An empirical study of acknowledgment structures

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Abstract

The subject of our study is one type of "response" in dialogue, usually called acknowledgment or positive feedback. We show here how distinguishing between different acknowledgments is central to the establishment of information. The study is based on a french corpus of direction-giving dialogues which we have gathered. The factors that we investigate about the acknowledgments are their producer, their target and their scope. We focus on the relations between those features and linguistic discourse markers.

1 Introduction

The subject of our study is one type of "response" in dialogue, usually called acknowledgment, and how it relates to the dynamics of settled information in a conversation. Dialogue acts are commonly divided between initiations (assertions, questions, commands,...) and responses to initiations; something also called "forward communicative" and "backward communicative" functions in the work of (Core and Allen, 1997).

There have been several studies detailing the many roles that assertions, questions and answers can have in a conversation. Coding schemes for dialogue (Core and Allen, 1997; Carletta et al., 1997) take great care in distinguishing these functions. A lot of attention has been given to the question/answer pair and answers and how it interact semantically and pragmatically within a conversation (Asher and Lascarides, 1998; Ginzburg, 1994). Less emphasized is the role of all speech turns ensuring that information exchanged is properly interpreted (*feedback*). The important work of (Traum, 1994) has studied in some detail how these utterances play a role in deciding the status of information exchanged during a dialogue (mutually accepted or under discussion). He emphasizes that different levels of acknowledgment exist as proposed by (Clark, 1996; Allwood et al., 1992). It has often been noted that some utterances signal something has been heard and are marking expectations, while (Clark and Schaefer, 1989) for instance, mention different kinds of evidence that a speaker understands what has been previously said. We want to show here how distinguishing between such turns is central to the establishment of information, along with question/answer pairs; and how they can be accounted for in a structural theory for representing dialogue. We have thus studied the role and influence of several discourse markers on acknowledgments, in a french corpus of direction-giving dialogues which we have gathered.

Since we want to explicit the relational nature of such dialog acts, we have also studied the scope of such acts within the structure of a dialogue. We tried to integrate it in SDRT (Asher and Lascarides, 2003) a theory in which dialogue structure is defined as relations between utterances.

We present here a preliminary quantitative study of factors taking a part in various types of acknowledgments. We based our study on empirical data, complementing more qualitative studies such as (Allwood et al., 1992; Novick and Sutton, 1994).

2 Types of acknowledgments and underlying processes

The feedback effects range from rejection to acceptance. Here, we will focus on positive feedback or acknowledgment. The speaker uttering the response might have heard, understood or agreed on the target of the backchannel. However, it is not often clear what factors take part in defining this level of acceptance, nor how they interact with the other functions of feedback. As example, an acknowledgment can support the current *initiative* state (*continuers, assessment* (Schegloff, 1982) or try to modify it (*incipient speakership* (Jurafsky et al., 1998)).

We do not make a difference *a priori* between acknowledgment of assertions, question/answer pair or complete sub-dialogues[1]. We see the question/answer pair as defining a kind of assertion about the topic given by the question. We believe the nature of the corresponding acknowledgment is the same, even though the conditions they impose on the actual form of the acknowledgment can vary.

In a first analysis, we have listed the following functions for the different kinds of feedback, in accordance with other works (Allwood et al., 1992; Clark, 1996; Carletta et al., 1997; Jurafsky et al., 1998) considering this topic (terminology may vary). We do not claim that it is very original or more relevant than those cited above, but gives a picture of the different concepts that seem to be at play.

weak acknowledgment (*continuer*, *support acknowledgment*) signals that what has been said and heard without necessarily accepting it. We will see that the most common markers for this phenomenon are *(oui, ouais, mhmm)* (in English *yes, mh*). In (Traum, 1994), this acknowledgment is a "grounding" act and belongs to the " utterance" level.

strong acknowledgment (*agreement, acceptance*) accepts an utterance either as true or as committing the receiver. It is mainly uttered with *oui, ok, d'accord* (in English *yes, okay*)[2]. In Traum's taxonomy, acceptance is "core speech act" and belongs to the "discourse" level. We put also *confirmation* in this category often associated with (*c'est ça, exactement*) (in English *that's it, exactly*). Indeed their originality comes from the status of the speaker (informant or not). Nevertheless, we will see that the form of such confirmations allow us to recognize them most of the time.

