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# ASURA フレームワークによる英日変換

友清睦子　　鈴木雅実
ATR 音声翻訳通信研究所
(619-02) 京都府相楽群精華町光台２－２

あらまし

ASURA フレームワークによる英日変換は、書換えエンジンと書換規則によってなされる。書換規則は英日間の言語現象の差を規則で定義したものである。この規則は、IFT という中間言語をもっているが、発話の力を類別した一種のラベルである。IFT は、文中に遂行動詞の存在を仮定し、命題部分の構造的意味的検討をすることによって決定される。本稿は、その IFT 決定方法と言語学的検証について述べる。

和文キーワード

発話の力、遂行動詞、命題内容、書換えシステム、書換規則、発話行為、音声言語

# English-Japanese Transfer within ASURA Framework

Mutsuko Tomokiyo Masami Suzuki
E-mail tomokiyo@atr-la.atr.co.jp
ATR Interpreting Telecommunications Research Laboratories
2-2 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-02 Japan

Abstract

English-Japanese transfer is performed through Illocutionary force types which are intermediary concept between two languages: input data is feature structures from analysis results which are produced by the HPSG and unification grammars. The top level in semantic representation of a sentence is IFT. Input feature structures are changed into feature structures for target language feature structures by rewriting rules on transfer phase.

Almost of rewriting rules are defined with in and out. in represents logico-semantic pattern with which should be made pattern match operations of actually incoming logico-semantic pattern of source text. out represents logico-semantic pattern to be output of target language.

Transfer task bases on formalizing differences of semantic representation between source and target languages, by checking whole a sentence.

英文 key words: illocutionary force (IFT), performative clause, propositional content, rewriting system(RWS), speech act, spoken Japanese

# 1 Introduction

This paper aims to describe IFT determination as well as the overview of English-Japanese transfer within ASURA system[1].

Transfer processes base on firstly extracting necessary information from analysis results, secondarily applying rewriting rules, finally outputting transfer results to generation phase. Transfer from English to Japanese consists largely in semantic transfer and pragmatic transfer. The former is performed by intermediate languages which are invented as illocutionary force type[2]. This comes at the top level of the semantic representation and its object is verbs of main sentence or such grammatical issues as the interrogative, negative, etc. Pragmatic transfer consists in changing communicative conditions between English and Japanese languages.

Transfer by IFT depends on which kind of IFTs are extracted from semantic feature structures. The good point of this method is to be able to neutralize syntactic differences existing between source and target languages in transfer process. The problem is that there exists difficulty in determining unique IFT from extracted information. For example, grammatical negation is not necessarily negation from the viewpoint of IFT and also interrogative utterance is not necessarily questions from speaker. Each of IFT labels should be conditioned with pertinent details, when a IFT is determined.

Properly speaking, transfer rules should be rules to be applied beyond one sentence: sentences as an utterance should be taken up as transfer unit, at least a unit of 2 sentences, or caller-and- receptionist utterance unit in our task domain.

We will have two steps as transfer phase activities: firstly, application of sentence-by-sentence transfer rules, secondarily application of rules concerning the sentence units in future.

Our task domain is telephone conversation of which topic is limited to inquiries about international conference. Speakers on telephone are a caller and receptionist of the conference office.

# 2 Rewriting system and rules

Rewriting system is a system in which feature structures from analysis component are rewritten with rules defined by unique formulae.

## 2.1 Rewriting rules

We will give simple explanations about the rewriting rules formulae and its use. The rewriting rules are constituted with rule index, rule definition and rule body.

*e.g.* expect-vt-1

```
(rew:defrwschema2 def528 V EX                                    rule index
" on <OBJE RELN> expect-vt-1in :phase :E-J :type :default
in = [[RELN unknown-IFT]                                         rule definition
      [AGEN ?agen]
      [RECP ?recp]
      [OBJE [[RELN expect-vt-1]
             [SUBJ ?subj]
             [OBJE ?obje]                                        rule body
             [COMPLEMENT ?complement]
              ?rest]]]
  SET PARAMETER :IFT :INFORM
out = [[RELN inform]
       [OBJE [[RELN yoteisuru-1]
              [SUBJ ?subj]
              [OBJE ?obje]
              [COMPLEMENT ?complement]
                  ?rest]]]
end")                                                            (RW.1)
```

Rule definition is constituted with feature path name: ⟨OBJE RELN⟩, lexie: expect-vt-1, rule application condition: in :PHASE :E-J :TYPE :default.

