Nigel: textual semantics documentation

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(largely drawn from [Bateman and Matthiessen, 1990])

Draft: comments welcome!

Function of this Document

This document describes the majority of inquiries belonging to the textual metafunction of the Nigel grammar as of 1992. It gives a brief introduction to the nature of the textual metafunction and its consequences for language but does not go into theoretical depth. For more introductory material, see [Bateman and Matthiessen, 1990]; for further theoretical detail, see [Matthiessen, 1992a]. The description of the Nigel grammar overall is to be found in [Matthiessen, 1992b]. The information given in this document should be sufficient for controlling most of the *textual* variation that the Nigel grammar offers.

Contents

1 Introduction: The control of textual resources

For a text to be coherent, comprehensible, and natural, there needs to be some overall organization that relates the parts of the text together. Furthermore, the information presented in a text will be presented in a way that creates, or displays, that organization for the reader. Random presentation of clauses is unlikely to achieve acceptable texts; their order needs to be planned according to the text's communicative goals. This is the level with which most previous text planning and generation work is concerned. However, even within ordered clauses, there are still many possibilities for variation that have great significance for text coherence and fluency. Within text generation, these phenomena are brought to the fore as places where *control* needs to be exercised over the grammatical resources responsible for their appearance. The grammar component of a generation system typically defines how a linguistic phenomenon may be caused to appear — it will not, however, be able to state just when such an appearance is appropriate for the meaning to be expressed and when not. This issue of control is a crucial one for text generation. It also focuses on particular areas where linguistic theory needs to be further articulated.

Complementary to the question of control is the question of the information that is recoverable during analysis. We do not explicitly consider analysis here. However, generation-based work has of necessity been pushed to consider the more abstract levels of information in more depth than that typically found in analysis-based approaches. The textual semantics reported here is one consequence of this. Ultimately, the information present in this textual semantics should also be recovered during analysis — thus, by virtue of its more abstract and detailed nature, simplifying subsequent contextual processing and discourse interpretation. But there is still substantial work to be undertaken before such analysis components are available and we shall remain with the generation perspective for current purposes.

As an example of the methodology of uncovering semantic distinctions by considering necessary control for generation, let us take the following constructed text from Halliday (1978:134),

> "Now comes the President here. It's the window he's stepping through to wave to the crowd. On his victory his opponent congratulates him. What they are shaking now is hands. A speech is going to be made by him. 'Gentlemen and ladies. That you are confident in me honors me. I shall, hereby I pledge, turn this country into a place, in which what people do safely will be live, and the ones who grow up happily will be able to be their children."

This text can safely be used as an example of a text that is "textually out of control". Although the ordering of the individual clauses is plausible and the grammar that the text presupposes certainly need not be a textually impoverished one — indeed there are a number of sophisticated textual devices employed — the textual resources of that grammar have not been coordinated successfully.

The main problem with the lack of control exhibited in this text involves *marking*. In particular:

- There are marked choices of *theme*. For example, in the first clause of the text, the time circumstance (*now*) is in first position in the clause. This makes it *thematic*

(Halliday, 1985:38). It would be rather more typical, i.e., unmarked, for the the location circumstance (*here*) to be thematic in this case.

- There is use of 'cleft' sentences or *theme predication* (Halliday, 1985:59). Here some element of a clause is highlighted by being made part of a separate predication, as in *It's the window he's....* This frequently serves the function of representing contrast structurally.
- There is use of 'pseudo-cleft' sentences or *theme identification* (Halliday, 1985:56). In this case, the element of the clause that is singled out by predication is also explicitly 'identified' by that predication, for example, as in *What they are shaking now is hands.*

Marked choices are fine — as long as there are good reasons for them. If the hypothetical grammar of the text above had not been free to run wild in the area of theme marking alone, the first of the above three, then the result would already have been decidedly better. The following text shows the effects of appropriate control of theme marking; the differences between this text and the last are shown by underlining.

> "Here comes the President now. It's the window he's stepping through to wave to the crowd. His opponent congratulates him on his victory. What they are shaking now is hands. A speech is going to be made by him. 'Gentlemen and ladies. That you are confident in me honors me. I shall, I hereby pledge, turn this country into a place, in which what people do will be live safely, and their children will be able to be the ones who grow up happily.' "

The text can still, of course, be improved; attention to the latter two areas of variation, theme predication and theme identification, gives the following:

> "Here comes the President now. He's stepping through the window to wave to the crowd. His opponent congratulates him on his victory. They are shaking hands now. A speech is going to be made by him. 'Gentlemen and ladies. It honors me that you are confident in me. I shall, I hereby pledge, turn this country into a place, in which people will live safely, and their children will be able to grow up happily.' "

This is still not a natural text; yet further control is required. For example, if the textual resources of *voice* (i.e., choice of passive and active) and the sequence of 'gentlemen' and 'ladies' is also brought under appropriate control, we approach an acceptable text:

> "Here comes the President now. He's stepping through the window to wave to the crowd. His opponent congratulates him on his victory. They are shaking hands now. He is going to make a speech. 'Ladies and gentlemen. It honors me that you are confident in me. I shall, I hereby pledge, turn this country into a place, in which people will live safely, and their children will be able to grow up happily.' "

What these textually disfluent texts show is that selections among alternatives within the grammar need to be controlled and co-ordinated appropriately. Otherwise, there is no guarantee — indeed, a rather small likelihood — of anything reading or sounding like a natural text occurring. In short, even when a grammar contains the theoretical capability of describing or generating particular textual phenomena, their use must be *controlled appropriately for the development of the text in context.* The deployment of resources needs to be made sensitive to an ongoing sense of what the text wishes to communicate and how the text is to be structured in context. Only with such an underlying stratum of textually oriented abstractions can appropriate text be created. This, however, requires detailed theories of text organization and design in order to populate this underlying stratum with the abstractions that are necessary. In the overall architecture organization here assumed, theories of text organization are in general placed in a modular component called the text base (as described in detail in [Bateman and Matthiessen, 1990] and [Matthiessen and Bateman, 1991]). As long as this component can support the distinctions required by the lexicogrammar and described here, its internal details can be ignored. This high degree of modularity is an essential part of the architecture.

The importance of controlling the resources of the grammar is strikingly revealed by the inadequacies of language generated automatically by machine. While texts such as the one used in this section, where textual options have not been appropriately controlled, do not occur in natural texts very often[1], they do occur in artificially created texts. Furthermore, we can get a good sense of the information responsible for text creation by examining such texts. Examples of such disfluencies, as found even in quite sophisticated text generation systems (including the Penman system), are presented and discussed in [Bateman and Matthiessen, 1990].

In the rest of this document, we will describe the resources that are currently available for controlling these textual aspects of the Nigel grammar of English (and, therefore, where appropriate for controlling grammatical resources of other languages that have been derived from Nigel in ongoing multilingual work). We begin by briefly reviewing how grammatical resources in general are represented and controlled within Nigel and then go on to a region-by-region account of Nigel's textual semantics.

2 The representation of grammatical resources: brief review

In this section, we briefly summarize the representation of linguistic resources necessary for understanding the rest of this document. For more details see the relevant documentation.

The view of language as resource found in all systemic-functional linguistic accounts foregrounds the paradigmatic mode of organization rather than the syntagmatic one. This is a fundamental organizing principle of systemic functional linguistics in general, and systemic-functional grammar in particular: linguistic strata are organized as large networks of interrelated choice points, the systems of systemic theory. In general, a system consists of two parts, an entry condition, which specifies under what condition the choice is available, and two or more terms, which specify the choice. The terms are labelled with features. The entry condition is either a simple feature or a complex of features, which are terms in other systems. This composition of entry conditions from terms in other systems establishes a connectivity between systems that organizes them into *system networks.* As an example, a part of the

[1] Although, they *do* occur: see, for example, the discussion of textual inadequacies in the translated computer manuals reported in [Plum *et al.*, 1990].

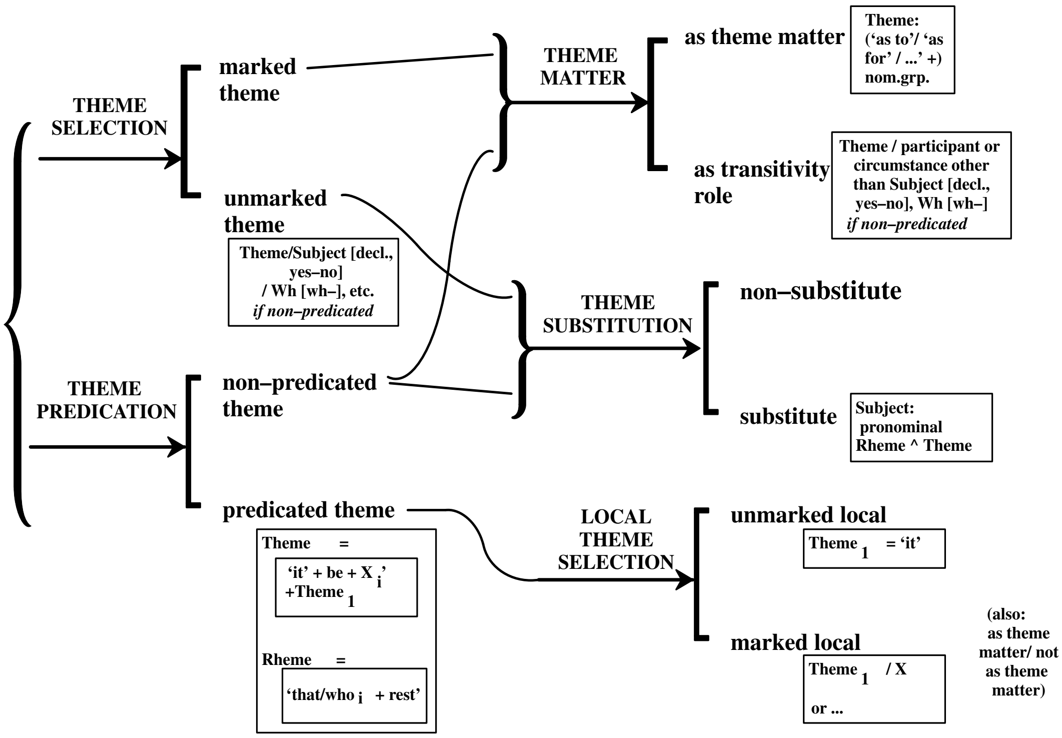

Figure 1: Generalized THEME systems

abstract system network of THEME in English is shown in Figure 1. This network fragment generalizes over the options that are available for theme in English and covers more than is actually present within Nigel at the current time. For more details, as with all aspects of the Nigel grammar, see [Matthiessen, 1992b]. For some other systemic descriptions of the possibilities of theme, see, e.g., [Williams, 1988] and [Hovy *et al.*, 1992, p65]. The present network is more directly related to the possibilities actually prepared for within the Nigel grammar however.