This classification is less fine grained (Clark, 1996) or (Allwood et al., 1992) who distinguish four levels of communication (*(i) contact-execution/attention, (ii) perception-presentation/identification, (iii) understanding-meaning/understanding, (iv) attitudinal reactions-proposition/consideration)*[3]. What we called *weak acknowledgment* covers the levels (i) and (ii); but, the determination of any difference between marking attention and perception seems hard to include in an annotation scheme without accurate prosodic analysis. We prefer to *infer* such difference from our basic annotated data. For the same kind of reasons our annotation will not integrate the fourth level. These remarks lead us to the simple weak/strong division. But, during the annotation task we will have only one kind of acknowledgment. The weak/strong division will come from succeeding inferences.

Feedback is associated with the establishment of different kind of objects:(i) propositions and/or their truth on the one hand (grounding), (ii) referents and their identity on the other hand (anchoring). (Clark and Schaefer, 1989) and (et

[1] Here we consider a question/answer compound strictly as one question and one answer. Any other kind of question/answer structures will be regarded as a subdialogue.

[2] Since *oui* and *ouais* are already markers for weak acknowledgment, the markers will be often ambiguous. We still think that is possible to go a bit further in the analysis of these turns by taking into account other information sources.

[3] In our list the first item belongs to Allwood's terminology and the second to the Clark's one. There is two terms in the second item because in Clark's grounding levels the actions of the speaker and of addressee are separated.

D. Wilkes-Gibbs, 1986) focus respectively on these different aspects.

grounding (understanding, settling proposition) is not related to the truth of utterances or the acceptance of an order. It is just a coordination between the speakers on what has been said. The participants agree on the content of an utterance but not necessarily on the truth of this constituent nor the acceptance of this constituent for the current purpose (Clark and Schaefer, 1989; Traum, 1994).
For instance: *y a un café [...] qui s'appelle le Matin.- le Matin* (there is a café called le matin - le matin) possibly followed by . *I don't know where it is.*.

accepting (agreement), opposite to grounding, leads to the acceptance of the truth about the information agreed or at least it leads to the acceptance of the information regarding to the current purpose. In Clark's terminology, *grounding* describes the whole process of information establishment, thus accepting is just one level of this global process.
For instance: *tu prends la rue des Filatiers à gauche de là ou tu es - la rue des filatiers? - oui - ok* (you take the Filatiers street on the left of where you are - the Filatiers street? - yes - ok.).

anchoring (establishing referent) is finding an internal anchor in one's beliefs for what has been said by the other speaker (e.g. a common referent has been found, something crucial in our examples). This explains the difference between the following example and the one mentioned on *grounding* above: *c'est à dire après t'arrives à Esquirol quand tu continues.- ouais ouais je vois où c'est Esquirol* (then you arrive at Esquirol [Plaza] when you go on - yeah yeah i see where Esquirol is).

closing is terminating a span of discourse as a sub-dialogue (i.e a transaction in the discourse analysis literature – or an exchange) either successfully *voilà, c'est fini!* ("here, we're done"), or unsuccessfully (*en fait c'est pas grave...*) ("actually it doesn't matter"). Here we'll study only the positive (or successful) closure. Generally only the speaker with the initiative is allowed to perform a closure.

However it is not easy to find systematically the function of a given feedback utterance. Moreover interactions between those processes are complex. There is not direct entailment between them except maybe that *accepting* requires *grounding*. Accept an utterance requires also most of the time to anchor (establish all the referents within) it before. Finally a speaker could be wrong about what he understood without realizing it right away, allowing for later corrections.

To analyze how these notions are at play in conversations and how they interact with each other, we have studied our corpus with a special attention to the following factors:

- the linguistic cues of agreement (discourse markers, redundancies);
- the kind of response acknowledgments take part in;
- the kind of target acknowledgments have (mood and function);
- the kind of structure is agreed on (the contexts of acknowledgments).
- the role of the speaker (Is he the informant or the informee? Does he have the initiative at this very moment?)

3 A corpus of acknowledgments

To support our study of conversation structures, we have recorded a set of dialogues between French speakers located at two different places. Speakers talked to each other on a phone. Speaker A (*the giver*) had the task of explaining to speaker B (*the receiver*) how to get from where B was to the place where A was. A and B didn't know each other in advance. The corpus is made of 21 dialogues (about 9000 words) involving 23 speakers[4]. The conditions of the experiment gave little

[4]Most of the participants only recorded one dialogue, but some of them were involved in more than one (either in the same or in different roles).

indications to the *receiver* outside of the conversation itself (no signs, no *a priori* common knowledge), so we expected a lot of speech turns explicitly devoted to the settlement of information. This was all the more important as the task itself was discursive (speakers have to agree on the basis of a linguistic description of a route)[5]. We focus here on the conditions of acknowledgments during such dialogs and on their occurrence in acknowledgment structures. We use the *acknowledgment structure* term to emphasize our special attention on acknowledgment in discourse structures where such phenomenon occurs.

