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An English Analysis Grammar in a Unification-based Framework

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An extension of a basic English analysis grammar in a unification framework is reported on here. Structures analyzed include adjectival and adverbial modification including negation; request structures incorporating "please;" sentences with the dummy subject "there;" sentences and noun phrase in conjunctive structures; and sentences containing introductory fragments (e.g., "well, then"). Changes and additions made to the system are given along with illustrative example analyses. Further adjustments necessary to the efficient integration of system components are discussed and indications of future directions are made. Appendices contain sample analyses of the initial system and analyses for all the utterances of the first conversation in the conference corpus.

Contents

Chapter 1

Introduction

From 1988 to 1991, Yoshihiro Ueda of Fuji Xerox and Sondra Ahlen of ATR designed a unification-based, English analysis grammar. The goal of the work reported here was to extend that grammar to cover additional structures in the conference conversation corpus, demonstrating the feasibility of this approach within that context. Before the current work was begun, the following construction types could be analyzed by the grammar then in place:

- simple declarative sentences, with either monadic, dyadic or triadic verbs, including provisions for subject-verb agreement and the use of various modals
- noun phrases with a number of different determiners and the possibility of adjunct prepositional phrases
- various idiomatic "greetings" such as "I see," and "you're welcome"
- sentences of the form "subject/be/noun phrase"
- yes/no questions
- imperatives
- relative clauses

In addition to basic syntactic information (including argument function) and semantic labeling, the analysis gives pragmatic information concerning sentence-type, identification of hearer and speaker, and, in some cases, intention. The specific details are clearly illustrated in the example analyses given in Appendix A.

The current work focused on extending the range of analyses to include:

- both adverbial and adjectival modification in a number of syntactic contexts including negation
- the use of "please" in a variety of request structures
- "there" as "dummy" subject
- both sentence and noun phrase conjunction and subordination
- introductory phrases (e.g., "well, then")

In addition, some changes were made to the basic analysis approach in order to render the system more readily usable by the Japanese generation component, and some "fine-tuning" of the analysis of particular structures, including structures with verbs subcategorizing for prepositional phrases, was done.

Below each of these areas will be discussed in turn, beginning with an overview of the proposed analyses, outlining the additions and adjustments made to the system. Then the specific rules and templates involved are given, with example analyses for each new structure following.

Chapter 2

Modification

2.1 Summary

Since there was no provision for adjectival or adverbial modification in the original system, extensive changes were necessary in order to accommodate such modification. Types and definitions for adverbs were added, as well as lexical entries for adverbs, including "not," and adjectives. Existing adjective entries required changes allowing for the semantic content of the adjective to make a contribution to the content of the phrase in which it appeared.

Rules authorizing the structures in which modification takes place were added as well. Once these basic elements were implemented, a rule was needed to define the modifier-head relationship, namely, that the head daughter is restricted by the semantic content of the modifier, which is the complement daughter. In addition, a rule authorizing specifiers with noun phrases was added and changes were made to the rule characterizing the specifier-head relationship so that the definiteness of the noun phrase would be preserved despite the appearance of a modifier in the phrase.

In order to authorize the appearance of adjective phrases in copular sentences, changes were also made to the lexical entry for "be," including the addition of the conditions under which a lexical element may be said to subcategorize for an adjectival phrase.

The structures that can be analyzed as a result of these changes include:

- Det AP Noun
- Det AVP AP Noun
- NP be AP
- NP be AVP AP
- NP AVP VP
- NP VP AVP

Example analyses are given at the end of the list of changes made.

2.2 Changes made

2.2.1 Definitional

```
(deffstemp avsign nil
  (<syn loc head> == [ avhead ]))

(deffstemp avp nil
  (<!m> == [ avp ])
  !avsign)

(deffstemp av nil
  (<!m> == [ av ])
  !no-gap)

(defrule xp == (avp)
  !sign)

(defrule avp == (av)
  !sign)

(deffstype avp (xp))

(deffstype av (avp))
```

2.2.2 Lexical entries

```
(deflex-named |necessary| ``necessary" a
  !word
  !(lex-orth ``necessary")
  !(key  *necessary*)
  (<sem cont reln> == [*necessary*]))
```

A line analogous to the last line of this entry was added to the original entry type for all adjectives in order to allow adjectives to make a semantic contribution to the structures in which they appear.

```
(deflex-named |sorry| ``sorry" a
  !word
  !(lex-orth ``sorry")
  !(key  *sorry*)
  (<sem cont reln> == [*sorry*]))

(deflex-named |very| ``very" av
  !word
  !(lex-orth ``very")
  (<sem cont reln> == [*very*]))

(deflex-named |already| ``already" av
  !word
  !(lex-orth ``already")
  (<sem cont reln> == [*already*]))

(deflex-unit |any-time| av
  !word
  (<word> == ``any time")
```

```
  (<orth> == (:dlist ``any'' ``time''))
  (<sem cont reln> == [*any-time*]))

(deflex-named |immediately| ``immediately'' av
  !word
  !(lex-orth ``immediately'')
  (<sem cont reln> == [*immediately*]))

(deflex-named |not| ``not'' av
  !word
  !(lex-orth ``not'')
  (<sem cont reln> == [*not*]))

(deflex-unit |be-Unit| dyadic
  !v-sem
  !verb
  (:or
    (!(key *identical*)
     !takes-np
     !(dyadic-reln-cases obje iden))
    (!(key *progressive*)
     !(takes-vp prp)
     !subj-control-1
     (<temp sem cont reln> == <temp key>)
     (<temp sem cont obje> == <temp sem cont arg2>))
    (!(key *modify*)
     !takes-ap
     (<temp sem cont arg1> == <temp sem cont arg2 obj>))
    (!(key *exists*)
      !takes-np
      (<temp sem cont arg1> == <temp sem cont arg2>)
      (<temp sem cont iden> == <temp sem cont arg2>)))
```

This entry is given here in only partial form; the "modify" option is the one pertinent to the discussion of modifiers. (The "takes-ap" template is given below.)

2.2.3 Structural rules

```
(defrule np =ch=> (npspecp np)
  !specific-to-ch
  !(threading-ch !gap)
  !specifier-head-rule
  (<!m syn loc wh> == <!c-dtr-1 syn loc wh>))

(defrule np =ch=> (ap undetnom)
  !specific-to-ch
  !(threading-ch !gap)
  !(modifier-head-rule)
  (<!c-dtr-1 sem cont obj> == <!h-dtr sem cont ind>))

(defrule ap =ch=> (avp ap)
  !specific-to-ch
  !(threading-ch !gap)
  !(modifier-head-rule))

(defrule vp =hc*=> (vp avp)
  !specific-to-hc
  !(threading-hc !gap)
```

```
  !(modifier-head-rule))

(defrule vp =ch=> (avp vp)
  !specific-to-ch
  !(threading-ch !gap)
  !(modifier-head-rule))
```

2.2.4 Definition of relationship

```
(deffstemp modifier-head-rule nil
  !phrase
  (<!m syn loc lex> == -)
  (<!h-dtr syn loc subj> == <!m syn loc subj>)
  (<!h-dtr syn loc subcat> == (:list))
  (<!h-dtr syn loc subcat> == <!m syn loc subcat>)
  (<!h-dtr sem cont restr> == <!c-dtr-1 sem cont>))

(deffstemp specifier-head-rule nil
  !phrase
  !(simple-subcat-principle-for spec)
  (<!m syn loc spec> == (:list))
  (<!h-dtr syn loc subj>   == <!m syn loc subj>)
  (<!h-dtr syn loc subcat> == (:list))
  (<!h-dtr syn loc subcat> == <!m syn loc subcat>)
  (<!c-dtrs rest> == (:list))
  (<!m sem cont definiteness> == <!c-dtr-1 sem cont definiteness>))

(deffstemp takes-ap ()
  (<!subcat-1> == [ap])
  (<!subcat-1 !gapin> == <!subcat-1 !gapout>)
  (<temp sem cont arg2> == <!subcat-1 sem cont>)
  !(argn-default arg2))
```

2.3 Example analyses

- Det AP Noun

```
> (ana3 ''the necessary form'')
A New Result has been found! [19 steps: 1 sec.]
Number of results = 2
Number of equivalents = 1
[NP[ORTH (:DLIST         the
                         necessary
                         form
                  |?X04| )]
   [SYN [[LOC [[HEAD [NHEAD[CASE [CAS]]]]
              [SUBJ [LIST]]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [WH  -]
              [GAP [[IN ?X01[]]
                    [OUT ?X01]]]]]]
   [SEM [[CONT [IND-OBJ[DEFINITENESS [UNIQUE]]
                       [IND ?X03[INDEX[REF-TYPE [COMMON-REF]]
                                      [VAR ?X02[PARAM[PERS  3RD]
```

```
                                                    [NUM [SING]]]]
                                          [RESTR [[RELN [*FORM-1*]]
                                                  [INST ?X02]
                                                  [ADJUNCT (:LIST)]]]]]
                          [RESTR [[RELN [*NECESSARY*]]
                                  [OBJ ?X03]]]]]]]
   [PRAG [[PARAMS []]
          [SPEAKER [[LABEL  *SPEAKER*]]]
          [HEARER [[LABEL  *HEARER*]]]]]]
```

- Det AVP AP Noun

```
> (ana3 ``the very necessary form")
A New Result has been found! [25 steps: 1 sec.]
Number of results = 2
Number of equivalents = 1
[NP[ORTH (:DLIST         the
                         very
                         necessary
                         form
                  |?X04| )]
   [SYN [[LOC [[HEAD [NHEAD[CASE [CAS]]]]
              [SUBJ [LIST]]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [WH  -]
              [GAP [[IN ?X01[]]
                    [OUT ?X01]]]]]]
   [SEM [[CONT [IND-OBJ[DEFINITENESS [UNIQUE]]
                       [IND ?X03[INDEX[REF-TYPE [COMMON-REF]]
                                      [VAR ?X02[PARAM[PERS  3RD]
                                                     [NUM [SING]]]]
                                      [RESTR [[RELN [*FORM-1*]]
                                              [INST ?X02]
                                              [ADJUNCT (:LIST)]]]]]
                       [RESTR [[RESTR [[RELN [*VERY*]]]]
                               [RELN [*NECESSARY*]]
                               [OBJ ?X03]]]]]]
   [PRAG [[PARAMS []]
          [SPEAKER [[LABEL  *SPEAKER*]]]
          [HEARER [[LABEL  *HEARER*]]]]]]
```

