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Speech Acts and Discourse Relations in Man-Machine Dialogue

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Summary :

This paper presents the theoretical framework based on speech acts and SDRT (Segmented Discourse Theory Representation), which allows plugging the process of dialogue on an efficient formalism to solve the problem of pragmatic interpretation in a man-machine dialogue system. After outlining the interest to preserve the concept of speech act in the standard theory of the SDRT, the paper describes a formalization of the discourse relations related to the pragmatic point of view. Examples are given to illustrate the formal aspects of them.

1. Introduction

In this paper we consider the man-machine dialogue as a *conversational game* related to finalized tasks. In this perspective the dialogue presents two main aspects: *communicative* for one hand and based on *action* for another hand. A level of mutual and shared knowledge is needed to bind these two aspects i.e. that (and how) is built or exchanged during the dialogue. In conversational game, the action managed by several participants is said *joint* - it is a question of achieving and of satisfying goals that are setup at the beginning of the game (then during the game) - and proceeds in the world of the game but also between the participants at the deontic (social) level: that means that it also acts for them, during the game, to agree on the conditions to achieve these goals (which does what and how).

The work presented below continues our previous work on the modelling of the dialogue using the concept of *dialogue strategies* [Caelen, 2002] (the dialogue strategies are related to the directions of goal adjustment and the manners of reaching it).

A conversational game takes place in the general framework of the game theory with incomplete and non-monotonic knowledge management. Here, the game is not with null sum but rather a game with positive sum because the participants can cooperate on a common task and maximize both their benefits. The dialogue runs in a public way, i.e. statements and choices made by the participants get a value of commitment as regards with the rules of the dialogue game and speaker decisions themselves. The main "moves" are speech acts on the main axis of progress of the game. The other acts performed (for example communicative acts) can have a subordinate role in a perspective of game coordination. It is necessary to well distinguish the concept of *game strategy* itself - which is the manner of achieving the goal using plans - from the concept of *dialogue strategy* mentioned above.

We make the assumption that the speakers (named also participants) contribute to the dialogue game with the *joint intention* to achieve goals. They act in a rational way, what implies that their joint action is relevant - what means that they use compatible sub-plans

contributing to a common plan [Bratman, 1999]. This allows us to set the principle of commitment as true *a priori*.

Thus, we revisit first in SDRT framework [Asher and Al, 1993] the question of the speech acts and the discourse relations, this theory seeming productive to model discourse structure, on which relies the dialog modeling on pragmatic level [Xuereb and Al, 2004].

2. Theoretical framework

The SDRT uses the concept of *rhetoric relation*. This concept is connected with the concept of speech act but is not strictly equivalent. It refers to the concept of *adjacent pair* resulting from the ethno-methodological theories of the conversation [Goffman, 1967]: every speech act tries "to close" an open pair. However, this point of view on the dialogue tends to lock up it in a kind of system of resolution of expectations. That relies to a cognitive map of "the other" since it acts now, for the addressee, to interpret these expectations. It however seems to us that from the point of view of a *projective model* [Vernant, 1997], each act is projected towards the future and takes its significance in an *interact* built in an emerging way with the other participant during the dialogue [Trognon, 1995]. It is thus a question rather "of projecting" the dialogue ahead at every moment, each participant taking his share in the action but also by delegating some a part to others. The measurement of the effects of these actions becomes paramount then for the continuation of the dialogue and mutual coordination. For example, in the following situation where a man A approaches a young girl B in the street at midnight,

A: Have you got the time?

B: No, I haven't

it is obvious that the response of B contains more than the simple answer to the previous question, it contains also the project "*leave me quiet*" of B. The effects of this "*no*" relate not only to the closing of the question of A, but it also poses a new expected goal (B hopes to make share this goal with A). This goal will be perhaps taken again by A in the following talking turn; it will become joint then and possibly current goal of the dialogue. This potentiality is not modelled entirely by the SDRT.

For these reasons we took the choice to keep the concept of speech act (due to the projective aspect of the goals which it offers) in our model of dialogue structure, and to mix it with the concept of rhetoric relation resulting from the standard SDRT. This is more compatible with the effective management of the history of the dialogue while making it possible to attach the effects of the actions on expectations in a reflexive way.