This system network says that there are two simultaneous systems, THEME SELECTION (unmarked theme / marked theme) and THEME PREDICATION (predicated theme / non-predicated theme). If 'marked theme' is selected, the system THEME MATTER ('theme-matter' / 'non-theme matter') is available; and so on. The THEME paradigm defined by this system network is exemplified for declarative clauses in the table of Figure 2.

The system network specifies what grammatical options are available to a speaker. Each system specifies a meaningful choice. The meaningfulness lies in the factors that determine that one alternative is chosen over another. The question is then how to represent the factors involved in making the choice. In order to meet the requirement of text generation that the general resource provided by the grammar be controlled to satisfy particular demands for expression, the construct of the *chooser* has been developed for computational instantiations of systemic-functional grammars. Each of the functional alternation points in the grammar, i.e., each system — THEME SELECTION, THEME PREDICATION, and so on in the theme system network illustrated in Figure 1 — has an appropriate chooser associated with it (cf. [Mann,

<table>
<tr><td></td><td colspan="2">unmarked theme</td><td colspan="4">marked theme</td></tr>
<tr><td></td><td rowspan="2">non-substitute theme</td><td rowspan="2">substitute theme</td><td colspan="2">as theme matter</td><td colspan="2">as transitivity role</td></tr>
<tr><td></td><td>(Subject)</td><td colspan="3">(Other than Subject)</td></tr>
<tr><td>not predicated theme</td><td>Ernest lives in the country</td><td>He lives in the country, Ernest</td><td>As for Ernest, he lives in the country</td><td>As for the country, Ernest lives there</td><td colspan="2">In the country Ernest lives (from March to June)</td></tr>
<tr><td rowspan="2">predicated theme</td><td rowspan="2">It's Ernest that lives in the country</td><td>Ernest it is that lives in the country (i)</td><td colspan="2" rowspan="2"></td><td rowspan="2">It's in the country that Ernest lives</td><td rowspan="2">In the country it is that Ernest lives</td></tr>
<tr><td>In the country it is Ernest that lives (ii)</td></tr>
<tr><td></td><td>local unmarked theme</td><td>local marked theme</td><td colspan="2"></td><td>local unmarked theme</td><td>local marked theme</td></tr>
</table>

Or:

(i) *As for Ernest, it's him that lives in the country*
(ii) *As for the country, it's Ernest that lives there*

Figure 2: Examples of thematic options in English

1983]). A chooser is then a process which describes the basis for selecting some particular functional alternative that the grammar offers. The grammar's choosers make text generation responsive to what is required of the final text; choosers collectively ensure that the grammatical choices made will be those appropriate for any particular demand for expression or text need.

A chooser reaches a decision as to which choice is to be made by putting specific questions, called *inquiries*, to the context in which the grammar is embedded. Each aspect of meaning to be expressed that the grammar needs to know about is made accessible to the choosers by means of a single inquiry whose function is to determine where any particular meaning to be expressed stands on that aspect. This architecture supports the modularization of the text generation task by providing a clean interface between the operation of the grammar and those components of the text generation task that rely upon the grammar.[2]

During grammar development and experimentation, each inquiry is typically defined in terms of an informal natural language gloss that represents the function of the inquiry. This description needs to be drawn from the terms of the precomputational theory of meaning that is built into the design of the grammar. That there is a theory of meaning being built into the grammar is inherent in the systemic-functional approach. The construction of a systemic-functional grammar can be taken as making certain commitments to the types of meaning that are to be realized through the grammar. The theory of these meanings is then embodied in the definitions of the inquiries — first precomputationally, in natural language, and later computationally, in implementations in code that a machine can execute.[3]

The finer the functional differentiations that a grammar makes become, the more focused the statement of the consequences of that grammar can be. This follows straightforwardly from the requirement that each functional differentiation made in the grammar should find a corresponding semantic motivation that enables the differentiation to be controlled. The Nigel grammar is now very detailed and thus affords considerable insight upon the processes necessary for organizing and creating text.

The grammatical alternations of the Nigel grammar are grouped into *functional regions*. Each region is responsible for some isolatable area of the functionality of the grammar of English. There are over 40 functional regions specified within Nigel — these involve over 600 inquiries, over 100 of which are textual.[4] Although the majority of functional regions make reference to textual distinctions, some are almost exclusively textual in nature. It is these textual inquiries that provide a first set of codifications of the general requirements for textual organization and that are are the concern of this document.

It is worth noting here that we cannot yet produce a document concerning the text base, i.e., the source of control for inquiries, as we can with the ideation base in the form of the upper model [Bateman *et al.*, 1990]. Whereas we can implement most of the ideational inquiries

[2] Ongoing work is concerned with the replacement of the procedural chooser implementation of the Penman system with a declarative mapping: this work is simplified by the fact that the procedurality is more of a historical relic than a design decision and that there are virtually no places in the linguistic resources themselves where it is relied on.

[3] The current implementations in the Penman system are in LISP, although a subset of these has also been re-represented in the knowledge representation language LOOM (MacGregor and Bates, 1987).

[4] The current list of regions defined for any version of Nigel is recoverable by calling the Lisp function (once Penman plus Nigel are loaded) `penman::get-regions`. The full list of inquiries defined for any region can be obtained by issuing `(penman::print-inquiries-of-region` <region-name>`)`.

so that interaction with the lexicogrammar occurs automatically, the textual metafunction is not so well developed. We are therefore forced at present to provide control of the lexicogrammatical textual options by directly placing textual inquiry responses into the Sentence Plan Language (SPL) input to the lexicogrammar. This can be illustrated as follows.

The SPL input notation for Nigel provides an event- or relation-based semantic specification of the information to be expressed lexicogrammatically (see appropriate documentation for more details). Since it needs to cover the semantic requirements of the entire grammar, SPL is as metafunctionally broad as the grammar — i.e., it covers ideational, textual, and interpersonal aspects of meaning. The upper model enables most of the ideational control to happen 'behind the scenes' in the chooser and inquiry interaction initiated by the grammar. Thus, if we have domain concepts 'kill', 'farmer', and 'duckling' properly subordinated to upper model concepts (in this case, to *directed-action*, *person*, and *object* respectively), then the (simplified) SPL expression:

```
(e1 / kill
      :actor (p1 / farmer)
      :actee (o1 / duckling))
```

is sufficient for guiding the responses to the grammar's ideational inquiries in order to produce transitivity structures such as:

The farmer	*killed*	*the duckling.*
Actor	Process	Goal

This is because the implementations of the ideational inquiries already access upper model concepts in order to permit domain concepts to inherit appropriate realization possibilities. For example, distinctions to be drawn concerning the semantic types of the process and its arguments are motivated by inquiries which address the typed variables `e1`, `p1` and `o1`. The responses which such inquiries receive (e.g., that the inquiry `mental-process-q` when asked of `e1` classifies that concept as `nonmental`) follow from the subsumption relationships holding between upper model concepts and the semantic type of the selected variables (e.g., in this case, that the semantic type `kill` does not lie beneath `mental-process` in a subsumption relationship).

This is *not* the case for the textual inquiries since there is as yet no implemented text base. In order to obtain the differences between, for example,

(a) *The farmer killed the duckling.*
(b) *A farmer killed some duckling.*
(c) *The duckling was killed.*
(d) *It was the farmer who killed the duckling.*
(e) *The duckling a farmer killed.*
etc.

there are, therefore, the following two possibilities. Either we can add appropriate textual inquiry responses directly to the SPL, or we can provide implementations for the textual inquiries that make reference to a text base or discourse model. Here we will only describe the first option, since this makes it clear where the additions for the second option need to be placed. Thus, in order to constrain the lexicogrammar to produce example (e), again ignoring other ideational aspects such as temporal semantics and interpersonal aspects such as speech function semantics, the actual SPL would need to be:

```
(e1 / kill
      :actor (p1 / farmer
                 :identifiability-q  notidentifiable
                 :multiplicity-q     unitary
                 :amount-attention-q minimalattention
                 :set-totality-q     partial)
      :actee (o1 / duckling
                 :identifiability-q  identifiable
                 :multiplicity-q     unitary
                 :amount-attention-q nonminimalattention
                 :set-totality-q     partial)
      :theme o1)
```

The additional specifications of the form:

```
(var1 / semantic-type
      ⋮
      :inquiry-q response
      ⋮)
```

explicitly provide responses to the inquiries that the grammar requires during generation. This notation adds the constraint that the variable `var1` is semantically classifiable as lying in the class `response` with respect to the semantic distinction `inquiry-q`. The majority of these textual inquiries are described below and all can be used in SPL expressions as shown in the present example.

3 The textual resources of the lexicogrammar

The textual metafunction is a universal of languages in general, but particular languages organize the space of textual meanings in different ways. One difference, for instance, is whether the identifiability (recoverability) status of the referent of a nominal group is always specified; it is in English, but not in Chinese. Furthermore, the realizations of selections within the textual resources may differ. For instance, Theme in English and Chinese is realized by initial position in the clause, whereas other languages may use a theme particle (cf. Japanese *wa*) or some other strategy for similar (but not necessarily identical) purposes.[5] Similarly, so-called zero pronominalization is a very common general referential strategy in Chinese, but is restricted to instructional registers in English. Here, we will survey the textual resources of English and then, in the following section, go on to describe the inquiries found necessary for controlling these resources in Nigel.

[5] We will provide more detail on the function of Theme, as it is used here, below.

The grammar distinctions that are textual in nature and which are already represented within the Nigel grammar may be summarized as follows; all of them need to be targets for text base control.

- Conjunction: a clause may need a specification of a *conjunctive relation* to prior text to be expressed; there may even be a specification of two relations. The conjunctive relation may be oriented towards the world external to the text; for instance in relating processes forming a temporal sequence:

  > Proteins are first broken down into amino acids. Then they are absorbed into the blood and pass round the body.

  But the relation may be internal to the process of communicating, concerned with the development of an argument, etc.; e.g.:

  > Program. Programs issue instructions to the computer. Many programs process files. **For example**, a message program can, by following your commands, create and send a message and manipulate a file of messages. (Moses)

- Theme: a clause needs a specification of *contextualization*, i.e., a plan of how to contextualize the clause (in relation to what happened up to that point in the discourse). More specifically, the contextualization breaks down into three components: textual-conjunctive (contextualization according to how the clause is related conjunctively to prior text), interpersonal-modal, etc. (contextualization according to how the clause is evaluated modally, attitudinally, etc.) and experiential-participant/circumstantial (contextualization according to some aspect of the process configuration). We used a segment of a grammar network concerned with theme as an example of the representation of grammatical resources in Section 2 above.

- Internal matter: another thematic resource of the clause, again concerned with contextualization, more specifically a topic related to preceding topics typically by virtue of being reintroduced in an elaborating relationship. It is often realized by such phrases as, e.g., *as for, as to, regarding,* etc.

- Voice: although usually interpreted in systemic linguistics as a member of the interpersonal resources of the grammar, voice selections are often thematically relevant also. More specifically, this clausal resource requires information about the identity of the current (participant) topic.

- Culmination: is concerned with *news*, specifically the relative newsworthiness of non-thematic participants and circumstances in the clause. This is typically realized by preferred orderings among circumstances and participants in a clause depending on their status as being newsworthy.

