The End of Competence? Adding Dysfluencies into the Grammar

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Outline

Background I

- Dysfluencies are a common and inevitable feature of spontaneous interaction.
- Dysfluencies have typically been viewed by theoretical linguists and logicians as the *untouchables* of language—elements not fit to populate the grammatical domain. Their very existence is a significant motivation for the competence/performance distinction Chomsky, 1965.
- 'The competence approach uncontroversially excludes performance mishaps such as false starts, hesitations, and errors from the characterization of linguistic knowledge.' Seidenberg, 1997

Background II

- Schegloff, Jefferson, & Sacks, 1977 initiated the study of such utterances among conversation analysts, showing that self-corrections share many properties with clarificational and correctional utterances made by the other interlocutor. (See also De Fornel & Marandin, 1996 for French.).
- The majority of work on dysfluent language has come from psycholinguistic models of speech production and comprehension (e.g. Levelt, 1983; Clark & FoxTree, 2002; Bailey & Ferreira, 2007; Shuval, Konieczny, & Hemforth, 2011),
- from phoneticians (e.g. Candea, Vasilescu, Adda-Decker, et al., 2005; Horne, 2012)

Background III

- from structural approaches designed to improve performance in speech applications (e.g. Shriberg, 1994; Heeman & Allen, 1999).
- and from computational linguists designing parsers that can detect dysfluencies (Johnson & Charniak, 2004; Miller & Schuler, 2008).

Today I

- Arguments why grammars should accommodate dysfluencies.
- A detailed formal account which:
  1. unifies dysfluencies (self-repair) with Clarification Requests (CRs), without conflating them
  2. offers a precise explication of the roles of all key components of a dysfluency, including editing phrases and filled pauses,
  3. accounts for the possibility of self-addressed questions in a dysfluency.
- Sole modification needed to accommodate dysfluencies—an incremental perspective for grammar, a move with extensive psycholinguistic and linguistic motivation (see Rieser & Schlangen, 2011)

Outline

Dysfluencies in Conversation

- Speech dysfluencies follow a fairly predictible pattern

until you're	*at the le-*			*I mean*		*at the right-hand*	*edge*
start	reparandum	moment of interruption	editing terms		alteration	continuation

Backwards looking dysfluencies

- Inspired by a similarly named distinction in the DAMSL annotation scheme (Core & Allen, 1997) , we distinguish between:
- *backward-looking* dysfluencies, where the moment of interruption is followed by an alteration that refers back to an already uttered reparandum.

(1) a. Flights to Boston I mean to Denver. (Shriberg 1994)
b. Have you seen Mark's erm earphones? Headphones. (British National Corpus, file KP0, l. 369-370)
c. From yellow down to brown - no - that's red.

Forwards looking dysfluencies

- *forward-looking* dysfluencies: dysfluencies where the moment of interruption is followed not by an alteration, but just by a completion of the utterance which is delayed by a filled or unfilled pause (hesitation) or a repetition of a previously uttered part of the utterance (repetitions).

(2) a. Show flights arriving in uh Boston. (Shriberg 1994)
b. And also the- the dog was old. (Besser and Alexandersson (2007))
c. A vertical line to a- to a black disk (From Levelt (1989))

The eliminativist view of dysfluencies

- Common assumption:
  1. dysfluencies uniformly present obstacles to comprehension and
  2. dysfluencies need to be excluded in order to study comprehension/ as input to the semantics etc
- Psycholinguistic and semantic evidence contra.

Psycholinguistic Motivation for a non-eliminativist view

(3) From (Brennan & Schober, 2001):

a. Move to the yel- purple square

b. Move to the yellow- purple square

c. Move to the yel- uh purple square

d. Move to the purple square

- Responses to 3a–3c are faster than to 3d (wrt the onset of the target word *purple*).
- Responses to 3a–3b led to more errors than to 3c–3d (indicating that the reparandum had been processed and acted upon).
- Responses to 3c–3d were equally accurate (indicating that the filler helped flagging the repair).

Psycholinguistic motivation for a non-eliminativist view

- Dysfluencies inform comprehension: the utterances in 3 have different immediate effects in terms of inferences and timing.
- Listeners interpret dysfluent speech immediately and make use of the information it provides.
- This goes against any eliminativist approach where dysfluencies are filtered before interpretation.

Do include dysfluencies in the grammar

- Friction analogy: non-dysfluent speech is analogous to frictionless motion. Some of the time it's useful to ignore effects of friction, but the theory of motion is required to explicate the existence and quantitative effects of friction.

Do include dysfluencies in the grammar: dysfluencies are semantically potent

- Dysfluencies are not *noise*: they participate in semantic and pragmatic processes such as anaphora, conversational implicature, and discourse particles:

(4) a. Peter was + { well } he was] fired. (Example from Heeman & Allen, 1999)

b. A: Because I, [[[any, + anyone,] + any friend,] + anyone] I give my number to is welcome to call me (Example from the Switchboard corpus) (implicature: 'It's not just her friends that are welcome to call her when A gives them her number')

c. From yellow down to brown - NO - that's red. (Example from Levelt, 1983)

Do include dysfluencies in the grammar: dysfluencies are semantically potent

- Dysfluencies are source for inference: (5a) entails (5b) and defeasibly (5c):

(5) a. Freda: Becaus-ah (silence: 3.3 seconds)
b. Freda was unsure what she should say after 'because'
c. Freda was unsure about how to explain the situation

Do include dysfluencies in the grammar: crosslinguistic variation I

- Differences in hesitation markers, based on vocalic repertory of language (Candea et al., 2005):

(6) a. 'uh' 'um' (English) (Clark & FoxTree, 2002)
b. 'euh' ... (French): tu sais c'était un peu euh : : l'ambiance santa-Barbar- euh (De Fornel & Marandin, 1996, example (1a))
c. 'em', 'eh' (Modern Hebrew)
d. Mandarin 'en', 'neige' (literally 'that')
e. Japanese 'etto', 'e', '(n)to', '(a)to' (Yoshida & Lickley, 2010)

