts by the scale of contextuality. In computa-

tional applications, I have described the implementation of a speech act generator, CoSAG, and discussed the relationship between the speech act theory presented in this thesis and a current computational theory of stylistics.

In the following sections, I review the contributions of my work and the future directions of research it suggests. In the next section, I discuss the theory I have proposed, while in the subsequent section, I discuss the computational work I have presented.

5.2 Speech acts and pragmatics

5.2.1 Contributions

I have given a review of speech act theory with the aim of distinguishing between the conventionalist and anticonventionalist approaches to speech acts. I have argued against conventionalist views on primary performatives, explicit performatives, and indirect speech acts. The conventionalist approach, most notably developed by Searle,[1] relies on the existence of special, conventional, felicity conditions for the performance of illocutionary acts and presents many difficulties. I have argued for the anticonventionalist view as it relies on existing linguistic and pragmatic concepts such as the lexical semantics of performative verbs and Grice's maxims of cooperative conversation.

Accordingly, I have also outlined a model of an anticonventionalist theory of speech acts that responds to the issues raised regarding conventionalist theory. I have presented a definition of clausal mood and semantic modality and the link between them. Since the declarative, interrogative, and imperative moods are the

[1] See Searle (1969), (1975), (1976), and Searle and Vanderveken (1985).

only moods common to most, if not all, human languages, I have been primarily concerned with these, as well as the subjunctive mood, which my theory predicts. The declarative, interrogative, and imperative moods correspond to the statement, question, and mand modalities, respectively, and indicate how a communicated proposition is to be interpreted. I have also shown how this system of moods and modalities is related to Grice's maxim of quality, and how it explains the interpretation of primary performatives.

I have presented an anticonventionalist algorithm for the analysis of explicit performatives, which I contrast with the previous algorithm of Bach and Harnish (1979). The algorithm I have proposed is deductive, rather than inductive, and distinguishes between explicit performatives and indirect speech acts. This algorithm also places the correct emphasis on the performative verb in explicit performatives. Performative verbs lexically convey a context for the interpretation of a proposition.

Also, I have reviewed indirect speech acts. Indirect speech acts are speech acts that require inductive inference using Gricean conversational maxims to derive their intended meaning from their literal meaning. Indirect speech acts convey a context for the interpretation of a proposition by means of the assumptions necessary to understand their intended meaning.

Finally, I have proposed a basis for the comparison of various forms of speech acts: the scale of contextuality. This scale relates the forms of speech acts to their dependence on context for correct interpretation. The center of the scale is occupied by primary performatives, as they rely the most on context for interpretation. Explicit performatives occupy the 'lexical' end of the scale because they encode a context of interpretation in lexical meaning of the performative verb. Indirect speech acts occupy the 'inferential' end of the scale as they encode a context of interpretation in the inferences necessary for their correct understanding.

5.2.2 Discussion

This thesis is, I believe, a first step in developing an anticonventionalist theory of speech acts. While I have tried to be as thorough and precise as possible, my conclusions are still prefatory to a more formal and refined model of speech acts. Future improvements to the theory should include a formal representation of belief and intention, and the refinement of the distinction among speech acts made by the scale of contextuality. Future extensions to the theory could address the issue of conventionalization of speech acts and the description of non-sentential utterances.

The most obvious candidate for a formal representation of belief and intention in speech acts is that developed by Cohen and Levesque (1985), and (1990a).[2] A more formal representation offers greater precision and predictive power to the theory presented here, while, conversely, the theory I have presented offers an analysis of the linguistic phenomena relevant to issues in formal representation.

A more formal representation of my theory would also permit refinement of the scale of contextuality. I have placed various forms of speech acts provisionally along the scale based on how much of the context of interpretation is encoded in the literal form of the speech act. Only a more formal representation will allow these placements to be more precisely described and verified or altered. This is particularly true of indirect speech acts, for which placement along the scale depends on the number of inferences necessary to derive the intended meaning from the literal one.

In developing my theory of speech acts, I have avoided any consideration of their conventionalization. That is, I have not considered how certain speech acts or forms of speech acts may become idiomatic or fixed in meaning. For example,

[2]See also Cohen and Levesque (1990b), (1990c), and Perrault (1990).

Can you pass the salt? is more acceptable as an indirect request than *Are you able to pass the salt?*, although both have similar literal meanings. It appears that the *Can you ...* form[3] is a conventionalized means of conveying an indirect request.[4] As a linguistically thorough account of language should account for idioms, further study of the conventionalization of speech acts would help to generalize the theory presented here.

Also, I have confined myself to the examination of sentential utterances. However, not all expressions are sentential, such as *Hello!*, *OK*, and *Huh?* Such utterances have been described as *conversation acts* by Traum and Hinkelman (1991). It would be interesting to consider how the coverage of the theory presented in this thesis could be extended to cover such acts.