Schematically all occurs in the speaker mind as (a) if he evaluates the state of the situation - state of the game, goal to reach, useful knowledge - then (b) if it chose a solution of playing - strategy, act - according with the effects expected on others participants and the situation, then (c) if it produced an act of which a part would be a delegation in the form of a *interact* and then finally (d) if it would evaluate the effects compared to its expectations. This type of model is very close to that one developed by [Trognon, 1996].

Dialogue/Acts

Definition of the dialogue (dedicated for a man-machine purpose): the dialogue is a coordination of actions (both verbal and not-verbal) according to rules of game (in order to achieve a goal, present or future, epistemic or stated in the world) with construction of mutual knowledge and mutual know-how.

The game interaction progress using acts (or moves): F^A , F^F , F^{FS} , F^S , F^D , and F^P which have the general form $Fp = \text{illocutionary force} + \text{propositional content}$. Each act has prerequisite (named satisfaction conditions) and effect on the world [Vanderveken, 1990]. Certain acts are pure actions ($F^A = \text{to do an action}$, $F^F = \text{to order an action}$) i.e. for purpose expected in the world (events, facts, achievement of a task), others are with epistemic aiming ($F^{FS} = \text{to ask something}$, $F^S = \text{to assert something}$) i.e. for purpose in the discourse or on knowledge (mutual or private), and others finally are with deontic aiming ($F^D = \text{to oblige}$, $F^P = \text{to offer}$) i.e. create obligations (necessity) or offer choices (possibility) for the continuation of the dialogue. These last acts control the interaction and possibly change the rules of the game.

The interaction involves in parallel on two axes: (A) a level on communication (between participants) and (b) a level on transaction (on the world). The communication level is composed by the epistemic and the deontic dimension (it what and it how). The deontic dimension articulates the epistemic (needed knowledge to do and preparatory conditions for doing) and transactional ones (to do it together). It sets up the local tactics to pass from a plan to another or to divert the problem (escape). It is an internal level of regulation of the dialogue, controlled by the participants themselves. There is also a level of control, external but implicit, on the compliance with the rules of the dialogue game: the play stops if somebody violates the rules of them. The effect of an action is double: on the one hand on the world in the moves of facts and on the other hand in mutual knowledge transformation.

The table, below, summarizes these concepts: Acts, left-hand column, commit speakers A and/or B when they do them, in a certain aiming, taking their source in the background (world, task and private knowledge - K_A indicates knowledge of A, K_B those of B). Their effects relate to a modification of mutual knowledge K_{AB} , plans (elaboration of plans), goals (elaboration of goals) and state of the world.

Acts	Commitment	Aims	Background	Effects
F^{FS}_A	A, B	epistemic	World, K_A	K_{AB}
F^S_A	A	epistemic	World, K_B	K_{AB}
F^P_A	A	deontic	B	Plan
F^D_A	B	deontic	B	Goal
F^F_A	A, B	action	Goal	World, K_{AB}
F^A_A	A	action	Goal	World, K_{AB}

In the case of the man-machine dialogue (conversely as private conversation, dialogue non-finalized, etc.), the speaker does not tend to speak himself with oneself to put questions or to comment on his own acts - one does not consider the types of man-machine dialogues like the didactic or theatrical ones (to make a reasoning with loud voice, to speak with a public, to make asides agreed upon, etc.). We henceforth consider only the man-machine dialogue finalized while being persuaded that our models can also apply to certain types of human dialogues.

Counterparts

We call *counterparts* the category of the acts which deny with its speaker the right or the possibility of doing an act (they are severe questionings, handing-over in question of the roles, etc.). They are for instance "A does not accept that F_{BP} " or "A denies with B the F_{BP} act", in utterances as "*of which right me requests you that?*" or "*why would I answer you?*", "*you do not have to impose that to me*", etc. A counterpart is noted $\neg Fp$ (to be distinguished from the negations which are in $F\neg p$ form). In the following of the paper we do not distinguish the

causes from these refusals which are in the field of the deontic relations between participants (for example, refusal of authority, refusal to recognize a competence, refusal to recognize the social position, etc.). The counterparts are regulating elements in the game control.

