

Closing by repetition: A formal account of replicative mechanisms in closing sequences

Matías Guzmán Naranjo & Ludger Paschen*

Abstract

This paper sketches a new way of integrating high-level linguistic units (turns, sequences) into a formal model of grammar. Our main claim is that some of the typical formal characteristics of closing sequences in conversation can be analysed as repetition of specific discourse entities at various levels of abstraction. We employ indexing in HPSG as a formal means to accommodate repetitions within larger sequence constructions.

1. Introduction

Interlocutors constantly reproduce fragments of conversation previously mentioned by some speaker in the course of a conversation. This is in part necessitated by the finiteness of lexical and grammatical resources in a language, and also by the fact that conversations develop around specific topics, and speakers tend to repeatedly utter specific words associated to the current topic(s) at a given time during a conversation.

Between-utterances replication of lexical items and syntactic objects has been argued to be a pervasive and ubiquitous feature of dialogical interaction, with no specific meaning attached to it (Du Bois 2014). However, there are also contexts in which repetition of material within a conversation clearly serves a specific discourse-related purpose. One such case are *closing* sequences, i.e. sequences in which a speaker tries to bring an ongoing conversation to an end (Schegloff & Sacks 1973). One of the characteristics of closing sequences is the reproduction of previously mentioned lexical items that are relevant for information structure or are otherwise salient. Another prominent feature of many closing sequences are multiple repetitions of the same discourse particle, often accompanied by special suprasegmental features such as integration of that particle string into a single prosodic unit.

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The aim of this paper is to show that both kinds of replication are part of a larger construction that licenses closing sequences containing repetitions at the offset of a conversation. Though two seemingly different processes on the surface, we argue that both kinds of replication can be modeled using a similar mechanism, namely feature identity in HPSG. To this end, we sketch a larger model of discourse based on HPSG into which the account of closings will be integrated.

The paper is organised as follows. Section 2 offers a discussion of several processes that involve replication in conversation and motivates our choice of closing sequences for the envisaged formalisation of discourse. In section 3, we discuss a concrete example of a closing sequence from Russian that includes several instances of interactionally motivated repetitions. In section 4, we introduce the formal model, and in section 5, we demonstrate how both replicative processes and sequence structure can be implemented within our adaptation of HPSG.

2. Replication in conversation

In the course of a conversation, speakers systematically reproduce parts of sentences from previous turns. Size and abstractness of the recycled material can vary considerably, ranging from adapting subtle sub-segmental details and simple repetitions of lexical items to copying of larger syntactic chunks. All those replicative mechanisms contribute to the perceived coherence and resonance (Du Bois 2014, see discussion below) of multiparty conversations. Recent work on talk-in-interaction has identified an impressive number of phenomena occurring in spontaneous speech that involve some form of replication such as *other-repair* (Schegloff 1987, Wu 2009), but also *accommodation* (Siebenhaar 2006, 2012, Beňuš et al. 2011, Schweitzer & Lewandowski 2014) in its numerous manifestations, e.g. as *prosodic orientation* (Szczepek Reed 2007) or *rhythmic integration* (Couper-Kuhlen 1993, Ogden 2015).

In the following, we will briefly sketch the idea of resonance, which we believe represents a very general and (nearly) unrestricted instance of replication in conversation (section 2.1). We then discuss closing sequences and argue that replication in those sequences is part of a construction associated with a specific interactional meaning and is thus subject to a much higher degree of restrictiveness (sections 2.2 to 2.3).

2.1. Resonance as an inherent property of dialogues

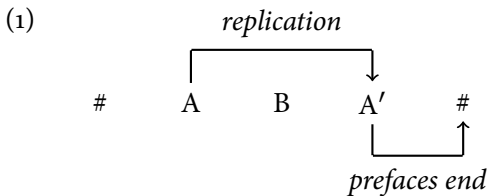
Du Bois (2014) presents an approach to replication in conversation named *dialogic syntax* – a framework that recognises the *diagraph* as a crucial structural unit to establish links between pairs of utterances which generate *resonance* – ‘catalytic activation of affinities across utterances’ (p. 360). His approach draws from the observation that speakers often construct an utterance based on a previous utterance by an interlocutor. The constant coupling of utterances is argued to give rise to a higher-order linguistic structure – the diagraph. Coupling can be achieved at ‘varying levels of abstraction, ranging from identity of words and affixes, to [syntactic] parallelism [...] to equivalence of [...] abstract features of form, meaning, and function’ (p. 360). Crucially, in dialogic syntax form does not predict function: The fact that a speaker reproduces parts of a previous speaker’s utterance does not entail that the meaning of the current speaker’s turn is parallel or opposite (or even related) to that of the one it replicates.

We believe that while the concept of resonance would be extremely hard to implement in a formal model of conversation as we envisage it (both from a formal and a functional point of view), the idea of a higher-order structural unit (in Du Bois’ terms, the diagraph) overseeing affinities across utterances at various levels resembles the idea of *constructions* – abstract constraints on relations between linguistic units. This idea is taken upon in our HPSG-style model, which we will argue to be capable of formally implementing replicative processes in conversation in section 5.