Rule body is constituted with in and out.

in, the right-hand side of an equation is semantic feature structure as input and out is semantic feature structure as output. Analysis results of source language are checked by pattern matching operations with

[1]Transfer system was developed by T. Hasegawa as Japanese-English transfer system in November of 1990 in ATR.

[2]Illocutionary force type (IFT) will be mentioned later.

feature structures of in portion. When pattern matching is successfully made, input feature structures are rewritten into such feature structures as shown by out feature structures. Feature structures of out portion are target language structure corresponding to source text.

## 2.2 Main rule and others

Rules are built to rewrite purposively analysis results into generation input forms. They are rules which bridge between source and target languages by rewriting feature structures, since semantic representation is formalized through feature and value system. Input feature structures represent semantic structure of source language and output is one of target language.

Rules are classified into 3: main rule, lexical rules and others.

Firstly main rule is used to specify rule application order and way: recursively, loop or once.[1][2] It also set up an environment for IFT, which is specified at the transfer phase. Assume that input feature structure which is object of the transfer is as follows:

*e.g.* This is the conference office.

```
[[SEM [[RELN BE-VI-5]
       [ASPT STAT]
       [TENSE PRESENT]
       [OBJE [[RELN THIS-PRON-1]]]
       [IDEN [[RELN NAMED]
              [IDEN [[RELN CONFERENCE_OFFICE-1]
                     [INDEX [[DETEM SPECIFIED]
                             [GENDER NEUT]
                             [PERSONA 3RD]
                             [NUMBER SING]]]]]]]]]
 [PRAG [[HEARER !X3]
        [SPEAKER !X2]]]]
            (input from analysis component)
```

Main rule is setting up rule application environment for IFT in (RW.2) and transcribes SEM portion of input feature structures into following structures:

```
[[SEM [[RELN  UNKNOWN-IFT]                          .........setting IFT
       [AGEN ?X2[[LABEL *SPEAKER*]]]
       [RECP ?X3[[LABEL *HEARER*]]]
       [OBJE [[RELN BE-VI-5]                         .........coming from analysis component
              [ASPT STAT]
              [TENSE PRESENT]
              [OBJE [[RELN THIS-PRON-1]]]
              [IDEN [[RELN NAMED]
                     [IDEN [[RELN CONFERENCE_OFFICE-1]
                            [INDEX [[DETEM SPECIFIED]
                                    [GENDER NEUT]
                                    [PERSONA 3RD]
                                    [NUMBER SING]]]]]]]]]
 [PRAG [[HEARER !X3]
        [SPEAKER !X2]]]]
          ( RW.2)
```

The value UNKNOWN-IFT is at the top of the semantic representation and [RELN BE-VI-5] is dominated under UNKNOWN-IFT. And UNKNOWN-IFT will be filled by IFT label later. SPEAKER and HEARER labels are also set up for AGEN and RECP. This means that AGEN and RECP are filled up with SPEAKER and HEARER.

Secondarily, lexical rules are used to transfer English into Japanese.

Finally, IFT rules, tense and aspect calculation rules, politeness calculation rules, idiom rules...etc. are there. The rules, excepting main rule are constituted with following features and values:

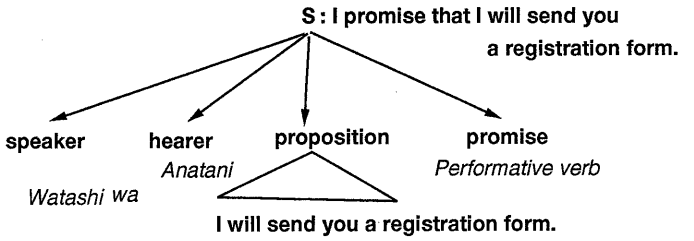
sem feature has relation name, tense, aspect and obligatory arguments of verbs as its values. prag has hearer, speaker, topicalization, presupposition, politenee,..etc. as its values.