- NP be AP

```
> (ana3 ``the form is necessary")
A New Result has been found! [48 steps: 8 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         the
                        form
                        is
                        necessary
                 |?X01| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
             [SUBJ (:LIST)]
```

```
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN ?X02[]]
                    [OUT ?X02]]]]]]]
  [SEM [[CONT [CIRC[RELN [*MODIFY*]]
                   [TENSE [*PRESENT*]]
                   [ARG1 ?X04[IND-OBJ[DEFINITENESS [UNIQUE]]
                                     [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                [VAR ?X03[PARAM[PERS  3RD]
                                                               [NUM [SING]]]]
                                                [RESTR [[RELN [*FORM-1*]]
                                                       [INST ?X03]
                                                       [ADJUNCT (:LIST)]]]]]]]
                   [ARG2 [[RELN [*NECESSARY*]]
                          [OBJ ?X04]]]
                   [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER [[LABEL  *SPEAKER*]]]
         [HEARER [[LABEL  *HEARER*]]]]]]
NIL
```

- NP be AVP AP

```
> (ana3 ''the form is very necessary")
A New Result has been found! [61 steps: 3 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         the
                        form
                        is
                        very
                        necessary
                  |?X01| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                          [VFORM  FIN]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN ?X02[]]
                    [OUT ?X02]]]]]]
  [SEM [[CONT [CIRC[RELN [*MODIFY*]]
                   [TENSE [*PRESENT*]]
                   [ARG1 ?X04[IND-OBJ[DEFINITENESS [UNIQUE]]
                                     [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                [VAR ?X03[PARAM[PERS  3RD]
                                                               [NUM [SING]]]]
                                                [RESTR [[RELN [*FORM-1*]]
                                                       [INST ?X03]
                                                       [ADJUNCT (:LIST)]]]]]]]
                   [ARG2 [[RESTR [[RELN [*VERY*]]]]
                          [RELN [*NECESSARY*]]
                          [OBJ ?X04]]]
                   [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER [[LABEL  *SPEAKER*]]]
         [HEARER [[LABEL  *HEARER*]]]]]]
NIL
```

- NP AVP VP

```
> (ana3 ``i already have the form")
A New Result has been found! [64 steps: 9 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        already
                        have
                        the
                        form
                |?X01| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN ?X02[]]
                   [OUT ?X02]]]]]]]
  [SEM [[CONT [CIRC[RESTR [[RELN [*ALREADY*]]]]
                  [RELN [*HAVE-1*]]
                  [AGEN ?X04[IND-OBJ[DEFINITENESS [PERSONAL]]
                                    [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                               [VAR [PARAM[PERS  1ST]
                                                          [NUM [SING]]]]]]
                                    [LABEL  *SPEAKER*]]]
                  [OBJE ?X05[IND-OBJ[DEFINITENESS [UNIQUE]]
                                    [IND [INDEX[REF-TYPE [COMMON-REF]]
                                               [VAR ?X03[PARAM[PERS  3RD]
                                                              [NUM [SING]]]]
                                               [RESTR [[RELN [*FORM-1*]]
                                                       [INST ?X03]
                                                       [ADJUNCT (:LIST)]]]]]]]
                  [TENSE [*PRESENT*]]
                  [ARG1 ?X04]
                  [ARG2 ?X05]
                  [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER ?X04]
         [HEARER [[LABEL  *HEARER*]]]]]]
NIL
```

- VP AVP

```
> (ana3 ``i have the form already")
A New Result has been found! [72 steps: 8 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        have
                        the
                        form
                        already
                |?X05| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
             [SUBJ (:LIST)]
```

```
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN  ?X04  NONE]
                    [OUT  ?X04]]]]]]]
  [SEM [[CONT [CIRC[RESTR [[RELN [*ALREADY*]]]]
                   [RELN [*HAVE-1*]]
                   [AGEN ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
                                     [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                [VAR [PARAM[PERS  1ST]
                                                           [NUM [SING]]]]]]
                                     [LABEL  *SPEAKER*]]]
                   [OBJE ?X02[IND-OBJ[DEFINITENESS [UNIQUE]]
                                     [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                [VAR ?X01[PARAM[PERS  3RD]
                                                               [NUM [SING]]]]
                                                [RESTR [[RELN [*FORM-1*]]
                                                        [INST ?X01]
                                                        [ADJUNCT (:LIST)]]]]]]]
                   [TENSE [*PRESENT*]]
                   [ARG1 ?X03]
                   [ARG2 ?X02]
                   [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
        [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                 [LABEL  *HEARER*]]]
        [SPEAKER ?X03]]]]
NIL
```

Chapter 3

Negation

3.1 Summary

Once the analysis for modification described above was in place, it became possible to analyse negative sentences. A lexical entry for "not" as an adverb was added and it became possible to analyse the following sentential types:

- NP be not AP
- NP do not VP
- Do not VP

3.2 Changes made

3.2.1 Lexical entry

```
(deflex-named |not| ``not" av
  !word
  !(lex-orth ``not")
  (<sem cont reln> == [*not*]))
```

3.3 Example analyses

- NP be not AP

```
> (ana3 ``the form is not necessary")
A New Result has been found! [69 steps: 10 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         the
                        form
                        is
                        not
                        necessary
```

```
                |?X04| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN  ?X03  NONE]
                   [OUT  ?X03]]]]]]]
  [SEM [[CONT [CIRC[RELN [*MODIFY*]]
                   [TENSE [*PRESENT*]]
                   [ARG1 ?X02[IND-OBJ[DEFINITENESS [UNIQUE]]
                                     [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                [VAR ?X01[PARAM[PERS  3RD]
                                                               [NUM [SING]]]]
                                                [RESTR [[RELN [*FORM-1*]]
                                                        [INST ?X01]
                                                        [ADJUNCT (:LIST)]]]]]]]
                   [ARG2 [[RESTR [[RELN [*NOT*]]]]
                          [RELN [*NECESSARY*]]
                          [OBJ ?X02]]]
                   [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                  [LABEL  *HEARER*]]]
         [SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                   [LABEL  *SPEAKER*]]]]]
NIL
```

- NP do not VP

```
> (ana3 ''i do not have the form")
A New Result has been found! [87 steps: 12 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        do
                        not
                        have
                        the
                        form
                |?X06| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN  ?X05  NONE]
                   [OUT  ?X05]]]]]]]
  [SEM [[CONT [CIRC[RELN [*DO-1*]]
                   [OBJE ?X04[CIRC[RESTR [[RELN [*NOT*]]]]
                                  [RELN [*HAVE-1*]]
                                  [AGEN ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]]
                                            [IND [INDEX[REF-TYPE [NONANA-PRO]]]
                                                       [VAR #|*|#

[PARAM[PERS  1ST]
      [NUM [SING]]]
```

```
                                                                #|*|#]]]
                                                        [LABEL  *SPEAKER*]]]
                                              [OBJE ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                                        [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                                   [VAR #|*|#

?X01[PARAM[PERS  3RD]
          [NUM [SING]]]
                                                                       #|*|#]
                                                                  [RESTR #|*|#

[[RELN [*FORM-1*]]
 [INST ?X01]
 [ADJUNCT (:LIST)]]
                                                                        #|*|#]]]]]
                                        [ARG1 ?X02]
                                        [ARG2 ?X03]
                                        [ADJUNCT (:LIST)]]]
                          [TENSE [*PRESENT*]]
                          [ARG1 ?X02]
                          [ARG2 ?X04]
                          [ADJUNCT (:LIST)]]]]]]
  [PRAG [[PARAMS []]
        [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                 [LABEL  *HEARER*]]]
        [SPEAKER ?X02]]]]
NIL
```

- Do not VP

```
> (ana3 ''please do not submit the form")
A New Result has been found! [67 steps: 9 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST         please
                               do
                               not
                               submit
                               the
                               form
                        |?X06| )]
        [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  IMPERATIVE]]]
                   [SUBJ (:LIST)]
                   [SPEC (:LIST)]
                   [SUBCAT (:LIST)]
                   [GAP [[IN  ?X01  NONE]
                         [OUT  ?X01]]]]]]]
        [SEM [[CONT [CIRC[RELN [*REQUEST*]]
                         [AGEN ?X07[[IND [[REF-TYPE [NONANA-PRO]]]]
                                   [LABEL  *SPEAKER*]]]
                         [RECP ?X04[[IND [INDEX[REF-TYPE [NONANA-PRO]]
                                               [VAR [PARAM[PERS  2ND]]]]]
                                   [LABEL  *HEARER*]]]
                         [OBJE [CIRC[RELN [*DO-1*]]
                                   [OBJE ?X05[CIRC[RESTR [[RELN [*NOT*]]]]
                                                  [RELN [*SUBMIT-1*]]
                                                  [AGEN ?X04]
                                                  [OBJE ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                                                    [IND #|*|#
```

```
[INDEX[REF-TYPE [COMMON-REF]]
      [VAR ?X02[PARAM[PERS  3RD]
                     [NUM [SING]]]]
      [RESTR [[RELN [*FORM-1*]]
              [INST ?X02]
              [ADJUNCT (:LIST)]]]]
                                                                  #|*|#]]]
                                                [ARG1 ?X04]
                                                [ARG2 ?X03]
                                                [ADJUNCT (:LIST)]]]
                                      [ARG1 ?X04]
                                      [ARG2 ?X05]
                                      [ADJUNCT (:LIST)]]]]]]]
         [PRAG [[PARAMS [[POLITENESS  2]]]
                [HEARER ?X04]
                [SPEAKER ?X07]]]]
NIL
```

Chapter 4

"Please"

4.1 Summary

In order to analyze imperative-structure requests using the word "please," it was necessary to add rules authorizing both "vp please" and "please vp" structures. In the corpus, "please" also attaches to a declarative sentence; an additional rule was required to authorize that structure. "Please" was analyzed as a "greeting word" and added to the lexicon as such.