- Differences in editing phrase possibilities:

Do include dysfluencies in the grammar: crosslinguistic variation II

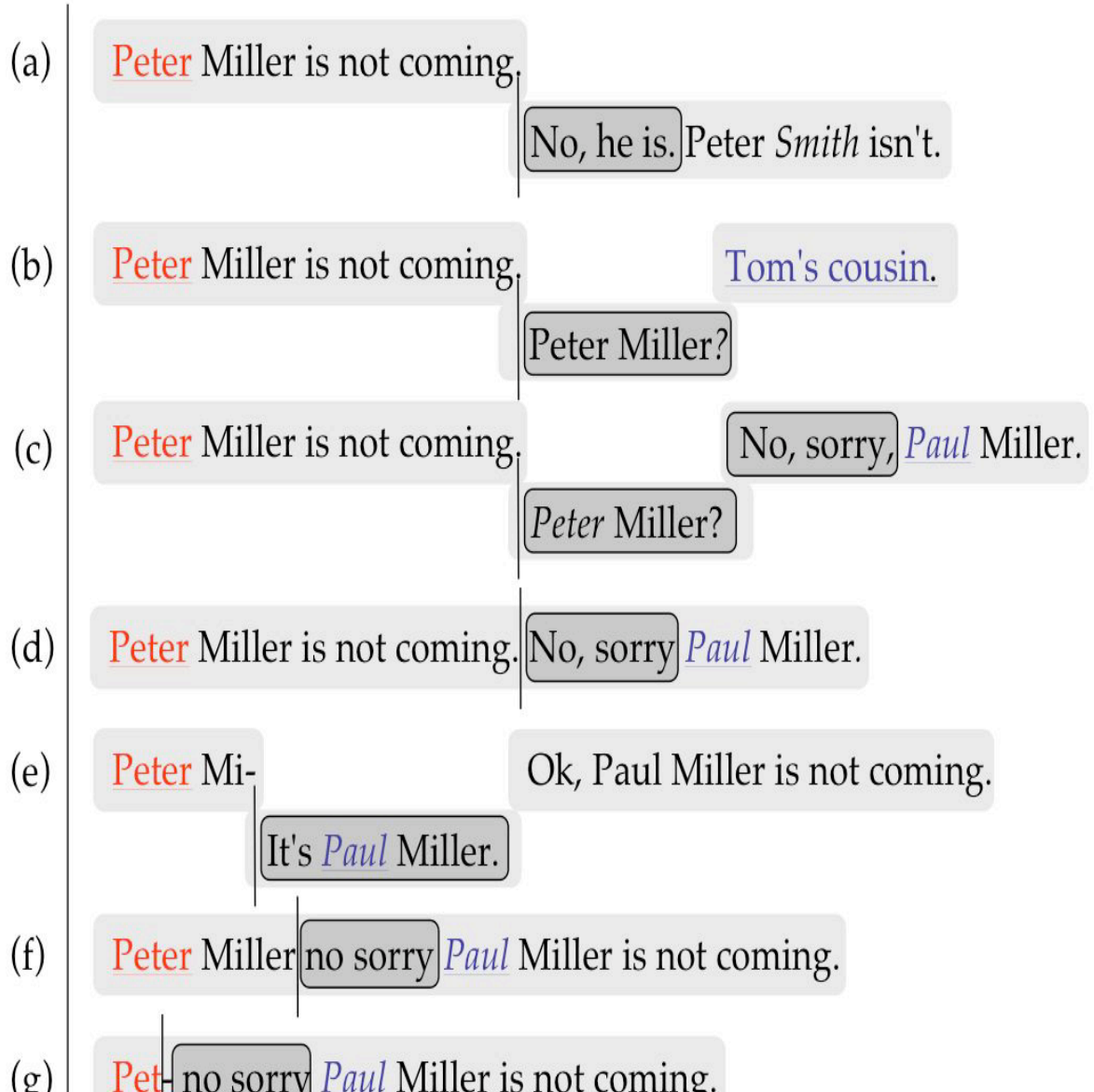
(7) quand ma belle mère enfin quand ma femme apelle
(De Fornel & Marandin, 1996. example (2a))

- Putative universal: if NEG is a language's word that can be used as a negation and dialogue–level correction, then NEG can be used as an editing phrase in BLDs. (e.g. 'Non', 'No', 'Nein', 'lo' (Heb), 'la' (Arabe), . . .)

Unifying self- and other- repair I

- Similarities btw. self-correcting dysfluencies and other types of corrections:

Unifying self- and other- repair II



Unifying self- and other- repair

- There are clear similarities between all these cases:
  1. material is presented publicly and hence is open for inspection;
  2. a problem with some of the material is detected and signalled (= there is a 'moment of interruption');
  3. the problem is addressed and repaired, leaving
  4. the incriminated material with a special status, but within the discourse context.
- That (a)-(c) describe the situation in all examples here should be clear; that (d–f) is the case also for self-corrections suggested by evidence just given.

