The Semantics of Corrections

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The basic phenomena, previous work and the novel aspects of our account. In each of the examples in (1) the speaker makes a mistake, signals her mistake (*uh, sorry*), and, finally, corrects it. We refer to these as ERROR CORRECTION STRUCTURES (ECSs).

1. a.	Andrew, *uh, sorry*, $[\text{Anders}]_F$ ate a taco.	FULL CORRECTION
b.	Anders made, *uh, sorry*, $[\text{ate}]_F$ a taco.	ELLIPTICAL CORRECTION
c.	Anders made, *uh, sorry*, he $[\text{ate}]_F$ a taco.	ANAPHORIC CORRECTION

The underlined material is the ANCHOR (a.k.a. reparandum; Shriberg 1994), the italicized material is the TRIGGER (a.k.a. editing term) and all subsequent material is the CORRECTION (a.k.a. alteration+continuation). ECSs have been studied in some detail in the psycholinguistics and computational linguistics literature (see references below). Within generative linguistics, repair/revision cases comparable to (1) have received little attention, with the recent exception of Ginzburg et al (2014), who analyze error corrections as a type of clarification requests (Purver 2004) within an incremental dialogue-understanding framework.

In contrast, we focus here on the interaction between ECSs and three core semantic phenomena: (i) contrastive focus, (ii) anaphora to quantificational dependencies and (iii) anaphora to propositional content. We argue that both the anchor and the correction are fully interpreted and contribute propositional contents, but only the corrected proposition is added to the Common Ground (CG). Our account builds on Compositional DRT (CDRT, Muskens 1996), adding explicit discourse reference to propositions and logical forms of the kind needed for focus semantics (Rooth 1992 a.o.) or parasitic scope (Barker 2007 a.o.).

Empirical generalizations. Previous analyses (Heeman & Allen 1999, Ferreira et al 2004 and Ginzburg et al 2014 a.o.) only examine elliptical corrections like (1b) at length, in which the correction is missing otherwise obligatory syntactic material. This focus has lead to accounts which, though couched in very different frameworks, pursue versions of what we call a snip&glue approach: the mistaken portion of the anchor is deleted (snip), the correction is attached to what remains of the anchor (glue), and the result is a single sentence associated with a single propositional content without reference to any corrected structure.

We argue however that all three types of corrections share grammatical behavior that warrants a unified account, and that snip&glue approaches (on their own) cannot provide it. Of particular note are anaphoric corrections like (1c), in which the correction contains a pronominal element that relies on the anchor for interpretation. Corrections of this kind demonstrate that anchor and correction are not fused into a single clause structure.

We make the following generalizations: (**A**) ECSs are a kind of contrastive structure, (**B**) anaphora in ECSs behaves like anaphora between sentences/clauses and (**C**) propositional anaphora to either half of an ECS is possible. Together, they show that snip&glue approaches (on their own) are inadequate. We discuss the three generalizations in turn.

Generalization A: contrastive focus must be placed on all locations in the correction that correspond to mistakes in the anchor. The examples in (2) show this for one correction locus, while the examples in (3) show this for two correction loci.

2. ✓Andrew, uh, sorry, $[\text{Anders}]_F$ ate a taco. *vs* ??Andrew, uh, sorry, Anders ate a $[\text{taco}]_F$.

3. ✓Anders made a taco, uh, sorry, $[\text{ate}]_F$ a $[\text{chalupa}]_F$. *vs* ??Anders made a taco, uh, sorry, $[\text{ate}]_F$ a chalupa. *vs* ??Anders made a taco, uh, sorry, ate a $[\text{chalupa}]_F$.

Generalization B: singular and plural anaphora to quantifiers in error corrections is restricted to the same set of quantifiers that participate in cross-sentential 'telescoping' anaphora; singular pronoun anaphora is restricted to *every* and *each* while plural pronoun anaphora has a wider distribution (Roberts 1987 a.o.). Anaphora across ECSs behaves like anaphora between separate sentences, not like within-sentence binding. These facts are unexpected for snip&glue accounts, which merge anchor and correction into a single sentence.

4. a ✓{Every, Each} boy made, uh, sorry, he [ate]$_F$ three tacos. (based on a corpus example in Milward & Cooper 1994)
b. *{No, Most, Half of the, Twenty} boy(s) made, uh, sorry, he [ate]$_F$ three tacos.