4.2 Changes made

4.2.1 Lexical entry

```
(deflex-named |please| ``please" greeting
      !word
      !(lex-orth ``please")
      !(greeting-word *polite-request*))
```

4.2.2 Structural rules

```
(defrule sentence =hc*=> (vp greeting)
  (<!m orth> == [ dlist ])
  !specific-to-hc
  !request
  (<!m prag params politeness> == 2)
  !imperative-sent
  !(threading-hc !gap)
  (<!h-dtr syn loc subcat> == (:list)))

(defrule sentence =ch=> (greeting vp)
  (<!m orth> == [ dlist ])
  !specific-to-ch
  !request
  (<!m prag params politeness> == 2)
  !imperative-sent
  !(threading-ch !gap)
  (<!h-dtr syn loc subcat> == (:list)))
```

```
(defrule sentence =hc*=> (sentence greeting)
  !specific-to-hc
  !(threading-hc !gap)
  !phrase
  !simple-coh-principle-1
  (<!h-dtr prag params politeness> == 2)
  (<!h-dtr syn loc subcat> == (:list)))
```

4.3 Example analyses

- Please Request

```
> (ana3 ``please ask us any time")
A New Result has been found! [26 steps: 3 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST          please
                                ask
                                us
                                any
                                time
                        |?X04| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  IMPERATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [GAP [[IN  ?X01  NONE]
                          [OUT  ?X01]]]]]]]
         [SEM [[CONT [CIRC[RELN [*REQUEST*]]
                         [AGEN ?X05[[IND [[REF-TYPE [NONANA-PRO]]]]
                                         [LABEL  *SPEAKER*]]]
                         [RECP ?X02[[IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                         [VAR [PARAM[PERS  2ND]]]]]
                                         [LABEL  *HEARER*]]]
                         [OBJE [CIRC[RESTR [[RELN [*ANY-TIME*]]]]
                                         [RELN [*ASK-1*]]
                                         [AGEN ?X02]
                                         [RECP ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]]
                                                         [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                                         [VAR #|*|#

[PARAM[PERS  1ST]
      [NUM [PLUR]]]
                                                                                 #|*|#]]]]]
                                         [ARG1 ?X02]
                                         [ARG2 ?X03]
                                         [ADJUNCT (:LIST)]]]]]]]
         [PRAG [[PARAMS [[POLITENESS  2]]]
                [HEARER ?X02]
                [SPEAKER ?X05]]]]
NIL
```

- Request please

```
> (ana3 ``submit the form please")
```

```
A New Result has been found! [43 steps: 6 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST          submit
                                the
                                form
                                please
                        |?X05| )]
        [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  IMPERATIVE]]]
                   [SUBJ (:LIST)]
                   [SPEC (:LIST)]
                   [SUBCAT (:LIST)]
                   [GAP [[IN  ?X01  NONE]
                         [OUT  ?X01]]]]]]]
        [SEM [[CONT [CIRC[RELN [*REQUEST*]]
                        [AGEN ?X06[[IND [[REF-TYPE [NONANA-PRO]]]]
                                  [LABEL  *SPEAKER*]]]
                        [RECP ?X04[[IND [INDEX[REF-TYPE [NONANA-PRO]]
                                              [VAR [PARAM[PERS  2ND]]]]]
                                  [LABEL  *HEARER*]]]
                        [OBJE [CIRC[RELN [*SUBMIT-1*]]
                                  [AGEN ?X04]
                                  [OBJE ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                                    [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                                [VAR #|*|#

?X02[PARAM[PERS  3RD]
          [NUM [SING]]]
                                                                     #|*|#]
                                                               [RESTR #|*|#

[[RELN [*FORM-1*]]
 [INST ?X02]
 [ADJUNCT (:LIST)]]
                                                                          #|*|#]]]]]
                                  [ARG1 ?X04]
                                  [ARG2 ?X03]
                                  [ADJUNCT (:LIST)]]]]]]]
        [PRAG [[PARAMS [[POLITENESS  2]]]
              [HEARER ?X04]
              [SPEAKER ?X06]]]]
NIL
```

- Declarative sentence please

```
(ana3 ``i would like to apply for the conference please")
A New Result has been found! [107 steps: 11 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST          i
                                would like
                                to
                                apply
                                for
                                the
                                conference
                                please
                        |?X06| )]
        [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
```

```
                                [VFORM  FIN]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  -]
                    [GAP [[IN  ?X01  NONE]
                          [OUT  ?X01]]]]]]]
          [SEM [[CONT [CIRC[RELN [*DESIRE-1*]]
                      [AGEN ?X04[IND-OBJ[DEFINITENESS [PERSONAL]]
                                       [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                  [VAR [PARAM[PERS  1ST]
                                                              [NUM [SING]]]]]]
                                       [LABEL  *SPEAKER*]]]
                      [OBJE ?X05[CIRC[RELN [*APPLY-1*]]
                                    [AGEN ?X04]
                                    [ARG1 ?X04]
                                    [ARG2 ?X03[CIRC[RELN [*FOR*]]
                                                   [OBJE #|*|#

[IND-OBJ[DEFINITENESS [UNIQUE]]
         [IND [INDEX[REF-TYPE [COMMON-REF]]
                    [VAR ?X02[PARAM[PERS  3RD]
                                   [NUM [SING]]
                                   [SEMF [NONHUMAN]]]]
                    [RESTR [[RELN [*CONFERENCE-1*]]
                            [INST ?X02]
                            [ADJUNCT (:LIST)]]]]]
                                                          #|*|#]]]
                                    [LIMIT ?X03]
                                    [ADJUNCT (:LIST)]]]
                      [TENSE [*PRESENT*]]
                      [ARG1 ?X04]
                      [ARG2 ?X05]
                      [ADJUNCT (:LIST)]]]]]
          [PRAG [[PARAMS [[MODERATE  +]
                         [POLITENESS  2]]]
                 [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *HEARER*]]]
                 [SPEAKER ?X04]]]]
NIL
```

Chapter 5

"There" as a dummy subject

5.1 Summary

Sentences with "there" as dummy subject are analysed as verb phrases lacking a subject. "There," like the "to-inifinitive" in the original analysis, is analyzed as a verb that subcategorizes for a following verbal form that has the semantic content "exists." The semantic reading for these sentences is the assertion of the existence of the noun phrase which follows the copula, here given the label "iden."

5.2 Changes made

5.2.1 Lexical entries

```
(deflex-named |there-V| ''there" dyadic
  !word
  !(key *there-exists*)
  !(takes-vp fin)
  (<!subcat-1 sem cont> == <sem cont arg1>)
  (<!subcat-1 sem cont> == <sem cont obj>)
  (<!subcat-1 sem cont reln> == [*exists*])
  (<syn loc head vform> == there)
  (<syn loc head sent-type> == declarative)
  (<sem cont> == <temp sem cont>)
  (<temp sem cont reln> == <temp key>)
  !(lex-orth ''there"))


(deflex-unit |be-Unit| dyadic
  !v-sem
  !verb
  (:or
    (!(key *identical*)
     !takes-np
     !(dyadic-reln-cases obje iden)
    (!(key *progressive*)
     !(takes-vp prp)
     !subj-control-1
     (<temp sem cont reln> == <temp key>)
     (<temp sem cont obje> == <temp sem cont arg2>))
```

```
    (!(key *modify*)
     !takes-ap
     (<temp sem cont arg1> == <temp sem cont arg2 obj>))
    (!(key *exists*)
      !takes-np
      (<temp sem cont arg1> == <temp sem cont arg2>)
      (<temp sem cont iden> == <temp sem cont arg2>)))
```

Again, this is only a partial representation for "be." In this case, it is the "exists" reading which is of interest.

5.2.2 Structural rules

```
(defrule s =hc*=> (vp)
  !specific-to-h
  !phrase
  !no-gap
  (<syn loc head vform> == there)
  !simple-coh-principle-1
  (<syn loc subj> == (:list))
  (<!h-dtr syn loc spec>   == (:list))
  (<!h-dtr syn loc spec>   == <!m syn loc spec>)
  (<!h-dtr syn loc subcat> == (:list))
  (<!h-dtr syn loc subcat> == <!m syn loc subcat>)
  (<!h-dtr syn loc lex> == -) )
```

5.3 Example analysis

- There VP

```
> (ana3 ''there is a form")
A New Result has been found! [50 steps: 15 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         there
                        is
                        a
                        form
                  |?X05| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  THERE]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN ?X04[]]
                   [OUT ?X04]]]]]]]
  [SEM [[CONT [CIRC[RELN [*THERE-EXISTS*]]
                  [ARG1 ?X03[CIRC[RELN [*EXISTS*]]
                                 [IDEN ?X02[IND-OBJ[DEFINITENESS [ASSERTIVE]]
                                                   [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                              [VAR #|*|#

?X01[PARAM[PERS  3RD]
          [NUM [SING]]]
                                                                        #|*|#]
```

```
                                                                [RESTR #|*|#

[[RELN [*FORM-1*]]
 [INST ?X01]
 [ADJUNCT (:LIST)]]
                                                                        #|*|#]]]]]
                                      [TENSE [*PRESENT*]]
                                      [ARG1 ?X02]
                                      [ARG2 ?X02]
                                      [ADJUNCT (:LIST)]]]
                    [ARG2 ?X03]
                    [OBJ ?X03]
                    [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER [[LABEL  *SPEAKER*]]]
         [HEARER [[LABEL  *HEARER*]]]]]]
NIL
```

Chapter 6

Conjunctive structures

6.1 Summary

The conjoining of sentences and of noun phrases in a variety of relationships was accomplished through the same general procedure: first a conjunction-plus-sentence (or noun phrase) structure was defined by rule. Then the combination of two sentences (or noun phrases) was defined, with the requirement that one of the sentences contain a conjunction. Because the corpus contains conjunctions of both S and S, and S and SENTENCE, two rules are required.

The phrase "well, then" was also analyzed as a conjunction; its appearance within a single-clause sentence is authorized by the rule characterizing sentences with conjunctions. This analysis was chosen because it allowed "well, then" sentences to be analyzed with no further complication of the rule system. Semantically, "well, then" combines the statement of a previous utterance (e.g., "I do not have a form") with the result expressed in the utterance it introduces (e.g., "well, then, I'll send you one"). There is no mechanism for capturing this sort of semantic relationship at present, however, and so the semantic description given for these sentences (below) is somewhat simpler.