## 3 *Illocutionary force* types (IFT)

Illocutionary force is defined in this paper as performative force of utterances, which is produced while speaking of things, actions or matters as speech act. It can be classified into some groups and each group name is IFT(Illocutionary force type). IFT is given per sentence and used to determine S2 level, which is the top level of semantic representation in generation phase. In generation phase, S2 rule[3] is located at the top level of phrase structure and transfer results firstly is tried to take a match with it.[6]

### 3.0.1 *Illocutionary force*

Sentence is analyzed into performative verb portion and propositional content portion. The propositional content is assumed to be embedded in the performative verb clause, although in general the performative verb clause is omitted in real conversation, because speaker's existence itself promises speech performances. The *Illocutionary force* depends on the peformative verb and the propositional content.




**(fig.2)**

We call such a verb as promise in (fig.2) the performative verb and proposition in (fig.2) the propositional content.

IFT is determined by considering the performative verb, the propositional content and grammatical information synthetically. Grammatical information serves to specify the propositional content. Additionally, IFT is valid under conditions, called preparatory conditions. Preparatory conditions limit environment of the conversation: conversationistes are a receptioniste of conference and questioner about the conference in our task domain. This is telephonic conversation.

### 3.0.2 Sentence classification

In order to determine IFT, firstly sentence is classified into declarative, interrogative, imperative, causative or passive sentences.

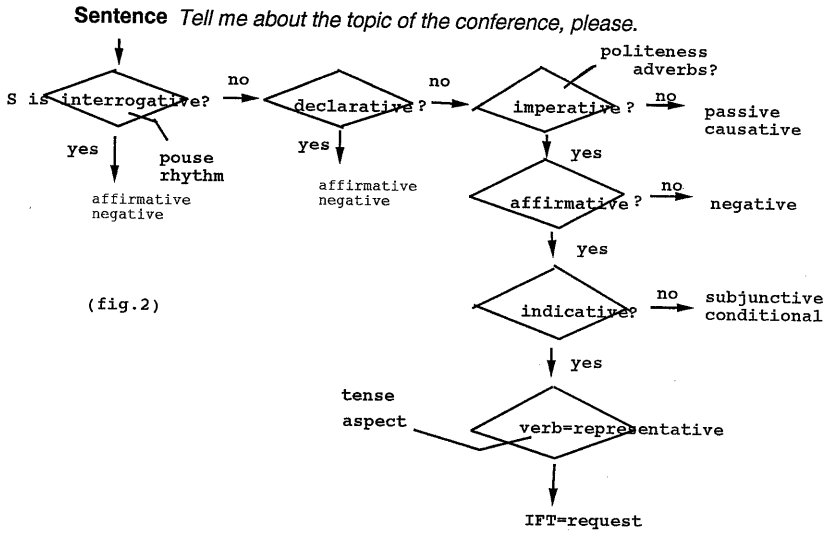
Secondarily sentence is classified into affirmative or negative.

Thirdly, sentence is classified into indicative, subjunctive or conditional sentence.

Finally, are examined *tense*, *aspect*, propositional verb meaning, subject type and sentence-final element rhythm[4],..etc.

[3] S2QUESTIONIF-S1_FP_SIGN

[4] The use of final-sentential rhythm isn't implemented yet. This is ongoing research.




(fig.2)

Examination of these points can be made within surface information of sentence, excepting the propositional verb meaning, because they are expressed as grammatical matters in sentence.

### 3.0.3 *Proposition*

Proposition of sentences as defined in this paper is the content of what speaker wants to communicate to hearer in conversation. Proposition content can be classified into some groups, by investigating meaning of kernel verb in propositional clause [3][4]:

> statement, command, obligation, agreement-disagreement, fact-hypothesis, tentative condition-open condition[5], possibility-impossibility, ability-inability, certainty-uncertainty, probability-improbability, belief-assumption, liking-disliking, appearance

### 3.0.4 *Performative* clauses and their verbs

Performative clause as defined in this paper is performative verb clause, in which the subject is SPEAKER=I and indirect complement object is HEARER=YOU[6]. It's assumed to be hyper-node of phrase structures and to have embedded clause as direct complement object. The performative verb is such verbs as express speaker's intention, when the speaker addresses what he wants to say to the hearer.[7][8][9] We named following verbs the performative verbs.