- Determination: a nominal group resource; determination refers to the manner in which referring expressions are embedded into their linguistic context. The resources of determination specify the means by which a hearer is invited to pick out the referent — for example, a definite determiner is a claim by the speaker that the hearer is able to find some particular referent intended, in contrast to an indefinite determiner which presupposes no such referent being identifiable or a determiner such as *some* that explicitly denies the relevance of picking out any particular referent.

- Quantification: another nominal group resource that is closely related to determination in Nigel. Quantification is seen here as providing further information for the hearer to constrain his/her search for a referent.

- Pronominalization: the nominal group resources for referring to entities that are already strongly predicted, either textually — within the clause or the discouse, or contextually — either immediate or cultural.

In addition, the following functional regions have significant textual components although it is not usual to consider them as textual regions proper: clause complexity, nominal group complexity, and prepositional phrase complexity. They all involve the combination of units of like size into configurations of such units that function as single units. The grouping involved is often a textual matter.

Finally, the following are well recognized within systemic-functional linguistics but have not yet received adequate treatment within Nigel — partly for the very reason that there is no well developed means of controlling these resources currently available. We therefore include them as further likely sources of constraint for the text base although we will not discuss them in any detail here.

- Cohesive relations, including Substitution and Ellipsis (e.g., Halliday and Hasan, 1976).

- Information inclusion and spread (e.g., Halliday, 1967).

The table of Figure 3 provides a summary of these textual resources of English grammar (cf. [Halliday, 1985, Matthiessen, 1992b]).

4 Textual inquiries region by region

We now present in more detail the principal functional differentiations that systemic-functional grammars such as Nigel draw in the textual area and interpret these in terms of their consequences for the higher-level control required. In particular, we describe the following functional regions identified in the previous section and illustrated in Figure 3: reference (including determination, quantification, pronominalization), conjunction, theme (including internal matter), voice and, very briefly, information distribution (including culmination).

This description is approached by setting out in an explicit form the pre-computational interpretation of the semantics of the grammar that is embodied in the grammar's inquiries. We also may make use of other accounts that have been selected for the functional motivation of these resources at this point. This gives us an initial set of properties that any theoretical treatment of the text base will need to address. Note that the issues here addressed can only be avoided at the cost of failing to control the corresponding textual variation. They are thus an *intrinsic* part of the description of English and will need to be considered no matter what theoretical position is taken.

<table>
<tr><td></td><td>logical:</td><td colspan="4">textual</td></tr>
<tr><td></td><td>structural</td><td colspan="3">cohesive</td><td rowspan="2">structure forming</td></tr>
<tr><td></td><td>alternation</td><td>organic</td><td colspan="2">componential</td></tr>
<tr><td>clause</td><td>CLAUSE COMPLEX
(expansion / projection)</td><td>CONJUNCTION
(expansion: elaboration/ extension/ enhancement)</td><td rowspan="2">ELLIPSIS-SUBSTITUTION
(contrast in continuity: in clause complex, clause, and groups)</td><td></td><td>THEME
(local context: thematic – Theme^Rheme)
VOICE
(unmarked Theme)</td></tr>
<tr><td>group-phrase</td><td></td><td></td><td>REFERENCE
(recoverable / not recov.)</td><td></td></tr>
<tr><td>information unit</td><td></td><td></td><td></td><td></td><td>INFORMATION
(news status: Given + New)</td></tr>
<tr><td></td><td colspan="2">transitional relations</td><td colspan="3">textual statuses</td></tr>
</table>

n.b.: lexical cohesion

Figure 3: Survey of textual resources in English

		singular		non-singular		unmarked
				plural	mass/plural	
total	positive	*each* *every*		*both*	*all*	
	negative		*neither (not either)*			*no (not any)*
partial	selective	*one*	*either*			*some (s∧m)* *any*
	non-selective	*a(n)*			*some (sm)*	
		'one'	*'two'*		*'not one'*	(unrestricted)

Figure 4: (Non-specific) Deictic items (Halliday, 1985:161)

4.1 Reference: determination, quantification, and pronominalization

The actual grammar Nigel as implemented contains considerably less detail than Halliday's (1985) description of nominal group organization; nevertheless, it still contains considerably more detail than we can go into here. We focus therefore upon two essential organizational points, or 'movements', in the construction of the nominal group. These movements arise from two important functions that nominal groups perform: that which is being picked out, or referred to, is approached from the terms of our experience concerning how we decide to classify what is being picked out, and from the context and situation of use of the nominal group in its particular text. The former can be seen as an essentially right-to-left movement across the components of a nominal group, from head noun, through successive and cumulative modifications of that head noun; the latter as essentially left-to-right, from the deictic elements that relate to the immediate context of use (*this* vs. *that*, etc.) through 'post-deictics', (words like *same, certain, famous, other, alleged, ...*), whose function we will describe below.[6] We will further focus principally upon this latter movement, since it is this that falls most directly under textual control.[7]

4.1.1 The functions of determination

In this section we describe the account of determiners, which includes so-called quantifiers such as *all, each, every, a,* etc., that is embodied in the Nigel grammar. The now almost traditional approach to this problem is to take quantifiers as defined at some level of logical form and relate these to likely 'quantifiers' in the grammar. This approach was taken with respect to Nigel by [Sondheimer and Nebel, 1986]. There, the solution adopted was to relate,

[6] Note that it is this double functionality occuring in the nominal group that underlies the debate in structural linguistics concerning which element should be treated as 'head' of the nominal group. The more traditional 'noun-as-head' analysis (giving a nominal phrase) foregrounds the right-to-left movement; the newer 'determiner-as-head' analysis (giving a determiner phrase) foregrounds the left-to-right movement. However, both perspectives (at least!) are necessary to fully understand the functionality of the nominal group.

[7] The selection of nominal group heads also contributes, of course, to textual organization, but more via lexical cohesion and the discourse semantic area of *ideation* (cf. [Martin, 1992]) than directly via textual inquiry control. This relates to the register variable of *field* and the selection/creation of experiential terms within a text.

via particular inquiry implementations, quantifiers at the logical form level of input to the generation module to selected paths through the grammar. These paths then resulted in supposed English equivalents of the quantifiers being generated: universal quantifiers guided grammar traversal to produce the determiner *all*, existential quantifiers to produce variations on *a*, etc. The weakness of this solution from a theoretical perspective is readily apparent, since the inquiries for controlling the area of 'determination' and 'quantification' in the grammar far outstrip the number of available quantifiers in any logical form. This is because the grammar is designed to be linguistically (both theoretically and descriptively) adequate and not merely logically adequate.

In short, there is no unique way of expressing in English what might be represented at the level of logical form by any single quantifier. For example, a universal quantification in logical form may find expression in any of the sentences:

every A is a B
(0) A's are B's
the A's are B's
all A's are B's
an A is a B
each A is a B
any A is a B

For the purposes of text generation we need to know what motivates each of these choices. The six or so quantifiers commonly found at logical form are not sufficient for selecting from the large number of alternatives that English provides. Moreover, from linguistic analyses of the use of 'quantifiers' in texts, it is clear that a large degree of control is provided by considering the *textual* contribution of the selected quantifiers. The area of the grammar concerned with determination thus breaks down the selection of determiners/quantifiers along many textual dimensions, which, only when taken together, allow the unique constraint of a textually and ideationally appropriate determiner.

Halliday (1985) presents the following set of *functional grammatical* distinctions in the use of determiners observable in actual texts: specific vs. non-specific, selective vs. non-selective, positive vs. negative, singular vs. non-singular; the non-specific items he tabulates as shown in Figure 4. These items are generated in Nigel in the normal way by means of which all grammatical variation is generated: i.e., by traversing the interlocking network of grammatical options that captures the relations between these and other distinctions in order to collect constraints on their appropriate structural realizations. As described in Section 2, in order for such a network to be traversed, it is necessary to specify the precise conditions under which each alternative is to be chosen rather than another and this is done in terms of inquiries. The network of semantic distinctions this sets up can only be presented in extremely pruned form here and so we will concentrate on just some of the possible paths through the network, neglecting many of the interactions that may restrict access to those paths in particular circumstances. A more representative overview of Nigel's current coverage is then set out at the end of this section in tabular form in Figure 5 and in the tables following.

In order to produce the deictic form that is appropriate for a particular text need, it is necessary to respond to the inquiries that are reached during traversal. Traversal therefore leads to the selection of a deictic item that expresses the semantic distinctions posed by those inquiries traversed. Thus, for example, the first (for present purposes) inquiry reached during construction of a nominal group is: `identifiability-q`, which has the following informal natural language gloss:

> Does the referent represent a concept which the speaker expects the hearer to find novel, not previously mentioned or evoked, and thus does not expect the hearer to identify uniquely by reason of the attention which it currently holds, its inherent uniqueness in culture, or its association with an identifiable entity?[8]

This notion of identifiability, (cf. du Bois, 1980), is used to ground the specific/non-specific distinction in the present grammar. When the discourse entity is identifiable, further inquiries concern themselves with the strategies for performing that identification; this leads to the specific determiners *the, these, my,* etc. as motivated by constructs of *possession*, *proximity*, etc.

When the discourse entity is not identifiable, however, alternative reference strategies are pursued that rely on two further constructs which support the two directions of movement in nominal group development mentioned above: inquiries need to determine the *potential representative set* (PRS) and the *current representative set* (CRS). The PRS is the set of referents of the general *experiential type* that could be picked out by the present nominal group given the immediate discourse context. Thus, as an example, in the nominal group

a more sophisticated transmission line analogue

which refers to an electronic analogue of the vocal tract, the PRS is the set of electronic circuits that provide analogues of transmission lines (themselves analogues of the vocal tract) as discussed earlier in the text. This is the experiential classification of the item the nominal group is to pick out.[9]

The CRS is the (set of) discourse entity(-ies) that the text is *at that moment* concerned with picking out by means of a nominal group. In the nominal group given above, the CRS is the individual transmission line analogue circuit that the text is about to discuss. In terms of the above grammatical distinctions, that circuit is picked out by a non-specific, non-selective nominal group; what this then *means* may be defined by the nature of the inquiries that are necessary to produce the selection of these grammatical distinctions in response to a text need.

The relationship between the PRS and the CRS motivate the referent determination strategies that are appropriate for a nominal group. When the CRS exhausts or excludes the PRS then strategies relying on determiners such as *all, every, each* or *no* are appropriate; when this is not the case, further inquiries need to know whether the existence of the referent is presupposed by the text, whether it is the speaker's intention to select some particular member of the set rather than any other, etc. in order to motivate particular selections of determiners. In both the identifiable and nonidentifiable cases, inquiries need also to be able to determine, for example, whether or not the discourse entity is to be presented as a single entity, or as a collection of entities, etc. That this is not simply ascertainable from the 'propositional content', i.e., the ideational specification, is apparent from alternations such as the following:

[8] The vast majority of the inquiry natural language glosses were written by Christian Matthiessen between 1980 and 1988.