Our Approach

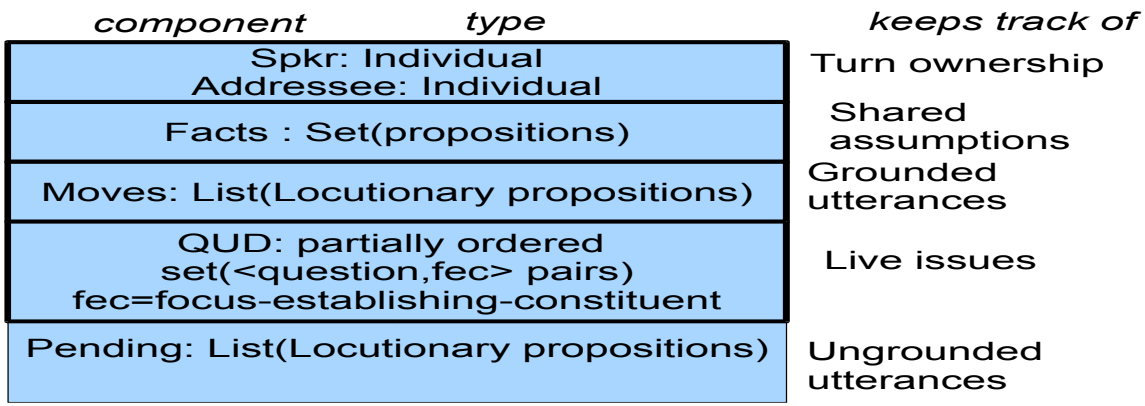
- Dysfluent material, although no longer active in content construction, still remains in context, as with Clarification Requests.
- The revision effect (of repairs and elaborations) is actually caused by the meaning of the interruption, and is a discourse effect on a par with other, more typically described, discourse-level correction and elaboration moves.

Outline

Starting Point: the DGB I

- KoS (Ginzburg, 1994; Ginzburg & Fernández, 2010; Ginzburg, 2012)
- A cognitive architecture in which there is no single common ground, but distinct yet coupled Dialogue GameBoards, one per conversationalist.

Dialogue Gameboard



Simple assertion and querying: ingredients

- Querying: increment QUD with q
- Assertion: increment QUD with p?
- Acceptance: decrement p? from QUD, increment FACTS with p

Decomposing Protocols using Conversational Rules

- Conversational rules that give rise to these protocols:

(8) a. **QUD-Specificity (QSPEC)**: given MaxQUD = q, one can make an utterance which is About or Influences *q*

b. **Ask/Assert QUD Update**: given LatestMove = Ask(A,B,q) (Assert(A,B,p)), q (p?) becomes QUD maximal

Pending: composition

- How do we integrate metacommunicative interaction (MCI) into this picture?
- Utterances are kept track of in a contextual attribute PENDING in the immediate aftermath of the speech event.
- Given a presupposition that u is the most recent speech event and that T_u is a grammatical type that classifies u, a record of the form $\begin{bmatrix} \text{sit} = \text{u} \\ \text{sit-type} = \text{T}_u \end{bmatrix}$ (of type LocProp (*locutionary proposition*)), gets added to PENDING.

An utterance type

$$\begin{bmatrix}
\textsc{phon} : \texttt{is georges here} \\
\textsc{cat} = \mathsf{V}[+\mathsf{fin}] : \mathsf{syncat} \\
\mathsf{constits} = \left\{ \mathsf{is},\ \mathsf{georges},\ \mathsf{here},\ \mathsf{is\ georges\ here} \right\} : \mathsf{set(sign)} \\
\textsc{c-params} : \begin{bmatrix} \mathsf{spkr}\colon \mathsf{IND} \\ \mathsf{addr}\colon \mathsf{IND} \\ \mathsf{I}\colon \mathsf{LOC} \\ \mathsf{g}\colon \mathsf{IND} \end{bmatrix} \\
\mathsf{cont} = \mathsf{Ask}(\mathsf{spkr},\mathsf{addr},\ ?\left[\mathsf{sit\text{-}type} = \mathsf{In}(\mathsf{I},\mathsf{g})\right]) : \mathsf{IllocProp}
\end{bmatrix}$$

A locutionary proposition

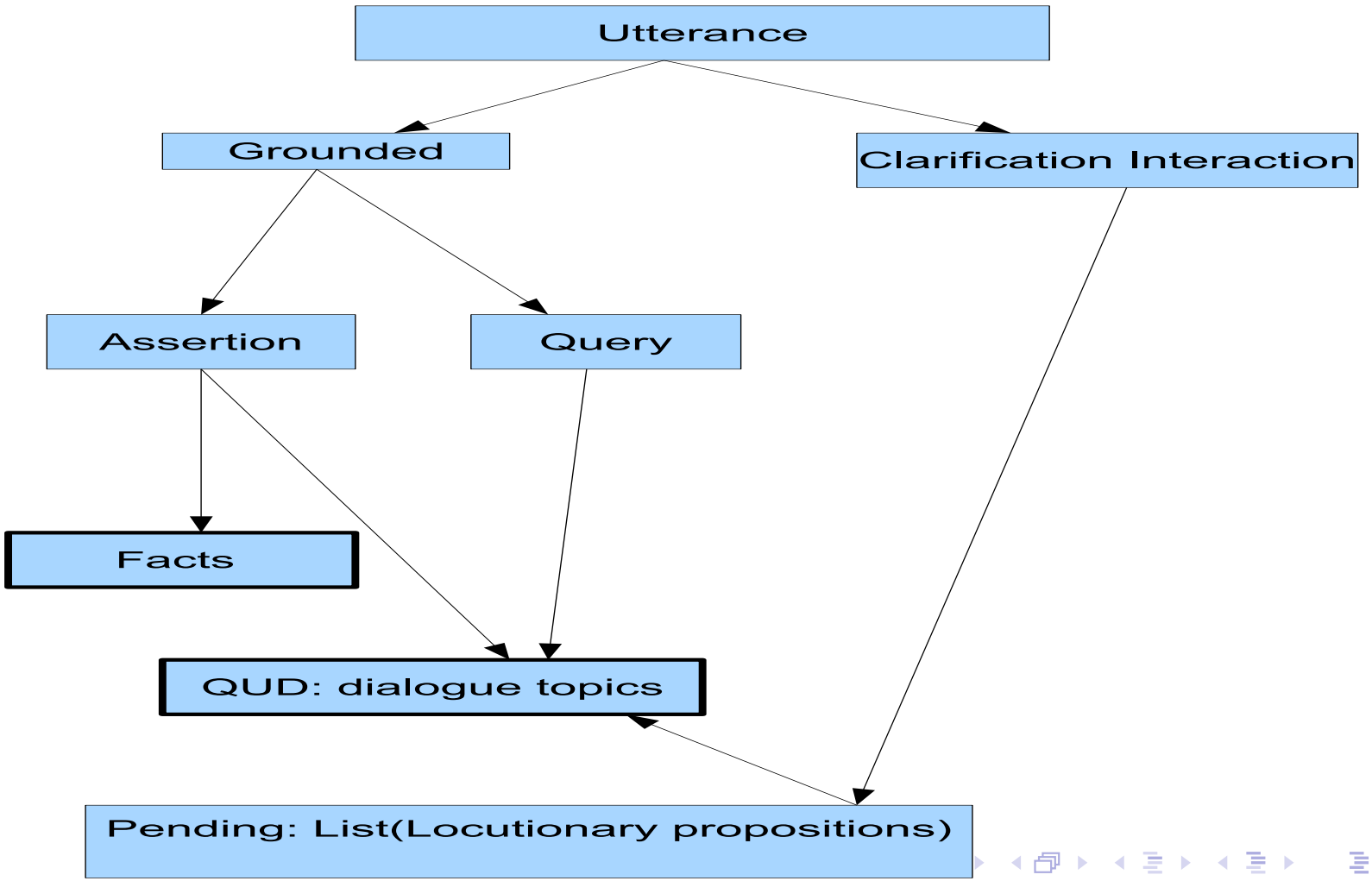
(9)

