Cheap repairs:
A Distributed Morphology tool kit for sentence construction

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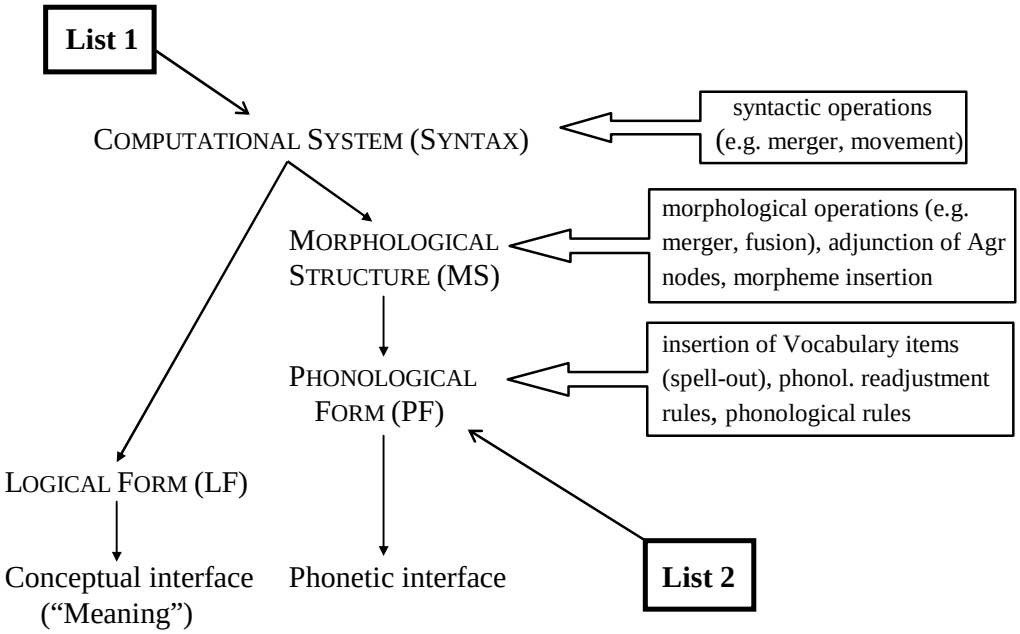
1. Introduction

→ Central question: what kinds of processes mediate between a communicative intention and the articulation of an utterance (Fromkin 1971, Garrett 1975, 1980a; Dell 1986; Berg 1988; Levelt 1989)? And: what role do grammatical units and rules play?
→ Slips of the tongue are of interest because of the assumption that the rules of grammar enter into the processing mechanism such that "evidence concerning production, recognition, [...] and language use in general can [...] have bearing on the investigation of rules of grammar" (Chomsky 1980:200f).
→ Focus of this talk: what can grammar theory tell us about the nature of speech errors and – vice versa – what can speech errors tell us about the nature of grammar?
→ Weak mentalism (Katz 1964; Chomsky 1980): is the theory accurate for the data under investigation, i.e. does it explain the available evidence?

2. Distributed Morphology (DM)

→ In DM (Halle & Marantz 1993; Harley & Noyer 1998, 2003), the computational system is taken to manipulate only abstract roots and morphosyntactic features drawn from List 1.
→ At Morphological Structure (MS), the arrangement and number of terminal nodes may be changed (e.g. insertion of agreement nodes, feature copy, morpheme insertion), cf. (1).

(1)