[9] There is thus some similarity between the PRS and the notion of 'restricted quantification'.

(a)	Lions are almost extinct	[species consisting of individuals]
(b)	The lion is almost extinct	[species as class]

The selection here is a textual one largely controlled by the inquiry `:species-multiplicity-q`, which has the informal English gloss:

> "Is the intensional object (Thing) – species, genus, etc. – denoted with respect to some relation or relations among its features, sub-species, or any other aggregation as a multiplicity of structural aspects?"

If, for the sake of illustration, we assume that the inquiry `identifiability-q` classifies its argument as `notidentifiable`, then the following subsequent lines of inquiry are pursued:

`set-totality-q` Does the collection CRS exhaust or nearly exhaust the collection PRS?

This inquiry comes the closest to the raw ideational content represented by the universal quantifier — although we see here that it is always interpreted with respect to an explicitly restricted set of entities, the PRS. Then,

- If the collection is exhausted, and if that exhaustion is in a positive direction (contrasting *all* with *no* for example) rather than in a negative direction, then the following inquiries are relevant:

  `set-totality-individuality-q` (*when previous inquiries have ascertained that a singular nominal group is appropriate*) In the generalization across the members of CRS is attention to be given to the collection as a whole or is it to be given to the individuality of the members?

  `duality-q` (*when plural*) Is the set CRS known to have exactly two members?

  These are sufficient for the choices *every* vs. *each* and *all* vs. *both* to be made respectively.

- If the CRS does not exhaust the PRS, then the selective/non-selective grammatical distinction is made by means of the following inquiries:

  `presuppose-existence-q` Does the speaker believe that CRS has definite existence within the expressive context?

  Giving rise to

  – (*presupposed*) When singular,

    `selection-particularity-q` Does the speaker select the member of CRS from PRS with a particular referent in mind or a non-particular, i.e., unspecified, referent in mind?

    thus motivating the distinction *one* vs. *some*; when not singular the deictic element can simply be selected as *some*.

  – (*not presupposed*)

`duality-q` Is the set CRS known to have exactly two members?

which here motivates the distinction *either* vs. *any*.

From the perspective of these inquiries, then, the principle function of deictics can be interpreted to be one of relating the CRS to the PRS. The PRS defines the experiential class that could be at issue, the selection of deictic then proceeds to inform the hearer how some particular member or instance of that class is to be selected as the discourse entity of concern.

It is interesting to contrast the functionality of two further components of the nominal group in this light. Thus, *numeratives*, which express numerical information concerning the CRS, do *not* relate to the PRS. For example, in

these two trains

the PRS is the class of trains, the CRS is some specific sub-class of that class which is to be identified by virtue of 'closeness' (in contrast to *those*), and the numerative states that the cardinality of that CRS is two — without reference to what that set might be or its relationship to the class of trains generally. In contrast, with certain *post-deictics*, such as *alleged, famous, usual,* etc., the relationship between the PRS and the CRS is explicitly mentioned in the post-deictic's selection; indeed, it is that relationship that the post-deictic serves to clarify. For example, in

an alleged transmission line analogue

the status of the CRS as an acceptable member of the PRS is being explicitly held up for examination.

It is a claim of the theoretical account that this is how deictics are used by speakers of English; i.e., that they select and interpret the deictics they encounter in terms of expressing and perceiving the communicative goals that the inquiries presented above represent. This places a quite different interpretation upon the role of determiners than that assumed by relating them to quantifiers in the logical form. The previous round of implementation within Penman that attempted this served primarily to uncover the mismatch that exists between the logical view of nominal groups as introducing quantifiers into a formula and the communicative goal view inherent in the functional-systemic account. This suggests to us very strongly that we instead attempt implementations relying directly upon those communicative goals as produced by a text planner in order to achieve the flexibility of expression that the variety of determiners in English supports.

The next stage in the development of a computational account is therefore to formalize the informal inquires that are used to guide the grammar during generation, and this can only be done by means of providing a computational implementation that can run with respect to some specified knowledge base and text planning component. The most immediate consequence is a specification of the kinds of information that the text planner must make available; some of this information is clearly user-model related, as in the references to identifiability. The remaining information includes:

- the formation of the CRS and PRS

- the ability to make decisions concerning their similarity, overlap, dissimilarity, and cardinality
- the speaker's goal for the method of selection of CRS member; i.e. from *set-totality-individuality-q*, whether attention is to be given to a collection as a whole or to the individuality of its members, and from *selection-particularity-q*, whether the selection is predicated upon the significance of a particular choice being made over any other.

It should be clear that the reasoning that the text planner needs to perform in order to produce these kinds of product is rather different from that that attention to logically-adequate quantification suggests should occur. Current work suggests that the view presented here is not only more textually appropriate but also more likely to generalize across languages than does a straight translation to logical quantifiers.

4.1.2 Summary of DETERMINATION: inquiry definitions and uses

As with all areas of grammatical variation, in order to produce the form of determination appropriate for reference according to a particular text need, it is necessary to respond to the inquiries that are reached during traversal of the grammatical resources for DETERMINATION. Traversal leads to the selection of a deictic item that expresses the semantic distinctions posed by those inquiries traversed. The following list contains the informal inquiry glosses of this functional region of the grammar:

`:amount-attention-q` Does ITEM specify that more than minimal attention is to be given to the amount or cardinality of the focal element?

`:body-of-water-q` Is ITEM a body of water such as a sea ocean or river?

`:calender-term-q` Does ITEM represent a time period which is named in the calendar?

`:deictic-part-q` Should ITEM be expressed as part of the deictic elememt or should it expressed separately?

`:deictic-quantity-q` Does DET specify some indeterminate low quantity, or no quantity at all?

`:distance-q` Does the proximity specification of ITEM represent near proximity or distant proximity?

`:duality-q` Is the set SET1 known to have exactly two members?

`:full-negative-q` Is the negativity specified by ITEM fully expressed?

`:generalized-modification-q` Is there a specification of a grammatically realizeable possessor within ITEM?

`:identicality-comparison-modification-q` Does ITEM specify expressing the positive distinctness of the entity from another?

`:identifiability-q` Does NODE represent a concept which the speaker expects the hearer to find novel, not previously mentioned or evoked, and thus does not expect the hearer to identify uniquely by reason of the attention which it currently holds, its inherent uniqueness in culture, or its association with an identifiable entity?

`:identity-questioning-q` Does ITEM specify a demand for the identity of its focal element?

`:means-of-transportation-q` Is ITEM a means of transportation such as a ship, a plane, or a train?

`:period-modification-q` Is there a classification of the focal element within the MODIFICATION-SET according to some salient relation with a time period?

`:possessor-modification-q` Is there a specification of possessor within ITEM?

`:possessor-questioning-q` Does the variable ITEM whose identity is being sought represent a possessor?

`:presuppose-existence-q` Does the speaker believe that ITEM has definite existence within the expressive context?

`:proximity-modification-q` Is there a specification of proximity within HEADTHING?

`:selection-particularity-q` Does the speaker select the member of CRS from PRS with a particular referent in mind or a non-particular, i.e., unspecified, referent in mind?

`:set-totality-individuality-q` In the generalization across the members of SET is attention to be given to the collection as a whole or is it to be given to the individuality of the members?

`:set-totality-polarity-q` Does the collection CRS exhaust or nearly exhaust the collection PRS positively or negatively, i.e., does the former contain all or nearly all of the members of the latter or none or nearly none?

`:set-totality-q` Does the collection CRS exhaust or nearly exhaust the collection PRS?

`:time-q` Does ITEM represent a time concept?

`:type-questioning-q` Does ITEM specify a demand for the type of the focal element, i.e., for a characterization of it in terms of its kind, properties, class etc.?

`:conceptual-correlate-id` What is the identity of the existing or synthesized concept which represents the conceptual correlate of the presentation specification PRESENTATIONSPEC, i.e. a thing known only as specifically as the presentation specification specifies?

`:current-representative-id` What is the set of all current representatives of the conceptual category CONCEPTUALCATEGORY intended to be evoked in this mention of it?

`:possessor-mod-id` What is the identity of the portion of THING-MOD which expresses constraint by or identifies possessor?

`:potential-representative-id` What is the set of all potential representatives of the conceptual category specified by CONCEPTUALCATEGORY in this mention of it?

`:proximity-mod-id` What symbol represents the specification of proximity within HEADTHING?

The particular examples above, showed that the semantic functional contribution to a text of each deictic element is factored in terms of inquiries such as those presented in this list. More concretely, the selection of some 18 deictics present in Nigel is shown in Figure 5. This still does not include the 6 personal possessive deictics that the grammar covers, the quantity terms — such as *many*, *few*, etc. — that are reached by a positive response to the inquiry `amount-attention-q`, selective possessives - reached via `possessor-modification-q`, and numeratives — reached via `amount-attention-q`; these are shown in the tables below. Each selection is functionally motivated by those inquiries as explained. All of these inquiries carry with them a notion of what would be required for their implementation, thus significantly constraining plausible planners. It needs also to be noted that this tabular presentation of the

inquiry names	*inquiry responses*																	
'SINGULAR'	S	S	P	P	S	S	P	S	S/P	S	S/P	S/P	S/P	S/P	S	S	P	P
Identifiability	N	N	N	N	N	N	N	N	N	N	N	N	N	I	I	I	I	I
Set-totality	T	T	T	T	N	N	N	N	N	N	T	-	T	-	-	-	-	-
Set-totality-individuality	C	I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Duality	-	-	D	N	-	-	-	D	N	-	N	-	D	-	-	-	-	-
Presuppose-existence	-	-	-	-	P	P	P	N	N	-	-	-	-	-	-	-	-	-
Selection-particularity	-	-	-	-	P	N	N	-	-	-	-	-	-	-	-	-	-	-
Amount-attention	-	-	-	-	N	N	N	N	N	M	-	-	-	-	-	-	-	-
Deictic-quantity	-	-	-	-	-	-	-	-	-	N	-	N	-	-	-	-	-	-
Set-totality-polarity	P	P	P	P	-	-	-	-	-	-	N	-	N	-	-	-	-	-
Proximity-modification	-	-	-	-	-	-	-	-	-	-	-	-	-	N	P	P	P	P
Distance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	N	F	N	F
Possessor-modification	-	-	-	-	-	-	-	-	-	-	-	-	-	N	-	-	-	-
determiners:	every	each	both	all	one	some	some	either	any	a	no	-	neither	the	this	that	these	those

Key The responses to the inquiries named here are as follows:

Identifiability (Non-identifiable, Identifiable), Set-totality (Total, Not-total), Set-totality-individuality (Collection, Individual), Duality (Dual, Non-dual), Presuppose-existence (Presupposed, Not-presupposed), Selection-particularity (Particular, Not-particular), Amount-attention (Nonminimal, Minimal), Deictic-quantity (No-quantity, Quantity), Set-totality-polarity (Positive, Negative), Proximity-modification (Non-proximal, Proximal), Distance (Near, Far), Possessor-modification (Non-possessor, Possessor).