2.2. Bracket structure as replication: An analogy from classical music

Before we continue with the discussion of replication in dialogues, let us consider an example from music. Most classical musical compositions such as sonatas, arias and minuets, obey strict rules as to their formal make-up. Sonatas, for example, are characterised by a tripartite structure comprising exposition, development and recapitulation, and those parts again have some sort of internal structure as well, depending on which subtype of sonata they represent. A recurring pattern in many of those compositions is a general form *ABA'*, as illustrated in (1). Baroque da capo arias, for example, consist of three parts: Two contrasting parts (*A* and *B*) followed by a repetition of the first part, *A'*. The final part, *A'*, often comes with some degree of variation with respect to

the original *A*-part, be it in the form of modifications built into the score by the composer or as musical ornaments freely available to the interpreter.



From a derivational point of view, the *ABA'* pattern can be said to contain a bracket structure created by copying (and possibly slightly modifying) the *A* part to a designated position to the right side of *B*. From a functional perspective, however, *A'* does not only establish a link to the beginning of the piece, but also provides an indication of the ensuing end of the piece, as represented in (1). The copy thus serves two functions: The listener can once more enjoy the initial part of the composition, while at the same time he is made aware of its upcoming ending. Such a *prefacing* function of a (near-)copy of something produced at some earlier point is paralleled by other phenomena in the structure of conversations involving repetition, as will be shown in the next section.

2.3. Replication in closing sequences

In classical Conversation Analysis (Sacks et al. 1974, Ford et al. 2002; CA henceforth), the part of a conversation in which one or more interlocutors try to bring the ongoing conversation to an end is usually referred to as a *closing sequence* (Schegloff & Sacks 1973 and much subsequent work). Closing a conversation is an interactional process achieved collaboratively by all participants: simply exiting a conversation by stopping talking and walking away (face-to-face interaction) or hanging up (telephone interaction) at some point without any previous indication of an intention to do so would be considered rude in most situations and occurs extremely rarely. However, some participants may be more persistent in their endeavour to reach that goal than others, and socio-cultural rules may dictate a specific routine of sequences at the offset of a conversation, which is why often several closing attempts are necessary before the ultimate end of a conversation is reached.

Speakers have a wide range of resources available to them for initiating the end of a conversation, and normally several of them are used at the same time.

Closing strategies include lexical, phonetic, and syntactic devices as well as routines (Schegloff & Sacks 1973, Button 1987, Müller 1996, Wright 2011). One particular strategy that has been recognised in the literature (Button 1985, Curl et al. 2006, Local 2007, Barth-Weingarten 2011) is *repetition*. By repeating previously uttered parts of the conversation, speakers can make their turns closure-implicative, signalling their intention to complete an ongoing sequence or a whole conversation. In general, there seem to be no restrictions on the size and locality of repeated chunks – repetition can apply very locally to single lexical items, but it can also stretch over the whole of a conversation, e.g. when the main topics or results of a discussion are reiterated. One of the underlying principles of the latter case seems to be the fact that the need to communicate is often triggered by a mismatch in speakers' common ground. When, after some negotiation stretching over a certain number of turns, interlocutors have arrived at a point where that mismatch is resolved, a conversation can be considered felicitous and complete.¹ Speakers have several ways of communicating when they think that point is reached, and topical repetition is one of them. Thus, repetition does not need to be verbatim, but can also happen on the information-structural or the semantic level.

3. Case study: Two kinds of replications in a closing sequence

In this section, we will discuss a concrete example of a complex multi-turn closing sequence that contains both local and non-local repetitions. We will argue that both kinds of repetitions – local doubling of lexical material and non-local reproduction of topical discourse entities introduced previously in the conversation – are part of an interactional practice constituting a closing sequence, and that the repetitions can be thought of as part of an abstract sign-based construction licensing this practice.

The fragments in (2)–(4) are taken from the ORD speech corpus, a large collection of day-long recordings containing naturally occurring urban speech from Saint Petersburg (Šerstinova 2009). Transcriptions largely follow the GAT2 conventions (Selting et al. 2009). The fragments are situated within a

¹A similar approach is pursued in Yokoyama (1986, 2001): In its *neutral* mode, discourse is defined as a trade-off of knowledge, reflected by a constant updating of the interlocutors' *current concerns*. In addition, Yokoyama's model also includes a *non-neutral* mode, in which speakers can access a meta-level and negotiate the discourse setting itself.

larger episode in which S24, a 63-year old lecturer at Saint Petersburg State University, is talking to several colleagues and students at her department.

In line 01 of fragment (2), S24 is approached by FX, one of her students, who starts inquiring about a test that the students will have to take in the near future. FX establishes the common ground by mentioning a specific folder (l. 03), which S24 acknowledges (response token in line 04). FX then puts forward the main reason for starting the conversation: She seeks information on an upcoming test (l. 05), and is particularly worried about the questions that will appear in it (l. 06).