3.1 Lexical cues for acknowledgments and roles of the speaker

We have isolated a set of markers indicating positive feedback of the other speaker utterances, listed in table (1), along with approximate English equivalents. The determination of the set was not an easy task. The question was to determine (i) what can count as a discourse marker (DM) and (ii) what can be associated to positive feedback.

With respect to the former issue, the literature offers long (but non-exhaustive) lists of DM in English (Schiffrin, 1987; Aijmer, 2002; Stenström, 1994), in French (Auchlin, 1981; Colineau, 1997; Reboul and Moeschler, 1998) and in other languages. These studies conclude that any word: small group of words, or sound can be considered as a DM when it becomes grammaticalized.

With respect to positive feedback, existing works about DM in french, even when they consider interactional DM, are not focused on their feedback aspect (Auchlin, 1981). There is a lot of studies about linguistic clues signaling feedback in English (mainly developed to enrich dialogue act taxonomies) but it seems difficult to use them for french markers (See in Table 1). In fact, we decided to devote more attention to feedback because we observed a significant number of speech turns without propositional content (at least in a strict sense) Our first set of DM was created from the elements of these turns signaling a positive feedback obviously enough (e.g. 1). Within this set we only kept markers who can form a speech turn by themselves. We hope this selection filters markers of other phenomena like hesitating (*euh*) or attitudinal changes toward information (*ah, en fait*) (*ah, actually*)[6].

(1) F_{41c}. c'est au 27 rue des Polinaires
R_{42a}. ouais je vois,
F_{42b}. en fait c'est rue des Polinaires,
R_{42c}. d'accord.
F_{43}. voilà
(it's the 27, Polinaires street – ok i see – in fact, its on Polinaires street – ok – that's it)

We add to the DM analysis the observation of *informationally redundant utterances* who help participants to infer acceptance as described in (Walker, 1996). Such redundancies are also illustrated in example (1:F_{42b}).

We found 337 various acknowledgments in our corpus, only 34 without either of these markers[7]. We indicate how many times each marker appears in an acknowledgment by one participant (and in parentheses, the number of times where it is the only marker in the utterance).

About speaker's variability, since there was many participants, none of them will have a too big influence on data. Local behaviour don't modify global picture.

The asymmetry between the two participants allowed us to investigate which markers were preferably used by someone with or without the initiative. In our corpus examples, the *giver* had globally the initiative of the explanation. The two "strong" acknowledgment markers *voilà* and *d'accord* seem respectively typical of the *giver* with the initiative and of the *receiver* without it. These are noisy data obviously, since our dialogues are mixed-initiative ones (Walker and Whittaker, 1990) (i.e in our context initiative can be locally taken by the receiver).

[5] In the end, we isolated 337 acknowledgment acts, in a total of 746 speech turns.

[6] See the very accurate studies of *ah, oh* and *actually* proposed by (Schiffrin, 1987; Aijmer, 2002).

[7] Half of which are turns that repeat part of the previous utterance, and the rest are marginal synonyms of cases listed. Note also that Table (1) makes up more than 337 since several markers can appear in the same utterance.

[8] For technical reasons, this category covers only utterances containing exactly a string from the target. It will be interesting to extend the treatment in order to detect cases where strings do not exactly match but are still redundant.

Table 1: Count and English equivalents of reported french acknowledgment markers

Count	French markers	Produced by Giver(alone)	by Receiver(alone)	English equivalents
141	*oui, ouais*	34(28)	107(85)	yes/yeah
67	*d'accord*	18(13)	49(33)	ok, I see
47	*voilà*	38(31)	9(9)	exactly, that's it
37	*ok*	9(6)	28(18)	ok
29	*mhmm*	8(8)	21(20)	mmmh
18	*bon*	10(5)	8(2)	now, ok, well
14	*je vois*	1(1)	13(2)	I see
12	repeat[8]	8	4	-
22	other	-	-	-

The study of which utterances contain multiple markers is also an indication of the strength of the acknowledgment in the rough scale mentioned before, with the extreme example 2.

As it was pointed out by one reviewer, this kind of acknowledgment could be a clue about attitudinal changes in the speaker's mind. We agree with this conclusion; but, we still believe that even when the producer of such feedback has changing opinions about the target information, at the end of the turn the information is strongly grounded or rejected. The reason is just that by producing such turns the speaker emphasizes her attention to this piece of information, and thus has to signal acceptance or rejection.

