

High Level Memory Structures and Text Coherence
in translation

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Various memory organization schemes have been proposed in the last five years. Lots of intelligent computer systems have been experimenting with memory schemes like scripts, plans, goals, [4] and MOPs [5] in the domain of text understanding [3] [1] and information retrieval [2]. In this paper, the focus is on the problem of translating sentences that involve lexical items which don't have equivalent counterparts in the target language. Examples are drawn from translations between English and Mandarin Chinese.

Consider the following sentence.¹

1a John went to a restaurant and ordered a hamburger.

1b JOHN CHIU YI G1A TSAN TIEN DIAN< LEH

1c John go one restaurant order

YI GEH HAMBURGER,
one hamburger.

Notice that "and" in 1a does not appear in 1c. However, in 2a below:

2a John read a book and wrote a letter.

2b JOHN DWU- LEH YI BEN< SRVU HEH-

2c John read one book and

SHIYE< LEH YI FONG SHIEN*.
write one letter.

the word "and" IS translated (i.e. ^{ge} "HKH-"). What then determines when "and" should be

The following conventions will be used throughout this paper:

a refers to the English sentence

b refers to the Chinese sentence (in upper case).

c refers to the word-for-word translation of b

Nouns like "John" and "hamburger" are not translated since their translation are phonetical.

translated in Chinese? Although both 1a and 2a consist of two events, the two events in 1a are causally related and the ones in 2a are not. In 1a, each verbal phrase corresponds to an event in the restaurant script [4]. Recall a script is actually a giant causal chain. So, if two events are part of the same script, their causal connections can easily be inferred. The two events in 2a, however, have no such connections at all.

So our claim is:

IF the causal connection between two events in a Chinese sentence is inferable,

THEN the two verbal phrases representing these two events are connected without the use of HEH-. (In fact, its use is forbidden)

Verbal phrases that satisfy the above condition are said to be conjoinable.

Without the knowledge at the script level, both 1a and 2a will just be understood as 2 separate events. So they should be translated exactly the same way. If this is the case, then it is impossible to determine why "and" is translated differently in 1b and 2b. Therefore, understanding 1a at the script level is crucial to its correct translation.

However, we are not saying that all events in a script can be expressed in a sentence without using connectives. Consider the next example:

3a John went to a restaurant where he ate a hamburger and drank a cup of tea.

3b JOHN CHIU' TSAN TIEN TSRE LEH YI GEH

3c John go restaurant eat one

HAMBURGER HEH- HEH LEH YI BEI TSRA-.
hamburger and drink one tea.

Although eating a hamburger and drinking a cup of tea are events in a restaurant script, they are not causally related. So the connective "HEH-" must be used in 3a. The conclusion we should draw here is that scripts together with causal chains provide a definite criterion for conjoinability of verbal phrases in Chinese.

Now let's consider the following more complex

story:

1. John went to a restaurant for lunch.
2. He left without paying the check.

The translation of the first sentence is quite straightforward and irrelevant to our discussion here* Let's focus on the translation of the second sentence:

- 4a. He left without paying the check.
- 4b. TA MEI- FWU CHIAN- CIO' D20< LEH.
- 4c. He not pay money TTT? leave.

According to the dictionary, "GIO" means "at that moment". But actually it means more than that. We understand that John shouldn't leave the restaurant without paying because we have the knowledge about restaurants (i.e. the restaurant script). 4a doesn't explicitly express that a violation of the restaurant knowledge has occurred. The Chinese translation of this story, however, uses "GUT" to indicate that "leaving the restaurant" should not occur before "not paying the check". Although "GIO" can't be directly translated from English, this doesn't mean "GIO" should never appear in a Chinese translation of English.

Let's see how "GIO" can be generated using the knowledge at the script level. First, 4a is parsed into two CDs (Conceptual Dependency representations [4]):

- 1 (PTRANS (ACTOR John)
(OBJECT John)
(FROM restaurant))
- 2 UTRANS (ACTOR John)
(OBJECT money)
(FROM John)
(MODE neg))

With the knowledge of the restaurant script, the generator realizes that 1 followed by 2 is not a normal instantiation of the script. So "GUT" must be generated to indicate this violation.

Usually, words are generated from some specific nodes in the memory or slot fillers. For example, DZO< (means "to leave") is generated from "PTRANS from current place", FWU" (means "to pay") is generated from "ATRANS money", and so on. However, we can't find such memory nodes or slot fillers that correspond to words like "GUT". It is used to characterise certain states or aspects of the memory structures. In other words, certain patterns of memory structure can also trigger generation besides static memory nodes. "GIO" should be generated for any memory structures that satisfy the condition we discussed above. Failure to do so will result in serious misunderstanding. For example, if "GUT" is left out in 4b, then 4b becomes 4b' as shown below:

4b' TA MEI- FWIT CHIAN- ZO< LEH.

4c' He not pay money leave.

Native Chinese speakers will think that 4b' does not make sense. We are going to show why they will think so by the conjoinability criterion discussed earlier. In 4b, the two verbal phrases representing "not paying the check" and "leaving the restaurant" are not connected by any connectives. This implies that these two events are causally related according to the conjoinability criterion. Thus, 4b' should be interpreted as "John didn't pay the check so he left the restaurant" which obviously violates our knowledge about restaurants. Therefore, 4b' won't sound right to Chinese speakers. The point is that without the knowledge of the restaurant script, 4b' will be generated to as the translation of 4a.

As a concluding remark, we want to emphasize that high level memory structures are responsible for maintaining text coherence in translation. Our discussion has just scratched the surface. There are many other kinds of memory structures besides scripts. Currently, we are working on how different high level memory structures are related to the generation of coherent text.

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