(2) *Initiating a request sequence: Russian transcription and English translation*
(ordS24-10, 00:34.940 – 00:45.170)

01	FX	zdravstvujte (-)
02		možno vas pobespokoit'
03		ja (-) ja dostala papku po pervomu kursu večernikov=
04	S24	=tak=
05	FX	=vot (.) i chotela by uznat' v kakoj forme my sdaëm èkzamen
06		(.) °h i po povodu voprosov

01	FX	hello (-)
02		may I have a moment
03		I (-) I took the folder of the first-year evening students=
04	S24	=so=
05	FX	=well (.) and I wanted to ask in what form we will take the test
06		(.) °h and about the questions

Following the request initiation sequence, both interlocutors engage in a discussion about the exam and the test questions, with FX continuing to inquire about the details of the test and S24 promising to provide the necessary information in time, though the statements she makes are rather unspecific and her answers evasive. About 44 seconds after the end of fragment (2), S24 initiates a new sequence that aims at bringing the ongoing discussion sequence – and also the conversation as a whole – to an end. This new sequence (given in (3) below; a complete basic transcript including the omitted sections is included in the appendix) starts with S24 taking the floor (l. 30) despite the incomplete syntactic and prosodic nature (steady mid-level Fo throughout *to est' èto* 'that

means it's') of FX's previous turn (l. 28) and the fact that FX (unsuccessfully) tries to initiate a new TCU (Turn Construction Unit) at the same time S24 comes in (l. 29). The reason for this rather crude turn transition lies in the fact that S24 is obviously feeling uncomfortable with the current situation: Not only is she either not willing or unable to answer all questions directed to her by FX to their mutual satisfaction, but she also has a tight schedule and other pressing business at the department that she must attend to. For that reason, S24 readily reinterprets the response token *chorosho* 'ok' (l. 28) with which FX is indicating closure of some previous (sub-)sequence as prefacing the onset of a conversation-closing sequence, which S24 then initiates. Thus, external factors cause S24 to rank her own wish for the current conversation to be as brief as possible higher than the indications by FX as to the incompleteness of the ongoing discussion sequence.

(3) *Closing sequence (ordS24-10, 01:28.950 – 01:35.330)*

28	FX	chorosho. to est' èto- (-)
29	FX	[a]
30	S24	[è]to ne problema budet voprosy
31	FX	aga=
32	S24	=ja vam dam i èto ne budet vot tak (.)
33		da da da da da
34	FX	ugu (.) vsë.

28	FX	ok. that means it- (-)
29		[but]
30	S24	[the] questions won't be a problem
31	FX	I see=
32	S24	=I will give them to you and it won't be that's it (.)
33		yeah yeah yeah yeah
34	FX	mhm (.) that's all.

Let us now focus on some conspicuous features of the closing sequence proper (ll. 30–34). S24 recapitulates her previous comments on the concerns raised by FX by stating that the questions (*voprosy*) in the test will not be too difficult for the students (*ne problema budet*) (l. 30). This way, S24 'ticks off' the topic *questions* in the common ground, and – since the unresolved issue of the exam

questions was FX's justification for starting the conversation in the first place – clears the way for bringing the dialogue to an end. Crucially, S24 makes reference to the topic by using the exact same lexical item (*voprosy* 'questions') that has been uttered several times in the course of the conversation, e.g. at the very beginning in line 06. In the transcript, lexical repetitions are marked in boldface; *ne problema* 'not a problem' in line 30 has been highlighted, too, because it is not only the essence of what S24 is trying to convey throughout her discussion with FX, but also a literal repetition of one of her previous utterances (l. 16, see the complete version of the transcript in the appendix for reference).

FX reacts with a response token signaling agreement (l. 31), and S24 continues to reassure her of there being no reason to feel anxious about the test, and thus no reason to prolong the ongoing dialogue (l. 32). After the end of the TCU in l. 32, S24 produces five repetitions of the particle *da* in rapid succession (l. 33). Intervals between the repeated particles are of roughly equal length (around 0.6 – 0.7 sec), suggesting that the string of *da*'s is rhythmically integrated into a single larger prosodic unit; a diminuendo and steadily falling pitch contour stretching over the whole string offer further support for this analysis.² The single-unit five-partite string *da da da da da* serves the same purpose as the topical repetitions in line 30: It is almost as if with every new instantiation of *da*, S24 is trying to cancel any past, present and future attempts her interlocutor has made or might make to open a new sequence. The crucial interactional device at work here is the repetition and not so much the individual particle, as a repetitive string made up of a different particle such as *ladno* 'ok, alright' would be equally acceptable and pragmatically (quasi)-synonymous in this context.³ Positive response tokens, however, do seem to be particularly well-suited to perform a function related to closings (of sequences or conversations) cross-linguistically (see e.g. the discussion of German *jaja* 'yesyes' in Barth-Weingarten 2011).