5. a. ✓{Every, Each, Most, Half of the, Twenty} boy(s) made, uh, sorry, they [ate]$_F$ three tacos.
b. *No boy(s) made, uh, sorry, they [ate]$_F$ three tacos.

The paper reports two novel experiments establishing the validity of Generalization B.

Generalization C: the (partially specified) propositional content of both the anchor and the correction are available for subsequent propositional anaphora. It is unclear how snip&glue approaches on their own can capture this.

6. a. A: Anders ate fifty, uh, sorry, he ate [five]$_F$ tacos. B: That would've been crazy!
b. A: Anders ate fifty, uh, sorry, he ate [five]$_F$ tacos. B: That's much easier to believe!

Outline of the account. We argued that ECSs involve sub-sentential contrastive focus, but the overall interpretation of ECSs seems to involve a notion of contrast, summarized in **I**.

I. Contrast-driven interpretation of ECSs: fill in missing material in both the anchor and the correction so that a contrast rhetorical relation can be established between the anchor and the correction (cf. the definitions of contrast in Kehler 2000 a.o.).

The correction can easily be construed as contrasting with the anchor if both anchor and correction are complete, as in (1a). Assessing the contrast relation is trickier if the anchor, correction, or both are incomplete, as in (1b,c). Under our approach both anchor and correction always have clause-like semantic values, and this supports the inferences necessary to establish a contrast rhetorical relation between them.

Closely following Ginzburg et al (2014), we propose an additional, discourse-level component associated with the interpretation of ECSs in **II** below. Since corrections can occur in questions, **II** is meant to cover those cases as well; a suitably general formulation could use the conversation table of Farkas & Bruce (2010).

II. The discourse effect of ECSs: once the contrast relation between correction and anchor is established, only the speaker's commitment to the correction is added to the CG.

We now outline the basic formal infrastructure needed to capture generalizations **A**, **B**, **C** and the interpretive contributions in **I**, **II**. Our account builds on CDRT adding: (i) discourse referents (drefs) for propositions and (ii) logical form structures of the kind needed for focus semantics or parasitic scope. Our basic types are e (entities), t (truth values), s (variable assignments) and $\mathbf{w}$ (possible worlds). We introduce the following abbreviations:

7. $\mathbf{e} := se$; 'individuals' are drefs for individuals, basically individual concepts
$\mathbf{s} := s(\mathbf{w}t)$; intensionality: sentences are interpreted relative to the current assignment and the current proposition/set of worlds that are live candidates for the actual world
$\mathbf{t} := s(st)$; the interpretation of a sentence is a DRS, i.e., a binary relation between an input and an output assignment – see also DPL formulas, Groenendijk and Stokhof (1991)

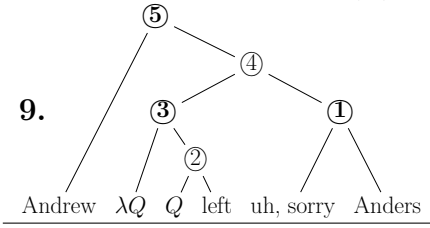
A dref for individuals $u_{\mathbf{e}}$ is of type $\mathbf{e} := se$, while a dref for propositions $p_{\mathbf{s}}$ is of type $\mathbf{s} :=$

$s(\mathbf{w}t)$. When an intensional n-ary static lexical relation R of type $\mathbf{w}(e(e(\ldots t)))$ is interpreted relative to a propositional dref $p_{\mathbf{s}}$, it is interpreted distributively relative to the worlds in p: $R_p(u_1,\ldots,u_n) \coloneqq \lambda i_s.\ \forall w_{\mathbf{w}} \in pi\ (R(w)(u_1 i)\ldots(u_n i))$. We abbreviate introducing drefs $\nu_1,\ldots,\nu_n$ as $[\nu_1,\ldots,\nu_n]$, and a DRS that contains only conditions $C_1,\ldots,C_n$ as $[C_1,\ldots,C_n]$. Dynamic conjunction is symbolized as ';' and for two DRSs D, D' of type $\mathbf{t}$, we have that $D; D' \coloneqq \lambda i_s.\lambda j_s.\ \exists k_s(Dik \wedge D'kj)$, where '$\wedge$' is classical static conjunction. A DRS $[\nu_1,\ldots,\nu_n|\ C_1,\ldots,C_n]$ introducing some drefs and contributing some conditions is just the abbreviation of the dynamic conjunction $[\nu_1,\ldots,\nu_n];\ [C_1,\ldots,C_n]$.