5.3 Implementation

5.3.1 Contributions

The CoSAG sentence generator uses feature structures as a means of representing the functional structure of linguistic expressions. I have given examples of the feature structures that CoSAG accepts as input and the corresponding expressions that CoSAG then generates as output. I chose the examples to demonstrate the structural variation in speech acts that arise in connection with the scale of contextuality. Specifically, I have given examples of primary performatives, explicit performatives, whimperatives, hedged performatives, and embedded performatives.

CoSAG is implemented in Prolog and demonstrates how partially-instantiated

[3] A whimperative; see section 3.4.2.

[4] See Sadock (1974), Searle (1975), Morgan (1977), and Bach and Harnish (1979).

Prolog lists can be used to implement feature structures. Partially-instantiated lists and the procedures that operate on them have been chosen specifically to allow CoSAG to be extended in a manner similar to previous computational work in speech act planning. Interestingly, the `apply` predicate has proven to be the only operation needed in this work to use partially-instantiated lists. This greatly simplifies the definition of constraints on feature structures in the grammar and procedural components of CoSAG.

The grammar component of CoSAG is completely declarative because it provides constraints only on the form of valid feature structures in the system. The body of a CoSAG grammar rule is given by its dependent functor list, the preconditions are given by the head functor constraint list, and the postconditions are given by the dependent functor constraint list. These grammar rules are similar to the planning operators suggested by Cohen and Perrault (1979). This similarity should allow the grammar rules of CoSAG to serve as a basis for designing further planning operators in future enhancements of the system.

The parsing component of CoSAG calls the grammar rules just discussed in order to manage a feature structure and uses a Prolog Definite Clause Grammar to construct the output string. In fact, the parsing component consists of one predicate, `parse`, and a number of utility predicates, such as the `apply` predicate, to generate expressions. Although the coverage of CoSAG is still small, its simplicity and the variety of its output demonstrate the expressive power of feature structures in describing linguistic expressions.

5.3.2 Discussion

This thesis suggests many directions for future computational work. Although the CoSAG system shows the feasibility of using feature structures to describe expressions, CoSAG does not represent the model of belief and intention outlined in chapter 3. Also, the flexibility of CoSAG would be greatly improved by using the grammatical description from an established theory of syntax. While I have examined the varying linguistic mechanisms underlying speech acts, I have not done much to account for what purposes are served by using one mechanism rather than another. I believe that the extension of computational stylistic theory to semantics will help produce such an account.

In section 4.2.5, I suggested that CoSAG could be extended by creating a `plan` predicate to perform the task of deriving a feature structure for *parse* based on some representation of a proposition and modality. I have not been able to carry this out since the representation of modality presented in chapter 3 is not yet sufficiently precise. Once an adequately formal representation is available, the next step would be to test it empirically by incorporating it into a generator such as CoSAG. The ability to generate a variety of natural-language expressions would be a strong argument for the usefulness of the underlying representation. This promises to be a difficult task, since variations along the scale of contextuality would also require a fairly detailed representation of context and conversational implicature.

Another area in which CoSAG needs improvement is its syntactic description of sentences. The syntactic description used is *ad hoc*, and this means that it will be difficult to extend the linguistic coverage of the generator and to apply it to different tasks. The most appropriate syntactic theories for this purpose would be those that already make use of feature structures, such as Generalized Phrase

Structure Grammar (GPSG),[5] Lexical Functional Grammar (LFG),[6] or possibly Systemic Functional Grammar.[7]

5.4 Computational stylistics

5.4.1 Contributions

I have argued that the control of sentence form provided by DiMarco's (1990) theory of computational stylistics can be used to account for observable linguistic variations in speech acts. This also suggests that the interaction between speech acts, measured along the scale of contextuality, and stylistics should be further studied in the future. This would help both in expanding the flexibility of computational utterance planning and in delimiting the phenomena that speech act theory should be expected to account for. For example, speech act theory should not need to account for clausal ellipsis in utterances like *I protest!*

I have also outlined the implications that the theory of speech acts presented in this thesis might have for the extension of DiMarco's stylistic theory to semantic and lexical style. Semantic style could be viewed as the relationship between the literal meaning of an expression and its intended meaning in context. This view is consistent with the suggestion made by Green (1992b, p. 12) that semantic style should deal with tropes like metaphor and simile. Lexical style could be viewed as the relationship that an individual lexical item has with both the semantic meaning and the pragmatic interpretation of the expression within which it occurs. Such

[5] See Gazdar *et al.* (1985).
[6] See Kaplan and Bresnan (1982).
[7] See Halliday (1985) and Kasper (1985).

theories of style would be relevant to speech act theory in that all of them deal with the interaction between semantics and pragmatics.