FX's immediate reaction to S24's turn consists of a response token *ugu* 'mhm' and a sequence-closing discourse marker *vsë* '[that's] all' (l. 34). Falling pitch

²Particle repetition is a strategy used by speaker S24 in a wide range of closing situations as attested in the ORD corpus (see Paschen & Richter 2014 for discussion)

³Another interesting case of *da*-repetition is reported in Bolden (2009): In a Russian telephone conversation, one speaker tries to initiate a closing sequence, while the other expands the conversation by commenting and asking questions. At some point, the latter speaker utters three repetitions of *da*, aiming at closing down her interlocutor's closing sequence. We thus have a case of *da*-repetitions with an other-directed sequence-closing function just as in our example above, but with the intention of sustaining, rather than concluding, an ongoing conversation.

at the end corroborates the impression of a closing function of *vsě*. FX thus appears to relent over her interlocutor's closing intentions which have just been reinstated in the form of the *da*-sequence. At this point, the conversation could have perfectly well come to an end, with an optional insertion of a farewell routine such as *spasibo, do svidanija* ('thanks, bye'). However, this is not what happens, as the continuation of the transcript given in (4) below shows.

- (4) *Re-negotiating and expanding the closing sequence, initiating a new sequence (ordS24-10, 01:34.440 – 01:54.425)*

34	FX	ugu (.) vsě. ↑togda značit=
35	S24	=i u vas budet da ėkzamen
36	FX	ugu
37	S24	Katja prosti da slušaj ętot

34	FX	mhm (.) that's all. ↑then so--=
35	S24	=and you will take the test
36	FX	mhm
37	S24	Katja excuse me yes listen this

Following the potential sequence-closing TCU in the first half of line 34, FX immediately self-selects to start a new TCU, expressing her intention of initiating a new sequence or returning to a previous sequence. Paralleling a previous competitive turn transition (ll. 28–30), S24 again does not allow FX to finish her turn, as she comes in at a point where FX's turn is not complete syntactically or prosodically (l. 35); this time, though, the transition lacks audible overlap and is somewhat smoother.

At the point S24 realises that her first attempt to conclude the conversation, the closing sequence in (3), has been unsuccessful, she has a set of possible options how to react. Still adamant in her intention to push her closing initiative through and unwilling to allow any new sequence to unfold, S24 chooses to post-expand the closing sequence; to that end, she resorts to the same strategy she used several times before in the course of the conversation: repetition of topically relevant lexical material (*ėkzamen* 'test', l. 35). However, the sequence (and the conversation as such) is then ended abruptly as S24 re-engages in a

conversation with a colleague of hers, *Katja* (l. 37 onward), with whom she talked before she was approached by FX.

To conclude, the essential structural components of the conversation and replicative devices used by the speakers can be summarised as follows:

(5) *Structure of the conversation*

Lines	Speakers	Sequence	Replication
01–06	FX	START, greeting, requesting	
07–29	S24, FX	discussing	
30–34	S24, FX	closing	topic (<i>questions</i>), particle (<i>da</i>)
34	FX	re-opening discussion (at-tempt only)	
35–36	S24, FX	expanding prev. closing seq.	topic (<i>test</i>)
37	S24	aborting current (= END) and opening a new conver- sation	

4. The (quasi) formal model

In a different paper (Guzmán Naranjo & Paschen forthcoming) we propose a similar model based on Sign-Based Construction Grammar (Boas & Sag 2012), but for this paper we rethink the proposal in terms of constructional HPSG (Ginzburg & Sag 2000, GS from now on). The main reason for this is that the locality constraints imposed by SBCG might be too strong for CA phenomena. Our initial argument on why we need a declarative, model-theoretic approach to conversation still holds, however. The reason is simple: It makes more sense to describe conversational interactions with a set of constraints of what is possible and what is not, than to provide a set of rules to derive them. Additionally, ‘ungrammaticality’ in conversation can be easily understood as a type of awkwardness that follows the violation of some constraint. Assume, for instance, a simple constraint specifying that all conversations in a given language must start with a greeting sequence. Conversations without such a sequence then would still be possible, but speakers would feel that something went wrong. A rule-based approach, however, would fail to produce such a conversation in the first place.

4.1. TCUs

Turn Construction Units (TCUs) were among the first structural building blocks recognised in classical CA (Sacks et al. 1974), and the concept has been widely used in the CA literature ever since. The exact definition and the categorical status of TCUs have been the subject of considerable debate, however (see Selting 2000 for discussion). The fundamental notion is that TCUs are divisions within turns. The idea is that there are significant units, usually smaller than turns, which can be understood as containing complete semantic content. What this means is that TCUs are understood as potentially complete turns (Schegloff 1996). Nonetheless, there is little agreement regarding the formal features of TCUs and how they should be formalised. In this study, we will assume that TCUs subdivide turns into complete messages, and optionally contain a boundary marker. Additional properties of TCUs could be integrated as long as they respect the turn boundary, that is, in this approach TCUs can not be shared by multiple speakers.⁴

4.2. Turns

We take turns to be the basic units of conversation. We will analyse TCUs as clauses within a turn. That is, the feature TCUS is a list with all clauses contained in the turn. Additionally, we will define turn constructions which are constraints on turn sequences and turn interactions. The basic form of a turn is given in (6). *turn* types consist of three main features: FORM, TCUS and TURN-PRAG.⁵ The FORM feature is the concatenation of the lists of the FORM features of the daughters. The TCUS feature lists the daughters of the turn, which are of the type *overt-expression* (phrases or words).