The purpose of a counterpart is to create a rupture in the progress of the dialogue. It closes the current dialogue and moves it on another ground (for example the domain of the aggression, the rupture, the escape, etc.). It does not become possible at this time that the speaker do not answer this counterpart especially if it acts of a personal attack. Owing to the fact that we do not consider the mental dialogue we will not have to consider the case of the counterparts addressed to oneself. For example *"I do not have the right to say that"*.

The counterparts are possible following F^{FS} , F^S , F^F , F^A acts, according to social relations between participants. They do not have application after F^D and F^P , because in the particular case of F^D it acts of a social obligation which cannot be discussed and in the case of F^P a free choice is left to the speaker, that it is not ordinary subject to dispute.

The concept of *Projective Dialogue*

Following [Vernant, 1997] we consider that the dialogue progresses on two principal axes, the transaction and the knowledge themselves doubled of two secondary axes, named subordinated, which controls the communication and the understanding of events. At these four axes it is necessary to add two more: one for the incidences and one another for the counterparts (figure 1).

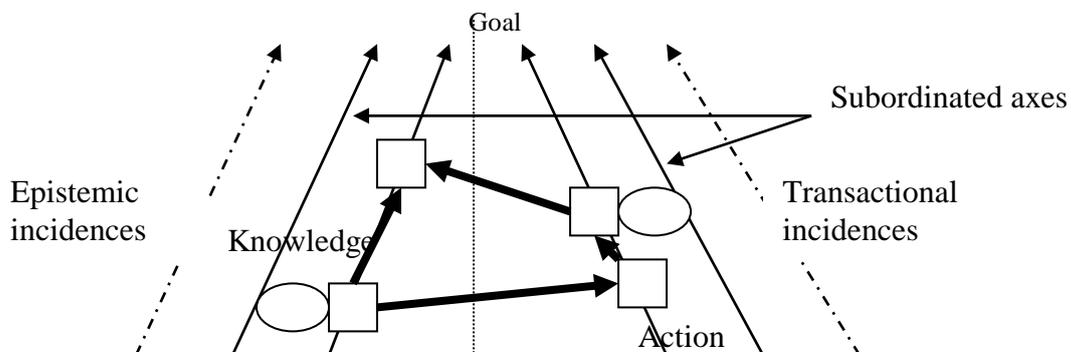


Figure 1 : The projection of the dialogue on 6 axes: themain and subordinated action, main and subordinated knowledge, transactional and epistemic incidences.

Why SDRT?

Dynamic semantics captures the idea that prior sentence in the discourse changes the context in which the current sentence is interpreted. In these theories, the SDRT holds a prominent position. It provides a powerful formal tool to model the coherence of the discourse by building a complete logic structure: the SDRS. SDRS is a hierarchical structure. It is made up of components connected by discourse relations: the rhetoric relations.

A SDRS is a couple $\langle U, Cond \rangle$ where,

U is a set of speech acts discourse referents (labels π in the SDRS),
 Cond is a set of condition units on the elements of U.

The conditions are on the form:

- $\pi:K$, where K is a SDRS
- $R(\pi_1, \pi_2)$ where R is a discourse relation (rhetoric relation)

The formal syntax of the SDRS is defined below [Asher et al., 2003] (section 4.4.1):

- ψ is a set of dynamic logical formulas (DRS) representing propositions of the natural language,
- Π is a set of labels (variables π_1, π_2 , etc.)
- \mathfrak{R} is a set of binary relations (rhetoric relations R_1, R_2 , etc.)
- The set Φ of the well-formed SDRS is defined as follows:

$$\psi \subseteq \Phi$$

$$R(\pi_1, \pi_2) \in \Phi$$

$$\forall \phi, \phi' \in \psi, (\phi \wedge \phi')^1, \neg\phi \in \Phi$$

It comes from this definition the cohabitation of both simple and complex components. The simple components are labelled as DRS, whereas the complex components contain themselves the SDRS connected by relations (called rhetoric relations).

When processing the dialogue interpretation, the incremental construction of the complete SDRS (common to both speakers) efficiently models the common knowledge and the sharing of the referents. So, the way the structure is built will set constraints on the linking of the discursive components and the accessibility of the referents

3. Rhetoric Relations (RR)

A dialogue consists of interventions/exchanges proceeding of various talk turns. There can be in these interventions, monological or dialogical sequences. We examine now the rhetoric relations (RR) in the light of these two types of sequences. Previously we give the list of the rhetoric relations which were chosen as relevant taking into consideration a pragmatic view for the case of man-machine dialogue. The definition and the scope of these relations will take sense progressively in the paper, following the examples given and complete formalization.

