

MODALITY EXPRESSIONS IN JAPANESE

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あらまし モダリティとは、話し手が言語的手段で、命題の真偽についての自分の立場を表現することである。モダリティは、動詞だけではなく、様々な言語表現で表現することができる。機械翻訳のなかに、モダリティの単純な1対1マッピングが失敗しやすいため、機械翻訳研究のテーマとはなり得なかった。

本研究では、モダリティの全てのパターンを、L1 と L2 の中間モデルである抽象的な3スロットモデルで表す方法を提案する。主節の助言に関わる形しかモデルにマッピングされない。

法がないためと、モダリティを過去助動詞などで表す日本語のためには、モデルパターンをトリガーする方法を紹介する。

キーワード モダリティ、様相、機械翻訳、日本語、中間言語

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Abstract Modality means that the speaker can express his attitude to the truth value of propositions he utters by linguistic means. The most common modality types are deontic obligation, subjective and objective epistemic modality, unrealness and wishes. Modality can be expressed not only by the verb, but by a variety of linguistic expressions. This diversity lets simple 1:1 mappings in Machine Translation (MT) often fail, one of the reasons why modality was no major topic in MT.

We propose to express all patterns of modality in an abstract three-slot model to intermediate between modal forms in L1 and L2 in MT. Only forms related to the main clause predicate are mapped into model patterns.

Japanese has no mood and expresses modality only with borrowed auxiliaries. For Japanese, trigger forms are proposed for several modality types; the combination of two trigger forms enhances the correctness.

Keywords modality, Machine Translation, Japanese, interlingua, epistemic

1. HISTORICAL CONFUSION OF CONCEPTS

Modality is a concept with almost complimentary meanings and different aliases in linguistics and logic.

In classical logic, modality is a judgement on truth conditions of a proposition *p*. There are two judgement categories: necessity and possibility [Metzler-Lexikon Sprache 1993]. Both are logically woven into each other:

(1) $nec\ p \rightarrow \sim\ poss\ \sim\ p$

(2) $poss\ p \rightarrow \sim\ nec\ \sim\ p$

Note that the logical notion of modality is a priori not related to language and even less to concrete linguistic expressions.

In linguistics, more precisely in semantics, the most consistent reflection on modality was probably done by [Lyons 1977]. His definition is: "The speaker explicitly qualifies his commitment to the truth of the proposition expressed by the sentence he utters." In contrary to the abstract definition in logic, Lyons' semantical modality is around about the speaker. He stresses the fact that every utterance has a person who utters it and is possibly influenced by that person (called the "Subjectivity"¹ of language).

The attitude of the speaker towards truth condition is a degree of *factivity*. The several types and subtypes of factivity establish a taxonomy for modality semantic modality as shown in table 1.

The speaker is convinced of the truth of the proposition with factive expressions, he indicates that they are not true at the utterance time by contra-factive expressions and non-factive expressions are those, where the speaker distances himself from the judgement of truth.

Deontic modality describes obligations or permissions. With subjective epistemic modality, the speaker states that he supposes or believes a proposition, but doesn't know it for sure. These two types are considered fun-

Factive		<i>He is a doctor.</i>
Non-factive	Deontic	<i>You mustn't be rude.</i>
	Subj. epistemic modality	<i>It might be raining.</i>
	Obj. epistemic modality	<i>This medicament will probably relieve your pain.</i>
Contra-factive	Alethic	<i>It must be him.</i>
	Irrealis	<i>He would be very angry (if he knew.)</i>
	Optative	<i>I want to eat.</i>

Tab. 1 Modality types

damental since they are intrinsic to human needs toward language and can be found in any language.

Objective epistemic modality indicates that the speaker has objective grounds to believe a proposition (a meteorologist doing weather calculations). Alethic modality is close to a mathematical-logical modality (e.g. reasoning like Sherlock Holmes: If all other possibilities are excluded, it must be the remaining one.) These latter two types of modality seem to occur only in advanced societies with a need for a kind of scientific discourse.

In everyday speech, epistemic refers to expressions of knowledge and probabilities to talk about the impact of the speaker's opinion in speech. This epistemic modality, however, resumes all kinds of speaker-referred expressions. E.g. "I know" would be epistemic in this modern definition, while it wouldn't in the semantic model of epistemic modality.

Another term often used synonymically with modality, is mood. Mood was initially coined in traditional linguistics to describe a parameter of inflected forms of the verb including forms such as conditional or optative, as opposed to tense, voice, number and person inflections.

