Syntactic Procedures for the Detection of Self-Repairs in German Dialogues

Bernd Tischer

Ludwig-Maximilians-Universität München, Germany
Institut für Phonetik und Sprachliche Kommunikation, Schellingstr. 3, D-80799 München
tischer@phonetik.uni-muenchen.de

Abstract. One problem of spoken language processing is the handling of self-interruptions and self-repairs in spontaneous speech. Within a sample of negotiation dialogues and free conversations 4300 self-repairs were collected. The repairs were classified by two kinds of covert repair (hesitations, word repetitions) and four kinds of overt repair (retracings, instant repairs, fresh starts, pivot constructions). Self repairs show syntactic regularities which can be used for automatic processing of spontaneous speech (automatic identification of a repair and automatic transformation into the correct utterance). 96% of the repairs are identified and transformed by eleven detection rules. For only 4% of the repairs the rules cannot be applied. For the detection of these rare cases prosodic cues have to be taken into account.

1 Introduction

One problem of spoken language processing is the handling of self-interruptions and self-repairs in spontaneous speech (see [3], [5], [7] and [8]). Within the domain of speech recognition systems robustness with respect to ungrammatical or incomplete structures is a basic requirement, but most systems fail if the speech input contains self-interruptions, fresh starts or other forms of self-repair. In order to develop a grammar for the processing of spoken language the syntactic and prosodic regularities of self-repairs have to be examined.

Mere self-interruptions are disruptions of the speech flow which are marked by an editing term (*hesitations*, in German e.g., "äh", "ähm", "also") or by *repetition* of words, syllables or single phonemes. After the interruption point the utterance is continued without any repair. However, the interruption indicates that the speaker had some trouble, maybe in solving a content problem, in lexical access or in generating the surface structure. Self-interruptions without overt repair are called *covert repairs* ([1], [4]). In contrast to interruptions without any repair, *overt repairs* contain a repair of the preceding utterance. The main forms are sentence break-offs with a *fresh start* after the interruption (false starts, e.g., "In München ist/- ich brauch fast dreimal so viel wie in Heidelberg"; "I prefer/- perhaps we can find a day in the second week"), *word replacements, inserts, deletions,* and *pivot constructions* ([6]), in which the repair is mediated by a term or a phrase which is both part of the original utterance and the following repair (e.g., "Shall *I* can tell you tomorrow" - the pivot is "I", and the repair is the conversion from a question to an assertion).

If the input of automatic speech processing is spontaneous speech, speech processors should be able to detect repairs and to replace the original utterance by the correct utterance, e.g. for word replacements:

(1) IDENTIFY AS REPAIR: "Es war nicht/- war natürlich nötig"
(It was not/- was of course necessary)

(2) REPLACE "nicht" by "natürlich": "Es war natürlich nötig".
(not) (of course) (It was of course necessary)

One aim of the present investigation is the collection of self-repairs and their classification by a system of repair categories. Frequency counts give a first impression of the main forms of self-repair. The second step consists in the formulation of transformation rules by which the original utterance can be transformed into a correct utterance.

A subordinate question of the investigation refers to the effect of situational context on the frequencies and structure of self-repairs. One possible effect is the turn-taking behavior. In natural dialogues, the speaker having trouble must signal that he is continuing his turn (if he does not, he possibly will lose the turn). Therefore, hesitations and/or repetitions of words should increase if there is a possibility for self-selection of the turn by the other speaker. As has been described in [8], in one of the early experimental conditions of VERBMOBIL dialogues (negotiation of appointments) speakers could self-select the turn by speaking even when the other speaker was talking (*uncontrolled turn-taking without button*). In another condition, the speaker had to push a button when he finished his turn. After that, the other speaker could take the turn only by pushing his own speaker button (*controlled turn-taking with button*). Another possible effect is the high amount of problem solving activities in negotiation dialogues, which could raise the probability of self-repairs. To determine the effect of problem solving, the frequencies of repairs within VERBMOBIL dialogues (negotiation of appointments) are compared with the frequencies of repairs in *free conversations* without any problem solving pressure (partners are talking in order to get acquainted).

2 Speech Material

The corpus consists of 8733 turns containing 4300 covert and overt repairs. 3873 turns were drawn from negotiation dialogues without controlled turn-taking (no button pressing), 1390 turns from negotiation dialogues with controlled turn-taking (button pressing), and 3470 turns from free conversation without problem solving (partners getting acquainted). Negotiations without controlled turn-taking contain 1049 instances of repair (27% of all turns). Negotiations with turn-taking control contain 1088 repairs (78% of all turns), and free conversations contain 2163 repairs (62% of all turns). The lower percentage of repairs in negotiations without controlled turn-taking is due to the higher portion of short turns within these dialogues (short answers and back channel responses like "hm"). Negotiations with button pressing (controlled turn-taking) and free conversations contain long turns (e.g., narrations), which raise the probability of making a repair.