Families of Rhetoric Relations

Related to the various axes of the dialogue we can consider the following families of relations:

(a) The epistemic axis and its subordinate

- **The questions and answers:** QAP = Question Answer Pair, the answer P is supposed to provide information(s) to the question Q - one also distinguishes in this category: PQAP (Partial QAP) and IQAP (Indirect QAP). These questions and answers are on the principal axis (or governing axis) of the dialogue and contribute to progress it,
- **The subordinate questions:** Q-Sub = Question Subordination, are requests for clarification in connection with mutual knowledge. These requests are in the knowledge background of the participants (and not at the level of the discourse as the QAP). Requests for clarification, correction, reformulation, precision, etc. are in this class. They will be noted Q-Sub:clarification, Q-Sub:precision, etc.
- **The knowledge elaborations:** Elab = Elaboration, are contributions of mutual knowledge built during the play of dialogue. These contributions can be made multiple ways so much on the main axis (constructive questions, noted Elab_q , as assertions for example) that on the subordinate axis - in the latter case they are the clarification,

¹ \wedge denotes the dynamic conjunction.

correction, reformulation, precision, etc, needed to the speakers to itself understand. They will be noted Elab:clarification, Elab:correction, etc.,

(b) The transactional axis and its subordinate

- **The Requests and answers:** RAP = Request Answer Pair, is a request for doing an action expected by a series of actions to try to solve the goal in progress. The notation PRAP indicates that the answer-action is partial, and IRAP that the action is indirect). These relations are in the subordinate axis; they are analogue to the QAP in the epistemic axis,
- **The plan elaborations:** P-Elab = Plan Elaboration, is a contribution to the construction of a joint plan - this plan becomes the current framework of action which leads in the mental model of the participants to the resolution of the goal,
- **The question elaborations:** Q-Elab = Question Elaboration, is a contribution to the construction of a joint plan through a question,
- **The goal elaborations:** R-Elab = Request Elaboration, is a contribution to the construction of a goal - or the setting in prospect for this goal if it is already posed. This transaction on the goal is on the subordinated axis,

(c) Divergent axes : incidences and counterparts

- **The incidences I:** are acts which break the current topic by introducing a new topic. One distinguishes the incidences with return to the governing topic or turning (from the previous talking turn) and the incidences without return, insults for example. The turnings are in general constructive acts, but indirectly, for the background of the dialogue,
- **The counterparts R:** behave like closing coordination. Indeed one can connect only on one response to the counterpart or by a loophole (opening of another topic). The counterparts however make it possible to change the rules of the dialogue, to control the catch of the talking turn and the exchanges, to dispute roles. Their effect is to modify the commitments of the participants. They are deontic ones which relates to the rules of the coordination of actions on the level of the dialogue game (for the development of tactics) since the rules of the game are given implicitly at the beginning and can be negotiated only in this manner,

(d) The continuations C: are acts which continue the dialogue on the same topic. The consents [Prévot, 2004] are continuations which have as a role to maintain the thread of the dialogue (like mmh, okay, etc.) or to close a succession of statements under the same topic. The consents are not *yes/not* answers with questions.

The phatic acts and meta-speeches do not generate rhetoric relations interesting the man-machine dialogue domain. We will show below that we can reduce them before analysis while placing them as subordinate elements to simply preserve them as traces of the dialogue.

Dialogic RR

Maintained by two acts (speaker A then B) which are in relation (attached in the SDRT point of view) and which structures the dialogue.

Definition

A dialogical rhetoric relation is $R_d = (F_{Ap}, F_{Bq})$. To be in relation does not mean to be consecutive (in spite of the appearance given by the examples below).

Corpus analysis (extracted from *planned meeting* application)

Let us examine below some possible cases of R_d .