$$\begin{bmatrix}
\text{sit} = \begin{bmatrix}
\text{phon} = \texttt{izjorjhia} \\
\text{cat} = \text{V[+fin,+root]} \\
\text{constits} = \left\{\text{iz,jorj,hia}\right\} \\
\text{dgb-params} = \begin{bmatrix} \text{l} = \text{loc0} \\ \text{g} = \text{g0} \end{bmatrix} \\
\text{cont} = ?\begin{bmatrix} \text{sit} = \text{s0} \\ \text{sit-type} = \text{Present(g,l)} \end{bmatrix}
\end{bmatrix} \\
\text{sit-type} = \begin{bmatrix}
\textsc{phon} : \texttt{is georges here} \\
\textsc{cat} = \text{V[+fin]} : \text{syncat} \\
\text{constits} = \left\{\text{is, georges, here, is georges here}\right\} : \text{set(sign)} \\
\textsc{c-params} : \begin{bmatrix} \text{spkr: IND} \\ \text{addr: IND} \\ \text{l: LOC} \\ \text{g: IND} \end{bmatrix} \\
\text{cont} = \text{Ask(spkr,addr, }?\left[\text{sit-type} = \text{In(l,g)}\right]) : \text{IllocProp}
\end{bmatrix}
\end{bmatrix}$$

Grounding and Clarification Interaction

- Grounding (Clark, 1996), utterance *u* understood: update MOVES with *u*
- Clarification Interaction:
  1. *u* remains for future processing in PENDING;
  2. a clarification question calculated from u, CQ(u) updates QUD (CQ(u) becomes discourse topic).

Utterance processing in KoS



Contextual extension I

- Contextual instantiation will of course occur as soon as an utterance has taken place, but it can also take place subsequently, as when more information is provided as a consequence of CRification

(10) **Contextual extension**
given the MaxPending locutionary proposition p = $\begin{bmatrix} \text{sit} = \text{u} \\ \text{sit-type} = \text{T}_u \end{bmatrix}$ and a record w that (a) contextually extends u and such that (b) $w.c - params$ is a subrecord of the c-param anchoring intended by u's speaker, integrate w into p.

Contextual extension II

$$\text{dgb1} = \begin{bmatrix} \text{spkr} & = & \text{A} \\ \text{addr} & = & \text{B} \\ \text{pending} & = & \left\langle \begin{bmatrix} \text{sit} & = & \text{u0} \\ \text{sit-type} & = & \text{IGH} \end{bmatrix} \right\rangle \\ \text{qud} & = & \text{dgb0.qud} \\ \text{facts} & = & \text{dgb0.facts} \\ \text{moves} & = & \text{dgb0.moves} \end{bmatrix}$$

Contextual extension III

$$\text{w0} = \begin{bmatrix} \text{spkr} & = & \text{A} \\ \text{addr} & = & \text{B} \\ \text{utt-time} & = & \text{t0} \\ \text{s0} & = & \text{sit1} \\ \text{I} & = & \text{I0} \\ \text{g} & = & \text{g0} \\ \text{c3} & = & \text{pr1} \end{bmatrix}$$

Contextual extension IV

$$\text{dgb2} = \begin{bmatrix} \text{spkr} & = & \text{A} \\ \text{addr} & = & \text{B} \\ \text{pending} & = & \left\langle \begin{bmatrix} \text{sit} & = & \text{w0} \\ \text{sit-type} & = & \text{IGH} \end{bmatrix} \right\rangle \\ \text{qud} & = & \text{dgb0.qud} \\ \text{facts} & = & \text{dgb0.facts} \\ \text{moves} & = & \langle\rangle \end{bmatrix}$$

CRification

- Failure to fully instantiate contextual parameters or recognize phonological types triggers CRification.
- This involves accommodation of questions into context by means of a particular class of conversational rules—Clarification Context Update Rules (CCURs).
- We can do this given the highly restricted nature of potential CRs (repetition requests, reference resolution, confirmation, Purver, Ginzburg, & Healey, 2001; Rodriguez & Schlangen, 2004)

Intended Content CRs I

- The non-sentential CRs in (11b-f) are all interpretable as in the parenthesized readings.

(11) a. A: Is Bo leaving?
b. B: Bo? (= Who do you mean 'Bo'?)
c. B: Who? (= Who do you mean 'Bo'?)
d. Who do you mean 'Bo'?
e. B: You mean Mo.

- This provides justification for the assumption that the context that emerges in clarification interaction involves the accommodation of an issue, one that for (11a) assuming the sub-utterance 'Bo' is at issue could be paraphrased as (11e).