5.4.2 Discussion

Computational stylistics, as demonstrated by Green (1992b), is a useful means of controlling the syntax of expressions in sentence generation. In section 4.3.2, I discussed how computational stylistic theory might be extended to cover semantic style. Such a theory would describe the effects produced by the literal and intended meaning of an expression. Since the scale of contextuality describes the relationship of literal to intended meaning in speech acts, it would be a basic element of such a theory. I also suggested that a theory of lexical style would be useful in describing and differentiating the semantic and pragmatic aspects of lexical items. I also wish to point out here two other theories that could augment the description of expressions given by the theory of speech acts I have presented: *rhetorical coherence* and *register* theory.

Speech act theory mainly describes the properties of an expression taken in isolation—in context, but without consideration of other expressions in the same discourse. Rhetorical coherence, as developed by Hobbs,[8] among others,[9] accounts for the connection of an expression with its neighbours in a text. A comprehensive theory of textual description useful for generating wide varieties of texts would benefit from combining the analysis provided by speech act theory and that provided by a theory of rhetorical coherence. While some ideas have been put forward in this regard, for example, Widdowson (1979, pp. 141–9) and Huenig (1981), integrating the analysis of both theories, perhaps within a theory of semantic style, is worthy

[8] See Hobbs (1979) and (1990).

[9] See, for example, Hovy and Maier (1991).

of further research.

Shelley *et al.* (1991) explore how register might be used in conjunction with speech act theory in a text generation system. Register theory describes what effect the topics, settings, and participants in a discourse have on the form of the discourse. A central concept in register theory is the *key*, or the level of formality of a discourse, and is often described by a scale ranging from the very informal to the very formal, *e.g., intimate*, *casual*, *consultative*, *deliberative*, and *oratorical.*[10] However, the term *formality* is ambiguous. If 'formality' is taken to refer to the formal, structural description of text, then it effectively divides that structural description, or grammar, into subgrammars corresponding to each key. If 'formality' is taken to refer to the level of anticipated criticism from an audience, then it effectively dictates the manner of planning expressions, rather than the grammar available to describe expressions.[11] Peng (1987) argues that the latter, "dynamic" view of register is the correct one for establishing a link between the concepts of register and style. Although the issue cannot be resolved here, register theory should provide important material for extending current theories of computational stylistics.[12]

5.5 Summary

In this thesis, I have examined the interaction between a speech act and its context, and particularly how this affects a linguistically motivated description of speech acts. As speech act theory has played a prominent role in computational research

[10] See Shelley *et al.* (1991, p. 116).
[11] See Widdowson (1979, pp. 21–36).
[12] See Bateman and Paris (1989) and (1990).

in text planning, the critical review of the theory should reflect constructively on future work in the area.

In my review, I have concentrated on the distinction between conventionalist and anticonventionalist approaches to speech act description. The difficulties presented by conventionalist theory, particularly that of Searle, have been pointed out and anticonventionalist alternatives have been suggested.

I have then used my criticism of previous work in speech act theory to establish the properties an improved theory should have. I have outlined such a theory and shown how it accounts for primary performatives, explicit performatives, and indirect speech acts. I have also proposed the scale of contextuality to allow for the comparison of speech act descriptions.

I have presented a simple speech act generator, CoSAG, which demonstrates the differences among speech acts indicated by the scale of contextuality. The relationship of speech act theory to computational linguistics has also been discussed, in addition to possible future extensions of both theories.

In summary, the work in this thesis presents a critical appraisal of past work in speech act theory, a proposed improvement to that theory, and a discussion of how it may be used to enhance future work in computational sentence generation.

Appendix A

Expressive verbs

The expressive category mentioned in section 3.3.3 is the same as the expressive category proposed by Searle.[1] Expressive verbs allow only prepositional phrases, rather than clauses, as their syntactic objects. Therefore, it appears that they aren't accounted for by the model I have described, because they don't govern propositions. For example, sentences (A-1), (A-2) and (A-3) are valid utterances, while (A-4), (A-5) and (A-6) are not:[2]

(A-1) I apologize for stepping on your toe.

(A-2) I congratulate you on your victory.

(A-3) I reproach you for your belching.

(A-4) *I apologize that I stepped on your toe.

[1] See section 2.4.1.
[2] See Searle (1976, pp. 12–3).

(A-5) *I congratulate you that you won.

(A-6) *I reproach you that you belch.

However, I believe that expressives could be explained by an extension of the model I have presented. Specifically, expressives might be handled appropriately by extending this model to handle verbs that report *mental* processes, discussed by Halliday (1985, p. 233). Halliday notes that verbs such as *think*, *believe*, *intend*, and *wonder* report ideas or propositional attitudes.[3] Expressive verbs could be accounted for as verbs that belong to both these mental and verbal classes.