> order, command, request, ask, beg, demand, invite, prohibit, advise, recommend, suggest, counsel, thank you, permit, allow, declare, claim, insist, name, promise, offer, would like to, may,..etc.

Almost of performative verbs are omitted in usual conversation. However, few verbs and auxiliaries which occur as the performative verb, *e.g. would like to, promise, advice,...etc.*, are uttered[7].[8]

The sentence in (fig.2) belongs to imperative, affirmative, indicative sentence. Its performative verb is assumed to be *ask*. The aspect and tense in the proposition are *present* and *unreal*, respectively. The proposition content is judged to be *statement*. Thus, IFT of the sentence is determined as request.

Following all of three sentences are labeled as request, in spite of differences at the grammatical viewpoints.

*e.g.*

[5]Conditional clauses are related to reason clauses, but they discuss the consequence of something which may or may not be a real event. The case the sepaker doesn't know whether the proposition is true or falsehood, is called tentative condition.

[6]This is proposed as hypothesis for the performative sentence by Austin(1962). There are different types of performative sentences as Austin himself says. However we will accept this hypothesis, because our corpus is about telephonic conversation and there are only two interlocutors.

[7]We have already some examples of performative verb classification as results of performative analysis: R.Lakoff, McCawley, Ross, Searle. We've referred mainly Searle's classification.

a. Please tell me about the topic of the Conference.

b. I would like to apply for the Conference.

c. May I have your name and your address?

| grammatical issues | sentence a. | sentence b. | sentence c. |
|---|---|---|---|
| declarative | | yes | |
| interrogative | | | yes |
| imperative | yes | | |
| causative | | | |
| passive | | | |
| affirmative | yes | yes | yes |
| negative | | | |
| indicative | yes | yes | yes |
| subjunctive | | | |
| conditional | | | |
| tense | present | present | present |
| aspect | unreal | unreal | unreal |
| performative v. | representatives | provocatives | permissives |
| proposition content | statement | liking | liking |
| adverb | politeness | | |
| subject | 2nd | 1st | 1st |
| wh-elements | | | |
| contracted form | | | |
| simbol | | | ? |

(list 1)

From these points of examinations, IFT of three sentences are labeled **request** [8]. Reversely speaking, a case of **request** is conditioned as follows:

**request:** [[CAT s][STYPE imperative][PNTYPE affirmative][SMOD indicatif][TENSE present][ASPECT unreal][PERFORM representatives[9] ][SUBJ 2nd]]

Thus, we determined 11 kinds of IFT. Absolute grammatical conditions for these IFTs are as follows:

request: commands from speaker to hearer
[[CAT s][TENSE present]]

questionif: such questions as only one of two answers (yes or no) is possible
[[CAT s][SMOD indicative]]

questionref: such questions as any number of answers can be given, so long as they give information required by the wh-words.
[[CAT s][SMOD indicative][WH (:set why what where how who)]]

tag-question: question added to end of a statement ask for confirmation of the truth of the statement
[[CONTRACTED yes][SUBJ 3rd][SYMBOL ?]]

echo-question: such a question as hearer asks the speaker to repeat some information, because usually hearer failed to hear it[10].
[[CAT NOT: s][SYMBOL ?]]

responseif: response to yes-no question
[[CAT adv]]

[8] IFT depends largely on stress of utterances. However, we don't currently deal with accents, intonations and pitches features in semantic representation. This direction is one of important researches of our domain.

[9] The performative verbs are classified into 10: representatives, erotetics, provocatives, advisives, expressives, permissives, expositives, stipulatives, obligatives, propositives.