⁴This obviously poses a problem for multi-turn TCUs, as they occur in other-completion or parenthetical constructions (see Mazeland 2007). One way of dealing with such cases in our model is to reanalyse them as competitive turn sequences consisting of non-complete messages and to require that it is only the sequence that forms a complete message.

⁵We will not elaborate on how conversational pragmatics interacts with formal semantics. For a more elaborated model of conversation pragmatics, see Ginzburg (2012).

$$(6) \left[\begin{array}{l} \text{turn} \\ \text{FORM} \quad \dots \oplus \boxed{A} (\oplus \boxed{B}) \oplus \dots \\ \\ \text{TCUS} \quad \left\{ \begin{array}{l} \left[\begin{array}{l} \text{PHON} \dots (\oplus \textit{boundary}) \\ \text{FORM} \boxed{A} \\ \text{SEM} \textit{message} \\ \text{PRAG} \mid \text{C-IND} \mid \boxed{1} \end{array} \right] \\ \oplus \left(\begin{array}{l} \left[\begin{array}{l} \text{FORM} \boxed{B} \\ \text{SEM} \textit{message} \\ \text{PRAG} \mid \text{C-IND} \mid \boxed{1} \end{array} \right] \end{array} \right) \end{array} \right\} \\ \text{TURN-PRAG} \quad [\text{NEXT-SPKR} / (-)] \end{array} \right]$$

Note that the basic *turn* type imposes no constraints on the SYN feature of the signs, but only on its SEM feature, specifying that it must be a semantic object of type *message*, that is, a complete communicative content (in GS: *message, proposition, question, outcome* or *fact*), which enforces that the sign in the TCU list must be clausal.⁶ The constraint on the PHON feature is meant to indicate that there is some sort of intonational boundary marking that separates and delimits the borders between TCUs, except for the last one, which may lack it. Finally, the TURN-PRAG feature should contain the pragmatics associated with different types of turns and turn-taking. Provisionally we only include the feature NEXT-SP(EA)K(E)R, which indicates whether a current speaker yields the floor to the interlocutor or not. Because turns only mark NEXT-SPKR + if there is an over indication of this, we stipulate that by default turns are marked have a – value in this feature (marked by the use of ‘/’), which more specific constructions or types can override. With this simple structure we believe we are able to accommodate the most crucial characteristics of TCUs.

4.3. Turn-managing constructions

With the types defined so far we can straightforwardly analyse turn-managing, turn-changing, and types of turn-taking. We define turn constructions as follows.

⁶Notice that coercing constructions will be necessary to allow cases which are syntactically non-clausal, but clausal in conversation. Also, notice that we cannot use the VFORM feature as in GS because we want to allow for non-verbal phrases to be clauses.

$$(7) \left[\begin{array}{l} \textit{turn-seq} \\ \text{PRAG} \quad \text{list}(\textit{turn-managing-prag}) \\ \text{DTRS} \quad \left\langle \left[\begin{array}{l} \text{C-PARAMS} \mid \text{SPEAKER } \boxed{1} \\ \text{C-PARAMS} \mid \text{SPEAKER } \boxed{2} \end{array} \right], \dots \right\rangle \end{array} \right]$$

What this feature description says is that *turn-sequences* are composed of at least two adjacent turns from different speakers. This definition implies that there can be no turn sequences by the same speaker, and that any utterance sequence produced by a single speaker which is not interrupted by some other speaker's turn constitutes one turn.

Trivially, competitive vs cooperative turns are modelled with the NEXT-SPKR feature in that cooperative turn constructions assign a positive value to the first turn, while competitive turn constructions assign a negative value:

$$(8) \left[\begin{array}{l} \textit{turn-seq-coop} \\ \text{PRAG} \quad \langle \textit{cooperative} \rangle \\ \text{DTRS} \quad \left\langle \left[\text{NEXT-SPKR } + \right], \dots \right\rangle \end{array} \right]$$

$$(9) \left[\begin{array}{l} \textit{turn-seq-comp} \\ \text{PRAG} \quad \langle \textit{competitive} \rangle \\ \text{DTRS} \quad \left\langle \left[\text{NEXT-SPKR } - \right], \dots \right\rangle \end{array} \right]$$

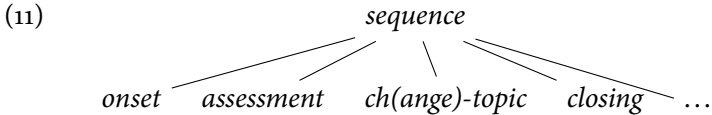
Since turn sequences are part of a hierarchy, unification provides the full types:

$$(10) \begin{array}{ccc} & \textit{turn-seq} & \\ & / \quad \backslash & \\ \textit{turn-seq-coop} & & \textit{turn-seq-comp} \end{array}$$

As mentioned before, additional overt constraints are required to allow turns to mark NEXT-SPKR as +. These might be over lexical material (posing a direct question), or a particular intonation contour. We will not elaborate on these constraints here.