Leech (1983, p. 210) gives evidence that seems to support this position. He notes that expressive verbs imply that the speaker presupposes the truth of the proposition named by their syntactic object. This can be seen by noting that negation destroys the presupposition in non-expressive performative verbs, but not in expressive ones. For example, the speaker of sentence (A-7) and (A-8) appears to believe the proposition *He ate too much.*

(A-7) She complained that he ate too much.

(A-8) She reproached him for eating too much.

When these sentences are negated, the presupposition disappears in (A-9), but seems to remain in (A-10).

(A-9) She did not complain that he ate too much.

(A-10) She did not reproach him for eating too much.

[3]See also Leech (1983, pp. 211).

It seems that the speaker of (A-10) still believes the proposition *He ate too much.* Thus, the negation seems to have affected the report of the verbal act of complaining, but not the report of the mental attitude in reproaching. While I cannot offer a means of fitting this observation into the model I have presented in chapter 3, a better account of expressive verbs and verbs of mental reporting would be an interesting and necessary area for additional research.[4]

[4]Relevant material is discussed by Arndt (1987). See also Fillmore (1971).

Appendix B

CoSAG program listing

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% Grammar rules are Prolog goals given in a uniform
% structure.  A rule is headed by a functor which takes
% three arguments.  The first argument is an ordered
% list of dependent functors, the second is the functor
% constraint list (a list of functional structure
% [path,value] pairs to be applied to the current
% functional structure), the third is the dependent
% constraint list (a list of [path,path] pairs relating
% the dominant functional structure to each dependent
% functional structure).  Therefore the first and third
% argument lists must be the same length.
%
% rule(
%    FList : list of dependent functors;
%    FCL : list of constraints on the dominant functional
%          structure ([path,value] pairs);
%    DCL : list of constraints ([path,path] pairs)
% )
%
% NB.  ||FList|| == ||DCL||.  "[]" for FList in rules is
```

```
% a shorthand for "[lex]", indicating the lexical
% interface.  Lexical rules constrain structures "lex"
% and "string" only.
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Sentence rules section.
%
% Functors:
%    s - sentence predicates;
%    restrict_verb - restrict verbal 'inversion' to "be"
%                    and "have".
%
% Functional structures:
%    pred:[
%       mood:{declv|impv|subjv|interv}
%       (declarative,imperative,subjunctive,interrogative)
%       subj:npstruc (see np section)
%       verb:verb structure (see verb phrase & verb sections)
%       dobj:npstruc (direct object)
%       iobj:npstruc (indirect object)
%       comp:sentence (complement or relative clause)
%       rel:relative pronoun (if subordinate clause)
% ]
%
% agr:[
%    per:person of verb {first|second|third}
%    num:number of verb {sing|plur}
%    form:form of verb {fin|inf} (finite|infinitive)
% ]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% declarative clause
s([np,vp],
  [
    [[pred,mood],declv],
    [[pred,subj,case],nom]
  ],
```

```
  [
    [ [[agr],[agr]], [[pred,subj],[npstruc]] ],
    [ [[agr],[agr]], [[pred],[pred]] ]
  ]
).

% imperative clause
s([vbar],
  [
    [[pred,mood],impv],
    [[agr,pers],second], [[agr,num],sing], [[agr,form],inf],
    [[pred,subj,case],nom], [[pred,subj,det],e],
    [[pred,subj,head],you], [[pred,subj,gen],e],
    [[pred,subj,num],sing]
  ],
  [
    [ [[agr],[agr]], [[pred],[pred]] ]
  ]
).

% subjunctive clause
s([np,vbar],
  [
    [[pred,mood],subjv],
    [[pred,subj,case],nom],
    [[agr,form],inf]
  ],
  [
    [ [[agr],[agr]], [[pred,subj],[npstruc]] ],
    [ [[agr],[agr]], [[pred],[pred]] ]
  ]
).

% parse inverted interrogative
s([sinv],
  [
    [[pred,mood],interv]
  ],
  [
```

```
    [ [[agr],[agr]], [[pred],[pred]] ]
  ]
).

% 'inverted' interrogative with auxiliary verb
sinv([aux,np,vbar],
  [
    [[pred,subj,case],nom],
    [[pred,verb,aux],Aux],
    [[vgap],Aux],
    [[agr,form],inf]
  ],
  [
    [ [[agr],[agr]], [[pred],[pred]] ],
    [ [[agr],[agr]], [[pred,subj],[npstruc]] ],
    [ [[agr],[agr]], [[pred],[pred]] ]
  ]
).