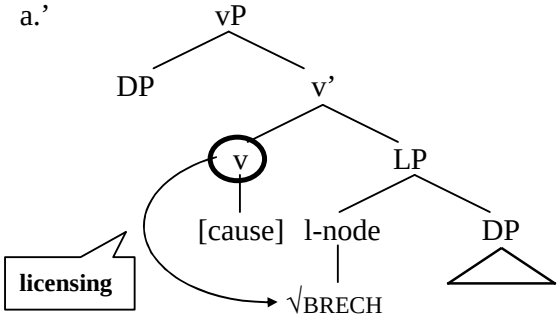


→ Phonological features are assigned to terminal nodes only after syntax at the level of Phonological Form (PF): "late insertion" of Vocabulary items (Marantz 1995). Phonologically specified forms are drawn from List 2, the Vocabulary.
→ At PF, readjustment rules may apply that change the phonological form of already inserted Vocabulary items (VIs) in certain syntactic contexts.
→ Roots drawn from List 1 have no categorial specification. The traditional terms for sentence elements (such as noun, verb, and adjective) are taken to be essentially derivative from more basic morpheme types (Marantz 1997; Harley & Noyer 1998).
→ That is, in syntax, there is only one type of lexical node (l-node) whose categorial status is defined by its context. A noun e.g. is a root whose nearest c-commanding functional node is a determiner, i.e. a noun is a root which is locally licensed by a determiner.
→ Similarly, a verb is a root which is locally licensed by a light verb and an adjective is a root which is locally licensed by a degree element (Corver 1997).
→ In both structures in (2), the l-node hosts the same root. In (2a), the verbal status of √BRECH ('break') is the result of inserting a VI into a terminal node that is governed by v. In (2b), the nominalization of the same root is the result of inserting a VI into a node that is governed by D (also cf. Barner & Bale 2002).

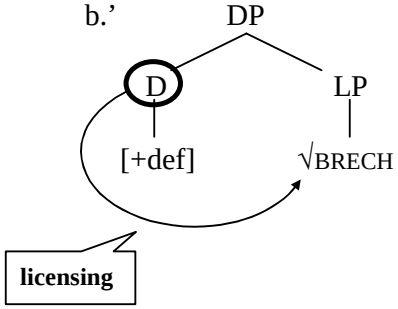
(2) a. Peter bricht den Stock
Peter breaks the stick

b. der Bruch
the breaking

a.'



b.'



→ In (2a') and (2b'), the VI that is inserted at PF will be the same: /breX/. Depending on the syntactic environment, however, different phonological readjustment rules will apply after Vocabulary insertion (3); cf. 6.2. for further discussion.

(3) a. /breX/ → /briX/ / [+v] [3sg]
b. /breX/ → /bruX/ / [+d]

3. Resolving conflicts by means of accommodations

3.1. Error vs. context accommodation

→ Accommodations are errors "in which the phonetic shape of elements involved in errors accommodates to the error-induced environment" (Garrett 1980b:263).
→ The "elements involved in errors" may be the shifted elements themselves (error accommodation: (4a), Garrett (1980b:264)) or the environment in which a shifted element

happens to land (context accommodation: (4b), Stemberger (1982:344)). Both types can co-occur in one error, e.g. (4c) (Meringer 1908, in Berg 1987b:282).[1]

(4) a. I don't know that I'd **hear** one if I **knew** it ← that I'd know one if I heard it
b. **you**'re too good for **that** ← that's too good for you
c. bis **er**'s bei **dir** abhol-t,
until 3.SG.M.NOM'it from 2.SG.DAT pick.up-3.SG
bis du's bei ihm abhol-st
until 2.SG.NOM'it from 3.SG.M.DAT pick.up-2.SG
'until you pick it up from him'

→ For the most part, I will be concerned with context accommodations, since error accommodations, in my opinion, are just a special kind of stranding, i.e. stranding of abstract features: tense in (4a) and case in (4c).

3.2. Accommodation at different levels

→ Accommodations are capable of reconciling processing conflicts at different grammatical levels. (5) is an example of a *phonological* accommodation (Rossi & Defare 1995:7): in the error, the first vowel of the verb is not nasalized.

(5) ils ont co**l**volé en justes noces ← ont cõnvolé
they have.3.PL (error) in right wedding(celebrations) ← have.3.PL married
'They got married in a decent wedding celebration.'

→ In (6), two examples of *morphophonological* accommodations are given. In the English example (6a), the appropriate plural allomorph is chosen (Fromkin 1973:27); in the Turkish example (6b), all suffixes harmonize with the stem after vowel exchange.

(6) a. **track cow**-s [z] ← cow track-s [s]
b. huk**u**met k**ü**r-ül-me-si ← hükümet kur-ul-ma-sı
(error) (error)-PASS-NMLZ-POSS ← government form-PASS-NMLZ-POSS
'formation of a government'

→ In a *morphological* accommodation, after the error, a (different) morpheme is inserted; cf. the English example in (7a) (Fromkin 1973:31) and the German example in (7b).