1. $F_A^{FS} \rightarrow F_B$: F_A^{FS} is a request for information (question) on the background or the situation. The propositional content of the question is of nature epistemic. But the answer can have contents about actions (to answer by the action). The question can be denied by B. F^{FS} creates a double commitment of A and B. It is supposed that A raises the question and B provides a certain response in the aiming of A. Examples:

F_A^{FS} : Où est la salle Lafayette ?	
Possible reactions	Rd
F_B^S : Elle est au fond de ce couloir	(QAP)
Dans un autre bâtiment	(PQAP)
A côté de la salle Rouge	(IQAP)
Le plan des salles est dans le hall	(P-Elab)
Je ne suis pas le concierge	(R)
F_B^{FS} : C'est pour la prochaine réunion ?	(Elab _q)
C'est bien une salle de réunion que vous cherchez ?	(Q-Sub:clarification)
Est-ce vous qui l'avez réservée ?	(Q-Sub:incidence)
Je vous ai parlé d'un général ?	(R)
F_B^F : Vous allez au fond de ce couloir	(QAP)
Vous allez dans l'autre bâtiment	(PQAP)
Vous allez dans la salle qui est à côté de la salle Rouge	(IQAP)
Demandez au concierge	(R-Elab)
F_B^A : Venez, je vous emmène avec moi	(QAP)
Venez avec moi je vous montre le début du chemin	(PQAP)
Je n'ai pas le temps, je m'en vais	(R)
F_B^D : Vous devez d'abord passer au contrôle	(R-Elab)
F_B^P : Vous montez là ou vous prenez l'ascenseur	(P-Elab)

2. $F_A^F \rightarrow F_B$: F_A^F is a request for action. A proposes an action with B and shares the effects of them. This act creates a goal which commits A and B. The act is interpreted differently according to the strategy of A (for example in directive strategy, A wants to achieve his goal, in cooperative strategy it will be rather an invite), but essentially this act poses a goal in background. Examples:

F_A^F : Pouvez-vous me réserver une salle ?	
Possible reactions	Rd
F_B^S : Je ne peux que vous donner les disponibilités	(PRAP)
Oui si le congrès est reporté	(IRAP)
Je ne suis pas votre serviteur !	(R)
F_B^{FS} : C'est pour la prochaine réunion ?	(Elab _q)
C'est bien une salle de réunion que vous voulez ?	(Q-Sub:clarification)
Est-ce vous qui avez déjà réservé hier ?	(Q-Sub:incidence)
Vous me prenez pour qui ?	(R)
F_B^F : Vous pouvez le faire vous-même par Internet.	(R-Elab)
Prenez-vous en charge !	(R)
F_B^A : Voilà c'est fait	(RAP)
Venez que je vous montre la page d'accueil d'Internet	(PRAP)
F_B^D : Vous devez d'abord donner votre identité	(R-Elab)
F_B^P : Vous pouvez accéder à Internet ou appeler le responsable	(P-Elab)

3. $F_A^D \rightarrow F_B$: F_A^D creates an obligation. A imposes a goal on B without assuming the effects of them. B cannot thus be concealed because this goal becomes only his, it does not relate to A. The goal is committing only for B. Examples:

F^D_A : Vous devez vous adresser au responsable	
Possible reactions	Rd
F^S_B : Oui, entendu	(RAP)
Je ne peux pas avant demain	(PRAP)
F^{FS}_B : Il pourra m'arranger une réservation ?	(Q-Elab)
Vous voulez dire le concierge ?	(Q-Sub:clarification)
Est-ce que vous en êtes sûr ?	(R)
F^F_B : Allez me le chercher	(R-Elab)
F^A_B : Entendu, je le fais	(RAP)
F^D_B : Vous devez d'abord me donner son identité	(R-Elab)
F^P_B : <i>sans objet</i>	

4. $F^P_A \rightarrow F_B$: F^P_A is an invite (council, suggestion) or an offer of action. This offer is formulated in the form of choice or of possibility of action. It does not create a goal nor of commitment for the speaker B but commits A. Examples:

F^P_A : Je vous propose la salle Bleue ou la salle Lafayette	
Possible reactions	Rd
F^S_B : D'accord, la salle Bleue	(RAP)
Cela m'est égal	(PRAP)
La plus grande	(IRAP)
F^{FS}_B : Laquelle a-t-elle du matériel de projection ?	(Elab _q)
Ce sont bien des salles de réunion toutes les deux ?	(Q-Sub:clarification)
Est-ce que vous êtes sûr qu'elles sont libres ?	(Q-Sub:incidence)
F^F_B : Donnez-moi la Bleue	(RAP)
Choisissez pour moi	(PRAP)
Donnez-moi la plus grande	(IRAP)
Demandez à mon patron	(R)
F^A_B : Je coche la Bleue	(RAP)
F^D_B : Vous devez d'abord m'enregistrer	(R-Elab)
F^P_B : Prenez la plus commode pour vous	(P-Elab)