% 'inverted' interrogative with "be" or "have"
sinv([verb,np|Objs],
  [
    [[pred,subj,case],nom],
    [[pred,verb,head],Verb],
    [[pred,verb,aux],e],
    [[vgap],Verb],
    [[agr,form],fin],
    [[pred,verb,trans],Trans] |
    FConstraints

  ],
  [
    [ [[agr],[agr]], [[pred],[pred]] ],
    [ [[agr],[agr]], [[pred,subj],[npstruc]] ] |
    DConstraints
  ]
) :- restrict_verb(Verb),
     trans_frame(Trans,Objs,FConstraints,DConstraints).
restrict_verb(be).
```

```
restrict_verb(have).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Noun Phrase section.
%
% Functors:
%    np - noun phrase;
%    pro - pronominal constituents (proper nouns & pronouns)
%    nbar - adjective & noun or just noun.
%    det - determiner
%    adj - adjective
%    noun - noun
%    get_lexnoun - retrieves noun according to number
%    pn - pronoun
%    propn - proper noun
%
% Functional structures:
% npstruc:[
%    det:{the|a|an|<e>} (<e> = empty string)
%    mods:adjective
%    head:noun
%    num:number of noun
%    gen:gender of noun
% ]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% noun phrase
np([det,nbar],
   [],
   [
     [ [[agr],[agr]], [[npstruc],[npstruc]] ],
     [ [[agr],[agr]], [[npstruc],[npstruc]] ]
   ]
).

% noun phrase
np([Pro],
   [ [[npstruc,det],e] ],
   [
```

```
      [ [[agr],[agr]], [[npstruc],[npstruc]] ]
   ]
) :- pro(Pro).

% pronominal
pro(propn).
pro(pn).

% adjective & noun
nbar([adj,noun],
     [],
     [
       [ [[npstruc],[npstruc]] ],
       [ [[agr],[agr]],[[npstruc],[npstruc]] ]
     ]
).

% noun
nbar([noun],
     [ [[npstruc,mods],e] ],
     [
       [ [[agr],[agr]], [[npstruc],[npstruc]] ]
     ]
).

% determiner
det([],
    [
      [[agr,num],Num],[[agr,pers],third],[[npstruc,det],Lex],
      [[lex],Lex],[[string],String]
    ],
    [
      [ [[lex],[lex]],[[string],[string]] ]
    ]
) :- lexdet(Lex,String,Num).
lexdet(the,[the],_).
lexdet(a,[a],sing).
lexdet(a,[an],sing).
lexdet(e,[],plur).
```

```
% adjective
adj([],
    [ [[npstruc,mods],Lex],[[lex],Lex],[[string],String] ],
    [
      [ [[lex],[lex]],[[string],[string]] ]
    ]
) :- lexadj(Lex,String).
lexadj(big,[big]).
lexadj(little,[little]).
lexadj(nice,[nice]).
lexadj(stupid,[stupid]).

% noun
noun([],
     [
       [[agr,num],Num],[[agr,pers],third],
       [[npstruc,head],Lex],[[npstruc,num],Num],
       [[npstruc,gen],Gen], [[lex],Lex],[[string],String]
     ],
     [
       [ [[lex],[lex]],[[string],[string]] ]
     ]
) :- get_lexnoun(Lex,String,Num,Gen).
get_lexnoun(Lex,String,sing,Gen) :- lexnoun(Lex,String,_,Gen).
get_lexnoun(Lex,String,plur,Gen) :- lexnoun(Lex,_,String,Gen).
lexnoun(dog,[dog],[dogs],neut).
lexnoun(cat,[cat],[cats],neut).
lexnoun(book,[book],[books],neut).
lexnoun(car,[car],[cars],neut).
lexnoun(ball,[ball],[balls],neut).

% pronoun
pn([],
      [
        [[agr,num],Num],[[agr,pers],Pers],
        [[npstruc,head],Lex],[[npstruc,num],sing],
        [[npstruc,gen],Gen], [[npstruc,case],Case],
        [[lex],Lex],[[string],String]
```

```
      ],
      [
        [ [[lex],[lex]],[[string],[string]] ]
      ]
) :- lexpn(Lex,Gen,Pers,Num,Case,String).

lexpn(i,e,first,sing,nom,[i]).
lexpn(i,e,first,sing,obl,[me]).
lexpn(you,e,second,sing,_,[you]).
lexpn(you,e,second,plur,_,[you]).
lexpn(he,masc,third,sing,nom,[he]).
lexpn(he,masc,third,sing,obl,[him]).
lexpn(she,fem,third,sing,nom,[she]).
lexpn(she,fem,third,sing,obl,[her]).
lexpn(it,neut,third,sing,_,[it]).
lexpn(we,e,first,plur,nom,[we]).
lexpn(we,e,first,plur,obl,[us]).
lexpn(they,e,third,plur,nom,[they]).
lexpn(they,e,third,plur,obl,[them]).