(7) a. I think it's **care**-ful to measure with **reason** ← reasonable to measure with care
b. das war zufällig die **Wohn**-ung,
that was coincidentally the.F live-NMLZ(F),
äh, die Straße, in der er wohnt
er, a.F street(F) in which.F he live-3.SG

[1] Note that the erroneous utterance is given first, while the intended utterance is given on the right side of the arrow. Whenever there is no arrow in an example, the error was self-corrected by the speaker. The error elements (i.e. the exchanged, anticipated, perseverated, or substituted elements) are in bold type while the elements that undergo post-error adaptation are underlined.

→ Finally, in a *morphosyntactic* accommodation, the structure of an utterance is adjusted with respect to morphosyntactic features after the error has taken place. An example involving the feature [2.SG] has been given in (4b), two examples involving the gender feature are given in (8a) and (8b); the latter is from Garcia-Albea et al. (1989:152).

(8) a. irgendwie habe ich heute eine **Zunge** im **Knoten**
somehow have I today a.F tongue(F) in.the.M knot(M)
← einen Knoten in der Zunge
← a.M knot(M) in the.F tongue(F)
'Somehow I have a knot in my tongue today.'

b. un **duro** de veinte **moneda**-s ← una moneda de veinte duro-s
a.M 5.peseta(M) of twenty coin(F)-PL ← a.F coin(F) of twenty 5.peseta(M)-PL
"a one hundred pesetas coin"

→ It is assumed that the error occurs at an early processing level while accommodation (error element and/or its environment) to certain grammatical well-formedness restrictions takes place at a subsequent processing level (Garrett 1980ab; Levelt 1989).

→ Berg (1987b:277) states that an accommodation is "a process whereby a processing conflict between the actual error and the context of the original utterance is reconciled". This is evidence for the fact "that the processing system is sensitive to the eventual output". Accommodation can thus be viewed as "a blind repair process which brings utterances in line with linguistic constraints".

→ I am going to show that accommodations receive a straightforward explanation when we apply the tools as made available by DM. I am going to claim (i) that no processing conflict is reconciled in an accommodation, (ii) that therefore no repair strategy is involved, and (iii) that output-oriented processing need not be assumed.

4. Tool #1: Feature copy at MS

4.1. Subject-verb agreement

→ Almost all of the errors that show accommodation of subject-verb agreement involve pronouns, cf. (4bc) and (9ab). In these cases, feature bundles are exchanged and at MS, subject features are copied onto the agreement node ((9b) from Berg 1987a:17).

(9) a. **sie** war 21, als **ich** gestorben bin
she was 21 when I die.PART be.1.SG
← ich war 21, als sie gestorben ist
← I was 21 when she die.PART be.3.SG
'I was 21 when she died.'

b. **du** behinder-st **sie**, sie behinder-t dich
2.SG.NOM hinder-2.SG 3.SG.F.ACC, 3.SG.F.NOM hinder-3.SG 2.SG.ACC
'You hinder her, she hinders you.'

c. die **Student**-en hab-en, äh, der Dik hat
the.PL student-PL have-PL, er, the.M Dik have.3.SG
einige seiner Student-en durchfall-en lass-en
some of.his.PL student-PL fail-INF let-INF
'Dik has failed some of his students.'

→ (9c) is the only case from my corpus in which a root is shifted together with the plural feature, this plural feature is copied onto the agreement node.
→ In (10), the Vocabulary items that spell out the roots and the agreement information are listed.

(10) a. √SEIN ↔ /bɪn/ / [1sg]
b. √BEHINDER ↔ /behɪndɐ/
[2.SG] ↔ /-st/
c. √HAB ↔ /ha:b/
[+pl] ↔ /-en/

4.2. Gender agreement

→ In DM, it is assumed that only abstract roots and features are manipulated in the syntax. In German and Spanish, the roots that are selected from List 1 must be specified for gender, i.e. they must be linked to a gender feature (cf. identical gender effect: Berg 1992; Marx 1999; Pfau 2000).
→ In (8a) and (8b), the gender features of the exchanged roots are copied onto the respective determiner positions after the root exchange has taken place.
→ At PF, the VIs that best match the feature bundles in D will be inserted. The VIs for the two determiner positions in (8a) are given in (11a), the VI for the determiner position in (8b) is given in (11b).