Because "well then" in this corpus appears in the context of a following promise (which utilizes at least two sentential levels), it was necessary to differentiate "conjunction" and "s(or sentence)conjunction" in order to ensure that "well, then" appeared at the correct sentential level of the analysis.

The changes made authorize the following structures:

- If S, S
- S, if S
- Well then, S
- NP and NP

6.2 Changes made

6.2.1 Definitional

```
(deffstype conjp (:complex))
(deffstype conj (conjp))
(deffstype sconjp (:complex))
```

```
(deffstype sconj (sconjp))
(deffstype s-complex (:complex))
(deffstype *subord-struct* (s-complex))
(deffstype *result* (illoc-force))

(deffstemp conj nil
  (<!m> == [ conjp ])
  !no-gap
  !sign
  (<syn loc head> == [ head ]))

(deffstemp sconj nil
  (<!m> == [ sconjp ])
  !no-gap
  !sign
  (<syn loc head> == [ head ]))

(defrule conjp == (conj)
  !sign)

(defrule sconjp == (sconj)
  !sign)
```

6.2.2 Lexical entries

```
(deflex-named |if| ``if" sconj
  !word
  !(lex-orth ``if")
  (<sem cont reln> == [*condition*]))

(deflex-named |well-then| ``well then" sconj
  !word
  (<word> == ``well then")
  (<orth> == (:dlist ``well" ``then"))
  (<sem cont reln> == [*in-that-case*])))

(deflex-named |and| ``and" conj
  !word
  !(lex-orth ``and")
  (<sem cont reln> == [*coordination*]))
```

6.2.3 Structural changes: Sentential levels

```
(defrule s =ch=> (sconjp s)
  !specific-to-ch
  !(threading-ch !gap)
  !subordinate-sent
  (<syn loc head vform> == fin)
  !sign
  !simple-coh-principle-1
  (<syn loc subj> == (:list))
  (<!h-dtr syn loc spec>   == (:list))
  (<!h-dtr syn loc spec>   == <!m syn loc spec>)
  (<!m syn loc subcat> == (:list))
  (<!h-dtr syn loc lex> == -)
  (<!c-dtrs rest> == (:list))
```

```
  (<!m sem cont> == <!c-dtr-1 sem cont>)
  (<!h-dtr sem cont> == <!c-dtr-1 sem cont obj>))

(defrule s =ch=> (s s)
  !specific-to-ch
  !(threading-ch !gap)
  !head-fp
  !sign
  !simple-coh-principle-1
  (<!c-dtr-1 !head sent-type> == subordinate)
  (<!m sem cont> == [circ [reln [*subord-struct*]]])
  (<!m sem cont arg1> == <!c-dtr-1 sem cont>)
  (<!m sem cont arg2> == [circ [reln [*result*]]])
  (<!m sem cont arg2 obj> == <!h-dtr sem cont>)
  (<!h-dtr !head sent-type> == declarative)
  (<!c-dtr-1 !c-dtr-1> == [ sconjp ]))

(defrule sentence =ch=> (s sentence)
  !specific-to-ch
  !(threading-ch !gap)
  !head-fp
  !sign
  !simple-coh-principle-1
  (<!c-dtr-1 !head sent-type> == subordinate)
  (<!m sem cont> == [circ [reln [*subord-struct*]]])
  (<!m sem cont arg1> == <!c-dtr-1 sem cont>)
  (<!m sem cont arg2> == [circ [reln [*result*]]])
  (<!m sem cont arg2 obj> == <!h-dtr sem cont>)
  (<!h-dtr !head sent-type> ==  imperative))

(deffstemp subordinate-sent ()
  (<!m !head sent-type> == subordinate))
```

6.2.4 Structural changes: Noun phrase level

```
(defrule np =ch=> (conjp np)
  !specific-to-ch
  !(threading-ch !gap)
  (<!c-dtr-1 sem cont obj2> == <!h-dtr sem cont>)
  (<!m sem cont> == <!c-dtr-1 sem cont>))

(defrule np =ch=> (np np)
  !specific-to-ch
  !(threading-ch !gap)
  !conjunction-rule
  (<!h-dtr !c-dtr-1> == [ conjp ]))

(deffstemp conjunction-rule nil
  !phrase
  !simple-coh-principle-1
  (<!h-dtr syn loc subj> == <!m syn loc subj>)
  (<!h-dtr syn loc spec>   == (:list))
  (<!h-dtr syn loc spec>   == <!m syn loc spec>)
  (<!h-dtr syn loc subcat> == (:list))
  (<!h-dtr syn loc subcat> == <!m syn loc subcat>)
  (<!h-dtr syn loc lex> == -)
  (<!c-dtrs rest> == (:list))
  (<!m sem cont> == <!h-dtr sem cont>)
```

```
  (<!m sem cont  obj1> == <!c-dtr-1 sem cont>))
```

6.3 Example analyses

- If S, S

```
> (ana3 ``if i have a form i will submit a form")
A New Result has been found! [137 steps: 18 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         if
                        i
                        have
                        a
                        form
                        i
                        will
                        submit
                        a
                        form
                  |?X08| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [GAP [[IN  ?X07  NONE]
                    [OUT  ?X07]]]]]]
  [SEM [[CONT [CIRC[RELN [*SUBORD-STRUCT*]]
                   [ARG1 [CIRC[RELN [*CONDITION*]]
                              [OBJ [CIRC[RELN [*HAVE-1*]]
                                         [AGEN ?X01[IND-OBJ[DEFINITENESS [PERSONAL]]
                                                           [IND #|*|#

[INDEX[REF-TYPE [NONANA-PRO]]
      [VAR [PARAM[PERS  1ST]
                 [NUM [SING]]]]]
                                                               #|*|#]
                                                           [LABEL  *SPEAKER*]]]
                                         [OBJE ?X06[IND-OBJ[DEFINITENESS [ASSERTIVE]]
                                                           [IND #|*|#

[INDEX[REF-TYPE [COMMON-REF]]
      [VAR ?X05[PARAM[PERS  3RD]
                     [NUM [SING]]]]
      [RESTR [[RELN [*FORM-1*]]
              [INST ?X05]
              [ADJUNCT (:LIST)]]]]
                                                               #|*|#]]]
                                         [TENSE [*PRESENT*]]
                                         [ARG1 ?X01]
                                         [ARG2 ?X06]
                                         [ADJUNCT (:LIST)]]]]]
                   [ARG2 [CIRC[RELN [*RESULT*]]
                              [OBJ [CIRC[RELN [*PROMISE*]]
                                         [AGEN ?X01]
                                         [RECP ?X09[[IND [[REF-TYPE [NONANA-PRO]]]]
                                                   [LABEL  *HEARER*]]]
```

```
                                        [OBJE ?X04[CIRC[RELN [*SUBMIT-1*]]
                                                      [AGEN ?X01]
                                                      [OBJE #|*|#

?X03[IND-OBJ[DEFINITENESS [ASSERTIVE]]
            [IND [INDEX[REF-TYPE [COMMON-REF]]
                       [VAR ?X02[PARAM[PERS  3RD]
                                     [NUM [SING]]]]
                       [RESTR [[RELN [*FORM-1*]]
                               [INST ?X02]
                               [ADJUNCT (:LIST)]]]]]
                                                           #|*|#]
                                                      [ARG1 ?X01]
                                                      [ARG2 ?X03]
                                                      [ADJUNCT (:LIST)]]]
                                        [TENSE [*PRESENT*]]
                                        [ARG1 ?X01]
                                        [ARG2 ?X04]
                                        [ADJUNCT (:LIST)]]]]]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X09]
         [SPEAKER ?X01]]]]
NIL
```

- Well then, S

```
> (ana3 ''well then i would like to submit a form")
A New Result has been found! [113 steps: 8 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         well
                        then
                        i
                        would like
                        to
                        submit
                        a
                        form
                  |?X06| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  SUBORDINATE]
                           [VFORM  FIN]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [GAP [[IN  ?X05  NONE]
                    [OUT  ?X05]]]]]]]
  [SEM [[CONT [CIRC[RELN [*IN-THAT-CASE*]]
                  [OBJ [CIRC[RELN [*DESIRE-1*]]
                             [AGEN ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]
                                               [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                          [VAR #|*|#

[PARAM[PERS  1ST]
      [NUM [SING]]]
                                                                 #|*|#]]]
                                               [LABEL  *SPEAKER*]]]
                             [OBJE ?X04[CIRC[RELN [*SUBMIT-1*]]
                                            [AGEN ?X02]
                                            [OBJE ?X03[IND-OBJ[DEFINITENESS [ASSERTIVE]]
```

```
                                                                [IND #|*|#

[INDEX[REF-TYPE [COMMON-REF]]
      [VAR ?X01[PARAM[PERS  3RD]
                     [NUM [SING]]]]
      [RESTR [[RELN [*FORM-1*]]
              [INST ?X01]
              [ADJUNCT (:LIST)]]]]
                                                                    #|*|#]]]
                                              [ARG1 ?X02]
                                              [ARG2 ?X03]
                                              [ADJUNCT (:LIST)]]]
                                 [TENSE [*PRESENT*]]
                                 [ARG1 ?X02]
                                 [ARG2 ?X04]
                                 [ADJUNCT (:LIST)]]]]]]]
  [PRAG [[PARAMS [[MODERATE  +]]]
         [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                  [LABEL  *HEARER*]]]
         [SPEAKER ?X02]]]]
NIL
```

- NP and NP

```
> (ana3 ``i have your form and your application")
A New Result has been found! [85 steps: 10 sec.]
Number of results = 2
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        have
                        your
                        form
                        and
                        your
                        application
                 |?X01| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN  ?X02  NONE]
                    [OUT  ?X02]]]]]]
  [SEM [[CONT [CIRC[RELN [*HAVE-1*]]
                   [AGEN ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
                                     [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                [VAR [PARAM[PERS  1ST]
                                                           [NUM [SING]]]]]]
                                     [LABEL  *SPEAKER*]]]
                   [OBJE ?X08[[RELN [*COORDINATION*]]
                              [OBJ1 [IND-OBJ[DEFINITENESS ?X05[POSSESSED]]
                                            [POSSESSOR ?X06[IND-OBJ[DEFINITENESS ?X05]
                                                                   [IND #|*|#

[INDEX[REF-TYPE [NONANA-PRO]]
      [VAR [PARAM[PERS  2ND]]]]
                                                                        #|*|#]
                                                                  [REF-TYPE [NONANA-PRO]]
```

```
                                                        [LABEL  *HEARER*]]]
                                              [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                         [VAR ?X04[PARAM[PERS  3RD]
                                                                      [NUM [SING]]]]
                                                         [RESTR #|*|#

[[RELN [*FORM-1*]]
 [INST ?X04]
 [ADJUNCT (:LIST)]]
                                                                  #|*|#]]]]]
                                    [OBJ2 [IND-OBJ[DEFINITENESS ?X05]
                                                  [POSSESSOR ?X06]
                                                  [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                             [VAR ?X07[PARAM[PERS  3RD]
                                                                          [NUM [MASS]]]]
                                                             [RESTR #|*|#

[[RELN [*APPLICATION-1*]]
 [INST ?X07]
 [ADJUNCT (:LIST)]]
                                                                  #|*|#]]]]]]]
                    [TENSE [*PRESENT*]]
                    [ARG1 ?X03]
                    [ARG2 ?X08]
                    [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X06]
         [SPEAKER ?X03]]]]
```

Chapter 7

Fine tuning

As the potential for analysis was expanded and as new analyses interacted with previously established ones, it became necessary to make adjustments to some present structures to ensure proper integration. In addition, as the English analyses created became more useful to Japanese generation, it also became desirable to make adjustments that would facilitate that usefulness as well as streamline the system.