% proper noun
propn([],
      [
        [[agr,num],sing],[[agr,pers],third],
        [[npstruc,head],Lex],[[npstruc,num],sing],
        [[npstruc,gen],Gen],
        [[lex],Lex],[[string],String]
      ],
      [
        [ [[lex],[lex]],[[string],[string]] ]
      ]
) :- lexpropn(Lex,Gen,String).
lexpropn(cam,masc,[cam]).
lexpropn(cameron,masc,[cameron]).
lexpropn(cams,masc,[cameron,shelley]).
lexpropn(steve,masc,[steve]).
lexpropn(steven,masc,[steven]).
lexpropn(steveg,masc,[steven,green]).
lexpropn(sarah,fem,[sarah]).
```

```
lexpropn(sarahc,fem,[sarah,connor]).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Verb Phrase section.
%
% Functors:
%    vp - verb phrase;
%    aux - auxiliary verb;
%    get_aux - retrieve auxiliary according to person
%       and number;
%    vbar - verb & objects;
%    trans_frame - transitivity frames;
%    get_relpro - retrieve 'relative pronoun' and
%       complement mood according to dominating verb;
%    comp - object complementizer for 'raising' verbs;
%    relpro - 'relative pronoun'.
%
% Functional structures:
%    vgap:name of auxiliary in 'inverted' interrogative;
%    agr:see sentence section;
%    pred:[
%       verb:[
%          aux:auxiliary verb;
%          trans:transitivity of verb {iv|tv|dv|rov|rel}
%             (intransitive - no objects;
%             transitive - one np object;
%             ditransitive - two np objects;
%             rov - raise to object verb;
%             rel - relative complement verb.)
%          head:verb lexical item;
%             (See sentence section)
%       ]
%    ]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% verb phrase
vp([aux,vbar],
   [
     [[vgap],e],
```

```
      [[agr,form],inf]
   ],
   [
      [ [[agr],[agr]],[[pred],[pred]] ],
      [ [[agr],[agr]],[[pred],[pred]] ]
   ]
).

% verb phrase
vp([vbar],
   [
      [[agr,form],fin]
   ],
   [
      [ [[agr],[agr]],[[pred],[pred]] ]
   ]
).

% auxiliary verb
aux([],
   [
      [[agr,pers],Pers],[[agr,num],Num],
      [[pred,verb,aux],Lex],
      [[lex],Lex],[[string],String]
   ],
   [
      [ [[lex],[lex]],[[string],[string]] ]
   ]
) :- get_aux(Lex,String,Pers,Num).

get_aux(Lex,String,Pers,Num) :- lexaux(Lex,String,Pers,Num).
get_aux(Lex,String,_,_) :- lexmodal(Lex,String).

lexaux(do,[do],first,_).
lexaux(do,[do],second,_).
lexaux(do,[does],third,sing).
lexaux(do,[do],third,plur).
lexmodal(must,[must]).
lexmodal(might,[might]).
```

```
lexmodal(can,[can]).
lexmodal(could,[could]).
lexmodal(will,[will]).
lexmodal(would,[would]).

% verb & objects
vbar([verb|Objs],
     [
       [[pred,verb,trans],Trans] |
       FConstraints
     ],
     [
       [ [[agr],[agr]],[[pred],[pred]] ] |
       DConstraints
     ]
) :- trans_frame(Trans,Objs,FConstraints,DConstraints).

% verb transitivity, objects and their constraint frames
trans_frame(iv,[],[],[]).

trans_frame(tv,[np],
[
   [[pred,dobj,case],obl]
],
[
   [ [[pred,dobj],[npstruc]] ]
]).

trans_frame(dv,[np,np],
[
   [[pred,iobj,case],obl],[[pred,dobj,case],obl]
],
[
   [ [[pred,iobj],[npstruc]] ],
   [ [[pred,dobj],[npstruc]] ]
]).

trans_frame(rov,[np,comp,vbar],
[
```

```
   [[pred,comp,pred,mood],declv],
   [[pred,comp,pred,subj,case],obl]
],
[
   [
      [[pred,comp,pred,subj],[npstruc]],
      [[pred,comp,agr],[agr]]
   ],
   [ [[pred,comp,pred,rel],[rel]] ],
   [
      [[pred,comp,pred],[pred]],
      [[pred,comp,agr],[agr]]
   ]
]).

trans_frame(rel,[relpro,s],
[
   [[pred,verb,head],Verb],
   [[pred,comp,pred,mood],Mood],
   [[pred,comp,pred,rel],Lex]
],
[
   [ [[pred,comp,pred,rel],[rel]] ],
   [
      [[pred,comp,pred],[pred]],
      [[pred,comp,agr],[agr]]
   ]
]) :- get_relpro(Verb,Mood,Lex).
get_relpro(request,subjv,that).
get_relpro(request,declv,if).
get_relpro(ask,subjv,that).
get_relpro(ask,declv,if).
get_relpro(demand,subjv,that).
get_relpro(claim,declv,that).
get_relpro(assert,declv,that).
get_relpro(inquire,declv,if).
get_relpro(promise,declv,that).
get_relpro(regret,declv,that).
get_relpro(conclude,declv,that).
```

```
% rov verb complementizer
comp([],
     [
       [[rel],Lex], [[lex],Lex],[[string],String]
     ],
     [
       [ [[lex],[lex]],[[string],[string]] ]
     ]
) :- lexcomp(Lex,String).
lexcomp(to,[to]).