(11) a. [ACC][-def][F] ↔ /ainə/
[DAT][+def][M] ↔ /de:m/
b. [-def][M] ↔ /un/

→ Gender feature copy is also observed after semantic substitutions when intended and substituted noun are of different gender; cf. (12).

(12) a. du muss-t die **Tür** dann festhalten, Quatsch, das Fenster
you must-2.SG the.F door(F) then hold, rubbish, the.N window(N)
'You'll have to hold the window then.'
b. ob dein **Irrtum** genauso ausfällt wie mein-er
whether your.M error(M) exactly turn.out like mine-M
← ob dein Urteil genauso ausfällt wie mein-es
← whether your.N judgement(N) exactly turn.out like mine-N
'whether your judgement will turn out to be exactly like mine'

→ Based on the DM-model, a prediction can be formulated: gender accommodation should only be observed after semantic substitutions but not after form-based substitutions, since feature copy takes place before VIs are drawn from List 2.
→ At least for the Frankfurt corpus, this prediction is borne out: there are 49 meaning-based and 47 form-based singular noun substitutions where target and intruding noun have different gender features. However, a fair number of these are not informative, since there is either an ambiguous gender cue in the environment (13a) or no gender cue at all (13b).

(13) a. eher geht ein **Kanal**, äh, ein Kamel durchs Nadelöhr
more.likely goes a.M canal(M), er, a.N camel(N) through.the eye.of.a.needle
'it is more likely for a camel to go through the eye of a needle'

b. sie ist nicht ohne **Wunder** bekannter ← ohne Zufall
she is not without miracle(N) more.known ← without chance(M)
'It is not without coincidence that she is more well-known.'

→ For the clear cases of accommodation and non-accommodation, the following distribution is found: all meaning based substitutions are followed by accommodation, while the same is true for only one out of 11 phonological substitutions (14).

(14)

NOUN SUBSTITUTION	ACCOMMODATION?	
	yes	no
meaning-based	21	0
form-based	1	11

→ In (15a), the only case of accommodation after phonological substitution is given, in (15b), one of the cases of non-accommodation (resulting in a gender feature conflict).

(15) a. wo sie über den **Kalender** guckt ← über das Geländer
where she over the.M calendar(M) looks ← over the.N railing(N)
'where she looks over the railing'

b. oh, ein neu-er **Luft**, äh, Duft
oh, a.M new-M air(F), er, fragrance(M)
'Oh, a new fragrance!'

5. Tool #2: Morpheme insertion at MS

→ At MS, morphemes may be inserted in certain syntactic environments, where syntactic environment means licensing environment; consider the slips in (7) and in (16).

(16) a. people still see Libya as a **nation**-al **danger**, as a danger-ous nation

b. **Einfach**-heit, äh, Pünktlich-keit ist einfach nicht seine Stärke
simple-NMLZ, er, punctual-NMLZ is simply not his strength
'Punctuality is just not his strength.'

c. dass ein **Tänz**-er, äh, dass ein Linguist so wild tanzt,
that a dance-NMLZ, er, dass a linguist so wildly dances
erwartet man nicht
expects one not
'One doesn't expect a linguist to dance so wildly.'

→ Again, abstract roots are manipulated in the syntax. At MS, morphemes will be inserted in certain licensing environments (17). See 6.3 for discussion of competing nominalizations of one and the same root.

(17) a. Insert /-al/ / √X licensed by [+deg]
(where X = √NATION, √COAST, √HERB …)
b. Insert /-hait/ / √X licensed by [+d])
(where X = √EINFACH, √SICHER, √SCHÖN …)
c. Insert /-ər/ / √X licensed by [+d])
(where X = √TANZ, √SING, √SPIEL …)

→ Note that cases in which after an error, nouns or verbs surface with appropriate plural (18a) or participial (18b) morphology are different, since these morphemes spell out morphosyntactic features at PF.

(18) a. die silben-tragend-en **Akzent**-e ← die akzent-tragend-en Silbe-n
the.PL syllable-bearing-PL accent-PL ← the.PL accent-bearing-PL syllable-PL
'the syllables that bear accent'
b. er hat mich ge-**dräng**-t, ge-bet-en ihn nicht zu dräng-en
he has me push-PART ask-PART him not to push-INF
'He has asked me not to push him.'