Intended Content CRs II

- The accommodation of this issue into QUD could be taken to license any utterances that are *CoPropositional* with this issue.
- *CoPropositionality* for two questions means that, modulo their domain, the questions involve similar answers.
- For instance 'Whether Bo left', 'Who left', and 'Which student left' (assuming Bo is a student.) are all co-propositional.
- In the current context co-propositionality amounts to: either a CR which differs from MaxQud at most in terms of its domain, or a correction—a proposition that instantiates MaxQud.

Intended Content CRs

- are specified by the update rule Parameter identification, which allows B to raise the issue about A's sub-utterance *u*0: *what did A mean by u0?*

(12) Parameter identification:

$$\begin{bmatrix} \text{pre} & : & \begin{bmatrix} \text{Spkr} : \text{Ind} \\ \text{MaxPending} : \text{LocProp} \\ \text{u0} \in \text{MaxPending.sit.constits} \end{bmatrix} \\ \text{effects} & : & \begin{bmatrix} \text{MaxQUD} = \begin{bmatrix} \text{q} = \lambda x \text{Mean(A,u0,x)} \\ \text{fec} = \text{u0} \end{bmatrix} : \text{InfoStruc} \\ \text{LatestMove} : \text{LocProp} \\ \text{c1: CoProp(LatestMove.cont,MaxQUD.q)} \end{bmatrix} \end{bmatrix}$$

Corrections I

- CRification: missing witness for ctxtual parameter or phonological type. So query for information and unify it in to the representation of the utterance.
- Correction: wrong witness for ctxtual parameter and/or phonological type. So isolate error and substitute the correct information to the representation of the utterance.
- Need to signal if CR answer is a correction:

(13) A: Is Susan Clinton coming? B: Who? A: (I meant) Hilary Clinton. (B: So why did you say 'Susan Clinton'?)

Corrections II

- Could possibly unify both using asymmetric unification—later information takes precedence (priority union, Grover, Brew, Manandhar, Moens, & Schoter, 1994).
- Contextual extension: replace MaxPending.dgm-params with dgb-params record which extends it.
- Pending extension: replace MaxPending with a loc prop which extends it.
- Contextual replacement: replace MaxPending.dgb-params with a record which is a substitution instance.
- Pending replacement: replace MaxPending [containing reparandum] with loc prop [containing alteration] which is a substitution instance.

Corrections III

(14)

A: [$_{u0}$Peter] quit. Not Peter, I meant Paul.

- 'Not Peter' is an initial utterance co-propositional with the issue 'Who did A mean by uttering u0',
- this latter question remains MaxQUD after the utterance 'Not Peter' allowing for a further utterance about this issue.
- Pending Replacement then applies.

Accommodating dysfluencies in the grammar

- The same story will accommodate dysfluencies with the sole modification that we need to take an incremental perspective.
- The monitoring and update/clarification cycle is happening at the end of each word (in fact, there is plenty of psycholinguistic evidence that in practice it happens at an even higher frequency.).
- And given their privileged position the producer of the utterance is monitoring her own speech constantly checking if indeed she uttered what she meant to utter (if yes, continue; if not 'self-clarification' and correction)

Outline

Motivation I

- Among dysfluencies (self-corrections and hesitations) intra-utterance cases vastly predominate.
- Intra-utterance acknowledgements also pervasive.
- Psycholinguistic evidence.
- Quick sketch here, to show how basic MCI principles discussed for CRs and inter-utterance corrections extend seamlessly to dysfluencies.
- Ultimate aim: compile existing sign-based grammars into incremental format.
- Inspired by (Milward, 1994) and recent work on combining TTR with DS by Hough and Purver.

Motivation II

- Milward associates a higher order λ-expression with each intermediate stage of an utterance.
- Represents space of possible continuations.
- For English:
  1. When initial NP encountered with content a, anticipate a property P such that $P(a)$
  2. When encountering a predicative phrase P try to unify with left argument and anticipate rightward arguments.

Motivation III

$$\underset{\langle t,t\rangle}{\lambda Q.tk'(s',Q)} \overset{\text{“John”}}{\rightarrow} \underset{\langle\langle e,t\rangle,t\rangle}{\lambda P.tk'(s',P(j'))} \overset{\text{“likes”}}{\rightarrow} \underset{\langle e,t\rangle}{\lambda Y.tk'(s',lk'(j',Y))} \overset{\text{“Mary”}}{\rightarrow} \underset{t}{tk'(s',lk'(j',m'))}$$

Motivation I

- Slight modification: we want incremental contents that are already dialogical contents
- Distinguish for each sub-utterance event type, its content and its *incremental content*. The incremental content is a record type consisting of fields for anticipated contents, as well as already introduced contents. The former are, in effect, existentially quantified away.
- *cont* and *incr-cont* are equal when utterance terminates and incr-cont is uniquely defined.
- integrates unification–based semantics and Montogovian semantics

Motivation II

(15) a. Jo . . . ↦

$$\begin{bmatrix} \text{phon} : \text{jo} \\ \text{cat} = \text{NP} : \text{syncat} \\ \text{content} = \text{j} : \text{Ind} \\ \text{incr-content} = \begin{bmatrix} \text{P} : \text{Ptype} \\ \text{p-type} = \text{P(j)} : \text{Type} \end{bmatrix} : \text{RecType} \end{bmatrix}$$

Motivation III

b. Jo saw. . . $\mapsto$

$$\begin{bmatrix} \text{phon} : \text{jo saw} \\ \text{constits} = \left\{ u_{jo}, u_{saw} \right\} \\ \text{content} = \lambda\ \text{r1} : \left[\text{x} : \text{Ind} \right] \left[\text{p-type2} : \text{Saw(j,r1.x)} \right] : \\ \left(\left[\text{x} : \text{Ind} \right] \right) \text{RecType} \\ \text{incr-content} = \begin{bmatrix} \text{x} : \text{Ind} \\ \text{p-type} = \text{Saw(j,x)} : \text{Type} \end{bmatrix} : \text{RecType} \end{bmatrix}$$

Motivation IV

- Existential incremental semantics basis for explicating:
  1. Sluicing possibilities in incomplete utterances:

     (16) a. A: Jo . . . B: Did what?
          b. A: Millie likes . . . B: Who(m)?