% rel verb relative complementizer
relpro([],
       [
         [[rel],Lex], [[lex],Lex],[[string],String]
       ],
       [
         [ [[lex],[lex]],[[string],[string]] ]
       ]
) :- lexrelpro(Lex,String).
lexrelpro(if,[if]).
lexrelpro(that,[that]).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Verb section.
%
% Functors:
%    verb - main verb;
%    get_lexverb - retrieve verb according to verb form.
%
% Functional structures:
%    agr:see sentence section;
%    pred:see sentence section.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% verb
verb([],
     [
```

```
        [[agr,pers],Pers],[[agr,num],Num],
        [[pred,verb,head],Lex],[[pred,verb,trans],Trans],
        [[agr,form],Form],
        [[lex],Lex],[[string],String]
      ],
      [
        [ [[lex],[lex]],[[string],[string]] ]
      ]
) :- get_lexverb(Pers,Num,Trans,Form,Lex,String).

get_lexverb(_,_,Trans,inf,Lex,String) :-
   lexverb(Lex,Trans,String,_,_,_,_);
   lexbe(Lex,Trans,_,_,_,String).
get_lexverb(first,sing,Trans,fin,Lex,String) :-
   lexverb(Lex,Trans,String,_,_,_,_);
   lexbe(Lex,Trans,String,_,_,_).
get_lexverb(second,sing,Trans,fin,Lex,String) :-
   lexverb(Lex,Trans,String,_,_,_,_);
   lexbe(Lex,Trans,_,String,_,_).
get_lexverb(third,sing,Trans,fin,Lex,String) :-
   lexverb(Lex,Trans,_,String,_,_,_);
   lexbe(Lex,Trans,_,_,String,_).
get_lexverb(_,plur,Trans,fin,Lex,String) :-
   lexverb(Lex,Trans,String,_,_,_,_);
   lexbe(Lex,Trans,_,String,_,_).

lexverb(sing,tv,[sing],[sings],[sang],[singing],[sung]).
lexverb(eat,tv,[eat],[eats],[ate],[eating],[eaten]).
lexverb(shoot,tv,[shoot],[shoots],[shot],[shooting],[shot]).
lexverb(chase,tv,[chase],[chases],[chased],[chasing],
   [chased]).
lexverb(stink,iv,[stink],[stinks],[stank],[stinking],
   [stunk]).
lexverb(decide,iv,[decide],[decides],[decided],[deciding],
   [decided]).
lexverb(leave,iv,[leave],[leaves],[left],[leaving],[left]).
lexverb(quit,iv,[quit],[quits],[quitted],[quitting],
   [quitted]).
lexverb(go,iv,[go],[goes],[went],[going],[gone]).
```

```
lexverb(give,dv,[give],[gives],[gave],[giving],[given]).
lexverb(hand,dv,[hand],[hands],[handed],[handing],[handed]).
lexverb(have,tv,[have],[has],[had],[having],[had]).
lexverb(regret,rel,[regret],[regrets],[regretted],
   [regretting],[regretted]).
lexverb(grieve,rel,[grieve],[grieves],[grieved],[grieving],
   [grieved]).
lexverb(conclude,rel,[conclude],[concludes],[concluded],
   [concluding],[concluded]).

lexverb(order,rov,[order],[orders],[ordered],[ordering],
   [ordered]).
lexverb(ask,rov,[ask],[asks],[asked],[asking],[asked]).
lexverb(ask,rel,[ask],[asks],[asked],[asking],[asked]).
lexverb(command,rov,[command],[commands],[commanded],
   [commanding],[commanded]).
lexverb(request,rov,[request],[requests],[requested],
   [requesting],[requested]).
lexverb(request,rel,[request],[requests],[requested],
   [requesting],[requested]).
lexverb(demand,rel,[demand],[demands],[demanded],
   [demanding],[demanded]).
lexverb(claim,rel,[claim],[claims],[claimed],[claiming],
   [claimed]).
lexverb(assert,rel,[assert],[asserts],[asserted],
   [asserting],[asserted]).
lexverb(inquire,rel,[inquire],[inquires],[inquired],
   [inquiring],[inquired]).
lexverb(promise,rel,[promise],[promises],[promised],
   [promising],[promised]).