4.4. Sequences

CA recognises that conversations have a structure of their own, with *onsets*, *topic changes*, *closings*, etc. We need to integrate this into our model to be able to account for closing turns. First we define a new type *sequence*:



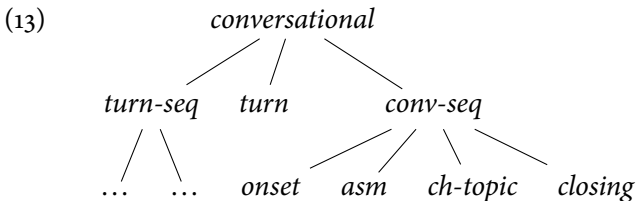
We then restructure the TURN-PRAG feature as:



Notice that this is a sketch, and we do not have a semantic ontology of exactly what these elements mean, but they are sufficient for our purpose of showing how conversation can be modeled parallel to syntax.

Then we need two special features: *START* and *END*, which mark the beginning and the end of a conversation.⁷ We use these to mark that a list can not undergo concatenation on the left (*START*), or on the right (*END*): $\langle \text{START}, \dots, \text{END} \rangle$.

So far the hierarchy that we have established can be represented as follows:



Next we need to define closing turn sequences. Notice these are different from simple closing turns (with a *closing* value in the SEQ feature), because they do not make reference to a single turn, but to the conversation as a whole. We propose that closing sequences are used to license the end of a conversation. That is, in order for the speakers to successfully stop the conversation, they have to first initiate a closing sequence. In practice, a conversation can of course end abruptly, but this leads to awkwardness.

⁷As far as we are aware, there are no equivalent objects in standard HPSG.

The simplest solution is to posit that the end of the conversation must be preceded by a turn with the *closing* value:

$$(14) \quad \left[\left[\left[\text{TURN-PRAG} \left[\begin{array}{l} \text{SEQ } \textit{closing} \\ \text{NEXT-SPKR } +/- \end{array} \right] \right] \oplus (\dots \oplus \text{END}) \right] \right]$$

Notice that the turn with the *closing* feature need not be the last turn. The turn with the *closing* feature is simply the turn that initiates the closing sequence. Moreover, there is no restriction that says that a closing turn has to initiate a closing sequence, since speakers can ‘override’ closing turns and refuse to follow into a closing sequence.⁸ All (14) says is that all closing sequences are initiated by a closing turn.

We could think of imposing further restrictions on the last turns of the closing sequence, like specifying that they must contain *goodbye* phrases. However, this is much more elaborate than we can describe here.

Finally, we would want to make more explicit what the properties of closing turns are. So far we have been dealing with the *closing* feature as if it were an abstract agreement feature. But just as agreement features usually have some formal expression, we want to claim that *closing* has a formal expression of its own. The two elements we will focus on here are repetition of semantic content, and repetition of particles.

5. Repetition and replication in our model

5.1. Particle repetition

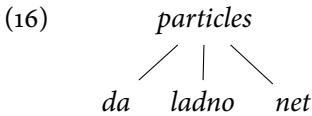
We see from the conversation that speaker S24 repeats *da* multiple times: *dadada*, but in principle other words are possible: *netnetnet*, *ladnoladnoladno*. These all mark the beginning of a closing sequence, and thus the *closing* feature. Note that we do not make any claims about other possible contexts in which particle repetitions can occur (closing a sequence, rhythmically-driven insertion of lexical material etc.); we merely state what can be said about them with respect to closing sequences.

⁸This is exactly what happens in sequence expansion, where a closing turn is present but the conversation does not end because of one of the speakers continuing it.

For the particle we see two possibilities. Either one proposes a recursive lexical rule that doubles a lexeme, or one introduces a construction that licenses reduplication of a given lexeme. Here we explore the second option. The main reason for this is that it seems to be a turn-specific phenomenon. Therefore, we encode the specification directly in the turn itself:⁹

$$(15) \left[\begin{array}{l} \text{FORM} \quad \left[(part^{2,n} \oplus) \langle \boxed{A} \rangle \right] \\ \text{TCUS} \quad \left\langle \left[\text{FORM } \boxed{A} \right] \right\rangle \\ \text{TURN-PRAG} \quad \left[\begin{array}{l} \text{SEQ } closing \\ \text{NEXT-SPKR } +/- \end{array} \right] \end{array} \right]$$

