TESTABILITY OF MOST RECENT FILLER STRATEGY IN JAPANESE

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This paper aims to demonstrate how we can test the validity of the Most Recent Filler Strategy by using the Japanese language as data.

Frazier, Clifton, and Randall (1983, abbreviated as FCR) claim that the human sentence processing system employs the "Most Recent Filler Strategy" (MRFS), which is stated as follows:

MRFS: During language comprehension a detected gap is initially and quickly taken to be co-indexed with the most recent potential filler. (p. 196)

Because of this strategy, a Distant Filler Sentence such as (2) below is claimed to be harder to comprehend than a Recent Filler Sentence such as (1) below:

(1) This is the girl the teacher wanted ___ to talk to ___.
(2) This is the girl the teacher wanted ___ to talk.

MRFS assigns the recent filler the teacher to the gap after the verb wanted in both (1) and (2). The second gap in (1) will be filled with the remaining possible filler, i.e., the girl. The parser has no difficulty in processing this sentence. At the end of the sentence (2), on the other hand, there is no gap to be filled with the obligatory filler the girl. Thus, the parser must go back to the gap position and cancel the recent filler, then determine the distant filler as the correct filler. This correction process ("garden path effect") is supposed to be responsible for the longer processing time in (2) than in (1).

Furthermore, FCR argue that the control information carried by a verb is delayed until MRFS has applied. If the use of control information precedes MRFS, there will be no difference in processing time for the following two sentences:

(3) This is the girl the teacher decided ___ to talk to ___.
(4) This is the girl the teacher forced ___ to talk.

The property of the verb decided requires that the subject of the matrix sentence the teacher should be the subject of the subordinate sentence, and the property of the verb forced demands that the object of the matrix sentence the girl should be the subject of the subordinate sentence. Therefore, the properties of each verb will uniquely determine the possible filler in each sentence.

Contrary to the above expectation, the experimental findings have shown that (4) requires longer processing time than (3), and this
difference is parallel to the difference between (2) and (1). Therefore, they conclude that "readers use control information only after they have applied the Most Recent Filler Strategy" (p.205). In other words, "the unambiguous sentences act as if they are ambiguous because they are effectively ambiguous due to the delayed use of semantic control information" (p.211). That is, they claim that the MRFS effect, which is observed with an ambiguous verb like want, is also observed with a non-ambiguous verb like decide and force.

Here we should raise a question concerning the superiority of MRFS. Does it precede every kind of information available to the parser? Sentence (4) seems to ignore subcategorization information, because there must be two gaps after the verb forced: one for a direct object of the verb and one for the subject of the subordinate clause. Thus, according to FCR both control and subcategorization information are suppressed by MRFS.

Clifton and Frazier (1986, abbreviated as CF) provide a different explanation from FCR. They say, "We do assume that verb subcategorization information is consulted early in sentence comprehension, and thus that a verb such as forced will be understood as requiring a direct object" (p.213). Therefore sentence (4) will be represented as follows:

(5) This is the girl the teacher forced t PRO to talk.

First, a gap is postulated after the verb forced, because this transitive verb requires an object. Then, another gap is postulated at the position preceding to talk by a general assumption that every clause has its own grammatical subject even if it is non-overt. Thus, there are two gaps postulated for two potential fillers.

Suppose that, because of MRFS, the most recent filler the teacher is assigned to the first gap. However, this position of the gap is an argument position, i.e., this gap has a grammatical case (accusative) assigned by the verb forced. Furthermore, the filler has also a case (nominative) assigned by Tense (or INFL=inflectional element). Thus, this position becomes a doubly cased position, which is prohibited by Case Theory in the Government Binding (GB) theory of Chomsky (1981). Owing to the Case Theory information, the parser can reject this filler assignment and can assign the more distant but correct filler which is in a non-argument position, i.e., the girl.

After this assignment of the correct filler to the first gap, MRFS assigns the most recent filler the teacher to the second gap. But this assignment is incorrect. Finally, control information is consulted to correct this mis-assignment of MRFS, but the temporary error will have made the processing of this sentence difficult. Thus, control information is supposed to be delayed in processing (5). Therefore, the proposed order of parsing operations according to CF seems to be as follows:

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(i) Use subcategorization information to detect an object gap
(ii) Use a general syntactic assumption to reveal a subject gap
(iii) Consult Case Theory to fill first gap
(iv) Apply MRFS to fill second gap (incorrect)
(v) Use control information to revise filling of second gap

Let us represent the above discussion in a schematic way as follows (t is a trace):

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  (iii) Case Theory
     /       \
    A'       A
  (v) Control Information
    /     \
   t [PRO to talk]
  (iv) MRFS
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According to CF, the reason for the long processing time for (6) is that control information is delayed so that the parser cannot assign the correct filler to PRO. However, it is also necessary for them to assume that MRFS ignores trace as a potential filler so that it assigns an incorrect filler.

It appears that there is a linguistic error in CF's analysis. First, the real controller for PRO should be the trace. This trace is a gap filled by the head NP of the relative clause, i.e., the girl. If the NP the girl directly control PRO, as is shown by the arrow (v) in (6), it contradicts the characteristic property of the control relation: "The controller must be the subject or object of the immediately dominating clause" (Riemsdijk and Williams, 1986: 137).