5. $F^S_A \rightarrow F_B$: F^S_A is an assertion. The propositional contents of this assertion are of epistemic nature. B can react in an unspecified way to this assertion: either to continue its own plan of action or to put questions of precision, of clarification, etc. that is to say to approve, to note, to dispute, to rectify, to correct this assertion, or to assert some other facts. F^S commits only A which thus exposes to all the possible actions of B. Examples:

F^S_A : La salle Lafayette est prise demain	
Possible reactions	Rd
F^S_B : Bon très bien	(C)
Non, pas demain vous vous trompez, mais jeudi	(Elab:correction)
Pour moi rien n'est jamais pris	(R)
F^{FS}_B : Vous avez bien dit demain ?	(Q-Sub:clarification)
Demain toute la journée ?	(Elab _q)
Qui a réservé ?	(Q-Sub:incidence)
Vous ne croyez pas que cela va m'intimider ?	(R)
F^F_B : Eh bien faites quelque chose	(R-Elab)
F^A_B : Je le note sur mon agenda	(C)
F^D_B : Vous devriez l'inscrire sur l'agenda	(R-Elab)

F_B^P : Bien prévenez les participants ou réservez une autre salle (**P-Elab**)

6. $F_A^A \rightarrow F_B$: F_A^A is an action which has a direct effect in the situation. It commits obviously its author but not the addressee who can thus dispute it, to rectify, to cancel, etc. Examples:

F_A^A : Je réserve la salle Lafayette pour demain mardi	
Possible reactions	Rd
F_B^S : Bon très bien	(C)
Non, pas demain vous vous trompez, mais jeudi	(Elab:correction)
Réserver... ça ne veut rien dire	(R)
F_B^{FS} : Vous avez bien dit demain mardi ?	(Q-Sub:clarification)
Demain toute la journée ?	(Q-Sub:precision)
Pour qui ?	(Q-Sub:incidence)
Vous vous prenez pour mon secrétaire ?	(R)
F_B^F : Eh bien mettez-moi du matériel aussi	(Elab _q)
Avec le même matériel qu'hier	(P-Elab)
F_B^A : Voilà je contresigne	(C)
Je préviens les participants	(P-Elab)
F_B^D : Vous devriez aussi l'inscrire sur l'agenda	(R-Elab)
F_B^P : Prévenez les participants ou dites à Paul de le faire	(P-Elab)

Table of the dialogical relations (relations I are not included)

act 1: vertical axis → act 2: horizontal axis

	F_B^{FS}	F_B^F	F_B^S	F_B^A	F_B^D	F_B^P
F_A^{FS}	[1] Q-Sub:clarific. Q-Sub:incidence Elab _q R	[2] QAP PQAP IQAP R-Elab	[3] QAP PQAP IQAP P-Elab R	[4] QAP PQAP R	[5] R-Elab	[6] P-Elab
F_A^F	[7] Q-Sub:clarific. Q-Sub:incidence Elab _q R	[8] R-Elab R	[9] PRAP IRAP R	[10] RAP PRAP	[11] R-Elab	[12] P-Elab
F_A^S	[13] Q-Sub:clarific. Q-Sub:incidence Elab _q R	[14] R-Elab	[15] C Elab:correction R	[16] C	[17] R-Elab	[18] P-Elab
F_A^A	[19] Q-Sub:clarific. Q-Sub:incidence Q-Sub:precision R	[20] C Elab _q P-Elab	[21] C Elab:correction R	[22] C	[23] R-Elab	[24] P-Elab
F_A^D	[25] Q-Elab Q-Sub:clarific. R	[26] R-Elab	[27] RAP PRAP IRAP	[28] RAP PRAP	[29] R-Elab	[30]
F_A^P	[31] Q-Sub:clarific. Q-Sub:incidence Elab _q	[32] RAP PRAP IRAP	[33] RAP PRAP IRAP	[34] RAP PRAP	[35] R-Elab	[36] P-Elab

	R	R				
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Monologic RR

They are relations maintained by two acts from the same speaker in the same talking turn or not which are in relation (utterances attached under the SDRT meaning) and which structures the discourse of this speaker in the current situation of dialogue (here and now). They are *a priori* of comparable nature that in a text (Narration, Continuation, Result, Background, Parallel, Elaboration, Precondition, Topic, Comment, Consequence, Contrast, Explanation, [Reformulation]) at the semantic level. See [Asher, 2003] for the formal definitions².