7.1 Semantic labels and argument types

In that light, the use of semantic labels and argument types was investigated.

First and second personal pronouns receive the semantic label "speaker" and "hearer," respectively. Other third person referring expressions receive the semantic label "none." However, "this" used as a pronoun with a verb having an "identical" argument type, was given the label "speaker" as well. This was to allow the pronoun "this" to be interpreted as the speaker in the context "this is the conference office." However, despite the fact that this is a frequent meaning for "this" in the corpus, in a real language context, it is a rare one. And, in fact, when "this" appears in the interrogative equivalent of that sentence, it refers, *not* to the speaker, but to the hearer; in "is this the conference office?," "this" refers to the hearer. It seems that the identification of "this" with "speaker" is a function of its use in the context of a telephone conversational opening and is more appropriately handled by a discourse analysis that would differentiate among the interactional uses of this utterance.

In a similar way, semantic labels and argument types were used to label "that" as "hearer" in a sentence with argument type "identical." However, in natural English,"that is the conference office" would, in fact, not be used to identify the hearer. Furthermore, in the interrogative form, the use of "that" is actually impolite. Thus, the semantic labelling of "that" as "hearer" is incomplete at best (since additional information is required to characterize the sentence "is that the conference office" as "rude" when using "that" to refer to the hearer), and simply incorrect at worst (since "that is the conference office" does *not* identify the hearer).

Given these difficulties with the analysis of "this" and "that" as "speaker" and "hearer," respectively, that analysis should be abandoned. Once "this" and "that" need no longer be differentiated from other third person referring expressions by use of semantic labels, the need for "semantic label == none" in the analysis is gone. So, too, is the need for sentential argument types such as "identify," since they were used only to characterize the context within which "this" referred to "speaker" (and "that" to "hearer"). This being the case, these structural complications were removed from the system.

This simplification of the system had one further advantage as well. Because of the restriction of "that" to "hearer," the phrase "that is right," a common confirmation statement in the corpus, had to be analyzed as an idiomatic expression. With that restriction removed, "that is right" can simply be analyzed just as any other "NP copula AP" phrase is analyzed.

7.2 Relative clauses

Minor adjustments had to be made to the rule authorizing relative clause structures in order to accurately characterize the index of the clause containing the relative clause. Further, the rule had to be written for NP's rather than for the noun level "undetnom" so that analysis could proceed accurately. The resulting rule is as follows:

```
(defrule np =hc*=> (np srel)
  !specific-to-hc
  !sign
  !head-fp
  (<!m syn loc subj> == <!h-dtr syn loc subj>)
  (<!m syn loc spec> == <!h-dtr syn loc spec>)
  (<!m sem cont ind> == <!h-dtr sem cont ind>)
  (<!m sem cont definiteness> == <!h-dtr sem cont definiteness>)
  (<!m sem cont ind restr> == <!c-dtr-1 sem cont>)
  (<!c-dtr-1 !gapin sem cont2> == <!h-dtr sem cont ind>)
  (<!m !gapout> == <!c-dtr-1 !gapout> == none))
```

Chapter 8

Future directions

While the work reported on here covers some significant aspects of grammatical analysis, clearly a wide range of structures remain to be accounted for.

8.1 Prepositional phrases

In the original system, prepositional phrases could be analyzed as adjuncts to a noun phrase. This accurately reflected the syntactic facts for PP's as adjuncts, but did not give a very informative semantic account. Further, there was no provision for noun phrases or verb phrases selecting for particular prepositions. Additions were made to the system to allow a verb to select for a particular preposition. However, although these rules give an accurate description of the structural situation, it is not clear that they are refined enough yet to give the optimal amount of the semantic contribution of the prepositional phrase to the sentence in which it occurs.

8.1.1 Changes made: Definitional

```
(deflex-unit |apply-Unit| dyadic
  !(key *apply-1*)
  !(takes-pp *for*)
  !(dyadic-reln-cases agen limit)
  !(verb-morph-forms ``apply" ``applies" ``applied" ``applied" ``applying"))
```

8.1.2 Changes made: Structural

```
(deffstemp takes-pp ( %p )
  (<!subcat-1> == [pp])
  (<temp sem cont arg2> == <!subcat-1 sem cont>)
  (<!subcat-1 sem cont reln> == [ %p ])
  !(argn-default arg2)))
```

8.1.3 Example analysis

- NP apply for NP

```
> (ana3 ``i applied for the conference")
```

```
A New Result has been found! [54 steps: 6 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        applied
                        for
                        the
                        conference
                  |?X05| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN ?X04[]]
                   [OUT ?X04]]]]]]]
  [SEM [[CONT [CIRC[RELN [*APPLY-1*]]
                  [AGEN ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
                                    [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                               [VAR [PARAM[PERS  1ST]
                                                          [NUM [SING]]]]]]]
                                    [LABEL  *SPEAKER*]]]
                  [TENSE [*PAST*]]
                  [ARG1 ?X03]
                  [ARG2 ?X02[CIRC[RELN [*FOR*]]
                                 [OBJE [IND-OBJ[DEFINITENESS [UNIQUE]]
                                               [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                          [VAR #|*|#

?X01[PARAM[PERS  3RD]
          [NUM [SING]]
          [SEMF [NONHUMAN]]]
                                                                #|*|#]
                                                              [RESTR #|*|#

[[RELN [*CONFERENCE-1*]]
 [INST ?X01]
 [ADJUNCT (:LIST)]]
                                                                    #|*|#]]]]]]]
                  [LIMIT ?X02]
                  [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER ?X03]
         [HEARER [[LABEL  *HEARER*]]]]]]
NIL
```

Thus, currently, the system will analyze prepositional phrases selected for by verbs, and will analyze prepositional adjuncts of noun phrases. However, the contrary cases must be accommodated as well: verbs with prepositional adjuncts and noun phrases selecting for particular prepositions.

8.2 Conjunction

The analysis for conjunction described above lays the groundwork for the description of many further cases of conjunction and subordination. As these cases are examined, it will become necessary to:

- extend coverage to a wide range of conjunctive lexical items

- streamline the system in order to avoid repetition of rules differentiated only by reference to noun phrase *vs.* sentence
- make provisions to avoid the proliferation of rules stemming from writing separate rules for conjunctive elements occurring sentence-initially and sentence-centrally.

8.3 Intentions

Only a very small number of pragmatic considerations have been built into this system. Certainly it would be possible to write rules characterizing confirmations, suggestions, offers, rejections and the like. Some of these characterizations could have syntactic significance; recall mention made above of the analysis of "well, then" as a conjunctive element, joining the statement of the previous sentence to the result expressed in the sentence in which "well, then" appears. Although the mechanisms for accomplishing this sort of analysis are not yet in place, they could be accommodated in the system and could make use of much more extensive pragmatic descriptions than those existing in the present system. This area, too, as also mentioned above, would be the appropriate place for the analysis of "this" as "speaker" in conversational openings such as "is this the conference office?".

8.4 Additional areas

In the initial stages of the work presented here, a survey was made of all the syntactic constructions in the corpus which could not be accounted for under the then current analysis system. As the work progressed, the goal of analyzing all the utterances of the first conversation became a major motivation (see Appendix B). Even when this was accomplished, however, many areas remained to be included in the system. The ones listed below may serve as a general indication of the extent to which further work remains to be done:

- Adjunct elements which could be called "tloc" ("this month," "a minute") or "sloc" (usually locative prepositional phrases)
- Verbal complements such as "VP that S," " VP if S"
- Question-ref structures with a wide range of question words, including question phrases: how much, what sort of, which NP, when, etc.
- A wide variety of phrases tangential to syntactic structure, but crucial to semantic and discourse analysis: "as far as that goes," "first...," sentence-initial "and"