The grammatical alternation SINGULAR has alternatives Singular, Plural, either Singular or Plural.

Figure 5: Example semantic classifications of determiners in Nigel

relationships between inquiries and determiners fails to bring out the inter-dependencies and nondependencies represented by the actual grammar. In addition, the use of the distinction 'Singular' (/'Plural') is adopted as shorthand; this is a grammatical distinction which is in fact motivated by a collection of inquiries of its own that is not shown in the table.

Similar selections of inquiries control a range of related determination and pre- and post-determination grammatical options. Many of these have been provided in terms of SPL macros, which can give a false impression since it seems that one is specifying surface forms directly in the semantic input. As the following more exhaustive lists should make clear, this is by no means the case. All of the possible forms are motivated by a set of inquiry responses as were the above determiners. As we can see from the entries below[10] (which can also be interpreted as kinds of 'semantic lexical' entries for the forms identified), some are more complex than the simple inquiry responses illustrated above. The principle is in all

[10] The majority of these and similar tables below are drawn directly from the SPL macro definitions formed by following Nigel's grammar network. The SPL macros were mostly created by Richard Whitney at ISI.

cases the same, however; all can be used in SPL specification as introduced above.

For example, consider the sentence:

All ducklings were killed by each farmer.

This would be constrained to appear by an SPL such as the following (again leaving out temporal and speech function semantics). Here, all the textual inquiries relevant for determination have been placed in boxes; the remaining textual inquiries are responsible for the selection of the passive construction and are described in Section 4.4 below.

```
(e1 / kill
    :actor (p1 / farmer
               :identifiability-q notidentifiable
               :multiplicity-q unitary
               :set-totality-q total
               :current-representative-id crs-farmers
               :potential-representative-id prs-farmers
               :singularity-q singular
               :set-totality-individuality-q individual
               :amount-attention-q nonminimalattention
               :reader-knowledge-path-id (o1) path1)
    :actee (o1 / duckling
               :identifiability-q notidentifiable
               :set-totality-q total
               :duality-q nondual
               :current-representative-id crs-ducks
               :potential-representative-id prs-ducks
               :multiplicity-q multiple
               :set-totality-individuality-q collection
               :amount-attention-q nonminimalattention
               :reader-knowledge-path-id (o1) path2)
    :actualization-constrainer-q nonactualizationconstrainer
    :paragraph-theme-exist-q exists
    :paragraph-theme-id o1
    :path-inclusion-q (path1 path2) contained
    :path-inclusion-q (path2 path1) notcontained)
```

The textual constraints for the variable `o1` (the ducklings) and the variable `p1` (the farmers) are drawn straightforwardly from the specifications shown in the determiners/quantifiers table (or in the alternative form shown in Figure 5). Note that this SPL represents the *full* specification as required by the grammar; in normal use of Nigel many of these options are left defaulted and so do not appear. This should not be relied upon, of course, when defining complete discourse semantic control.

DETERMINERS/QUANTIFIERS

form	inquiry	inquiry response
a	:identifiability-q	notidentifiable
	:set-totality-q (?s1 ?s2)	partial
	:multiplicity-q	unitary
	:amount-attention-q	minimalattention
all	:current-representative-id	?s1
	:potential-representative-id	?s2
	:identifiability-q	notidentifiable
	:set-totality-q (?s1 ?s2)	total
	:duality-q	nondual
	:multiplicity-q	multiple
	:singularity-q	nonsingular
	:set-totality-individuality-q	collection
	:amount-attention-q	nonminimalattention
another	:identifiability-q	notidentifiable
	:multiplicity-q	unitary
	:amount-attention-q	minimalattention
	:identicality-comparison-modification-q	comparison
any	:identifiability-q	notidentifiable
	:amount-attention-q	nonminimalattention
both	:set-totality-q	total
	:identifiability-q	notidentifiable
	:set-totality-polarity-q	positive
	:duality-q	dual
each	:current-representative-id	?s1
	:potential-representative-id	?s2
	:identifiability-q	notidentifiable
	:set-totality-q (?s1 ?s2)	total
	:duality-q	nondual
	:multiplicity-q	unitary
	:singularity-q	singular
	:set-totality-individuality-q	individual
	:amount-attention-q	nonminimalattention
every	:current-representative-id	?s1
	:potential-representative-id	?s2
	:set-totality-q (?s1 ?s2)	total
	:duality-q	nondual
	:identifiability-q	notidentifiable
	:multiplicity-q	unitary
	:singularity-q	singular
	:set-totality-individuality-q	collection
	:amount-attention-q	nonminimalattention

DETERMINERS/QUANTIFIERS (cont'd)

form	inquiry	inquiry response
much	:current-representative-id	?s1
	:potential-representative-id	?s2
	:identifiability-q	notidentifiable
	:set-totality-q (?s1 ?s2)	partial
	:multiplicity-q	unitary
	:singularity-q	nonsingular
	:high-quantity-q	high
	:amount-attention-q	minimalattention
	:diminished-q	diminished
no	:set-totality-q	total
	:identifiability-q	notidentifiable
	:set-totality-polarity-q	negative
	:full-negative-q	full
	:duality-q	nondual
one	:amount-attention-q	nonminimalattention
	:current-representative-id	?s1
	:potential-representative-id	?s2
	:identifiability-q	notidentifiable
	:presuppose-existence-q	presupposed
	:selection-particularity-q	particular
	:set-totality-q (?s1 ?s2)	partial
some	:current-representative-id	?s1
	:potential-representative-id	?s2
	:set-totality-q (?s1 ?s2)	partial
	:identifiability-q	notidentifiable
	:singularity-q	nonsingular
	:deictic-quantity-q	lowquantity
	:amount-attention-q	minimalattention
the	:identifiability-q	identifiable
	:proximity-modification-q	noproximity
	:amount-attention-q	nonminimalattention
that /	:identifiability-q	identifiable
those	:proximity-modification-q	proximity
	:proximity-mod-id	(hearer / person
		:distance-q distant)
this /	:identifiability-q	identifiable
these	:proximity-modification-q	proximity
	:proximity-mod-id	(speaker / person
		:distance-q nondistant)
∅	:identifiability-q	notidentifiable
	:current-representative-id	?s1
	:potential-representative-id	?s2
	:set-totality-q (?s1 ?s2)	partial
	:singularity-q	nonsingular
	:deictic-quantity-q	noquantity
	:amount-attention-q	minimalattention

QUANTITY DETERMINERS

form	inquiry	inquiry response
much	:quantification-q	quantified
	:quantification-id	quant
	:high-quantity-q	high
	:diminished-q	diminished
many	:quantification-q	quantified
	:quantification-id	quant
	:number-relativity-q	relative
	:high-quantity-q	high
	:diminished-q	diminished
lots-of	:quantification-q	quantified
	:quantification-id	quant
	:number-relativity-q	relative
	:high-quantity-q	high
	:diminished-q	undiminished
	:lot-q	multiplelot
a-lot-of	:quantification-q	quantified
	:quantification-id	quant
	:number-relativity-q	relative
	:high-quantity-q	high
	:diminished-q	undiminished
	:lot-q	singlelot
few	:quantification-q	quantified
	:quantification-id	quant
	:number-relativity-q	relative
	:high-quantity-q	nonhigh
	:low-quantity-q	low
any-number-of	:quantification-q	quantified
	:quantification-id	quant
	:number-relativity-q	relative
	:high-quantity-q	nonhigh
	:low-quantity-q	nonlow
little	:quantification-q	quantified
	:quantification-id	quant
	:high-quantity-q	nonhigh
	:low-quantity-q	low

4.1.3 Pronominalization

Another subregion of reference involves the form of reference that is employed. More particularly, if a given entity is textually identifiable (i.e., `:identifiability-q` responds `identifiable`), then a possibility that needs to be checked (by the grammar) is *how* identifiable it is. If the entity is so salient that no further information is required, then a pronominal reference may suffice. The inquiries which perform this classification are as follows:

`:empty-number-q` In the portion of PRESENTATIONSPECIFICATION specifying what must be expressed to identify its referent, if multiplicity is removed, then is there anything left to express or is the specification empty?

`:empty-set-relativity-q` Regarding ITEM as being identified relative to some set, is it an empty subset of that set?

`:empty-gender-multiplicity-q` In the portion of MODIFICATIONSET which specifies what must be expressed to identify its referrent, if gender and multiplicity are removed, is there anything left to express or is the specification then empty?

The presentation specification contains the information to be expressed concerning an entity on each particular occasion of use in a text. It can, therefore, become 'empty' when the text/discourse model registers that sufficient information has been given in previous references.

For completeness, the following inquiries are also used in pronoun selection — there is some overlap with the inquiries we have already seen in the previous section.

`:amount-attention-q` Does ITEM specify that more than minimal attention is to be given to the amount or cardinality of the focal element?

`:antecedent-q` Does the entity ITEM have an ientifiable antecedent?

`:consciousness-q` Is the individual or group represented by ITEM conscious?

`:gender-q` Is THING a male object, a female object or an object of neutral gender?

`:proximity-modification-q` Is there a specification of proximity within HEADTHING?

`:relative-pronoun-selection-q` Should ITEM be expressed as a that relative or a which relative?

`:set-totality-polarity-q` Does the collection COMPARISONSET exhaust or nearly exhaust the collection REFERENCESET positively or negatively, i.e., does the former contain all or nearly all of the members of the latter or none or nearly none?

`:set-totality-q` Does the collection COMPARISONSET exhaust or nearly exhaust the collection REFERENCESET?

`:conceptual-correlate-id` What is the identity of the existing or synthesized concept which represents the conceptual correlate of the presentation specification PRESENTATIONSPEC , i.e. a thing known only as specifically as the presentation specification specifies?

`:proximity-mod-id` What symbol represents the specification of proximity within HEADTHING?

These inquiries allow typical pronouns to be classified semantically as shown in the following table.

PRONOMINALIZATION

form	inquiry	inquiry response
he	:empty-number-q	empty
	:empty-gender-multiplicity-q	empty
	:multiplicity-q	unitary
	:singularity-q	singular
	:gender-q	male
	:identifiability-q	identifiable
it	:empty-number-q	empty
	:empty-gender-multiplicity-q	empty
	:multiplicity-q	unitary
	:singularity-q	singular
	:gender-q	neutral
	:identifiability-q	identifiable
that	:empty-number-q	empty
	:empty-gender-multiplicity-q	empty
	:multiplicity-q	unitary
	:singularity-q	singular
	:proximity-modification-q	proximity
	:proximity-mod-id	?prox
	:distance-q	distant
	:identifiability-q	identifiable
this	:empty-number-q	empty
	:empty-gender-multiplicity-q	empty
	:multiplicity-q	unitary
	:singularity-q	singular
	:proximity-modification-q	proximity
	:proximity-mod-id	?prox
	:distance-q	nondistant
	:identifiability-q	identifiable
she	:empty-number-q	empty
	:empty-gender-multiplicity-q	empty
	:multiplicity-q	unitary
	:singularity-q	singular
	:gender-q	female
	:identifiability-q	identifiable
they	:empty-number-q	empty
	:empty-gender-multiplicity-q	empty
	:multiplicity-q	multiple
	:singularity-q	nonsingular
	:identifiability-q	identifiable

4.2 Conjunction

We can list the semantic distinctions that the inquiries of each functional region of the grammar draws and summarize their import in precisely the way we have just shown for DETERMINATION. Thus, the informal inquiry questions that support the deployment of the resources of CONJUNCTION within the Nigel grammar may be set out as follows. Each of these supports distinctions that need to be drawn within the grammar.