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- ² **Narration**: relation which indicates the chronology on the space-time axis which connects events between them (then, following, etc.). The topic subsumes a narration. "Pierre came, then it set out again",
 - **Continuation**: relation of enumeration (in form of list, sub-list, etc.). The topic directs and pre-exists to a continuation. It is a description in a topic (for example a nonlinear description of a picture "there is an angel; a Madonna; the sky is blue"). The elements of a continuation are gathered under the same topic. Even critical of [Knott and Al, 2001] that below,
 - **Result**: relation which denotes the effect of an action. « Il pleut ; la place est inondée »
 - **Background**: relation between states (scene or world) and events (foreground). Something exists in bottom and an event occurs in foreground. The topic of background binds to the topic of before plan. "The truck was stopped; the bicycle struck it". Not to confuse background of the discourse (here) and background of knowledge (pragmatic) or encyclopaedia,
 - **Parallel**: relation between two simultaneous events "Pierre walks; Paul reads the newspaper", "Pierre is sick, Marie also", common topic, structural isomorphism,
 - **Elaboration**: relation of inclusion between events or states "the place is square; in the centre there is a statue", "the bicycle struck the truck; it tore off the rear view mirror". Concept of *part of*. This relation is discussed [Knott and Al, 2001] because it can be solved by a focalisation process. Precision and clarification are elaborations,
 - **Consent (phatic)**: used to maintain the contact in the dialogue (okay, mmh, etc). This type of consent is not an answer as "yes" (it would be then a QAP) but an incentive to continue the speech, a maintenance of the channel of communication,
 - **Topic**: relation which binds the statements referring itself to the same topic. It is a structural relation which is built at the time of the update of the speech at the time of the construction of complex components (principle of coherence). Elaboration and Continuation are computed progressively during the phases of attachment,
 - **Comment**: relation of meta-discourse, it can be processed as subordinated,
 - **Consequence**: a relation which binds an event in a state by a relation of effect "he fell; he broke the arm",
 - **Explanation**: relation of causality (close sometimes with the preceding one, binds the event to another event) "She fell; Paul pushed". Also reason-of, justification,
 - **Contrast**: relation which opposes two events or two states (often marked by *but*) "Pierre is sick; but not Marie", structural isomorphism,
 - **Plan-Elab**: utterances with transactional value which contribute to elaborate a plan.

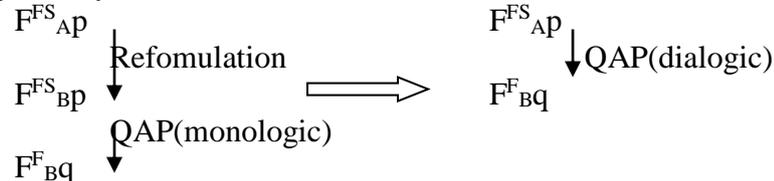
The reformulation

In the perspective of the dialogue progress, the reformulation is a kind of noise face to the normal development of the dialogue because it adds redundant acts only. Thus, we will suppose that these acts are eliminated during the analysis and do not enter in the SDRS.

Example:

A : Est-ce que la salle Lafayette est disponible ? F_{A}^{FS}
 B : ~~C'est pour la réserver je suppose ?~~ F_{B}^{FS}
 Oui, elle le sera demain. F_{B}^S

Here $(F_{A}^{FS}, F_{B}^S) = QAP$ only, we eliminate F_{B}^{FS} in order to reduce the charge of processing. Indeed more precisely one would have:



A repetition is a strict reformulation. We will not treat either hesitations, reformulations, false-departures, recoveries and auto-corrections suitable for the oral discourse, for the same reasons. One will make in the same way with acceptances of correction. For example:

A1 : La salle Lafayette, la bleue
 B1 : Non, vous devez vous tromper, la salle Lafayette est rouge
 A2 : Ah oui, excusez-moi.

