METONYMY: REASSESSMENT, SURVEY OF ACCEPTABILITY, AND ITS TREATMENT IN A MACHINE TRANSLATION SYSTEM

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ABSTRACT

In this article we outline a basic approach to treating metonymy properly in a multilingual machine translation system. This is the first attempt at treating metonymy in an machine translation environment. The approach is guided by the differences of acceptability of metonymy which were obtained by our comparative survey among three languages, English, Chinese, and Japanese. The characteristics of the approach are as follows:

(1) Influences of the context, individuals, and familiality with metonymy are not used.

(2) An actual acceptability of each metonymic expression is not realized directly.

(3) Grouping metonymic examples into patterns is determined by the acceptability judgement of the speakers surveyed as well as the analysts' intuition.

(4) The analysis and generation components treat metonymy differently using the patterns.

(5) The analysis component accepts a wider range of metonymy than the actual results of the survey, and the generation component treats metonymy more strictly than the actual results.

We think that the approach is a starting point for more sophisticated approaches to translation in a multilingual machine translation environment.

INTRODUCTION

Among others, both Lakoff and Johnson (1980), and Fass (1991) divide metonymic expressions into several fixed patterns such as Part-For-Whole and Container-For-Content. Sentence (1) is a typical Container-For-Content metonymy and "this glass" is replaced with "the liquid in this glass" in its metonymic reading.

(1) "He drank this glass."

One of the things that has been less focused on in previous literature on metonymy is the problem of generation typically in a machine translation system. For example, even though the analysis component of a machine translation system produces a correct metonymic reading for sentence (1), i.e. "the liquid in this glass" for "this glass", if the result of the analysis component is translated directly in word-for-word manner, such an output sentence may not be natural in the target language. On the other hand, it may not be appropriate either for the generation component to produce a sentence which is a direct translation of the original metonymy if the target language does not allow such expression.

We think it is necessary for a multilingual machine translation system to have not only understanding of metonymy which most previous works on metonymy have focused on, but also proper ways to handle generation of metonymy. In order to find out ways to treat metonymy properly in a multilingual environment, we have conducted a survey on acceptability of various examples of metonymy among English, Chinese, and Japanese. The patterns of previous works (Fass 1991, Lakoff and

Johnson 1980, Yamanashi 1987) seem to be obtained from the intuition of the analysts. However, we think that the patterns which are based on the analysts' intuition to begin with should be supported and determined more precisely by the result of this kind of survey. An analysis based on actual data allows us to establish a clear set of patterns and sub-groups, for example to decide whether we require either Producer-For-Product (Lakoff and Johnson 1980) or Artist-for-Artform (Fass 1991), or both of them.

A SURVEY OF METONYMY

A comparative survey on acceptability of metonymic expressions in English, Chinese and Japanese has been conducted. All of the 25 sentences which are used in the survey are taken from metonymy examples in English in previous works (Lakoff and Johnson 1980, Fass 1991, Yamanashi 1987). We asked native speakers of the three languages to score the acceptability of each sentence. Direct translations were used for Chinese and Japanese. The different languages show differences in acceptability (for the details, Kamei and Wakao 1992).

Based on both intuitive analyses and the result of the survey, we have established four major patterns, and several sub-groups for the first pattern (Locating) as shown in Appendix A. The patterns are 1) Locating, 2) Emphasis of one aspect, 3) Abstract and collective entity for its consisting concrete items, and 4) Information conveyer for information giver.

For example, sentence (2) belongs to the second group of Locating pattern (Producer for Product). Examples of "Ford", "Picasso", "Steinbeck" and "Bach" also belong to this group (see Appendix A 1.2). These sentences are fully acceptable in English and Japanese, however, their acceptability is low in Chinese and sentence (2) is completely unacceptable.

(2) "He read Mao."

On the other hand, sentence (3) belongs to the fourth pattern, information conveyer and giver. The tendency of the pattern is that those examples in this pattern are acceptable in English and Chinese, but not in Japanese.

(3) "The sign said fishing was prohibited here."

AN APPROACH TO TRANSLATING METONYMY

An important point to realize is that actual computational treatment of metonymic expressions is determined by the acceptability of the pattern to which the expression belongs. Another important point is that the analysis and generation components of a machine translation system should treat metonymy differently.

We believe that the main factors for treating metonymy correctly in a multilingual machine translation system are 1) its universality, which can be a guideline for the analysis component, 2) language dependency, which can be used for generation, and 3) others such as the context, culture, and familiarity. We think that it seems unrealistic to expect an actual machine translation system to cope well with the third of these factors at present. Given the lack of such knowledge, our basic heuristics for treating metonymy are as follows:

Even if some language shows the tendency of unacceptability, if one or more languages show acceptance in the group to which the expression belongs to in the result of the survey, the system should accept it for analysis, and come up with some metonymic reading using its inference mechanism (Iverson and Helmreich 1992, Fass 1991). Given such information, the generation component should look at the tendency of each language. If the target language allows a metonymic expression which corresponds to the original form, then the system should produce a direct translation since the translation preserves the naturalness. However, if the

target language does not allow a meto-
nymic expression which corresponds to the
original form, then the system should use
the result of the metonymic inference and
come up with an acceptable translation.

We think that these basic heuristics
are a good starting point for more sophisti-
cated approaches to translation in a multi-
lingual environment. We intend as our
next step to implement our ideas using
existing systems such as the ULTRA MT
system (Wilks and Farwell 1990) and the
Metallel metonymic analysis program
(Iverson and Helmreich 1992).

APPENDIX A

Some of the metonymic sentences used in
the survey.

1. Locating

1.1 Container for Content
   Dave drank the glasses.
   The kettle is boiling.

1.2 Producer for Product
   He bought a Ford.
   He's got a Picasso in his room.
   Anne read Steinbeck.
   Ted played Bach.
   He read Mao.

2. Emphasis of one aspect

We need a couple of strong bodies for
our team.
There are a lot of good heads in the
university.

3. Abstract entity for concrete entity

Exxon has raised its price again.
Washington is insensitive to the needs
of the people.

4. Information conveyer for information
giver

The T.V. said it was very crowded at the
festival.

The sign said fishing was prohibited
here.

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