`:conjunctive-relation-q` does relation specify expressing a relationship between the clause being created and one or more clauses of prior text?

`:absolute-position-q` Does Relation express absolute ordinal position in the presentational sequence of the text being created?

`:additional-conjunctive-relation-q` Does Relation specify expressing a relationship between the current message being created and one or more messages of prior text in addition to the relation already identified by Conj ?

`:contrastive-q` Does Relation express contrast between propositions to be expressed and propositions evoked in prior text, identifying the two collections as significantly different?

`:correction-q` Does Relation hold between prior propositions which are not affirmed and comparable material to be presented which is affirmed, such that the material to be presented is affirmed in preference to the other?

`:disjunctive-q` Is Relation a relation of alternation, of distinct, not necessarily exclusive, collections of propositions?

`:extremal-position-q` Does Relation specify that the proposition to be presented is in an extremal position in a sequence evoked in prior text?

`:generalization-direction-q` Is the direction of abstraction of Relation such that it relates previously evoked abstract material to less abstract material to be expressed?

`:hypothesis-opposition-q` Does Relation relate a previously evoked hypothesis to a collection of propositions which hold if the hypothesis does not hold?

`:joint-regard-q` Does Relation represent an intention to present propositions for joint consideration with propositions already evoked in prior text?

`:presentation-q` Is Relation a relationship in the presentational structure of the text being created, rather than in its subject matter?

`:process-regulated-q` Does the relationship represented by Relation arise from some sort of process such as progression or logical derivation?

`:reexpression-q` Is Relation a relation of equivalence between propositions to be expressed and propositions evoked in prior text, that is, that the former reexpresses the latter?

`:relative-position-q` Does Relation express a relative position of being an immediate subsequent in in the presentational sequence of the text being created?

`:sequence-q` Does Relation specify a sequence, presentational, numerical, temporal, logical or otherwise defined?

`:similarity-q` Is Relation a relation of similarity of resemblance between propositions to be expressed and propositions evoked in prior text?

`:time-precede-q` Does Relation specify that the proposition to be expressed is at a time subsequent to a time expressed in prior text?

`:time-precedence-q` Does Relation represent an order of precedence between the proposition to be expressed and one or more propositions expressed in prior text?

`:time-separation-q` Is the time relation represented by Relation one in which the propositions being related are separated in time rather than one in which one is immediately subsequent to the other?

The inquiries that control the deployment of the resources of conjunction, therefore, make critical reference to the types and subtypes of rhetorical moves that develop the discourse: e.g., contrast, affirmed and comparable, alternation, direction of abstraction, joint consideration, progression or logical derivation, equivalence, relation of similarity, absolute ordinal position, extremal position, relative position, sequence, time subsequent, order of precedence, separated in time, etc. More specifically, this can be seen as a classification of the *textual transitions* that may be made during a text.

The present theoretical basis that is used to provide support for this classification is *Rhetorical Structure Theory* (RST: Mann and Thompson, 1987; Hovy, 1988; Mann, Matthiessen and Thompson, 1989). RST is an approach to the study of text that gives us resources for describing a text in terms of its 'rhetorical structure' and has become almost a standard approach within computational linguistics concerned with text organization. A text is interpreted as being structured by relations, so-called rhetorical relations: two spans of text enter into a rhetorical relation such as *elaboration, cause, circumstance,* or *motivation.* These relations are typically asymmetric: one of the spans is *nuclear* and the other has a *satellite* status. The difference between the two spans, the nucleus and the satellite, is a matter of centrality or nuclearity; related notions have been used in tagmemic work and work influenced by tagmemics, e.g., hypotaxis (Grimes, 1975) and nucleus-margin (Pike and Pike, 1982).

A rhetorical relation is characterized in terms conditions on its use — what Mann and Thompson (1987) call constraints — and its intended effect:

- The conditions may apply to either text span entering into the relation or to the combination of them. They identify the conditions under which the rhetorical relation is applicable. For example, if a relation of motivation is only applicable if the listener is not motivated to comply with the request or accept the offer given in the nuclear span of the text.

- The effect identifies the function of a rhetorical relation in terms of the intended end-result — the intended effect on the listener. For instance, the relation 'motivate' relates a motivational satellite to a nucleus and its (intended) effect is to increase the listener's willingness to comply or accept. It is important to note that rhetorical relations are characterized in contextual terms, more specifically in terms of the listener's mental states, rather than in lexicogrammatical terms: a text is not seen as a concatenation of sentences.

Each span of text entering into a rhetorical relation may in turn be organized into spans related rhetorically; i.e., there may be, and typically is, internal nesting. This provision for internal nesting can give the structure considerable depth. In addition to the nucleus-satellite type of relations mentioned above, RST also identifies multi-nuclear relations such as 'contrast'. As an example of an RST structure, we can consider the analysis of the following grade school report on bats, taken from Martin and Rothery (1981).

> [1] The bat is a nocturnal animal. [2] It lives in the dark. [3] There are long nosed bats and mouse eared bats also lettuce winged bats. [4] Bats hunt at night. [5] They sleep in the day [6] and are very shy.

The RST analysis of this text is given in Figure 6. There we can see that text spans [4-6]

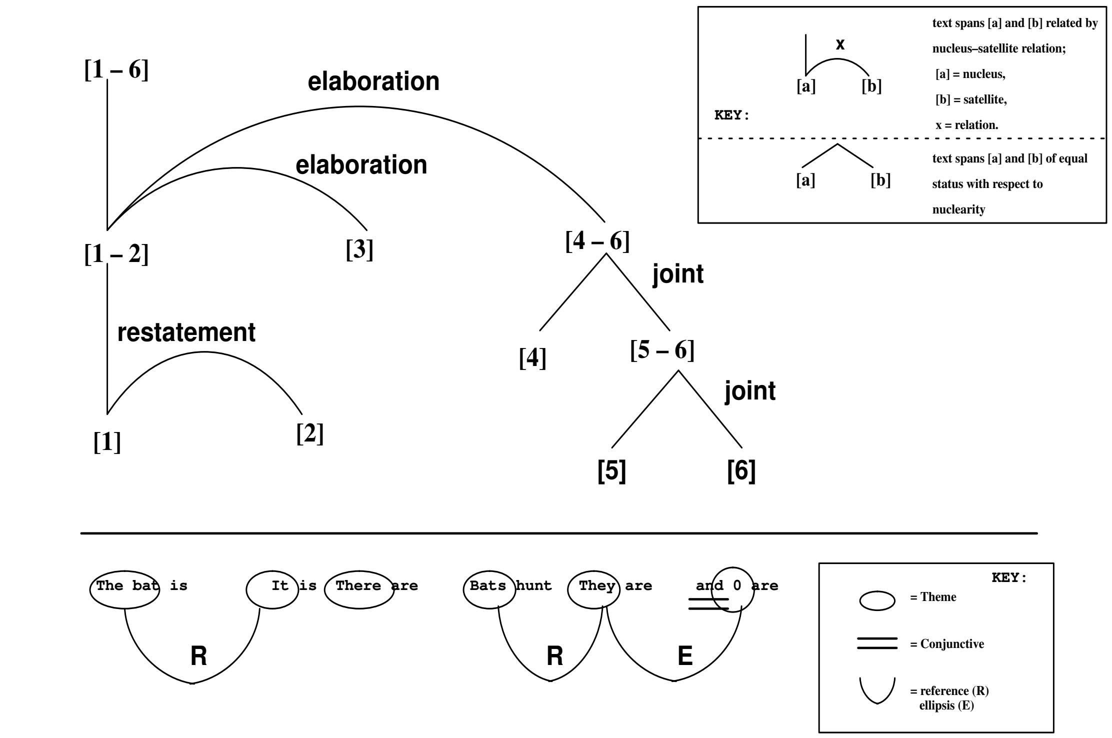

Figure 6: RST analysis of the bats report

and [3] 'elaborate' text span [1-2]. Internally, [4-6] is organized in terms of 'joints' and [1] is related to [2] by 'restatement'.

While RST provides considerable support for the types of discourse moves, or textual transitions, that develop a text, there are types of discourse moves that it does not cover. These are typically concerned with the interactive nature of text development and are widely found in conversational texts. These moves, including, for example, 'interrupt', 'dismiss', 'return to topic', etc. often do not respect the hierarchical ordering of a text by rhetorical relations.

In fact, the clause combining resources of the grammar at present far outstrip the possibilities for control offered by RST and the expanded sets of discourse relations offered by, e.g., [Maier and Hovy, 1991, Hovy *et al.*, 1992]. This again demonstrates the linguistic strengths of adopting a grammar-based approach. The closest to a level of control for the grammar currently available is probably the account given in [Martin, 1992], although this must still be computationally construed.

The following tables provide a classification of conjunctions in terms of their underlying inquiry semantics. These classifications can be used in SPL expressions in order to generate the required conjunctions (and the SPL macro `:conjunctive` serves exactly this purpose). More interestingly, the semantic decisions should be driven directly from more general text planning processes.

An example of the use of these sets of inquiries for conjunction control is the following SPL:

```
(e1 / kill
    :actor (p1 / farmer)
    :actee (o1 / duckling)

    :conjunctive-relation-q conjunctive
    :conjunctive-relation-id
           (rel / rhetorical-relation
                :process-regulated-q notprocessregulated
                :joint-regard-q notjoint
                :presentational-relation-q presentational
                :reexpression-q notreexpression
                :abstraction-q abstraction
                :generalization-direction-q generalization))
```

The textual inquiries here result in the generation of the following sentence:

Generally, a farmer kills a duckling.

Other selections are given in the tables below.