  2. Cases such as:

     (17) Isaac: it was a hell of a lot better than that steel cube that steel cube, did you see that steel cube (rotates head, back and forth) now that was [stops]
     Tracy: Yeah that was so
     (Isaac and Tracy laugh together and smile, *Manhattan*, Woody Allen)

Backwards Looking Dysfluencies (BLDs)

- BLDs we assume are possible essentially at any point where there is 'correctable material'.
- Technically this amounts to PENDING not being empty. We assume that editing phrases are, in some cases, content-ful constituents of the repair.
- The UR we posit for BLDs is simply parameter identification we saw earlier with the next turn holder being underspecified.

Backwards Looking Dysfluencies (BLDs)

Backwards looking appropriateness repair:

$$\left[\begin{array}{ll} \text{pre}: & \left[\begin{array}{l} \text{spkr} : \text{Ind} \\ \text{addr} : \text{Ind} \\ \text{pending} = \left\langle \text{p0}, \text{rest} \right\rangle : \text{list(LocProp)} \\ \text{u0} : \text{LocProp} \\ \text{c1: member(u0, p0.sit.constits)} \end{array}\right] \\ \text{effects}: & \text{TurnUnderspec} \wedge_{merge} \\ & \left[\begin{array}{l} \text{MaxQud} = \\ \left[\begin{array}{l} \text{q} = \lambda x \ \text{Mean(pre.spkr,pre.u0,x)} \\ \text{fec} = \text{u0} \end{array}\right] : \text{InfoStruc} \\ \text{LatestMove} : \text{LocProp} \\ \text{c2: CoPropositional(LatestMove}^{content}\text{,MaxQud)} \end{array}\right] \end{array}\right]$$

TurnUnderspec

$$
\left[\begin{array}{ll}
\text{pre} : & \left[\begin{array}{l} \text{Spkr} : \text{Ind} \\ \text{addr} : \text{Ind} \end{array}\right] \\
\text{effects} : & \left[\begin{array}{lll}
\text{PrevAud} = \left\{\text{pre.spkr}, \text{pre.addr}\right\} & : & \text{Set(Ind)} \\
\text{spkr} & : & \text{Ind} \\
\text{c1} & : & \text{member(spkr, PrevAud)} \\
\text{addr} & : & \text{Ind} \\
\text{c2} & : & \text{member(addr, PrevAud)} \\
 & \wedge & \text{addr} \neq \text{spkr}
\end{array}\right]
\end{array}\right]
$$

Backwards Looking Dysfluencies: examples

(18) a. From Shriberg (1994):
Flights to Boston I mean to Denver.

b. From BNC KP0 369-370: Have you seen Mark's erm earphones? Headphones.

- in 18a the alteration 'I mean to Denver' provides a direct answer to the issue *what did A mean with the utterance 'to Boston'*;
- in 18b we analyze 'headphones' as a bare fragment ('short answer') which gets the reading 'I mean headphones' given the QUD-maximality of the issue *what did A mean with the utterance 'earphones'*.

Backwards Looking Dysfluencies: one more example

(19) From Levelt (1989):
From yellow down to brown - no - that's red.

- Whereas 'I mean' is naturally viewed as a syntactic constituent of the alteration, 'no' cannot be so analyzed.
- 'no' can be used to express a negative attitude towards an event ('No!'), in this case an unintended utterance event.
- We could analyze 19 as involving the utterance 'brown'. Following this, the BLD rule is triggered with the specification QUD.q = what did A mean by FEC? and the FEC = 'brown.' The analysis then proceeds like the earlier cases.

Forward Looking Dysfluencies

- Forward Looking Dysfluencies are distinct from their backward cousins in a number of ways.
- Most crucially, they *require* an editing phrase, one whose import is the existence of a soon-to-be-uttered word.
- Shortly sketch a lexical entry for 'uh', inspired in part by (Clark & FoxTree, 2002; Horne, 2008) who argue that filled pauses are *conventionally* used interjections.
- FLDs involve the update rule in 20—given a context where the LatestMove is a forward looking editing phrase by A, the next speaker—underspecified between the current one and the addressee—may address the issue of what A intended to say next by providing a co-propositional utterance:
- This rule is inspired in part by Purver's rule for *fillers* (A: I'm. . . B: tired?), (91), p. 92, (Purver, 2004).

Forward Looking Dysfluencies

(20) Forward Looking Utterance rule:

$$\left[\begin{array}{l}
\text{preconds}: \left[\begin{array}{l}
\text{spkr}: \text{Ind} \\
\text{addr}: \text{Ind} \\
\text{pending} = \left\langle \text{p0}, \text{rest} \right\rangle : \text{list(LocProp)} \\
\text{u0}: \text{LocProp} \\
\text{c1: member(u0, p0.sit.constits)} \\
\text{LatestMove}^{content} = \text{FLDEdit(spkr,u0)} : \text{IllocProp}
\end{array}\right] \\
\text{effects}: \text{TurnUnderspec} \wedge_{merge} \\
\left[\begin{array}{l}
\text{MaxQUD} = \\
\left[\begin{array}{l}
\text{q} = \lambda x \ \text{MeanNextUtt(pre.spkr,pre.u0,x)} \\
\text{fec} = \text{u0}
\end{array}\right] : \text{InfoStruc} \\
\text{LatestMove}: \text{LocProp} \\
\text{c2: Copropositional(LatestMove}^{content}\text{,MaxQUD)}
\end{array}\right]
\end{array}\right]$$

Forward Looking Dysfluencies I

- The crucial difference from BLDs is that in FLDs the preconditions involve a prior LatestMove whose content is what we describe as an *FLDEdit* move, more on which shortly.
- Words like ‘uh’, ‘thee’ will be assumed to have such a force, hence the utterance of such a word is a prerequisite for an FLD.