lexbe(be,tv,[am],[are],[is],[be]).
```

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% Parsing mechanism: "parse" handles the calling of the
% syntactic rules and the unification of features with
% their values.  It also constructs the result in
% standard tree form as a list of embedded lists.  Any
% features introduced in a syntax rule must be filled
% for the rule to complete (I assume no features other
% than "lex" are introduced at the lexical interface).
%
% parse(
%    FList : list of syntactic constituents to be parsed;
%    SynList : list of syntactic constituents after parsing;
%    FStruc : functional structure currently defined.
% )
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% parse:0 is invoked when no more constituents need to
% be parsed.  It reads String off the input string, and
% inserts the corresponding lexical entry into FStruc.
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

parse([],[Lex],[FStruc]) -->
   %% locate string to be parsed and parse it.
   {apply(FStruc,[string],String)},
   String,

   %% find and unify "Lex" with the current lexical item
   {apply(FStruc,[lex],Lex)}.

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% parse:1 is invoked when only one constituent is to be
% parsed.  The constituent is made the parent node of
% any further constituents parsed.
```

```
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

parse([F],SynList,[FStruc]) -->
   %% construct the rule to be called in standard format
   {Rule =.. [F,DList,FCL,DCL]},

   %% call the rule
   {call(Rule)},

   %% apply the F Constraint List to the F Structure
   {unify(FStruc,FCL)},

   %% resolve Dependent Constraint List with the F Structure,
   %% giving the new Dependent Structures List
   {resolve(FStruc,DCL,DSList)},

   %% parse dependents of current functor
   parse(DList,NList,DSList),

   %% construct syntax node with current constituent as parent
   %% of subconstituents
   {make_node(F,NList,SynList)}.

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% parse:2 is invoked when more than one constituent is
% to be parsed.  The first constituent is parsed and
% made a sibling node to the other constituents in the
% ConstList.
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

parse([F|T],SynList,[FStruc|FTail]) -->
   %% ensure that the Functor list is non-singular and construct
   %% the syntax rule in standard format
   {T \== []},
   {Rule =.. [F,DList,FCL,DCL]},
```

```
   %% call the rule
   {call(Rule)},

   %% apply the F Constraint List to the F Structure
   {unify(FStruc,FCL)},

   %% resolve Dependent Constraint List with the F Structure,
   %% giving the new Dependent Structures List
   {resolve(FStruc,DCL,DSList)},

   %% parse dependents of current functor
   parse(DList,NList,DSList),

   %% construct syntax node with current constituent as parent
   %% of subconstituents
   {make_node(F,NList,List1)},

   %% parse the other constituents in the functor list
   parse(T,List2,FTail),

   %% construct final syntax node with current constituents
   %% as siblings
   {append(List1,List2,SynList)}.

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% "make_node" constructs a list with Const dominating
%  List.  If List is [], then a list with only Const is
%  returned.
%
% eg: (s,[np,vp],[s,[np,np]]) or (n,[],[n]).
%
% make_node(
%   Const : constituent to dominate structure;
%   List : list of subconstituents;
%   Return : return list
% )
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
make_node(Const,[],[Const]).
make_node(Const,List,[Const,List]).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% "unify" applies a functor constraint list (a list of
%  [path,value] pairs) to a functional structure.
%
% unify(
%    FStruc : functional structure;
%    CL : constraint list
% )
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

unify(_,[]).
unify(FStruc,[[Path,Val]|T]) :-
   apply(FStruc,Path,Val),
   unify(FStruc,T).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% "resolve" creates a list of dependent functional
% structures according to a list of constraints DCL
% ([path,path] pairs) relating a Functional Structure to
% each dependent.
%
% resolve(
%    FStruc : dominant functional structure;
%    DCL : list of dependent constraint lists;
%    DSList : list of dependent functional structures
% )
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

resolve(_,[],[]).
resolve(FStruc,[DCL|DCLT],[DH|DT]) :-
   resolve1(FStruc,DCL,DH),
```

```
   resolve(FStruc,DCLT,DT).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% "resolve1" creates a dependent functional structure
% according to a list of constraints ([path,path] pairs)
% relating a Functional Structure to a Dependent
% Structure.
%
% resolve1(
%    FStruc : dominant functional structure;
%    DCL : dependent constraint list;
%    DStruc : dependent functional structure
% )
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

resolve1(_,[],_).
resolve1(FStruc,[[FPath,DPath]|T],DStruc) :-
   apply(FStruc,FPath,X),
   apply(DStruc,DPath,X),
   resolve1(FStruc,T,DStruc).

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%
% "apply" unifies an arbitrary list Structure with a
%  value Val via the path Path in Struct.
%
% apply(
%    Struct : Prolog list structure;
%    Path : Path in Struct;
%    Val : Value at Path in Struct
% )
%
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

apply(Val,[],Val) :- !.
apply([H:St|_],[H|Pt],Val) :- !,
   apply(St,Pt,Val).
```

```
apply([_:_|St],Path,Val) :- !,
   apply(St,Path,Val).
```

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