Importantly, these particles should not be listed in the part of the hierarchy where words live, because they do not behave like words in any way. They cannot be selected for, cannot select for, do not interact with grammatical constructions, and do not seem to carry much semantic content in the classical sense. A simple solution is to list them in the discourse hierarchy:



But alternatively one could postulate a lexical rule which essentially removes the *SYNSEM* feature from a word:

$$(17) \left[\begin{array}{l} particle \\ \text{FORM} \quad \boxed{A} \\ \text{CAT} \quad discourse-particle \\ \text{M-DTRS} \quad \left\langle \left[\begin{array}{l} lexeme \\ \boxed{1} \text{ SYNSEM } \left[\text{FORM } \boxed{A} \right] \\ \boxed{2} \text{ ARG-ST} \end{array} \right] \right\rangle \end{array} \right]$$

This rule says that the only information which gets inherited by the mother

⁹We use a notation similar to that of regular expressions, which says that a particle (*da*) can be optionally repeated between 2 and *n* times.

is the FORM feature, while the rest of the SYNSEM and ARG-ST elements get lost. The advantage of using a lexical rule is that we can directly relate the discourse particles used for marking closings with their lexeme counterparts, the downside is that we still have to use a feature or hierarchy that specifies which lexemes this lexical rule applies to (since there are only a few that can be used in this way). Be it as it may, these discourse particles do not interact or behave like normal lexemes, and either approach captures this fact.

5.2. Topic repetition

Finally, we need to indicate how topic repetition works in closing marking turns. This is probably the hardest issue and we cannot give a complete explanation here. It is clear that not all cases of topic repetition result in a closing sequence:

- (18) A: so I went to the store yesterday
 B: so you went to the store
 A: yeah, and then...

We also have to keep in mind that the repeated material can be by the same or a different speaker:

- (19) A: what do we do about the books?
 ...
 B: so, I'll bring the books tomorrow and then we'll see
 A: ok, bye
 B: bye

What does seem to be the case is that the information repeated is a core part of the conversation and judged to be important for the conversation as a whole. We will call this the *Conversation Topic* (see Purver 2011 for computational approaches to topic extraction). There are two ways one could represent this. One possibility is that one proposes some sort of SLASH or feature amalgamation-like system for percolating the relevant information through turns. That is, turns all have a CONV-TOPIC feature which is passed to the next turn by default. This is not completely unmotivated. There are turns that explicitly change the conversation topic, and some can even refer to multiple topics. Alternatively, one could postulate a sort of turn external storage for this feature, similar to how common ground is usually understood. Importantly, in

these two alternatives the theme of the conversation can be accessed by a turn at any point, which means that independently of how one models conversation topic preservation and conversation topic management, the result is the same. We will ignore the issue of how exactly the conversation topic is marked. We will just assume that it is, and will simply employ a CONV-TOPIC feature. The CONV-TOPIC feature is a set of the same kind used for the semantic CONT(ent). Traditionally set elements are represented with Σ instead of Latin letters. With this, a closing turn sequence would then be as follows:

$$(20) \left[\begin{array}{l} \text{closing-turn-seq} \\ \left[\begin{array}{l} \text{closing-turn} \\ \text{FORM} \left[(\text{part}^{2,n} \oplus \langle \underline{A} \rangle) \right] \\ \text{TCUS} \left\langle \left[\begin{array}{l} \text{FORM } \underline{A} \\ \text{CONT} \left\{ \Sigma_3 \right\} \oplus \langle \underline{\Sigma}_1 \rangle \right] \right\rangle \\ \text{TURN-PRAG} \left[\begin{array}{l} \text{SEQ closing} \\ \text{CONV-TOPIC} \left\{ \Sigma_2 \right\} \oplus \langle \underline{\Sigma}_1 \rangle \right] \end{array} \right] \\ \dots, \text{END} \end{array} \right] \end{array} \right] \\ (\Sigma_1 \in \text{given conversation topic}) \end{array}$$

What the construction in (20) says is that a closing turn sequence contains at least a closing turn, which repeats the conversation topic information already mentioned in a previous turn, and which is subsequently followed by the end of the conversation. This analysis assumes that the representation of the conversation topic is of the same kind as that of the semantic content, and that it can be paraphrased.

A difficult question to answer is how many turns can follow a closing turn at most before the closing turn fails to license the end of the sequence. Our intuition is that in principle, any number of turns are possible, though we do feel that some way of constraining the number and nature of turns is necessary; however, we cannot elaborate on this issue at this point.

6. Discussion

So far, there has been relatively little work that addresses problems in conversational analysis from a formal perspective. Some exceptions are Ginzburg et al. (2003), Hough & Purver (2012), Hough & Purver (2014), Howes et al. (2012), Purver (2004), and Purver et al. (2010). Most of this research, however, has focused on the interaction between formal pragmatics and syntax/semantics, the semantic and pragmatic ontology of speech acts, and to a much lesser degree on issues developed in the more traditional approach to conversational analysis. As far as we are aware there is no previous work that attempts to formalise turns by directly introducing conversational types and conversational constructions. Particularly, Purver (2004) gives an implementation of conversations based on *grounding rules*, which act as an algorithm for parsing and generation. We claim that (at least some) aspects of conversations can also be stated and described as constraints, parallel to those used for syntax.