Forward Looking Dysfluencies II

$$\left[\begin{array}{l}
\text{phon} : \texttt{uh} \\
\text{cat} = \textit{interjection} : \text{syncat} \\
\text{dgb-params} : \left[\begin{array}{l}
\text{spkr} : \text{IND} \\
\text{addr} : \text{IND} \\
\text{MaxPending} : \text{LocProp} \\
\text{u0} : \text{LocProp} \\
\text{c1: member(u0, MaxPending.sit.constits)} \\
\text{rest} : \text{address(spkr,addr,MaxPending)}
\end{array}\right] \\
\text{cont} = \left[\text{c1} : \text{FLDEdit(spkr,addr,MaxPending)}\right] : \text{Prop}
\end{array}\right]$$

Forward Looking Dysfluencies

(21) A: Show flights arriving in uh Boston. (Shriberg (1994))

- After A utters u0= 'in', she interjects 'uh', thereby expressing FLDEdit(A,B,'in').
- This triggers the Forward Looking Utterance rule with MaxQUD.q = λx MeanNextUtt(A,'in',x) and FEC = 'in'.
- 'Boston' can then be interpreted as answering this question, with resolution based on the short answer rule.

FLDEdit

- So what is the predicate 'FLDEdit' from a semantic point of view?
- Intuitively, 22 should be understood as *A wants to say something to B* AFTER *u0, but is having difficulty (so this will take a bit of time)*:

(22) FLDEdit(A,B,u0) $\mapsto$ $\exists u1$[After(u1,u0) $\wedge$ Want(A,Utter(A,B,u1))]

- opens the way for a more 'pragmatic' account of FLDs.
- In other words, it suggests a way of *deriving* the FLD rule, rather than simply stipulating it.

FLDEdit

- Once a word is uttered that introduces FLDEdit(A,B,u0) into the context, in other words has an import like 22, this leads to a context akin to ones like 23, that license *inter alia* elliptical constructions like sluicing and anaphora:

(23) a. A: A woman phoned. introduces issue: 'who is the woman that phoned'.
b. A: Max drank some wine. introduces issue: 'what wine did Max drink' .

Self-answering queries I

- A nice consequence of 20, whether we view it as basic or derived, is that it offers the potential to explain cases like 24.
- In the aftermath of a filled pause an issue along the lines of the one we have *posited* as the *effect* of the conversational rule (20) actually gets uttered:

(24) a. Carol 133 Well it's (pause) it's (pause) er (pause) what's his name? Bernard Matthews' turkey roast. (BNC, KBJ)

b. Here we are in this place, what's its name? Australia.

c. They're pretty ... um, how can I describe the Finns? They're quite an unusual crowd actually. `http://www.guardian.co.uk/sport/2010/sep/10/small-talk-steve-backley-interview`

Self-answering queries II

- On our account such utterances are licensed because these questions are co-propositional with the issue 'what did A mean to say after u0'.
- This suggests that a different range of such questions will occur depending on the identity of (the syntactic/semantic type of) u0.
- To test whether this is indeed the case, we ran a corpus study on the BNC, using the search engine SCoRE (Purver, 2001) to search for all self-addressed queries.

Self-answering queries III

categorial context	questions found	Total
pre NP: prep _ or verb _ or NP and _		
	what's his/her name?	19
	what do they/you call him/her/it?	13
	who was it/the woman?	3
	what's the other one?	3
	what did you/I say?	2
	what did it mention	2
		42
det _		
	what do/did they/you call it/that/them	14
	what's it called	2
	what is it	3
	what am I looking for	1
		20
locative prep _		
	Where is it	3
	Where do they call that	2
	What's the name of the street/address	2
	what do they call X	2
	Where do we go	1
	Where did it say now	1
	what is it	1
		12
be _		
	what is she/it	3
	what's the word I want?	1
	what do you call it?	1
		5
Total self addressed questions		**83**

Self-answering queries IV

- Table 1 indicates that self-addressed queries occur in a highly restricted set of contexts, above all where an NP is anticipated and after 'the'.
- Moreover, the distribution of such queries across these contexts varies manifestly: the anticipated NP contexts involve predominantly a search for a name or for how the person/thing is called with some 'who'–questions as well, whereas the post 'the' contexts only allow 'what' questions, predominantly of the form 'what does X call Y';
- anticipated location NP contexts predominantly involve 'where' questions.

Self-answering queries V

- Such examples also highlight another feature of KoS's dialogue semantics: the fact that a speaker can straightforwardly answer their own question, indeed in these cases the speaker is the "addressee" of the query.
- Such cases get handled easily in KoS because turn taking is abstracted away from querying: the conversational rule QSpec, introduced earlier allows either conversationalist to take the turn given the QUD-maximality of q.

Outline

Concluding Remarks and Future Work I

- Dysfluencies need to be dealt with by the grammar:
  - Semantically potent.
  - Grammatically constrained.
  - Cross-linguistic variation.
- Dysfluencies emerge from grammar equipped to deal with clarification interaction and non-sentential utterances by adding incrementality.
- Incremental perspective motivated psycholinguistically
- TTR allows us to combine insights of λ-calculus driven and unification-based combinatorics.
- The end of (one notion of) competence: Grammar no longer characterizes 'well formed utterances', but (gradably) 'coherently interpretable' utterances:

Concluding Remarks and Future Work II

(25) A: What are you looking for?

a. The uh tha tha book (Ruth Kempson-p.c.)

b. Book the

- Cf. probabilistic view of grammaticality (Lappin, 2012): within a language model that assigns probability values to the sentences of a language, the acceptability (grammaticality) of a sentence becomes a graded value, relative to the properties of that sentence and the language of which it is a part.