Mood is a language-specific language-specific phenomenon observed in Latin, but

¹ Term coined by Emile Benveniste.

was generalised in traditional linguistics like other language-specific concepts such as relative clauses. The modal inflection of the verb is only persistent in the Roman languages; it is dying out in German and has no proper forms in English. In other languages, e.g. in Japanese, it cannot be observed at all.

All the above terms and concepts have been used to express the idea of "modality" in an inter-exchangeable way in the recent past (e.g. in [Ueno 1989]).

The fundamental line of distinction in linguistics is the one between form and function. Recent usage of terms for modality, however, crossed this line several times. Mood was initially a form-oriented term, but has led to the misinterpretation of functional modal terms as "mood" e.g. in Japanese (*daroo, desho*). On the other hand, the distinction of modality as an abstract linguistic function is mainly directed by the pre-limited search for certain forms, e.g. parenthetical verbs in English. That modality seems to be mainly expressed by verbs in European languages, was probably the reason why nominal and adjectival expressions in Japanese were never considered "modal" in Japanese.

If we neglect the strictly logical definition of modality, the common idea underlying all linguistic concepts dealing with modality is that language offers ways to the speaker to express his attitude about propositions. We will use the words "modality" and "modal" in this general meaning from now on.

2. MODAL FORMS

In most languages, there is a variety of means to express modality as shown in table 2.

The most important observation is that the tie between modality and the verb is looser than generally assumed. Almost all verb-related forms used to express modality can also bear completely different functions, cf. English *would* and Japanese *ta* appear, for instance, also as markers of past tense. The German Konjunktiv also indicates indirect speech. On the other hand, parenthetical, paralinguistic and prosodical expressions are clearly related

to modality, although they are not based on the verb. Also, neither English nor Japanese have a distinct verb mood for expressing subjective or objective epistemic modality.

This observation is significant, as modality theories are often based on formal observations of the ambiguous verb-related forms (e.g. [Lyons 1977]).

The diversity of forms expressing modality across the diverse languages is also already an indicator that in Machine Translation, mere 1:1 mappings of forms are likely to fail.

3. MODALITY IN MACHINE TRANSLATION

Modality seems not to have been a major topic in Machine Translation (MT) research. In most systems, modality, if at all, is handled as a part of tense processing. This ignorance is due to two reasons:

MT research traditionally focused on European languages. Due to linguistic proximity here, most modal expressions can be translated as *free rides*², i.e. direct translation of L1-forms into corresponding L2-forms without further functional or content analysis of the L1-forms, cf.³

(3) Ich würde nach Hause fahren.

(4) I would to home go. (=I would go home.)

But *would* is not always *würde*, cf.

(5) Würdest du mich anrufen?

(6) *Would you call me? (Correct: Could you call me?)

² Term from [Hutchins/Somers 1992]

³ German-English Machine Translation examples by "T1 Standard Englisch", published by Langenscheidt (based on Siemens' METAL system).

Type of expression	English	German	Japanese
Paralinguistic means		Doubtful face	
Prosody		Voice pitch, low voice	
Mood	Necessity	--	Imperative <i>Hör damit auf!</i> Yamero!
	Possibility	--	Konjunktiv <i>Ich ginge, wenn ich Zeit hätte.</i>
Auxiliaries to verb	<i>would, might, must</i>	<i>mögen, sollen, können</i>	<i>tai, deshoo, ta</i>
Parenthetics	Verb-like <i>I think, I suppose</i>	<i>ich glaube, ich meine</i>	<i>omou, sooda, rashii</i>
	Adverbs <i>probably, possibly</i>	<i>vielleicht, wohl</i>	<i>iabin, kitto</i>

Tab 2. Modality expressions

A similar approach for non-Indo-European languages like Japanese would be futile from the start, since there are not even preference translations for the “modal” auxiliaries. *daroo/deshoo* can become *would, might, or may*, but also fulfil dialogue maintenance (“right?”).

The main reason why modality is no central subject in MT, however, seems to be that “subjectivity” of language considered too complex and not relevant.

The major CL models were based on the assumption a linguistic utterance can be fully described by its relation to the world and to the linguistic context. The “utterer” of an utterance, i.e., the speaker or writer, was ignored except for the establishment of the origo⁴.

⁴ The origo is “I, here, now”, centering an utterance in relation to a person, location and time (Bühler 1934)

The linguistic paradigm pragmatics introducing the view of the speaker into linguistics (speech act theory) could be left aside, probably because of the fact that it is

The subjective parts of language like modality have the bad reputation of being difficult to formalise. This combined with the dangerous conclusion that the unformalisable parts of language are not important.

Pragmatics suffered from that assumption, and modality, though not a part of pragmatics, seemed to suffer from the same prejudices.