Consider the following example:

(7) *Johni wants [Mary to try [PROi to shave himself]]

As can be seen in the above sentence, the NP John, which is not in the immediately dominating clause of PRO, cannot be a controller. Thus, the girl in (6) cannot control PRO, because this NP is not in the immediately dominating clause of PRO.

The second point we should notice is that the real most recent filler for PRO should be the trace. As can be seen from the representation (6), the trace is apparently in the most recent position for PRO. However, MRFS seems to ignore the trace as a potential filler. One explanation for this is that the trace is not salient, because it is phonetically null (empty). As Fodor (1988) suggests, however, this salience hypothesis robs the whole investigation of its point, because it implies that the parser does not use the information in the grammar.

Considering the two points discussed above, the reasonable representation of (6) should be as follows:
Case Theory

(8) This is the girl that the teacher forced [PRO to talk]

MRFS

Control Information

Both MRFS and control information tells us that the trace is the real filler for PRO. Then there should be no difficulty for the parser to fill the gap, if the parser uses grammatical information correctly, and MRFS takes a trace as a filler. Using this analysis the fact that these sentences are difficult to process therefore cannot be explained by the MRF Strategy.

Which of these two representations ((6) or (8)) correctly describes the behavior of MRFS? Unfortunately, there is no way in English of making an independent test of MRFS, because control information actually precedes gaps, and the positions of the recent and distant filler cannot be exchanged freely in English.

Both FCR and CF claimed that control information is delayed for some reason. However, if we look at the examples discussed in their articles, we will notice that the asymmetry between subject and object control verbs is actually the difference between intransitive and transitive verbs. It is impossible to tell whether control information or transitivity information is ignored or delayed, because these two properties are closely related in the above examples. We must examine examples in which these two properties are clearly separated. That is, we need two types of verb that have the same subcategorization status, but have different control status.

Typical examples of control structure in English are as follows:

(9) John promised Mary [PRO to go]
(10) John advised Mary [PRO to go]

In (9), the subject of the subordinate clause is supposed to be John. That is, PRO is controlled by the subject of the matrix sentence. This control information is carried by the verb promise. Let us call this type of verb a "subject control verb". On the other hand, in (10) PRO is controlled by Mary which is the object of the matrix sentence. That is, not John but Mary is supposed to go. In this case, the verb advised tells us this control information. Let us term this type of verb an "object control verb".

Superficially, these two sentences have the same structure, i.e., "NP - V - [PRO - to - V]". In other words, the linear sequence and configuration of the elements is the same, though the control status of the verbs differ. According to MRFS, therefore, (9) should be harder to process than (10), because the distant filler John must fill the gap (PRO). It would be very useful if we could do an experiment using
these types of sentences. However, it is almost impossible to get a significant result from comparing these types of sentences, for the simple reason that in English there are few verbs such as promise, which can take both an NP object and a sentential argument together.

Now let us consider the following examples in Japanese (*koto* is a nominalizer which converts a verb or a sentence into a nominal expression):

(11) Taroo-ga Hanako-ni [ [PRO iku] koto]-o yakusokusita
    -NOM -DAT NP S go fact-ACC promised
    (Lit. Taroo promised Nanako the fact that PRO would go)

(12) Taroo-ga Hanako-ni [ [PRO iku] koto]-o susumeta
    -NOM -DAT NP S go fact-ACC recommended
    (Lit. Taroo recommended Nanako the fact that PRO would go)

In (11), like (9), the subject of the embedded sentence (PRO) is identical with the subject of the matrix sentence (Taroo). This information will be given by the verb *yakusokusita* (promised). That is, this verb is a subject control verb. On the other hand, in (12), like (10), the subject of the embedded sentence (PRO) is considered to be identical with the object of the matrix sentence (Hanako). The verb *susumeta* (recommended) will specify the possible interpretation. Namely, this verb is an object control verb.

Here we should notice that verbs in Japanese are located at the end of sentences. Therefore, no control information is available for a parser until the end of sentences. If MRFS is a strategy that a Japanese parser employs, then (11) should be more difficult than (12) to process, because the distant filler Taroo is the proper filler contrary to the prediction from MRFS that the most recent filler Hanako should be the proper filler. Thus we can examine whether MRFS applies for filler-gap relation independently from control information. Let us schematize the difference between English and Japanese cases as follows (F=Filler, G=Gap, C=Control Information):

![Diagram](attachment:image.png)
In Japanese MRFS can be tested without relying on CF's controversial hypotheses that control information is temporarily delayed. In other words, control information in Japanese is so late that if there is a strategy, it should be clearly observable.

Furthermore, NPs in Japanese are fairly freely exchangeable, perhaps due to their case markings. This means that we can exchange the positions of recent and distant fillers, and create a new recent filler which was a distant filler. Then, we can test whether the parser selects the new recent filler, which was a distant filler previously, or whether it takes the trace of the original recent filler to be the filler. Here we need to consider whether the conversion of two NPs creates a trace or not. This problem is related to the configurationality of Japanese, which will be a topic of another paper.

It is, of course, not necessarily true that the same strategy applies for all languages. From a viewpoint of typology, English is a head initial language, and Japanese is a head final language. However, MRFS is proposed as a very general "least effort" strategy that would be expected to apply equally in all languages. If it is false for Japanese, this will be a reason for caution in assuming it for English.

References