Concluding Remarks and Future Work III

- An incremental sign-based grammar.
- Detailed look at cross-linguistic differences in dysfluency structures, most notably with respect to editing phrases
- Tie in with other pervasive speech events of 'dubious grammaticality' such as laughter (NB: ca 33k laughter events in the BNC. Commoner than the most frequent verb.) and interjections

Bailey, K. G. D. & Ferreira, F. 2007. The processing of filled pause disfluencies in the visual world. In van Gompel, R. P. G., Fischer, M. H., Murray, W. S., & I. Hill, R. (Eds.), *Eye Movements: A Window on Mind and Brain*, pp. 485–500. Elsevier.

Brennan, S. E. & Schober, M. F. 2001. How listeners compensate for disfluencies in spontaneous speech. *Journal of Memory and Language*, *44*, 274–296.

Candea, M., Vasilescu, I., Adda-Decker, M., et al. 2005. Inter-and intra-language acoustic analysis of autonomous fillers. In *Proceedings of DISS 05, Disfluency in Spontaneous Speech Workshop*, pp. 47–52.

Chomsky, N. 1965. *Aspects of the Theory of Syntax*. MIT Press.

Clark, H. & FoxTree, J. 2002. Using uh and um in spontaneous speech. *Cognition*, *84*, 73–111.

Core, M. & Allen, J. 1997. Coding dialogs with the damsl scheme. In *Working notes of the AAAI Fall Symposium on Communicative Action in Humans and Machines* Boston, MA.

De Fornel, M. & Marandin, J. 1996. L'analyse grammaticale des auto-réparations. *Le gré des langues*, *10*, 8–68.

Ginzburg, J. 1994. An update semantics for dialogue. In Bunt, H. (Ed.), *Proceedings of the 1st International Workshop on Computational Semantics*. ITK, Tilburg University, Tilburg.

Ginzburg, J. 2012. *The Interactive Stance: Meaning for Conversation*. Oxford University Press, Oxford.

Ginzburg, J. & Fernández, R. 2010. Computational models of dialogue. In Clark, A., Fox, C., & Lappin, S. (Eds.), *Handbook of Computational Linguistics and Natural Language* Oxford. Blackwell.

Grover, C., Brew, C., Manandhar, S., Moens, M., & Schoter, A. 1994. Priority union and generalization in discourse grammar. In Schoter, A. & Vogel, C. (Eds.), *Edinburgh Working Papers in Cognitive Science: Nonclassical feature systems*. Centre for Cognitive Science, University of Edinburgh, Edinburgh.

Heeman, P. A. & Allen, J. F. 1999. Speech repairs, intonational phrases and discourse markers: modeling speakers' utterances in spoken dialogue. *Computational Linguistics*, *25*(4), 527–571.

Horne, M. 2008. Attitude reports in spontaneous dialogue: uncertainty, politeness and filled pauses. In Borin, L. & Larsson, S. (Eds.), *From Quantification to Conversation*, pp. 309–318. Gothenburg University, Gothenburg.

Horne, M. 2012. Attitude reports in spontaneous dialogue: uncertainty, politeness and filled pauses. In Borin, L. &

Larsson, S. (Eds.), *From Quantification to Conversation: Festschrift for Robin Cooper on the occasion of his 65th Birthday*, pp. 297–308. College Publications, Lars Borin and Staffan Larsson. This paper appeared in an online version of this collection in 2008.

Johnson, M. & Charniak, E. 2004. A tag-based noisy channel model of speech repairs. In *Proceedings of the 42nd Annual Meeting on Association for Computational Linguistics*, p. 33. Association for Computational Linguistics.

Lappin, S. 2012. The probabilistic representation of linguistic knowledge. ESRC Research Proposal (funded).

Levelt, W. J. 1983. Monitoring and self-repair in speech. *Cognition*, *14*(4), 41–104.

Miller, T. & Schuler, W. 2008. A unified syntactic model for parsing fluent and disfluent speech. In *Proceedings of the 46th Annual Meeting of the Association for Computational*

Linguistics on Human Language Technologies: Short Papers, pp. 105–108. Association for Computational Linguistics.

Milward, D. 1994. Dynamic dependency grammar. *Linguistics and Philosophy*, *17*, 561–405.

Purver, M. 2001. Score: a tool for searching the bnc. Tech. rep. TR-01-07, King's College, London.

Purver, M. 2004. *The Theory and Use of Clarification in Dialogue*. Ph.D. thesis, King's College, London.

Purver, M., Ginzburg, J., & Healey, P. 2001. On the means for clarification in dialogue. In van Kuppevelt, J. & Smith, R. (Eds.), *Current and New Directions in Discourse and Dialogue*, pp. 235–256. Kluwer.

Rieser, H. & Schlangen, D. 2011. Special issue on incremental processing in dialogue. *Dialogue and Discourse*, *2*.

Rodriguez, K. & Schlangen, D. 2004. Form, intonation and function of clarification requests in german task-oriented

spoken dialogues. In Ginzburg, J. & Vallduvi, E. (Eds.), *Proceedings of Catalog'04, The 8th Workshop on the Semantics and Pragmatics of Dialogue* Universitat Pompeu Fabra, Barcelona.

Schegloff, E., Jefferson, G., & Sacks, H. 1977. The preference for self-correction in the organization of repair in conversation. *Language*, *53*, 361–382.

Seidenberg, M. 1997. Language acquisition and use: learning and applying probabilistic constraints. *Science*, *275*(5306), 1599.

Shriberg, E. E. 1994. *Preliminaries to a theory of speech disfluencies*. Ph.D. thesis, University of California at Berkeley, Berkeley, USA.

Shuval, N., Konieczny, L., & Hemforth, B. 2011. Secret agents or sleeping beauties: what happens to repaired constituents?. In *Proceedings of the 33rd Annual Conference of the Cognitive Science Society*, pp. 3307–3312.

Yoshida, E. & Lickley, R. 2010. Disfluency patterns in dialogue processing. In *Proceedings of DiSS-LPSS Joint Workshop*, pp. 115–118.