A simple ECS like *Andrew left, uh, sorry, Anders*, is interpreted as shown in (9). The trigger contributes the crucial operator relating the correction to the anchor, shown in (8). The operator takes three arguments: the correction A_α (the type α is underspecified and is dictated by the correction itself)—this is *Anders* in our case; the mistaken part of the anchor A'_α that must have the same type as the correction—this is *Andrew* in our case; and the remaining part of the anchor $B_{\alpha(\mathbf{st})}$ that can be predicated of both A and A'—this is a type-lifted version of *left* in our case. This type lifting happens systematically as a consequence of (i) the mistake *Andrew* scoping out of the anchor and (ii) the trigger+correction *uh, sorry, Anders* taking parasitic scope immediately under the scoped-out mistake. We can think of this LF as necessary for establishing anchor-correction contrast; alternatively, we can provide a continuation-based analysis that does away with these LF operations. Once the operator in (8) takes its arguments, it introduces two propositional drefs p_1 and p_2 for the anchor and the correction respectively, and requires only the p_2 dref to be added to the CG. In (9), we assume a Lewis-style typing with the 'intensionalization' type $\mathbf{s}$ being innermost (closest to the type of sentences $\mathbf{t}$), and we assume Montagovian type lifts for proper names, i.e., they are of type $(\mathbf{e(st)})(\mathbf{st})$, e.g., *Anders* $\rightsquigarrow \lambda P_{\mathbf{e(st)}}.\lambda p_{\mathbf{s}}.\ [u_2|\ u_2 = \textsc{anders}];\ P(u_2)(p)$.

8. *uh, sorry* $\rightsquigarrow \lambda A_\alpha.\lambda B_{\alpha(\mathbf{st})}.\lambda A'_\alpha.\ [p_1,p_2];\ B(A')(p_1);\ B(A)(p_2);\ CG \mathrel{+}= p_2$

9.



$①\rightsquigarrow \lambda B_{(\mathbf{(est)st)st}}.\lambda A'_{\mathbf{(est)st}}.\ [p_1,p_2];\ B(A')(p_1);$
$B(\lambda P_{\mathbf{est}}.\lambda p_{\mathbf{s}}.\ [u_2|\ u_2 = \textsc{anders}];\ P(u_2)(p))(p_2);\ CG \mathrel{+}= p_2$

$③\rightsquigarrow \lambda Q_{\mathbf{(est)st}}.\lambda p_{\mathbf{s}}.\ Q(\lambda x_{\mathbf{e}}.\lambda p_{\mathbf{s}}.\ [\textsc{leave}_p(x)])(p)$

$⑤\rightsquigarrow [p_1,p_2,u_1,u_2|\ u_1 = \textsc{andrew},\ \textsc{leave}_{p_1}(u_1),$
$u_2 = \textsc{anders},\ \textsc{leave}_{p_2}(u_2)];\ CG \mathrel{+}= p_2$

The paper shows how the account captures generalizations **A**,**B**,**C**, how we derive the correct interpretation for more complex ECSs like those in (1), as well as how telescoping anaphora to quantifiers inside ECSs can be captured when we generalize the system to Dynamic Plural Logic/Plural CDRT (van den Berg 1996, Nouwen 2003, Brasoveanu 2008).

In sum, ECSs show that the clause-like semantic values of both the anchor and the correction become part of the interpretation context but in different ways, since only the correction is added to the CG. These two different types of participation/contribution to discourse context have not been systematically investigated before. Furthermore, ECSs are a new type of syntax/semantics-of-silence phenomena in addition to fragment answers, ellipsis, sluicing etc. Mapping out the similarities and differences between these types will increase our understanding of this range of phenomena. Finally, telescoping corrections indicate that we need a formal framework that tightly integrates focus and quantificational alternatives.

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