→ Actually, these examples exemplify yet another tool: the context-sensitive spell-out of morphosyntactic features such as [+pl] and [+part].
→ Also note that plural accommodation in German (18a) and English (6a) are different, since only in English, we are dealing with phonologically triggered allomorphy.

6. Tool #3: Phonological readjustment

6.1. Readjustment due to morphosyntactic features

→ In some errors, a root appears in an erroneous slot where it combines with some morphosyntactic feature which subsequently triggers a stem-internal change.
→ Amongst these morphosyntactic features are [+past] (19a), [+participle] (19b), [3.sg] (19c), and [+plural] (19d). All of these cases involve feature stranding followed by phonological readjustment.

(19) a. ich **las** ihr fürs, äh, ich dank-te ihr
I read.PAST her for.the, er, I thank-PAST her
fürs Korrektur les-en meines Handout-s
for.the correction read-INF of.my handout-GEN
'I thanked her for proofreading my handout.'
b. du hast doch ge-**log**-en, nicht mehr zu versprech-en,
you have PARTICLE lie-PART not anymore to promise-INF
äh, versproch-en, nicht mehr zu lüg-en
er, promise-PART not anymore to lie-INF
'But you promised not to lie anymore.'
c. als der Sprech-er sichtlich mitgenommen
when the speak-NMLZ obviously exhausted
ans Mikrophon **sprich**-t ← ans Mikrophon tritt
to.the microphone speak-3.SG ← to.the microphone step-3.SG
'when the speaker who is obviously exhausted steps to the microphone'

d. im Schwimm-bad könn-en sich die **Bäd**-er, äh, die Kind-er,
at.the swim-bath can-PL REFL the bath-PL, er, the child-PL
richtig austoben
really romp.about
'At the swimming pool, the children can really romp about.'

→ At PF, the Vocabulary Items in (20) will be inserted. After Vocabulary insertion, the phonological readjustment rules in (21) apply.

(20) a. √LES ↔ /le:s/
b. √LÜG ↔ /ly:g/
c. √SPRECH ↔ /sprɛX/
d. √BAD ↔ /ba:d/

(21) a. /e:/ → /a:/ / X [+past]
(where X = *les, geb, tret* ...)
b. /ü:/ → /o:/ / X [+part]
(where X = *lüg*)
c. /ɛ/ → /ɪ/ / X [3sg]
(where X = *sprech, brech, werd* ...)
d. /a:/ → /ä:/ / X [+pl]
(where X = *Bad, Vater, Plan* ...)

6.2. Readjustment due to licensing environment

→ A second type of readjustment is not due to morphosyntactic features but rather to a root appearing in a different licensing environment after the error has taken place (22).

(22) a. der **Sprung**, äh, der Funke spring-t über
the jump, er, the spark jump-3.SG over
'It clicks (between them).'
b. ihr-e **Gabe**, äh, ihr-e Nummer geb' ich dir morgen
her-F gift(F), er, her-F number(F) give.1.SG I you tomorrow
'I'll give you her number tomorrow.'

→ In (22ab), the stem-internal changes (ablaut) are triggered in an environment in which the roots are licensed by a determiner; cf. the readjustment rules in (23).

(23) a. /ʃprɪŋ/ → /ʃprʊŋ/ / [+d]
b. /ge:b/ → /ga:b/ / [+d]

→ The contrast, in (24) we are probably dealing with suppletion where a different (more specified) VI is inserted in a [+d]-environment (25)?