Chapter 9

Appendix A: Possible original analyses

```
> (ana3 ``i must send you a form")
A New Result has been found! [73 steps: 17 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        must
                        send
                        you
                        a
                        form
                  |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN ?X06[]]
                   [OUT ?X06]]]]]]]
  [SEM [[CONT [CIRC[RELN [*OBLIGATION*]]
                  [OBJE ?X05[CIRC[RELN [*SEND-1*]]
                                 [AGEN ?X04[IND-OBJ[DEFINITENESS [PERSONAL]]
                                                   [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                              [VAR #|*|#

[PARAM[PERS  1ST]
      [NUM [SING]]]
                                                                    #|*|#]]]
                                                   [LABEL  *SPEAKER*]]]
                                 [RECP ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]
                                                   [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                              [VAR #|*|#

[PARAM[PERS  2ND]
      [NUM [SING]]]
                                                                    #|*|#]]]
                                                   [LABEL  *HEARER*]]]
                                 [OBJE ?X03[IND-OBJ[DEFINITENESS [ASSERTIVE]]
                                                   [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                              [VAR #|*|#

?X01[PARAM[PERS  3RD]
          [NUM [SING]]]
```

```
                                                                  #|*|#]
                                                               [RESTR #|*|#

[[RELN [*FORM-1*]]
 [INST ?X01]
 [ADJUNCT (:LIST)]]
                                                                        #|*|#]]]]]
                                    [ARG1 ?X04]
                                    [ARG2 ?X02]
                                    [ARG3 ?X03]
                                    [ADJUNCT (:LIST)]]]
                  [TENSE [*PRESENT*]]
                  [ARG1 ?X04]
                  [ARG2 ?X05]
                  [ADJUNCT (:LIST)]]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER ?X04]
         [HEARER ?X02]]]]
NIL



> (sss 'np)
NP
> (ana3 ``each form for the conference")
A New Result has been found! [47 steps: 1 sec.]
Number of results = 1
Number of equivalents = 1
[NP[ORTH (:DLIST          each
                          form
                          for
                          the
                          conference
                 |?X01| )]
   [SYN [[LOC [[HEAD [NHEAD[CASE [CAS]]]]
              [SUBJ [LIST]]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [WH  -]
              [GAP [[IN ?X04[]]
                    [OUT ?X04]]]]]]]
   [SEM [[CONT [IND-OBJ[DEFINITENESS [SG-UNIVERSAL]]
                       [POSSESSOR []]
                       [IND [INDEX[REF-TYPE [COMMON-REF]]
                                  [VAR ?X03[PARAM[PERS  3RD]
                                                 [NUM [SING]]]]
                                  [RESTR [[RELN [*FORM-1*]]
                                          [INST ?X03]
                                          [ADJUNCT [[FIRST [CIRC[RELN [*FOR*]]
                                                                 [OBJE #|*|#

[IND-OBJ[DEFINITENESS [UNIQUE]]
        [IND [INDEX[REF-TYPE [COMMON-REF]]
                   [VAR ?X02[PARAM[PERS  3RD]
                                  [NUM [SING]]
                                  [SEMF [NONHUMAN]]]]
                   [RESTR [[RELN [*CONFERENCE-1*]]
                           [INST ?X02]
                           [ADJUNCT (:LIST)]]]]]]
                                                                        #|*|#]]]
```

```
                                                        [REST (:LIST)]]]]]]]]]]]]
   [PRAG [[PARAMS []]
          [SPEAKER [[LABEL  *SPEAKER*]]]
          [HEARER [[LABEL  *HEARER*]]]]]]


> (sss 'sentence)
SENTENCE
> (ana3 ''thank you very much")
A New Result has been found! [4 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST          thank
                                you
                                very
                                much
                        |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*THANKING*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  thank-you-very-much]]
NIL


> (sss 's)
S
> (ana3 ''the form is the application")
A New Result has been found! [58 steps: 5 sec.]
Number of results = 2
Number of equivalents = 1
[S[ORTH (:DLIST         the
                        form
                        is
                        the
                        application
                 |?X06| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN ?X05[]]
                    [OUT ?X05]]]]]]]
  [SEM [[CONT [CIRC[RELN [*IDENTICAL*]]
                   [IDEN ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                     [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                [VAR ?X01[PARAM[PERS  3RD]
```

```
                                                          [NUM [SING]]]]
                                                    [RESTR [[RELN [*APPLICATION-1*]]
                                                           [INST ?X01]
                                                           [ADJUNCT (:LIST)]]]]]]]
                        [OBJE ?X04[IND-OBJ[DEFINITENESS [UNIQUE]]
                                         [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                    [VAR ?X02[PARAM[PERS  3RD]
                                                             [NUM [SING]]]]
                                                    [RESTR [[RELN [*FORM-1*]]
                                                           [INST ?X02]
                                                           [ADJUNCT (:LIST)]]]]]]
                        [TENSE [*PRESENT*]]
                        [ARG1 ?X04]
                        [ARG2 ?X03]
                        [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER [[LABEL  *SPEAKER*]]]
         [HEARER [[LABEL  *HEARER*]]]]]]
Number of equivalents = 1
[S[ORTH (:DLIST          the
                         form
                         is
                         the
                         application
                  |?X06| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]
                           [VFORM  FIN]]]
               [SUBJ (:LIST)]
               [SPEC (:LIST)]
               [SUBCAT (:LIST)]
               [LEX  -]
               [GAP [[IN ?X05[]]
                     [OUT ?X05]]]]]]]
  [SEM [[CONT [CIRC[RELN [*IDENTICAL*]]
                        [IDEN ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                         [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                    [VAR ?X01[PARAM[PERS  3RD]
                                                             [NUM [MASS]]]]
                                                    [RESTR [[RELN [*APPLICATION-1*]]
                                                           [INST ?X01]
                                                           [ADJUNCT (:LIST)]]]]]]
                        [OBJE ?X04[IND-OBJ[DEFINITENESS [UNIQUE]]
                                         [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                    [VAR ?X02[PARAM[PERS  3RD]
                                                             [NUM [SING]]]]
                                                    [RESTR [[RELN [*FORM-1*]]
                                                           [INST ?X02]
                                                           [ADJUNCT (:LIST)]]]]]]
                        [TENSE [*PRESENT*]]
                        [ARG1 ?X04]
                        [ARG2 ?X03]
                        [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [SPEAKER [[LABEL  *SPEAKER*]]]
         [HEARER [[LABEL  *HEARER*]]]]]]
NIL


> (ana3 ``do you have any form")
A New Result has been found! [76 steps: 7 sec.]
```

```
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         do
                        you
                        have
                        any
                        form
                  |?X02| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  INTERROGATIVE]
                           [INV  +]
                           [VFORM  FIN]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN ?X01[]]
                   [OUT ?X01]]]]]]]
  [SEM [[CONT [CIRC[RELN [*S-REQUEST*]]
                [AGEN ?X07[[LABEL  *SPEAKER*]]]
                [RECP ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
                                  [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                             [VAR [PARAM[PERS  2ND]
                                                        [NUM [SING]]]]]]
                                  [LABEL  *HEARER*]]]
                [OBJE [[RELN [*INFORM-IF*]]
                       [AGEN ?X03]
                       [RECP ?X07]
                       [OBJE [[RELN [*DO-1*]]
                              [OBJE ?X06[CIRC[RELN [*HAVE-1*]]
                                             [AGEN ?X03]
                                             [OBJE ?X05[IND-OBJ[DEFINITENESS [NONASSERTIV:
                                                               [IND #|*|#

[INDEX[REF-TYPE [COMMON-REF]]
      [VAR ?X04[PARAM[PERS  3RD]
                     [NUM [SING]]]]
      [RESTR [[RELN [*FORM-1*]]
              [INST ?X04]
              [ADJUNCT (:LIST)]]]]
                                                                    #|*|#]]]
                                             [ARG1 ?X03]
                                             [ARG2 ?X05]
                                             [ADJUNCT (:LIST)]]]
                              [TENSE [*PRESENT*]]
                              [ARG1 ?X03]
                              [ARG2 ?X06]]]]]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X03]
         [SPEAKER ?X07]]]]
NIL


> (sss 'sentence)
SENTENCE
> (ana3 ``submit the form")
A New Result has been found! [42 steps: 3 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST          submit
                                the
                                form
```

```
                    |?X05| )]
          [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  IMPERATIVE]]]
                     [SUBJ (:LIST)]
                     [SPEC (:LIST)]
                     [SUBCAT (:LIST)]
                     [GAP [[IN  ?X01  NONE]
                           [OUT  ?X01]]]]]]]
          [SEM [[CONT [CIRC[RELN [*REQUEST*]]
                           [AGEN ?X06[[IND [[REF-TYPE [NONANA-PRO]]]]
                                     [LABEL  *SPEAKER*]]]
                           [RECP ?X04[[IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                 [VAR [PARAM[PERS  2ND]]]]]
                                     [LABEL  *HEARER*]]]
                           [OBJE [CIRC[RELN [*SUBMIT-1*]]
                                     [AGEN ?X04]
                                     [OBJE ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                                       [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                                  [VAR #|*|#

?X02[PARAM[PERS  3RD]
           [NUM [SING]]]
                                                                      #|*|#]
                                                                 [RESTR #|*|#

[[RELN [*FORM-1*]]
 [INST ?X02]
 [ADJUNCT (:LIST)]]
                                                                        #|*|#]]]]]
                                     [ARG1 ?X04]
                                     [ARG2 ?X03]
                                     [ADJUNCT (:LIST)]]]]]]]
          [PRAG [[PARAMS [[POLITENESS  1]]]
                 [HEARER ?X04]
                 [SPEAKER ?X06]]]]
NIL
```

