Repair Strategies in English

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Abstract

In speech extragrammatical constructions are common. There is a lot of interest in how to properly interpret such utterances. Here we model the production of a common class of extragrammatical utterances found in spoken language: self corrections. Self corrections manifest themselves in speech as disruptions to the flow of speech, or *disfluencies*.

In the work described here a corpus of disfluencies is categorised into Change of Speech Act and Corrections. The Corrections are further analysed in terms of the syntactic relation between the words before and after the interruption to the flow of speech.

The paper reviews three previously proposed rules regarding this relation. These rules specify the number of words from before the source of the trouble which a speaker may repeat so as to indicate the attachment site of the repair.

These strategies are implemented in a program which is given as input the *original utterance* and an utterance which it is believed was intended. The program generates repairs and compares them to the recorded repair gathered from the HCRC Map Task Corpus.

The coverage of each rule is compared and their relative merits are discussed.

1 Introduction

Self-corrections are signaled by a discontinuity in the profile of the utterance, this discontinuity taking either the form of a hesitation or an *editing phrase* such as *uhhm*, *sorry* etc. This project looked at a collection of discontinuities [1] collected from the HCRC Map Task Corpus [2]. These discontinuities could either take the form of hesitations (which were not included in this study), fresh starts which we term Change of Speech Act or corrections to the original utterance which we term Repairs. Repairs may *Retrace* words from the end of the OU. A number of people have proposed syntactic attachment rules which determine how far the speaker may retrace. Three of these rules were investigated: a word deletion mechanism [Langer 1990], a mechanism based upon Coordination [Levelt 1983] and one based upon phonological phrases [van Wijk & Kempen 1987].

2 Method

The Discontinuity Corpus is a collection of utterances which contain a disfluency. From the data within the corpus the Original Utterance (OU), Repair and Target were automatically extracted. The Target represents what it is inferred that the speaker intended to say.

[1] [Carletta, Caley & Isard 1993]
[2] [Anderson et al. 1991]

[How far d-{o you want to go}]
$_{OU}$

[west do you want me to go]
$_{Repair}$

[How far west do you want me to go]
$_{Target}$

Each of the syntactic attachment rules was transformed into a rule or set of rules which could be used to generate the Repair, given the OU and the Target.
A program was written which applied each strategy to every discontinuity and recorded whether the actual Repair could have been generated in accordance with it.

2.1 Word Deletion

This strategy relied upon deleting words from the right hand end of the OU. If the Target could be obtained by deleting a fixed number of words and concatenating the Repair then the strategy succeeded.

2.2 Coordination

If the OU and the Repair obeyed the Coordination Rule, given below, then the result was recorded as a success for this strategy.

> An Utterance Repair consisting of Original Utterance (α) and a Repair (γ) is well formed if there exists a completion (β) such that ($\alpha\beta$ or* γ) is well formed, and β is the completion of the constituent immediately dominating the last element of α ($^*or$ to be deleted if the first element of γ is also a sentence connective).

To test this the program parsed the Target and determined whether the Repair started at a coordinatable constituent boundary.

2.3 Phonological Phrase Boundary

A phonological phrase is a section of speech containing only one prominent word. The program checked if the Repair corresponded to the latest Phonological Phrase boundary before the trouble word. If the trouble word was itself the left constituent of a phonological phrase then no retracing would be predicted, otherwise the algorithm predicted retracing to the start of the phonological phrase containing the trouble word.

3 Strategy Comparison

The Coordination rule is the most successful strategy. However it does so in part because Change of Speech Act discontinuities vacuously satisfy the rule. If these data are removed then the Coordination Rule is still the most effective strategy as shown in table 1. This again is due to a single factor: the large proportion of Zero Retracing discontinuities. Retrace Zero successes are largely Immediate repairs, that is ones where there is no delay and no retracing. It is argued that these repairs may result from a different mechanism. The results for delayed retracing repairs only, that is repairs where the interruption occurs one or more words after the problem

Strategy	No.	%
Immediate	23	31.9
Retrace 0	37	51.4
Retrace 1	13	18.1
Retrace 2	10	13.9
Retrace 3	1	1.4
Retrace 4	1	1.4
Dominating Node	26	36.1
Phonological Phrase	32	44.4
Coordination Rule (Non Zero)	21	29.2
Coordination Rule (Zero)	37	51.4
Coordination Rule (Total)	58	80.6

Table 1: Results excluding Change of Speech Act

Strategy	No.	%
Retrace 0	7	25.9
Retrace 1	4	14.8
Retrace 2	6	22.2
Retrace 3	0	0
Retrace 4	0	0
Dominating Node	6	22.2
Phonological Phrase	8	29.6
Coordination Rule (Non Zero)	9	33.3
Coordination Rule (Zero)	7	25.9
Coordination Rule (Total)	16	59.3

Table 2: Results for Delayed Retracing

word, are shown in table 2. The combined retracing rules actually outnumber the retrace zero rule. This shows an increase in the proportion of Retracing Repairs as delay is increased above zero. This result is at variance with that found by Levelt.

4 Causes of Strategy failure

Two simple reasons for strategy failure were the use of a pronoun in the Repair and the Repair consisting of a single adverb.

4.1 Semantic Constraints

A more difficult matter was when the repair had to be inserted in the OU. The strategies all failed on the following example:

[Come due south from the edge of the footbridge]
OU

[straight south for about two inches]
Repair

[Come straight south from the edge of the footbridge for about two inches]
Target

It was proposed that this example requires a further constraint on the Coordination Rule:

- if the grammatical structure of an utterance is maintained, that is if a retracing repair is made, and additional material is added in the course of repair, and no information of that semantic type was already present, then this information is added to the existing information, rather than replacing it.

5 Conclusions

A set of tools was developed which enable an analysis of the Discontinuity Corpus in terms of proportions of retracing. It would be a relatively simple matter to extend the work to the whole corpus. In particular the increased proportion of retracing repairs after a delayed detection contradicts the main work on utterance repair [Levelt 1983], and it would be of interest to discover whether this held for a larger number of examples.

References

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