[10] *e.g.* I didn't enjoy that meal. -Did you say you didn't enjoy it?

responseref: response to wh-question
[[CAT NOT: adv]]

emotional-response: in order to express interest, surprise, pleasure, regret or simply to show speaker that hearer are still attending[11].
[[CAT (set: adv inter idiom)][SYMBOL ?]]

promise: speaker promises something to do
[[CAT s][TENSE (set:present future)][SMOD NOT:subjunctive]
[SUBJ 1st]]

suggest:suggest leaves the decision about what to do in the hands of the hearer[12].
[[CAT s][pc obligation]] or[[CAT s][VFORM inf]]

inform: statements in which speaker gives information
[[CAT s][SMOD NOT:imperative]]

invitation: speaker invite something to do
[[CAT s][SMOD imperative][PV provocatives][TENSE present]]
or [[CAT s][SMOD interrogative][PC invitation][TENSE present]
[SUBJ 1st]]

phatic: greetings in usual life
[[CAT interj]]

expressive: speaker expresses his emotion
[[CAT idiom]]

### 3.0.5 IFT and person

IFT varies according to the person and the polarity when it occurs in interrogative or declarative sentence. Following examples show that IFT of would like to depends on the person.

*e.g.*

a. I would like to apply for the conference.(request)

b. You (He, She, They) would like to apply for the conference. (inform)

In example a. speaker is asking to apply for the conference. In b. speaker is speaking for 2nd or 3rd persons. IFT of two sentences is completely different because of grammatical persons. This is the reason we examine grammatical persons, when we determine IFT. We have 2 steps' rule for would like to. Firstly it's rewritten to 1st-person-wish and finally 1st-person-wish is rewritten into request.

Rule: would like to

```
in= [[RELN UNKNOWN-IFT]
     [AGEN ?AGEN]
     [RECP ?RECP]
     [OBJE [[RELN WOULD_LIKE_TO-1]
            [OBJE ?OBJE]
            [EXPR [[RELN I-PRON-1]]]
                        ?rest]]]
```

```
out= [[RELN UNKNOWN-IFT]
      [AGEN ?AGEN]
      [RECP ?RECP]
      [OBJE [[RELN 1ST_PERSON_WISH]
             [OBJE ?OBJE]
                 ?rest]]]
```

(RW.3)

### 3.0.6 IFT and polarity

IFT depends on the polarity of sentence.

*e.g.*

[11] *e.g.* I heat Paula's getting married. Really?

[12] *e.g.* They suggested Smith shoud be dropped from the team.
They suggested that Smith be dropped from the team.

a. I would like to apply for the conference. (request)

b. I wouldn't like to apply for the conference. (inform)

Sentence a. is asking to apply for the conference, contrastively to b. which is simple statement.

Affirmative form isn't explicitly conditioned in our rules, but the denial has Negate label.

### 3.0.7 IFT and pragmatics

There are such linguistic phenomena, which are not explicitly expressed grammatically, as logical entail, presupposition or conversational implicature in utterance.[5]

*e.g.* He also will come. → Someone will come and he also will come.

In Japanese, almost of logical presupposition of utterances is expressed with particles.

*e.g.* Karemokimasu. → Darekagakuru ga karemo kuru.

Such presupositions as shown above are dealed with as pragmatics and described in prag portion. Whether the presupposition effects a change of IFT determination or not, depends on grammar writer competence.

However implicatures depending on the context or conventions of the life as shown below, aren't dealed with, because it's not possible to be dealed with, as long as inference task module concerning discourse isn't provided.

*e.g.* It's very cold here. → Will you close the door, please?

### 3.0.8 IFT and generality vs specificity

IFT varies according to whether marked or unmarked sentence is, particularly in the interrogative sentence or comparative form. In interrogative negative form is in general marked sentence. Thereby in sentence a., the speaker complains that you don't send.., contrastively to b., in which the speaker is asking why you send ...

*e.g.*

a. Why don't you send me a registration form? (request or complain)

b. Why do you send me a registration form?(question)

In general affirmative form is unmarked sentence in declarative style. However, comparative form with some kind of adjectives in the predicate is interpreted to be special meanings.

*e.g.*

a. Paul is taller than Michel.

b. Paul is shorter than Michel.

Sentence a. is interpreted that Michel is shorter than Paul and that we cannot know whether the two are taller than the others or not. b. reversively is interpreted that Paul and Michel are comparatively shorter than the others and the sentence b. as utterance means the fact that Paul is excessively short, because tall is unmarked adjective and short is marked adjective. This means there are adjectives which indicate generality or specificity (marked or unmarked) as standard interpretation. From our IFT viewpoint, two sentences are labeled as inform. However, there remains the difference of implications between the two and this is a subject of our future research.

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