Chapter 10

Appendix B: Analyses of Conversation A

```
> (ana3 ''hello")
A New Result has been found! [4 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST         hello
                       |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*OPEN-DIALOGUE*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  hello]]
NIL


> (ana3 ''is this the conference office")
A New Result has been found! [83 steps: 8 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         is
                        this
                        the
                        conference
                        office
                  |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [INV  +]
                           [SENT-TYPE  INTERROGATIVE]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN  ?X06  NONE]
                   [OUT  ?X06]]]]]]]
```

```
  [SEM [[CONT [CIRC[RELN [*S-REQUEST*]]
                  [AGEN ?X05[[IND [[REF-TYPE [NONANA-PRO]]]]
                            [LABEL  *SPEAKER*]]]
                  [RECP ?X04[[IND [[REF-TYPE [NONANA-PRO]]]]
                            [LABEL  *HEARER*]]]
                  [OBJE [[RELN [*INFORM-IF*]]
                         [AGEN ?X04]
                         [RECP ?X05]
                         [OBJE [[RELN [*IDENTICAL*]]
                                [IDEN ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                                  [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                             [VAR #|*|#

?X01[PARAM[PERS  3RD]
          [NUM [SING]]]
                                                                  #|*|#]
                                                            [RESTR #|*|#

[[RELN [*CONFERENCE-OFFICE-1*]]
 [INST ?X01]
 [ADJUNCT (:LIST)]]
                                                                    #|*|#]]]]]
                                [OBJE ?X02[IND-OBJ[DEFINITENESS [PROXIMAL]]
                                                  [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                             [VAR #|*|#

[PARAM[PERS  3RD]
      [NUM [SING]]]
                                                                 #|*|#]]]]]
                                [TENSE [*PRESENT*]]
                                [ARG1 ?X02]
                                [ARG2 ?X03]]]]]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X04]
         [SPEAKER ?X05]]]]
NIL



> (ana3 ``yes")
A New Result has been found! [4 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST         yes
                      |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*AFFIRMATIVE*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                               [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                              [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  yes]]
NIL
```

```
> (ana3 ''thats right")
A New Result has been found! [4 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST         thats
                               right
                      |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*CONFIRMATION*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  that-is-right]]
NIL


> (ana3 ''i would like to apply for the conference")
A New Result has been found! [102 steps: 21 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        would like
                        to
                        apply
                        for
                        the
                        conference
                |?X06| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN  ?X05  NONE]
                    [OUT  ?X05]]]]]]
  [SEM [[CONT [CIRC[RELN [*DESIRE-1*]]
                   [AGEN ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]
                                     [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                [VAR [PARAM[PERS  1ST]
                                                            [NUM [SING]]]]]]
                                     [LABEL  *SPEAKER*]]]
                   [OBJE ?X04[CIRC[RELN [*APPLY-1*]]
                                  [AGEN ?X02]
                                  [RECP ?X03[IND-OBJ[DEFINITENESS [UNIQUE]]
                                                    [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                                [VAR #|*|#

?X01[PARAM[PERS  3RD]
          [NUM [SING]]
```

```
          [SEMF [NONHUMAN]]]
                                                                  #|*|#]
                                                               [RESTR #|*|#

[[RELN [*CONFERENCE-1*]]
 [INST ?X01]
 [ADJUNCT (:LIST)]]
                                                                    #|*|#]]]]]
                                    [ARG1 ?X02]
                                    [ARG2 ?X03]
                                    [ADJUNCT (:LIST)]]]
                   [TENSE [*PRESENT*]]
                   [ARG1 ?X02]
                   [ARG2 ?X04]
                   [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS [[MODERATE  +]]]
         [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                  [LABEL  *HEARER*]]]
         [SPEAKER ?X02]]]]
NIL



> (ana3 ''do you already have a registration form")
A New Result has been found! [103 steps: 11 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         do
                        you
                        already
                        have
                        a
                        registration
                        form
                |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [INV  +]
                           [SENT-TYPE  INTERROGATIVE]]]
             [SUBJ (:LIST)]
             [SPEC (:LIST)]
             [SUBCAT (:LIST)]
             [LEX  -]
             [GAP [[IN  ?X06  NONE]
                   [OUT  ?X06]]]]]]]
  [SEM [[CONT [CIRC[RELN [*S-REQUEST*]]
                   [AGEN ?X05[[IND [[REF-TYPE [NONANA-PRO]]]]
                             [LABEL  *SPEAKER*]]]
                   [RECP ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]
                                     [IND [INDEX[REF-TYPE [NONANA-PRO]]]
                                                [VAR [PARAM[PERS  2ND]
                                                           [NUM [SING]]]]]]
                                     [LABEL  *HEARER*]]]
                   [OBJE [[RELN [*INFORM-IF*]]
                          [AGEN ?X02]
                          [RECP ?X05]
                          [OBJE [[RELN [*DO-1*]]
                                 [OBJE ?X04[CIRC[RESTR [[RELN [*ALREADY*]]]]
                                                [RELN [*HAVE-1*]]]
                                                [AGEN ?X02]
                                                [OBJE ?X03[IND-OBJ[DEFINITENESS [ASSERTIVE]]
                                                                  [IND #|*|#
```

```
[INDEX[REF-TYPE [COMMON-REF]]
      [VAR ?X01[PARAM[PERS  3RD]
                     [NUM [SING]]]]
      [RESTR [[RELN [*REGISTRATION-FORM-1*]]
              [INST ?X01]
              [ADJUNCT (:LIST)]]]]
                                                                  #|*|#]]]
                                                [ARG1 ?X02]
                                                [ARG2 ?X03]
                                                [ADJUNCT (:LIST)]]]
                                  [TENSE [*PRESENT*]]
                                  [ARG1 ?X02]
                                  [ARG2 ?X04]]]]]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X02]
         [SPEAKER ?X05]]]]
NIL


> (ana3 ''no")
A New Result has been found! [18 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST         no
                       |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*NEGATIVE*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  no]]
NIL


> (ana3 ''not yet")
A New Result has been found! [29 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST         not
                               yet
                       |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*NOT-YET*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
```

```
                          [LABEL  *SPEAKER*]]]
                 [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  not-yet]]
NIL



> (ana3 ''i see")
A New Result has been found! [30 steps: 3 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST         i
                               see
                        |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*CONFIRMATION*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  I-see]]
NIL



> (ana3 ''well then i will send you a registration form")
A New Result has been found! [134 steps: 117 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         well
                        then
                        i
                        will
                        send
                        you
                        a
                        registration
                        form
                 |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  SUBORDINATE]
                           [VFORM  FIN]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [GAP [[IN  ?X06  NONE]
                    [OUT  ?X06]]]]]]]
  [SEM [[CONT [CIRC[RELN [*IN-THAT-CASE*]]
                   [OBJ [CIRC[RELN [*PROMISE*]]
                              [AGEN ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
                                                [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                           [VAR #|*|#
```

```
[PARAM[PERS  1ST]
      [NUM [SING]]]
                                                        #|*|#]]]
                                          [LABEL  *SPEAKER*]]]
                              [RECP ?X01[IND-OBJ[DEFINITENESS [PERSONAL]]
                                          [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                     [VAR #|*|#

[PARAM[PERS  2ND]
      [NUM [SING]]]
                                                        #|*|#]]]
                                          [LABEL  *HEARER*]]]
                              [OBJE ?X05[CIRC[RELN [*SEND-1*]]
                                          [AGEN ?X03]
                                          [RECP ?X01]
                                          [OBJE ?X04[IND-OBJ[DEFINITENESS [ASSERTIVE]]
                                                     [IND #|*|#

[INDEX[REF-TYPE [COMMON-REF]]
      [VAR ?X02[PARAM[PERS  3RD]
                  [NUM [SING]]]]
      [RESTR [[RELN [*REGISTRATION-FORM-1*]]
              [INST ?X02]
              [ADJUNCT (:LIST)]]]]
                                                              #|*|#]]]
                                          [ARG1 ?X03]
                                          [ARG2 ?X01]
                                          [ARG3 ?X04]
                                          [ADJUNCT (:LIST)]]]
                              [TENSE [*PRESENT*]]
                              [ARG1 ?X03]
                              [ARG2 ?X05]
                              [ADJUNCT (:LIST)]]]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X01]
         [SPEAKER ?X03]]]]
NIL


> (ana3 ''may i have your name and your address please")
A New Result has been found! [102 steps: 9 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST         may
                               i
                               have
                               your
                               name
                               and
                               your
                               address
                               please
                       |?X09| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  INTERROGATIVE]
                                 [INV  +]
                                 [VFORM  FIN]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  -]
```

```
                    [GAP [[IN  ?X01  NONE]
                          [OUT  ?X01]]]]]]]
          [SEM [[CONT [CIRC[RELN [*S-REQUEST*]]
                         [AGEN ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]
                                          [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                     [VAR [PARAM[PERS  1ST]
                                                                [NUM [SING]]]]]]
                                          [LABEL  *SPEAKER*]]]
                         [RECP ?X05[IND-OBJ[DEFINITENESS ?X04[POSSESSED]]
                                          [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                                     [VAR [PARAM[PERS  2ND]]]]]
                                          [REF-TYPE [NONANA-PRO]]
                                          [LABEL  *HEARER*]]]
                         [OBJE [[RELN [*INFORM-IF*]]
                                [AGEN ?X05]
                                [RECP ?X02]
                                [OBJE [[RELN [*PERMISSION*]]
                                       [OBJE ?X08[CIRC[RELN [*HAVE-1*]]
                                                      [AGEN ?X02]
                                                      [OBJE #|*|#

?X07[[RELN [*COORDINATION*]]
     [OBJ1 [IND-OBJ[DEFINITENESS ?X04]
                   [POSSESSOR ?X05]
                   [IND [INDEX[REF-TYPE [COMMON-REF]]
                              [VAR ?X03[PARAM[PERS  3RD]
                                              [NUM [SING]]]]
                              [RESTR [[RELN [*NAME-1*]]
                                      [INST ?X03]
                                      [ADJUNCT (:LIST)]]]]]]