CONJUNCTIONS

form	inquiry	inquiry response
also	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	joint
	:contrastive-q	notcontrastive
	:similarity-q	notsimilarity
	:correction-q	notcorrection
	:disjunctive-q	notdisjunctive
alternatively	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	joint
	:contrastive-q	contrastive
before	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	notsequence
	:presentation-q	notpresentational
	:time-relation-q	timerelation
	:time-precedence-q	precedence
	:time-precede-q	notsubsequent
	:time-separation-q	immediate)
besides	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	joint
	:contrastive-q	notcontrastive
	:similarity-q	notsimilarity
	:correction-q	correction
further	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	sequence
	:absolute-position-q	notabsolute
	:relative-position-q	immediate
generally	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	notjoint
	:presentational-relation-q	presentational
	:reexpression-q	notreexpression
	:abstraction-q	abstraction
	:generalization-direction-q	generalization

CONJUNCTIONS (cont'd)

form	inquiry	inquiry response
however	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	notjoint
	:presentational-relation-q	notpresentational
	:hypothesis-opposition-q	hypothesisopposition
immediately	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	notsequence
	:presentation-q	notpresentational
	:time-relation-q	timerelation
	:time-precedence-q	precedence
	:time-precede-q	subsequent
	:time-separation-q	immediate
in-fact	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	notjoint
	:presentational-relation-q	presentational
	:reexpression-q	reexpression
in-particular	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	notjoint
	:presentational-relation-q	presentational
	:reexpression-q	notreexpression
	:abstraction-q	abstraction
	:generalization-direction-q	example
joint-however	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	joint
	:contrastive-q	notcontrastive
	:similarity-q	notsimilarity
	:correction-q	notcorrection
	:disjunctive-q	disjunctive

CONJUNCTIONS (cont'd)

form	inquiry	inquiry response
previously	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	notsequence
	:presentation-q	notpresentational
	:time-relation-q	timerelation
	:time-precedence-q	precedence
	:time-precede-q	notsubsequent
	:time-separation-q	separate
	:small-separation-q	small
	:tense past	
secondly	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	sequence
	:absolute-position-q	absolute
	:extremal-position-q	notextremal
similarly	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	notprocessregulated
	:joint-regard-q	joint
	:contrastive-q	notcontrastive
	:similarity-q	similarity
simultaneously	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	notsequence
	:presentation-q	notpresentational
	:time-relation-q	timerelation
	:time-precedence-q	noprecedence
spatial-besides	:conjunctive-relation-q	conjunctive
	:conjunctive-relation-id	(?rr / rhetorical-relation)
	:process-regulated-q	processregulated
	:necessity-q	nonecessity
	:sequence-q	notsequence
	:presentation notpresentational	
	:time-relation-q	nottimerelation
	:spatial-relation-q	spacerelation

CONJUNCTIONS (cont'd)

form	inquiry	inquiry response
then	`:conjunctive-relation-q`	`conjunctive`
	`:conjunctive-relation-id`	`(?rr / rhetorical-relation)`
	`:process-regulated-q`	`processregulated`
	`:necessity-q`	`nonecessity`
	`:sequence-q`	`notsequence`
	`:presentation-q`	`notpresentational`
	`:time-relation-q`	`timerelation`
	`:time-precedence-q`	`precedence`
	`:time-precede-q`	`subsequent`
	`:time-separation-q`	`separate`
	`:small-separation-q`	`notsmall`
therefore	`:conjunctive-relation-q`	`conjunctive`
	`:conjunctive-relation-id`	`(?rr / rhetorical-relation)`
	`:process-regulated-q`	`processregulated`
	`:necessity-q`	`necessity`
ultimately	`:conjunctive-relation-q`	`conjunctive`
	`:conjunctive-relation-id`	`(?rr / rhetorical-relation)`
	`:process-regulated-q`	`processregulated`
	`:necessity-q`	`nonecessity`
	`:sequence-q`	`sequence`
	`:absolute-position-q`	`absolute`
	`:extremal-position-q`	`extremal`

4.3 Theme

THEME provides resources for the marking of textual statuses such as thematicity. In addition to the examples given above in Section 2, we can now add the inquiry questions defined within the THEME region of Nigel:

`:attitudinal-theme-q` Should the specification of THEME provide a conceptual context regarding attitudes or beliefs of speaker with respect to which the elements of NOTTHEME are to be interpreted?

`:circumstantial-theme-q` Should the specification of CIRCUMSTANCE provide a conceptual context or topic with respect to which the elements of SPEC are to be interpreted?

`:closer-relation-q` Is some relationship of CLOSE to a participant in CLAUSETARGET significantly closer than any relationship of COMPETITOR to a participant in CLAUSETARGET?

`:command-q` Is the illocutionary point of the surface level speech act represented by ACT1 a command, i.e. a request of an action by the hearer?

`:dependent-beta-theme-q` Should the specification of DEPENDENT provide a conceptual context or topic with respect to which the elements of SPEC are to be interpreted?

`:paragraph-theme-exist-q` Is there a paragraph containing ITEM which has a theme?

`:path-inclusion-q` Does the chain of relationships LARGE contain the chain of relationships SMALL as a proper subpart?

`:previous-clause-exist-q` Was there a clause which was expressed immediately before THISCLAUSE?

`:textual-theme-q` Should the specification of RELATION1 as a relation to previous elements of the discourse serve as a conceptual context with respect to which the elements of SPEC are to be interpreted?

`:conceptual-correlate-id` What is the identity of the existing or synthesized concept which represents the conceptual correlate of the presentation specification PRESENTATIONSPEC , i.e. a thing known only as specifically as the presentation specification specifies?

`:paragraph-theme-id` What is the theme of the paragraph containing CLAUSEITEM?

`:previous-clause-id` What clause was expressed just before the clause THISCLAUSE?

`:reader-knowledge-path-id` What symbol represents the most salient chain of relationships in the reader 's attention and knowledge between PATH1 and PATH2?

Here, we can see that the concept of providing a 'local context for interpretation' is essential to the entire range of decisions that determine theme deployment. There would appear to be a particular *thematic status* that marks out an entity or relation as serving this function.

Fries (1981, 1987) has further shown that Theme in English is selected to bring out the *method of development* of a span of text. We can state this as follows: the local context of a clause specified thematically, the context in which the clause is to be understood, includes the way in which it develops the text. The process of contextualization is here, in a sense, 'anaphoric': the local context of the clause is set up in relation to the preceding discourse context. (We should not, however, equate the notion of contextualizing with the development of the text. Themes may also provide contexts that do not reflect the method of development.) Themes are thus often selected to guide the listener or reader through the text by indicating the method of development: the selection of a particular *type* of Theme will serve to inform the listener or hearer of the *type* of organization which is being used to construct the text. Methods of development include organizations that are temporal, spatial, lists, general to specific, object to attributes, object to parts, and compare and contrast (cf. Daneš, 1974). Thus, often a clause is contextualized by indexing into the method by which the text is developed. The 'bat' text above illustrates how themes are selected to bring out the point of elaboration (cf. Figure 6):

	Theme	*Rheme*
1.	the bat	is a nocturnal animal
2.	it	lives in the dark
4.	bats	hunt at night
5.	they	sleep in the day
6.	and ___	are very shy

(In unit (3) the feature of existence is thematic and the subtypes of bats are introduced rhematically; they are then ready to be picked up thematically, but the writer does not choose to elaborate further at this point.)

Internal matter or theme matter (*as for, regarding, with respect to,* etc. + nominal group) is quite similar to the thematic resources in general; it is a strategy for changing and specifying the *referential* context of a clause. The particular meaning seems to vary somewhat depending on the register.[11]

Some of the inquiries also make reference to a text notion of 'paragraph'. Within the Nigel grammar this functions as follows. Any paragraph is assumed to have a 'topic' which represents what the paragraph is about. Once a topic is determined, the concepts mentioned in its paragraph may be placed in a chain of conceptual organization representing the various links that exist between those concepts according to the text being produced. It is then possible to inquire as to the distance of any concept in the paragraph from the topic of that paragraph. This may most simply be modelled by the number of links that have to be traversed along the chain, or *thematic path*, in order to go from the topic down to the concept at issue. As a fairly straightforward kind of thematic development is assumed, it is possible to define the 'centrality' of any concept according to the length of its thematic path. Also, any longer path may be assumed to include shorter paths; that is, to get to any concept one needs to have passed through concepts that are more central thematically. Thus, it is possible to ask whether some thematic path *contains* another; the path that is contained is shorter and hence specifies a concept that is more central in relation to the topic of the paragraph. This relative distance of concepts from each other in chains such as these is then taken to determine those concepts' *conceptual closeness*. This information is used to determine clause-internal information such as types of passivisation and constituent ordering; this we can see in the account of the inquiries of the VOICE functional region shown in the following section.

4.4 Voice

The inquiries of the VOICE function region of Nigel show a certain degree of overlap with those for THEME we have just seen — Thompson (1987a), whose work contributed to the formulation of the VOICE chooser, provides a detailed motivation on the basis of text analyses for the distinctions drawn. The full list is as follows:

`:actualization-constrainer-q` Does the specification SPECIFICATION1 contain a specification of an entity which has some property – specifically volition or ability – other than the cause of the process PROCESS1 which nevertheless constrains the actualization, i.e., occurrence of it?

`:closer-relation-q` Is some relationship of CLOSE to a participant in CLAUSETARGET significantly closer than any relationship of COMPETITOR to a participant in CLAUSETARGET?

`:command-q` Is the illocutionary point of the surface level speech act represented by ACT1 a command, i.e. a request of an action by the hearer?

`:paragraph-theme-exist-q` Is there a paragraph containing ITEM which has a theme?

`:path-inclusion-q` Does the chain of relationships LARGE contain the chain of relationships SMALL as a proper subpart?

`:prefer-mention-agent-q` From the point of view of the representation of the current situation, is there any positive reason not to express that DOER is the agent of ACTIVITY ?

`:prefer-mention-medium-q` From the point of view of the representation of the current situation, is it preferable to mention MEDIATOR as the participant through which ACTIVITY can be instantiated as a process or should it be implicit and unidentified?

`:previous-clause-exist-q` Was there a clause which was expressed immediately before THISCLAUSE?

[11] This is no way unique to INTERNAL MATTER, of course; it is a specific instance of what Halliday has observed about register and situation specific semantices (Halliday, 1973).

`:same-as-q` Is FIRST identical to SECOND?

`:actualization-constrainer-id` What symbol in the specification SPECIFICATION1 represents the entity which has some property – specifically volition or ability – other than the cause of the process PROCESS1 which nevertheless constrains the actualization, i.e., occurrence of it?

`:conceptual-correlate-id` What is the identity of the existing or synthesized concept which represents the conceptual correlate of the presentation specification PRESENTATIONSPEC , i.e. a thing known only as specifically as the presentation specification specifies?

`:paragraph-theme-id` What is the theme of the paragraph containing CLAUSEITEM?

`:previous-clause-id` What clause was expressed just before the clause THISCLAUSE?

`:reader-knowledge-path-id` What symbol represents the most salient chain of relationships in the reader 's attention and knowledge between PATH1 and PATH2?