(2) F_{13a}. et voilà c'est là
R_{13b}. en face la Poste.
R_{14}. ah okay okay okay bon ben ouais d'accord.
(and there it is – facing the Post Office – ah ok ok ok well yes i see)

Conversely, the mumbling *mhmm* is practically always alone. It seems to confirm the intuition that it is only a weak form of backchannel (the only other case is *mhmm ... ouais*, *ouais* being a weak form also). We prefer to consider the combination of several acknowledgments markers as only one act instead of considering that each marker produces an act. We made this choice because in many cases DM were uttered together and very quickly. Another frequent phenomenon is the repetition of the same DM many times in a row. But we agree the case could be made for considering strictly one act for one marker. In the end we think that these two working methods should lead to the same conclusions. On one hand, the first one will be considering the complex properties of the combination of markers within an utterance. On the other hand, the second will study the combination of the acts.

3.2 Scope of the acknowledgments

Now we will turn to the difficult question of the scope of the feedback. Backward acts scope is a notoriously difficult issue. Here, the acknowledgment structure is partly based on the target(s) of the acknowledgments (see Table 2). If the target was a single segment or a set of segments within the same turn, we consider it as a *narrow scope* acknowledgment. If the target is one utterance performing a question/answer with a previous question, we say that it is a *QAP-scope* acknowledgment. Finally, if the target is another acknowledgment whose target is not a simple initiation, the segment under consideration will be set as a *wide-scope* acknowledgment[9].

We are aware of some flaws in this classification. For example, it is quite possible for the number of segments concerned by a QAP-scope acknowledgment to be the same as the a wide-scope one (in case of *assertive-ack-ack* and *interrogative-answer-ack* sequences). Another problem is when an answer is elaborated on several segments or turns, their acknowledgment will still be marked as a QAP-scope even when the scope is very wide. Further work is needed in order to make really accurate propositions; but, we think this work depends very much on the interpretation of question/answer structures.

[9] Agreement between annotators was good regarding the labelling of acknowledgments ($\kappa = 0.82$). Determining the targets of such acts was less convincing ($\kappa \approx 0.6$).

Table 2: Acknowledgments scope by cue words

	ouais	oui	ok	d'accord	voilà	mhmm	bon	Total
Narrow Scope	65	21	17	31	17	24	4	179
QAP Scope	12	1	5	8	7	1	7	41
Wide Scope	1	0	2	3	10	3	0	19
Total	78	22	24	42	34	28	11	239

3.3 Function of the acknowledgment target

As another preliminary step in the study of acknowledgment structures, we have looked at the function of the the previous utterance with the context (her relational function).

The data presented in table (3) distinguishes between task-related assertions (describing an itinerary: introduction of landmarks (e.g. 3:F_{1b}) or description of landmarks (e.g. 3:F_{1c}), instructions (e.g. 3:F_{1a}) and comments) and interactional segments which are not related to the task (mainly feedback turns).

We think these distinctions are important with respect to the difference between acceptance and anchoring, since anchoring is mainly about landmark management. The segment concerned by the management of landmarks mainly aims to anchor the referents they include. On the other side, the instruction needs to be grounded/accepted. To sum up, anchoring underlies the establishment of "managing referent segments" and grounding underlies the establishment of "instruction segments".

(3) F_{1a}. euh tu remontes
F_{1b}. il y a une pizzeria.
F_{1c}. elle est à peu près au milieu de la rue.
(er you go up / there is a pizzeria / it is about the middle of the street)

It is to be noted that these markers seem to have very different functions since they appear in significantly different contexts. This is an indication of different kinds of agreements at play.

3.4 Closure

Closure has not be annotated. It's a quite risky task to determine at a given point of a discourse which segments are closed and which are not. We do not consider necessarily that a segment is closed definitely. Participants can still go back on it but it will require an explicit signaling of this re-opening.

The tables 2 and 3 in conjunction give some information about the preferred closure scope of markers. We can notice that *voilà* is used to close a lot of sub-dialogs (actually, it closes 30% of all our dialogues). We see in table (3) that the previous utterance is often an acknowledgment itself, thus another indication that something larger than just one speech turn has been closed or is in the process of being closed. In comparison, the seemingly close marker "d'accord" is mainly used to confirm recent, task-related pairs; it is rarely after another acknowledgment.

It could also seem that *voilà* is ambiguous since we noticed that it occurs a lot as an acknowledgment of only one speech turn. However in that case this marker is almost always produced by the informant. It is used after a request for confirmation ("alignment"), not an acknowledgment, so it is easy to separate the two uses of the cue.