(24) a. auf ein-em **Stand**, auf ein-em Bein kann man nicht stehen
on one-DAT.M stand(M), on one-DAT.N leg(N) can one not stand
'You can't stop at one!'

b. dass er immer mit dem **Zug** zieh-t,
that he always with the.M procession(M) move-3.SG,
äh, mit der Masse zieh-t
er, with the.F crowd(F) move-3.SG
'that he always moves with the crowd'

(25) a. √STEH ↔ /ʃtand/ / [+d]
b. √ZIEH ↔ /tsu:g/ / [+d]

6.3. Competing nominalizations and DP-internal structure

→ Interestingly, in (24b) there a (at least) three different conceivable nominalizations of √ZIEH. Why is the root spelled out as *Zug* ('procession') and not as *Zieh-er* ('puller') or *Zieh-ung* ('draw')?
→ Following Abney (1987), Marantz (1997), and Harley & Noyer (1998), I assume that the functional structure within DP is more complex, involving light verb phrases and/or aspectual projections (cf. Marvin (2002) for Slovenian nominalizations).
→ Without going into details of the syntactic representation of nominalizations, I argue that the nominalization which is spelled out fits the internal semantics of the intended noun. For this reason, √ZIEH is spelled out as *Zug* and not as *Zieher* (which is agentive) or *Ziehung* (which is eventive).
→ Similarly, in (26a), √TERROR is not spelled out as *Terror* or *Terrorismus* ('terrorism'); crucially, both *Direktor* and *Terrorist* have agentive semantics, i.e. *Terrorist* best fits the slot into which it is anticipated.

(26) a. wir hatten schon lange den Eindruck, dass der **Terror**-ist,
we had already for.long the.ACC.M impression(M) that the.M terror-ist(M)
äh, dass der Direktor die gesamte Belegschaft terror-isier-t
er, that the.M director(M) the.ACC.F whole staff terror-ize-3.SG
'Already for a long time, we had the impression that the director terrorizes the whole staff.'
b. der **Touris**-mus, die Ignoranz der Tourist-en
the.M tourism(M), the.F ignorance(F) of.the tourist(M)-PL
nimm-t von Jahr zu Jahr zu
increase-3.PL from year to year PARTICLE
'The ignorance of the tourists increases from year to year.'
c. schreib-t man das mit Binde-**schrift** ← mit Binde-strich
write-3.SG one that with connect-writing ← with connect.line
"Do you write that with a hyphen?"

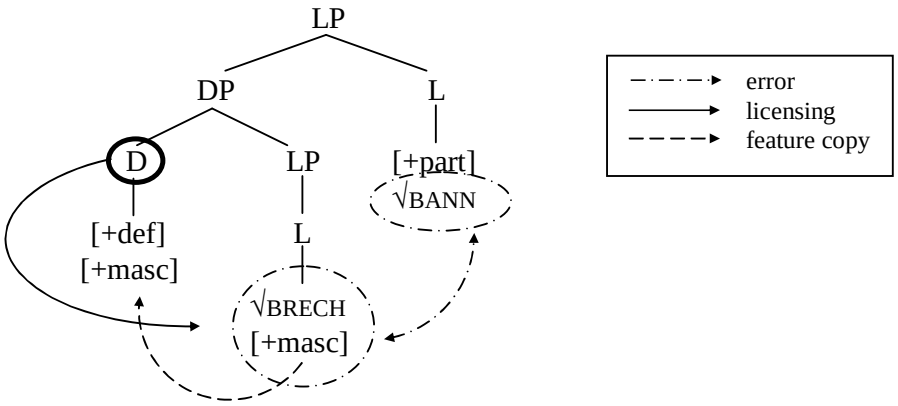
→ Interestingly, in (26b), √TOURIST is anticipated into another position where it is licensed by D, still it changes its form (morpheme insertion). Again, *Tourist* is agentive, while *Ignoranz* and *Tourismus* can be argued to be stative.
→ Finally, in (26c), √SCHREIB surfaces as *Schrift* (and not as e.g. *Schreiber* ('writer') or *Schreibung* ('writing')) because, just as *Strich*, it has stative semantics (while *Schreiber* is agentive and *Schreibung* eventive) – apart from the phonological similarity.

7. The tool kit in action: two more complex cases

→ The error in (27a) is a root exchange. The relevant (and simplified) part of the structure is given (27b). After the error has taken place, the gender feature of √BRECH is copied onto the determiner position.
→ In (27c), the relevant VIs are listed. After Vocabulary insertion, the phonological readjustment rule in (27d), which is triggered by the licensing environment, changes the form of the first error element.

(27) a. da war der **Bruch** ge-**bann**-t ← der Bann ge-broch-en
there was the.M break(M) spell-PART ← the.M spell(M) break-PART
'And then the spell was broken.'

b.