These inquiries can define the notion of paragraph theme (at the level of abstraction being dealt with here) as follows. A paragraph theme P is an entity that satisfies the following, or equivalent, textual semantic constraints:

```
:paragraph-theme-id P
:reader-knowledge-path-id (Agent P) ?thematic-path
:reader-knowledge-path-id (Medium P) ?included-path

:path-inclusion-q (?thematic-path ?included-path) contained
:path-inclusion-q (?included-path ?thematic-path) notcontained
```

Each entity needs to have its 'conceptual distance' from the paragraph theme classifiable by `path-inclusion-q`. In addition, the clause within which these constraints are to hold must also be classified as:

```
:actualization-constrainer-q nonactualizationconstrainer
:paragraph-theme-exist-q exists
```

An example of paragraph topic reasoning is the following, taken from one of the pre-stored example records of the exercise set that is supplied with Nigel. This is a direct trace of Nigel's operation.[12] Here we see for each inquiry that requires a response: first, the inquiry's name, then the informal English, and finally the response itself, shown underlined. Nigel is attempting to generate the clause 'Whom was the third response sent?'; it has already identified a number of environment hubs, or chunks of information to be expressed — those relevant here are: the hub RES8H which contains the information concerning the response, and the hub WH8H which contains whatever information is available on the SUBJECT of the question, the person to whom the response was sent.

```
   PARAGRAPH-THEME-EXIST-Q: Is there a paragraph containing EG25 which
   has a theme?
Environment's answer to Nigel is EXISTS
   PARAGRAPH-THEME-ID: What is the theme of the paragraph containing
   EG25 ?
```

[12] A more complete trace including this extract is given in [Matthiessen and Bateman, 1991, Appendix 2].

```
Environment's answer to Nigel is THEME8H
System BENEFACTIVE-VOICE-II associates hub THEME8H with PARAGRAPHTHEME
as CONCEPT
```

These two inquiries, `paragraph-theme-exist-q` and `:paragraph-theme-id`, first check whether there is a paragraph theme known to the text planner and, if there is, finds a symbol for it (the hub: THEME8H) which is then associated wtih the grammatical function PARAGRAPH-THEME. Although only the hub appears here, all subsequent reference to this text planning entity are in fact then channelled through the grammatical function, preserving the independence of the environment and the chooser and inquiry specifications.

```
   READER-KNOWLEDGE-PATH-ID: What symbol represents the most salient
   chain of relationships in the reader's attention and knowledge
   between RES8H and THEME8H ?
Environment's answer to Nigel is LONG
System BENEFACTIVE-VOICE-II associates hub LONG with MEDIUMTHEMATICPATH
as CONCEPT
```

This interaction asks for the conceptual links that the reader is to draw between the 'response' and the paragraph theme. This is considered to have some structure such as [RES8H (*response*) $C_1C_2...C_n$ THEME8H (the paragraph theme)], where C_i are intermediate concepts in the chain. The chain as a whole has been given the arbitrary hub name LONG and it is associated with the grammatical function MEDIUMTHEMATICPATH. Grammatically, the response, as the object that was sent, is termed the MEDIUM and so this chain of relationships represents the path from the participant that is the MEDIUM to the paragraph topic.

```
   READER-KNOWLEDGE-PATH-ID: What symbol represents the most salient
   chain of relationships in the reader's attention and knowledge
   between WH8H and THEME8H ?
Environment's answer to Nigel is TH8H
System BENEFACTIVE-VOICE-II associates hub TH8H with
BENEFICIARYTHEMATICPATH as CONCEPT
```

Similarly, this interaction asks for the conceptual links that the reader is to draw between the grammatical BENEFICIARY, the person to whom the response was sent as identified by the hub WH8H, and the paragraph theme. This is also taken to have a structure such as [WH8H (the beneficiary) $K_1K_2...K_n$ THEME8H (the paragraph theme)], where K_i are intermediate concepts in the chain. This is given the arbitrary hub name TH8H and is associated with the grammatical function BENEFICIARYTHEMATICPATH.

```
PATH-INCLUSION-Q: Does the chain of relationships TH8H contain the
chain of relationships LONG as a proper subpart?
Environment's answer to Nigel is CONTAINED
Chooser BENEFACTIVE-VOICE-II-CHOOSER chooses feature
NONAGENTIVE-MEDIORECEPTIVE.
```

Finally this inquiry compares the two conceptual chains. It seeks to find which terminal concept, WH8H or RES8H, is the closest to the paragraph theme. If one chain is included within the other as a proper subpart, then it's terminal concept is necessarily nearer to the paragraph theme. Here the response is CONTAINED, which indicates that the structure of the conceptual chain is something like: [WH8H (the beneficiary) ... RES8H (*response*) ... THEME8H (the paragraph theme)]. Therefore, the 'response' is 'nearer' to the paragraph theme and is accordingly made the SUBJECT of the clause. Had the response been that the chain LONG had contained the chain TH8H, then the beneficiary would have been nearer the paragraph theme and WH8H would have become the subject. In terms of the realization operations of the grammar, this is simply stated by specifying that the grammatical function BENEFICIARY (which has associated with it the hub information WH8H) and the grammatical function SUBJECT are to be *conflated* as described in the grammar documentation. The generated clause would then have been 'who was sent the message?'

This clarifies the selection of passive constructions as we saw used in the example of Section 4.1.2 above. The example is repeated here, this time with the passive textual reasoning shown boxed.

```
(e1 / kill
    :actor (p1 / farmer
               :identifiability-q notidentifiable
               :multiplicity-q unitary
               :set-totality-q total
               :current-representative-id crs-farmers
               :potential-representative-id prs-farmers
               :singularity-q singular
               :set-totality-individuality-q individual
               :amount-attention-q nonminimalattention
               :reader-knowledge-path-id (o1) path1)
    :actee (o1 / duckling
               :identifiability-q notidentifiable
               :set-totality-q total
               :duality-q nondual
               :current-representative-id crs-ducks
               :potential-representative-id prs-ducks
               :multiplicity-q multiple
               :set-totality-individuality-q collection
               :amount-attention-q nonminimalattention
               :reader-knowledge-path-id (o1) path2)
    :actualization-constrainer-q
    nonactualizationconstrainer
    :paragraph-theme-exist-q exists
    :paragraph-theme-id o1
    :path-inclusion-q (path1 path2) contained
    :path-inclusion-q (path2 path1) notcontained
    )
```

And so, taking a clause from our set of text variants presented in Section 1 above as an example, we can now readily motivate the rejection of the passive clause:

A speech is going to be made by him.

in favour of the non-passive version:

He is going to make a speech.

by noting that the paragraph theme is rather clearly the President and that there is a chain of relationships that begins with the President and ends with the speech. The speech is therefore further from the paragraph theme than the President is and does not motivate a passive construction.

Finally, in addition to those inquiries concerned with paragraph reasoning, there are also several which ask whether a participant should be mentioned or not. This needs to be supported by a sense of an entity's 'newsworthiness' (cf. next section). If an entity does not, or cannot, contribute to the message being expressed then it will not be realized.

4.5 Information distribution

Finally, and very briefly, we should note that in addition to thematicity, there is also a textual status that in English is predominantly realized in spoken language. Elements that the speaker classifies as *new* for the hearer are given relative intonational salience. Again, therefore, the text base needs to support a notion of 'newsworthiness'. There is only one reflex of this construct in the current Nigel grammar, although extensions that will require its support are straightforward to envision. There is a rather general tendency in English for informationally given entities to be ordered prior to informationally new entities (see: Halliday, 1970, 1985; Thompson, 1987b; Fries, forthcoming). This is supported at present by the single inquiry defined for the CULMINATION functional region:

`:ordering-q` is Item1 relatively more newsworthy for the listener than Item2, i.e., is it closer to the point the current message and/or more likely to retain topical value in the discourse to be produced later?

Depending on the response to this inquiry, items in a clause that are judged to be more newsworthy will, when grammatically possible (e.g., in cases of so-called 'dative shift' or with otherwise unordered circumstantials), be ordered after items that are less so. At present, the places where a specification of this inquiry will have an effect are rather limited and await a more general treatment of 'linear ordering' across the grammar as a whole and as a textual phenomenon partially orthogonal to constituency.

5 Summary and literature pointers

Each of the kinds of theoretical constructs appealed to by the textual inquiries described in this section needs some correlate in the text base. We can summarize the areas of theory the text base therefore involves as follows:

- Rhetorical structure theory: an approach to the study of text organization: e.g. [Mann and Thompson, 1987], [Fox, 1987], [Hovy, 1988], [Moore and Paris, 1988], [Moore and Paris, 1989], [Scott and de Souza, 1989], [Hovy, 1991], [Maier and Hovy, 1991], [Scott and de Souza, 1991], [Rösner and Stede, 1991], [Hovy *et al.*, 1992], [Moore and Pollack, 1992]. This gives us resources for describing a text in terms of its rhetorical structure.

- Rhetorical moves, conversational organization: there are a number of relationships between spans of a text that are not covered in the original statement of RST (although more recent work by, e.g., [Hovy *et al.*, 1992] attempts to move somewhat in this direction also). These include relations of a conversational and interactive nature such as: *addition with enforcement, dismissive relations, resumptive relations, verification relations, distractive relations, interpretive relations*. These are often signalled via the grammatical resources of conjunction. There should be substantial overlap here with accounts of *interaction* that are compatible with the rest of the systemic-functional framework, although this has not yet taken place to any substantial degree. Relevant systemic work here includes: [Sinclair and Coulthard, 1975], [Berry, 1981], [Bateman, 1985], [Ventola, 1987], [Eggins, 1991], [Martin, 1992].

- Textual statuses and information flow: we have seen that, in the clause, THEMATIZATION determines the thematic status of participants and circumstances (thematic *vs.* rhematic); in the information unit in spoken English, INFORMATION determines their information status (given *vs.* new); and DETERMINATION in the nominal group determines, among other things, a third textual status, the identifiability status of referents. Thematic status, given status, and identifiable status may coincide and they often do, as in the following example:

  > In the first days of February it seemed to Matthew that the dock buildings were permanently ablaze. There the Mayfair unit would be sent whenever there were no fires to deal with in their own district.

  But, although clearly related, the three statuses are independently variable. All three resources are thus concerned with textual statuses and they point to the need to plan and maintain this information in dynamically updated records. We have also seen that Themes may be used to bring out the method of development of a text; thus, the moment-by-moment distribution of information may be used to ground concepts of 'local contexts' and 'paragraph' topics. An extensive discussion of this area of discourse semantics is given in [Martin, 1992]. Computationally the area has also been suggested by Hovy's discussions of the necessity of a 'sentence planning' component in addition to general text planning.

The kinds of theoretical constructs required are summarized in general terms in Figure 7.

textual resource	*grammatical function*	*kind of support needed*
CONJUNCTION	conjunctive relation (to prior text); rhetorical moves	RST relation with added delicacy (e.g., subtypes of circumstance relation); also: other rhetorical moves (e.g., return to topic, dimissal of point, etc.)
DETERMINATION	experiential classification, deicticity	current representatives, potential representatives, identifiability, selection strategies, reference strategies
THEME	context: textual-conjunctive, interpersonal-modal (etc.), experiential - circumstantial and participant	Continuity and shift in local development, relying on method of development which correlates (partly) with the point of a rhetorical relation
INTERNAL MATTER	content: 're-entered' topic	as above; specifically, subsequent point of elaboration
VOICE	current (participant-) topic	'paragraph' topic and more local antecedent topic needed to compute relative topicality of candidate participants
CULMINATION	news: relative newsworthiness of non-thematic participants and circumstances	principle for selecting information (including anticipation of what will become topical)
nb: ellipsis/substitution, theme-predication, theme-identification		

Figure 7: Textual resources support

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