Recent sophisticated MT systems still exclude modality modules, pretending to focus on certain “objective” text types like newspaper articles, which would not contain “subjective” modality. This point of view, however, is fatal: Modality is one the fundamental ways a statement can be modalised, and therefore rarely absent of any text type. Just look for the number of “would”s in any English-language newspaper article or in this scientific paper.

very difficult to formalise. As it constitutes a distinct linguistic sub-science distinct from and thus not necessary for syntax or semantics, it could be rather safely ignored.

We showed above that the translation divergences⁵ even between close languages like English and German are significant. And they are more important for Japanese to European.

One MT system produces for (7) the output (8):

(7) Okane-ga aru-nara, kono-hon-wo katta-no-desu-ga.

money-SUBJ be-if, this-book-OBJ bought-EMPHASIS-be-ADVERSATIVE

If there had been money, I would have bought this book.

(8) If there was money, I bought this book

4. AN MT MODEL OF MODALITY

We have shown:

- modality plays a central role in language and cannot be ignored by MT
- linguistic forms are so divergent that a simple direct mapping of modal forms is not adequate

An adequate treatment of modality in MT consists of discovering:

1. Coherent model of modality (= a descriptive Interlingua module)
2. Formalisation of that model
3. Definite trigger patterns for each language into that model

By "coherent" we mean that the model should cover all possible modal forms in the major languages, thus being a "smallest common divisor" for all sets of modal forms with no need for more abstraction.

Our candidate for such a model is a modification of the formalism proposed by Lyons, a three-spot formula⁶.

(neustic) (tropic) (phrastic)

⁵ Term coined by [Dorr 1993]

⁶ Lyons' formalism is based on the classical logical formalism. We don't include his temporal flags.

"neustic" is a spot for the subjective opinion of the speaker ("I say so"), while "tropic" stands for the external calculation of probabilities ("it is so"). "phrastic" is the proposition itself. All three spots may take logical modifiers such as negation \sim , the first two can also take *poss* or *nec* to indicate possibility or necessity. $!$ stands for an obligation, $?$ for open and indirect questions, and $*$ for contra-factivity (=unrealness). The default neutral meaning is expressed by a simple dot ($.$).

(9) It might be raining.

with p = "it will be raining" has thus two formalisations,

(10) $poss . p$ (subjective epistemic: "I think it will be raining.")

(11) $. poss p$ (objective epistemic: Meteorologist: "My calculations indicate me that it will be raining")

As a more complex example, take the complex modality type "exemption" [Lyons 1977]:

(12) You needn't come. = "(I say that)(it be so that)(it is not that)(it be so that you come)"

(13) $! (\sim ! p)$

Wishes become

(14) $w * p$.

with w as the "wish"-operator. ⁷ Unrealness is expressed like:

(15) I would like to come.

(16) $. * (. * p)$

⁷ Wishes could be rewritten as a combination of two "unreal" propositions, cf.

$(. * p) \rightarrow (. * I_be_happy)$

Although more formalised and avoiding the additional w operator, this representation does not seem very explanatory adequate. Wishes are fundamental expressions of the speaker, as beliefs or knowledge; they have to be expressed by a distinct symbol.

Note that one modal pattern can have a lot of surface realisations in any language (no 1:1 mappings), cf. (10) can also become

(17) *I think it will be raining.*

(18) *It will probably be raining.*

and many others in English alone.

If we posit that the model is complete, we can proceed to the task of trying to figure out trigger patterns into the model for each language.⁸

5. ONLY MATRIX CLAUSE PREDICATES HAVE MODALITY

First, we have to figure out which parts of speech can have modality.

Modality is often regarded as a property of the verb, but non-conjugated verbal impressions like the participle can clearly not be modalised:

(19) * You have shouldn't seen him.

On the other hand, nouns and adjectives can be modalised, if they are predicate (as in Japanese):

(20) Kare desho.
he MOD
I think it's him.

Finally, predicates in subordinate clauses can bear modal forms, but we state that they cannot be modalised. An indication is the non-enunciative character of subordinate clauses [Neumann 1994], which means that subordinate clauses cannot bear new information and any other speech-act related function. They are just pure propositions, cf.

(21) * I don't like you because go home!

(22) * Kinoo atta-deshoo-hito wa dare desu-ka?

Yesterday met MOD man SUBJ who is QUEST?

⁸ Formalising the mapping of abstract model patterns back into (L2-)expressions seems to be of less importance, if we posit for the moment that the various forms for expressing one kind of modality don't differ largely from each other.

Who is the man that you probably met yesterday?

These observations lead to the following assumption:

Only main clause predicates can have modality.