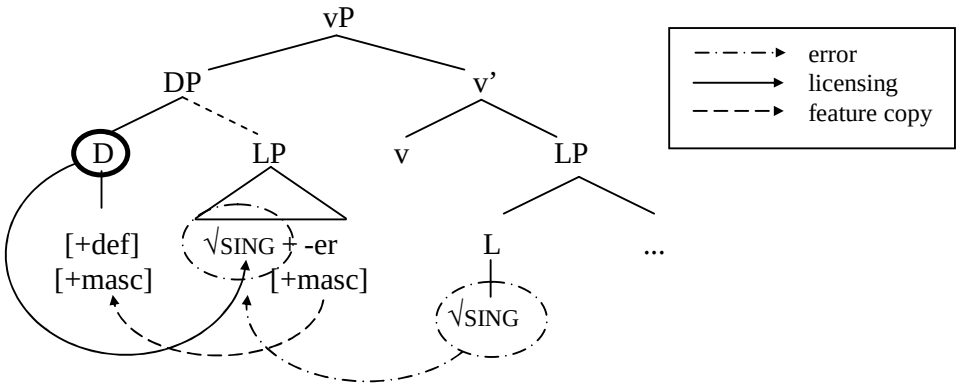
c. [+def] [+masc] [NOM] ↔ /de:ɐ/
√BRECH ↔ /brɛX/
√BANN ↔ /ban/
[+part] ↔ /ge-...-t/

d. /brɛX/ → /brʊX/ / [+d]

→ The slip in (28a) looks simple but is actually one of the most complex ones in my corpus; it is exceptional in that feature copy, morpheme insertion, and phonological readjustment join forces to yield an erroneous but yet grammatical output string.
→ In this slip, a root is anticipated into a slot where it is licensed by D (28b); in this environment, the morpheme insertion rule in (28c) is triggered. Note that I assume that the inserted morpheme comes with a gender feature which will be copied onto D.
→ In (28d), the relevant VIs are given that spell out morphosyntactic features in D as well as the root. The root will subsequently be subject to phonological readjustment (28e).

(28) a. der alt-e **Säng**-er, die alte Diva sing-t wie
the.M old-M sing-NMLZ(M), the.F old-F diva(F) sing-3.SG like
eine rostig-e Rassel
a.F rusty-F rattle(F)
'The old diva sings like a rusty rattle.'

b.



c. Insert /-ər/ / √X licensed by [+d])
(where X = √TANZ, √SING, √SPIEL …)

d. [+def] [+masc] [NOM] ↔ /de:ɐ/
√SING ↔ /ziŋ/

e. /ziŋ/ → /zɛŋ/ / [+d]

8. Conclusion

→ The errors I have discussed illustrate how DM mechanisms allow us to account for the surface form of the erroneous utterances in a straightforward way.
→ Crucially, all the mechanisms involved in the emergence of the above errors (feature copy, morpheme insertion, Vocabulary insertion, and phonological readjustment) are mechanisms which according to DM apply in the derivation of an utterance anyway.
→ Therefore, we need not assume repair strategies of any kind in order to explain such errors. In other words: strictly speaking, the repairs are not "cheap", they come for free. For the same reason, output-oriented processing need not be assumed.
→ I should point out that there are some errors in my corpus in which the above operations seem not to apply, consider, for instance, the ungrammatical exchange in (29).

(29) * da wird mancher **Neid** vor **blass** werden ← blass vor Neid
there will some envy with pale become ← pale with envy
'Some (people) will become pale with envy.'

→ It the slip in (29) was a root exchange – just as the ones discussed above – then the expected outcome (after morpheme insertion and phonological readjustment) would be *neidisch vor Blässe* ('envious with paleness').
→ I therefore have to assume that in these rare cases, we are not dealing with a root exchange but rather with an exchange of phonological words (VIs) at PF.
→ Note finally, that it is not my aim to claim that DM is the *only* model of grammar that can account for the data discussed in this talk (see Pfau & Bakker (2004) and Bakker & Pfau (in press) for analysis of agreement errors within the Functional Grammar framework)

→ Rather, my intention was to show how the operations as assumed in DM can be mapped onto the language production process. In this sense, DM makes for a psychologically real model of grammar.

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