On the basis of this analysis, for each of these marker, we gave a default feedback function corresponding to those introduced in section 2 (table 4). Lack of space prevents a detailed analysis here of every marker but we hope to have shown what is to be gained by a multiple factor analysis of this corpus to determine the forms of acknowledgments.

4 Representation of acknowledgment structures

We place ourselves within the framework of Segmented Discourse Representation Theory applied to dialogue (Asher and Lascarides, 2003). In this perspective dialogue acts realized by utterances are linked by "rhetorical" relations expressing their respective functions (semantic, intentional or conventional functions). The SDRT hypothesis about the relational nature of speech act (Asher and Lascarides, 2003) fits pretty well our representation of acknowledgments. In fact, One

Table 3: Acknowledgment targets by cue word

	ouais	oui	ok	d'accord	voilà	mhmm	bon	Total
Landmarks	46	14	13	24	9	12	4	122
Instructions	26	8	5	13	2	13	0	67
Comments	2	0	1	0	1	0	1	5
Feedback	4	0	5	5	22	3	6	45
Total	78	22	24	42	34	28	11	239

Table 4: Preliminary default properties of positive feedback french markers

Marker	Grounding	Accepting	Confirming	Closing	Anchoring
oui,ouais,yes	+	neutral	neutral	neutral	neutral
mhmm	+	-	-	-	-
ok, d'accord	+	+	-	neutral	neutral
voilà	+	-	+	+	-
bon	+	-	-	+	-
je vois	+	+	-	neutral	+
c'est ça, exactement	+	-	+	neutral	-
repeat[10]	+	neutral	neutral	neutral	neutral

of the most striking features of acknowledgments is precisely their relational nature. The determination of a turn as an acknowledgment highly depends on the nature of the target. As already signaled in (Allwood et al., 1992) a turn consisting of "yes" is interpreted as an answer if it targets a yes/no question but as an acknowledgment if it is related to an affirmative sentence.

About SDRT, some relations are considered hierarchical ("subordinating") so they induce a partial order and a tree that defines the structure of the dialog. By attaching left-to-right the most recent dialogue act only to the rightmost nodes of the tree, SDRT imposes constraints to possible continuations of a dialogue situation (achieving in a similar but arguably more flexible way what is realized in other frameworks with a dialogue stack, e.g. the QUD of (Ginzburg, 1994). Moreover parts of the dialogue can be combined to make complex nodes in the structure, open for further attachments. It is thus easy to define acknowledgment scopes as attachment at various levels of the rhetorical structure of the conversation. Thus a question/answer pair defines a superseding topic node which is a possible site for a closure.

The actual treatment of positive feedback in SDRT introduce only an acknowledgment relation which corresponds to an acceptance. We propose here to refine this point of view (i) by taking a more cautious position on the default nature of positive feedback (i.e. considering it as a grounding act and not as an accepting act) and (ii) by adding a *closure* relation. A weak acknowledgment must leave all segments available as possible attachments, whereas stronger forms of acknowledgment seem to settle the topic under discussion. So we have two relations: *acknowledgment* which is a *subordinating relation*, and *closure* which is a *coordinating* one. We do not have a relation for strong acknowledgment because strength scale in communication is not directly usable, at least without taking an *a posteriori* position about interpretation.

We still have to define precisely the semantics (Inference Rules and semantic/structural effects) of these relations in SDRT terms. And we have also to bring in the picture the other phenomena presented here (anchoring, accepting). We are not planning to represent these processes by new relations but rather by a combination of *weak acknowledge*, *closure* and more information about semantic content. Thus our model will take the form of predicates taking as arguments speech acts (SDRT's label) for *accepting*[11] and discourse

[10] Repetitions are not often by themselves. Thus they are neutral regarding to their function. For example, *repeat* + *mhmm* is totally different from *repeat* + *voilà* or *repeat* + *c'est ça*.

[11] This is actually already evoked by the *settled* predicate

referents for *anchoring*. Reasoning about feedback will also include inferences of implicit closure when it is not signaled by an explicit marker as what we studied here. Finally SDRT will be also useful when we will put in a same picture acknowledgment and question/answers structures.

5 Conclusion

Our goal here was twofold: (i) refine analysis of linguistic positive feedback (specially in french language) by showing what factors can be isolated (ii) focus on the form and on the targets of acknowledgment acts (in a broad sense). The study of markers of positive feedback is an invaluable help, even though it has to be continued to fully validate the choices made here. Moreover we also still have to precise the representations proposed within a formal theory of dialogue (SDRT), by fully formalizing the conditions under which they arise. This implies more complex interaction between semantics and the discourse structure.

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