Adverbs and adverbial-like parenthetical expressions like *I think* are also considered being part of the predicate (We exclude prosodical and paralinguistic means in this model).

We assume that modal forms in subordinate clauses are triggered by the modal form in the matrix clause. Modality in subordinate clauses is done with language-specific "clean-up"-rules after the mapping from the abstract modal patterns into L2. German allows *würde* in subordinate clauses, but only in combination with a modal in the matrix clause.

(23) Ich würde mir das Buch kaufen, wenn ich Geld hätte.

I would me the book buy, if I money had(KONJUNKTIV).

(24) I would buy the book, if I had money.

Note that the English subordinate predicate is in indicative (no *would* allowed – a major mistake for German speakers of English). A rule in German would exist saying: "Conditional subordinate clauses are modalised by *würde* if the matrix clause is in Konjunktiv."⁹ French also has modal subordinate clauses, but is different:

(25) Il est nécessaire qu' il vienne.
it is necessary that he come(SUBJUNCTIVE)

"il est nécessaire" is a parenthetical verb which makes the embedded verb to have subjunctive. The rule here would be: If an obligation is realised by "il est nécessaire", the subordinate predicate must bear subjunctive.

⁹ Consequently, we must also pose the (well-known) rule for English saying that conditional subordinate clauses are put into past tense if the matrix clause uses *would*.

Modality type		Formalisation	Trigger elements in Japanese
Subjective modality	epistemic	poss p	daroo, rashi, yooda, toomou, tabun, kitto, osoraku,
			II+ sooda
Objective modality	epistemic	poss p	hazuda,
			IV+ sooda
Deontic Obligation		! p	nai X ikenai
Deontic Prohibition		! ~p	te + wa + dame, te + wa + ikenai
Wish		w * p	tai, hoshui, tara + ii, nara + ii
Unrealness		* p	nara/tara + ta/daro/no-da (see below)

Tab. 3 Modality triggers in Japanese

Don't mix up this incapacity of real clauses to be modal with the embedding of two (or more) modalised propositions as sketched above to abstract complex modality types like exemption.

6. TRIGGER PATTERNS

We have now limited the possible trigger elements to elements within the predicate of the matrix clause.

The main research from now on consists in finding trigger patterns having unequivocal abstract representation patterns in the model. The search for trigger elements must part from two points: the known set of elements involved in modality in the given language, and, on the other hand, from the known combinations allowed by our model.

Here, we will sketch an outline of how trigger patterns can be established with the example of Japanese. In one Japanese-English MT system, in ALT-J/E, inflectional information about the verb is mapped into in abstract patterns (and not directly to a L2-expression). In Japanese, a typical agglutinated language, this abstraction step seems absolutely necessary to handle the usual three or four auxiliaries coming with the verb.

However, as outlined above, most modal expressions in Japanese are polyfunctional like *deshoo* introduced above. One of the main elements used for expressing unrealness, *ta*, is also the auxiliary to express (real) past tense.¹⁰

We propose to combine two or more triggers to enhance the right choice of modality, e.g. the well-known *nai... ikenai* for obligation.

In the following, we will present several exemplary modality types with their model formalisation and trigger elements related to them. The list of trigger elements is a first proposal, partly based on [Ueno 1989] and is far from being complete and unequivocal.

Unrealness is worth a special mention. In German and English, it is almost standardised by *would* resp. *würde* or Konjunktiv. In Japanese, though, none of the verbal auxiliaries alone qualifies as a sufficient trigger. However, as the latin grammar term

¹⁰ Past and future tenses and unrealness share the property of "remoteness" in contrast to the "present" present tense. The close relation between time and modality is explained in [Lyons 1977] and can probably lead, in the future, to a more coherent model of MT-handling of predicates.

“conditionalis” indicates, all unreal expressions are somehow preceded by a condition of unrealness (which may be mentioned only within the preceding sentences or the dialogue context).

Thus, we first should rather look for a conditional expression like *nara* or *tara* and then for a second element like *ta*, *daroo* or *no-da* to complete the trigger process.

7. FUTURE RESEARCH

Future research must focus on developing and testing trigger patterns. In a second step, we can try to find trigger patterns in other languages as German or English.

One of the fundamental remaining problems is to solve the following question: Is the degree of modality a parameter which takes distinct values in distinct languages? Then, we would be forced to assume that Japanese has a very high level of modalisation compared to German or English, with the effect that some modalised expressions are not to be translated at all, cf.

(26) J: Oishi-soo-desu.
tasteful-MOD-be

(27) D: Lecker!
tasteful

or

(28) J: Kare-ga kita-rashii.
he-SUBJ came-MOD

(29) D: Er ist da.
he is here

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