This paper provides but a simple sketch of what a complete and more sophisticated formal model of conversation could look like. A proper theory would need to be much more specific regarding many aspects we did not touch upon but we hope to have shown that pursuing a formal model of CA is feasible and worthwhile.

7. Conclusion

We have argued for recognising replication as a constitutive formal feature of closing sequences. Both replicative processes discussed in the paper – particle repetition and recycling of topics – have been shown to be employed by speakers as an interactionally meaningful device for signalling intention to end an ongoing conversation.

We have developed a formal, constraint-based analysis of some structural properties of conversation. Our analysis of topic repetition does not require copying or movement, but rather relies on co-indexation, a general mechanism in declarative theories of grammar. The issue of local particle repetition is resolved by enriching the respective turn construction with frequency specifications.

We have thus tried to integrate structural notions of CA within a model-theoretic approach to conversation. Considering the careful and scrutinising methodology of modern CA and the dynamic nature of talk-in-interaction, the

model presented here awaits further discussion and refinement. However, we are confident that marrying conversation analysis with formal approaches to grammar is a fascinating enterprise and will ultimately yield valuable insights for both formally and functionally oriented frameworks.

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A. Transcript

01	FX	zdravstvujte (-)
02		možno vas pobespoit'
03		ja (-) ja dostala papku po pervomu kursu večernikov
04	S24	tak
05	FX	vot (.) i chotela by uznat' v kakoj forme my sdaëm ekzamen
06		i po povodu voprosov
07	S24	voprosy ja vam (1.0) gde-to tam ja ne znaju
08		vo vtoroj polovine nojabrja ili v seredine nojabrja tol'ko dam
09	FX	ugu
10	S24	voprosy da kakoj va- vot dva voprosa tam budet (0.8)
11		vot po è-è èto v osnovnom po è- tomu materialu
12		kotoryj my s vami (.) budem prochodit' vot
13		no èto ne isključet è-è učebnik i kak-to nam na-
14		vam nado ob učebnike pogovorit'
15	FX	da u nas [prosto očen' mnogich] net
16	S24	[da ne problema]
17	FX	to est' èto budet vtoraja polovina nojabrja
18		a v internete vot dostat' v principe nel'zja
19		tol'ko vy vydaëte ich
20	S24	voprosy
21	FX	da
22	S24	ja ne znaju ja ich vo vsjakom slučae v internet ne otpravljala
23	FX	[((nrb., 2 sek.))]
24	S24	[možet kto-to da no u menja sobstennye]
25		sobstennye voprosy ja dumaju čto net (-)
26		a čto ja vam dam (-)
27		ne pisala tut (1.2) čitajte knižki poka
28	FX	chorosho to est' èto (-)
29	FX	[a]
30	S24	[è]to ne problema budet voprosy
31	FX	aga
32	S24	ja vam dam i èto ne budet vot tak (.)
33		da da da da da
34	FX	ugu (.) vsë togda značit
35	S24	i u vas budet da èkzamen
36	FX	ugu
37	S24	Katja prosti da slušaj ètot
38		(1.8) a (1.7) net (.) tak ja sejčas ubegaju

- 01 FX hello (-)
 02 may I have a moment
 03 I (-) I took the folder of the first-year evening students
 04 S24 so
 05 FX well (.) and I wanted to ask in what form we will take the test
 06 and about the questions
 07 S24 I'll give you the questions (1.0) around I don't know
 08 not until the second half of November or mid-November
 09 FX mhm
 10 S24 questions yes which- well there will be two questions (0.8)
 11 well about uh basically about the course materials
 12 that we will work with
 13 but that does not exclude uh the textbook and somehow we ha-
 14 you (will) have to say something about the textbook
 15 FX well there are [simply many] that we haven't got (yet)
 16 S24 [no problem]
 17 FX so it will be the second half of November
 18 is it not possible to get access to them on the internet
 19 is it only you who releases them
 20 S24 the questions
 21 FX yes
 22 S24 I don't know in any case I did not upload them
 23 FX [((unintelligible, 2 sec.))]
 24 S24 [maybe someone else did but my own]
 25 my own (questions) I don't think so (-)
 26 so what's the matter I'll give them to you (-)
 27 didn't write here (1.2) read your books in the meantime
 28 FX ok that means it (-)
 29 [but]
 30 S24 [the] questions won't be a problem
 31 FX I see
 32 S24 I will give them to you and it won't be that's it (.)
 33 yeah yeah yeah yeah yeah
 34 FX mhm (.) that's all then so
 35 S24 and you will take the test
 36 FX mhm
 37 S24 Katja excuse me yes listen this
 38 (1.8) eh (1.7) no (.) so I'm leaving soon