     [OBJ2 [IND-OBJ[DEFINITENESS ?X04]
                   [POSSESSOR ?X05]
                   [IND [INDEX[REF-TYPE [COMMON-REF]]
                              [VAR ?X06[PARAM[PERS  3RD]
                                              [NUM [SING]]]]
                              [RESTR [[RELN [*ADDRESS-1*]]
                                      [INST ?X06]
                                      [ADJUNCT (:LIST)]]]]]]]]
                                                           #|*|#]
                                                      [ARG1 ?X02]
                                                      [ARG2 ?X07]
                                                      [ADJUNCT (:LIST)]]]
                                       [TENSE [*PRESENT*]]
                                       [ARG1 ?X02]
                                       [ARG2 ?X08]]]]]]]]]
          [PRAG [[PARAMS [[POLITENESS  2]]]
                [HEARER ?X05]
                [SPEAKER ?X02]]]]
NIL


> (ana3 ''my address is 23 chaya-machi kita-ku osaka")
A New Result has been found! [49 steps: 5 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST        my
                       address
                       is
                       23
                       chayamachi
```

```
                        kitaku
                        osaka
                   |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN  ?X06  NONE]
                    [OUT  ?X06]]]]]]]
  [SEM [[CONT [CIRC[RELN [*IDENTICAL*]]
                   [IDEN ?X05[IND-OBJ[DEFINITENESS [UNIQUE]]
                                     [IND [INDEX[REF-TYPE [NAME-REF]]
                                                [VAR ?X03[PARAM[PERS  3RD]]]
                                                [RESTR [[RELN [*23-CHAYA-MACHI-KITA-KU-OSAKA:
                                                        [INST ?X03]]]]]]]
                   [OBJE ?X04[IND-OBJ[DEFINITENESS ?X02[POSSESSED]]
                                     [POSSESSOR ?X08[IND-OBJ[DEFINITENESS ?X02]
                                                            [IND #|*|#

[INDEX[REF-TYPE [NONANA-PRO]]
      [VAR [PARAM[PERS  1ST]
                 [NUM [SING]]]]]
                                                                #|*|#]
                                                            [REF-TYPE [NONANA-PRO]]
                                                            [LABEL  *SPEAKER*]]]
                                     [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                [VAR ?X01[PARAM[PERS  3RD]
                                                               [NUM [SING]]]]
                                                [RESTR [[RELN [*ADDRESS-1*]]
                                                        [INST ?X01]
                                                        [ADJUNCT (:LIST)]]]]]]]
                   [TENSE [*PRESENT*]]
                   [ARG1 ?X04]
                   [ARG2 ?X05]
                   [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                  [LABEL  *HEARER*]]]
         [SPEAKER ?X08]]]]
NIL


> (ana3 ''my name is mayumi suzuki")
A New Result has been found! [49 steps: 4 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         my
                        name
                        is
                        mayumi
                        suzuki
                  |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
```

```
              [GAP [[IN  ?X06  NONE]
                    [OUT  ?X06]]]]]]]
  [SEM [[CONT [CIRC[RELN [*IDENTICAL*]]
                  [IDEN ?X05[IND-OBJ[DEFINITENESS [UNIQUE]]
                                    [IND [INDEX[REF-TYPE [NAME-REF]]
                                               [VAR ?X03[PARAM[PERS  3RD]]]
                                               [RESTR [[RELN [*MAYUMI-SUZUKI*]]
                                                       [INST ?X03]]]]]]]
                  [OBJE ?X04[IND-OBJ[DEFINITENESS ?X02[POSSESSED]]
                                    [POSSESSOR ?X08[IND-OBJ[DEFINITENESS ?X02]
                                                           [IND #|*|#

[INDEX[REF-TYPE [NONANA-PRO]]
      [VAR [PARAM[PERS  1ST]
                 [NUM [SING]]]]]
                                                                #|*|#]
                                                          [REF-TYPE [NONANA-PRO]]
                                                          [LABEL  *SPEAKER*]]]
                                    [IND [INDEX[REF-TYPE [COMMON-REF]]
                                               [VAR ?X01[PARAM[PERS  3RD]
                                                              [NUM [SING]]]]
                                               [RESTR [[RELN [*NAME-1*]]
                                                       [INST ?X01]
                                                       [ADJUNCT (:LIST)]]]]]]]
                  [TENSE [*PRESENT*]]
                  [ARG1 ?X04]
                  [ARG2 ?X05]
                  [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                  [LABEL  *HEARER*]]]
         [SPEAKER ?X08]]]]
NIL


> (ana3 ``i will send you a registration form immediately")
A New Result has been found! [136 steps: 112 sec.]
Number of results = 1
Number of equivalents = 1
[S[ORTH (:DLIST         i
                        will
                        send
                        you
                        a
                        registration
                        form
                        immediately
                |?X07| )]
  [SYN [[LOC [[HEAD [VHEAD[VFORM  FIN]
                           [SENT-TYPE  DECLARATIVE]]]
              [SUBJ (:LIST)]
              [SPEC (:LIST)]
              [SUBCAT (:LIST)]
              [LEX  -]
              [GAP [[IN  ?X06  NONE]
                    [OUT  ?X06]]]]]]
  [SEM [[CONT [CIRC[RELN [*PROMISE*]]
                  [AGEN ?X01[IND-OBJ[DEFINITENESS [PERSONAL]]
                                    [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                               [VAR [PARAM[PERS  1ST]
```

```
                                                          [NUM [SING]]]]]]
                                    [LABEL  *SPEAKER*]]]
                  [RECP ?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
                                    [IND [INDEX[REF-TYPE [NONANA-PRO]]
                                               [VAR [PARAM[PERS  2ND]
                                                          [NUM [SING]]]]]]
                                    [LABEL  *HEARER*]]]
                  [OBJE ?X05[CIRC[RESTR [[RELN [*IMMEDIATELY*]]]]
                                 [RELN [*SEND-1*]]
                                 [AGEN ?X01]
                                 [RECP ?X03]
                                 [OBJE ?X04[IND-OBJ[DEFINITENESS [ASSERTIVE]]
                                                   [IND [INDEX[REF-TYPE [COMMON-REF]]
                                                              [VAR #|*|#

?X02[PARAM[PERS  3RD]
          [NUM [SING]]]
                                                                   #|*|#]
                                                             [RESTR #|*|#

[[RELN [*REGISTRATION-FORM-1*]]
 [INST ?X02]
 [ADJUNCT (:LIST)]]
                                                                      #|*|#]]]]]
                                 [ARG1 ?X01]
                                 [ARG2 ?X03]
                                 [ARG3 ?X04]
                                 [ADJUNCT (:LIST)]]]
                  [TENSE [*PRESENT*]]
                  [ARG1 ?X01]
                  [ARG2 ?X05]
                  [ADJUNCT (:LIST)]]]]]
  [PRAG [[PARAMS []]
         [HEARER ?X03]
         [SPEAKER ?X01]]]]
NIL


> (ana3 ''if there is something that you do not understand please ask us any time")
A New Result has been found! [195 steps: 40 sec.]
Number of results = 1
Number of equivalents = 1
[SENTENCE[ORTH (:DLIST          if
                                there
                                is
                                something
                                that
                                you
                                do
                                not
                                understand
                                please
                                ask
                                us
                                any
                                time
                       |?X09| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  IMPERATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
```

```
                    [SUBCAT (:LIST)]
                    [GAP [[IN  ?X01  NONE]
                          [OUT  ?X01]]]]]]]
          [SEM [[CONT [CIRC[RELN [*SUBORD-STRUCT*]]
                      [ARG1 [CIRC[RELN [*CONDITION*]]
                                [OBJ [CIRC[RELN [*THERE-EXISTS*]]
                                          [ARG1 ?X08[CIRC[RELN [*EXISTS*]]
                                                        [IDEN #|*|#

?X07[[DEFINITENESS [ASSERTIVE]]
     [IND ?X04[INDEX[REF-TYPE [NONANA-PRO]]
                    [VAR [PARAM[PERS  3RD]
                               [NUM [SING]]
                               [SEMF [NONHUMAN]]]]
                    [RESTR [CIRC[RELN [*DO-1*]]
                                [OBJE ?X06[CIRC[RESTR [[RELN [*NOT*]]]]
                                          [RELN [*UNDERSTAND-1*]]
                                          [AGEN ?X02[IND-OBJ[DEFINITENESS [PERSONAL]]
                                                            [IND #|**|#

[INDEX[REF-TYPE [NONANA-PRO]]
      [VAR [PARAM[PERS  2ND]
                 [NUM [SING]]]]]
                                                               #|**|#]
                                                            [LABEL  *HEARER*]]]
                                          [OBJE ?X05[[DEFINITENESS [PERSONAL]]
                                                    [IND #|**|#

[[REF-TYPE [PRONOMINAL]]]
                                                         #|**|#]
                                                      [REFERS ?X04]]]
                                          [ARG1 ?X02]
                                          [ARG2 ?X05]
                                          [ADJUNCT (:LIST)]]]
                               [TENSE [*PRESENT*]]
                               [ARG1 ?X02]
                               [ARG2 ?X06]
                               [ADJUNCT (:LIST)]]]]]]
                                                            #|*|#]
                                                         [TENSE [*PRESENT*]]
                                                         [ARG1 ?X07]
                                                         [ARG2 ?X07]
                                                         [ADJUNCT (:LIST)]]]
                                          [ARG2 ?X08]
                                          [ADJUNCT (:LIST)]
                                          [OBJ ?X08]]]]]
                          [ARG2 [CIRC[RELN [*RESULT*]]
                                     [OBJ [CIRC[RELN [*REQUEST*]]
                                               [AGEN ?X10[[IND #|*|#

[[REF-TYPE [NONANA-PRO]]]
                                                         #|*|#]
                                                      [LABEL  *SPEAKER*]]]
                                          [RECP ?X02]
                                          [OBJE [CIRC[RESTR #|*|#

[[RELN [*ANY-TIME*]]]
                                                            #|*|#]
                                                      [RELN [*ASK-1*]]
                                                      [AGEN ?X02]
                                                      [RECP #|*|#
```

```
?X03[IND-OBJ[DEFINITENESS [PERSONAL]]
            [IND [INDEX[REF-TYPE [NONANA-PRO]]
                       [VAR [PARAM[PERS  1ST]
                                  [NUM [PLUR]]]]]]]
                                                        #|*|#]
                                                  [ARG1 ?X02]
                                                  [ARG2 ?X03]
                                                  [ADJUNCT (:LIST)]]]]]]]]]]]
         [PRAG [[PARAMS [[POLITENESS  2]]]
                [HEARER ?X02]
                [SPEAKER ?X10]]]]
NIL


> (ana3 ``thank you very much")
A New Result has been found! [4 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST          thank
                                you
                                very
                                much
                       |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*THANKING*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *HEARER*]]]]]
         [TEMP [[KEY ?X03]]]
         [ID  thank-you-very-much]]
NIL


> (ana3 ``goodbye")
A New Result has been found! [4 steps: 0 sec.]
Number of results = 1
Number of equivalents = 1
[GREETING[ORTH (:DLIST          goodbye
                       |?X01| )]
         [SYN [[LOC [[HEAD [VHEAD[SENT-TYPE  DECLARATIVE]]]
                    [SUBJ (:LIST)]
                    [SPEC (:LIST)]
                    [SUBCAT (:LIST)]
                    [LEX  +]
                    [GAP [[IN  ?X02  NONE]
                          [OUT  ?X02]]]]]]]
         [SEM [[CONT [CIRC[RELN ?X03[*CLOSE-DIALOGUE*]]]]]]
         [PRAG [[SPEAKER [[IND [[REF-TYPE [NONANA-PRO]]]]
                          [LABEL  *SPEAKER*]]]
                [HEARER [[IND [[REF-TYPE [NONANA-PRO]]]]
                         [LABEL  *HEARER*]]]]]
```

```
            [TEMP [[KEY ?X03]]]
            [ID  goodbye]]
NIL
```