A1-B1-A2 is reduced in A1': « La salle Lafayette, la rouge », on which the continuation of the dialogue will be attached.

Definition

A monological rhetoric relation is noted $R_m = (F_{AP}, F_{AQ})$. To be in relation does not mean to be consecutive (in spite of the appearance given by the examples below).

Corpus analysis (extracted from *planned meeting* application)

Let us examine below some possible cases of R_m .

7. $F_{A}^{FS} \rightarrow F_{A}$: F_{A}^{FS} is a question which implies a double commitment of A and B (for B is to answer it). The fact that A keeps the speech means that it anticipates on the answer or that it makes a modification or a precision. The complete answer cannot be made by A (if not it would be a mental dialogue), $F_{A}^{FS} \rightarrow F_{A}^S$ is not located within framework QAP. Examples:

F_{A}^{FS} : Où est la salle Lafayette ?	
Possible continuations	Rm
F_{A}^S : Je veux dire la salle de réunion	(Elab:clarification)
Celle que j'ai réservée hier	(Elab:explanation)
Je sais qu'elle n'est pas loin d'ici	(PQAP)
F_{A}^{FS} : C'est bien celle où se tient la réunion ?	(Q-Sub:clarification)
On est bien dans le bâtiment B ici ?	(Elab _q)
Est-ce la même qu'hier ?	(Q-Sub:incidence)
Est-ce la plus grande salle ?	(Elab _q)
Et la sortie ?	(C)
F_{A}^F : Allez voir dans l'autre bâtiment SVP	(R-Elab)
F_{A}^A : Je lis le plan	(Elab)
Je vais voir jusqu'au panneau	(P-Elab)
F_{A}^D : Mais d'abord vous devez me montrer le poste de contrôle	(R-Elab)

F^P_A : Vous pouvez me donner le chemin ou dessiner un plan (P-Elab)

8. $F^F_A \rightarrow F_A$: F^F_A is a request for action. A proposes an action with B and shares the effects of them. This act creates a goal which commits A and B. A can thus make an act which goes in the direction of this request (to specify, to explain, etc.) or to do it partially or indicate it how to do it (development of plan). Example:

F^F_A : Pouvez-vous me réserver une salle ?	
Possible continuations	Rm
F^S_A : C'est pour une réunion	(Elab:explanation)
La même qu'hier	(Elab:clarification)
Je sais que la C2 est disponible demain	(PRAP)
F^{FS}_A : Y aura-t-il du matériel ?	(C)
C'est bien vous le responsable ?	(Q-Sub:clarification)
Est-ce que savez si Dupond l'a déjà fait ?	(Q-Sub:incidence)
Ou bien me dire qui peut le faire ?	(Q-Elab)
F^F_A : Faites-le par Internet	(R-Elab)
Il vous suffit de remplir ce formulaire	(P-Elab)
Et prévenir les participants	(C)
F^A_A : Je commence à remplir la fiche	(P-Elab)
F^D_A : Vous devez d'abord saisir ma demande dans le système.	(R-Elab)
F^P_A : Vous pouvez remplir une fiche ou appeler le responsable	(P-Elab)

9. $F^D_A \rightarrow F_A$: F^D_A creates an obligation; A imposes a goal on B without assuming the effects of them. B cannot thus be concealed because this goal becomes only his, it does not relate to A. The goal is committing only for B. Thus A can be ensured of this engagement or help B to assume it (by additional information, information or councils). Examples:

F^D_A : Vous devez vous adresser au responsable	
Possible continuations	Rm
F^S_A : Il n'y a pas d'autre solution	(Elab:explanation)
C'est le secrétaire de département	(Elab:clarification)
F^{FS}_A : Vous m'avez bien compris ?	(Q-sub:clarification)
Savez-vous qui c'est ?	(Q-sub:precision)
F^F_A : allez me le chercher	(R-Elab)
F^A_A : Voilà je le préviens	(P-Elab)
F^D_A : Vous devez d'abord lui montrer votre carte d'identité	(R-Elab)
F^P_A : Vous pouvez lui téléphoner ou lui envoyer un mail	(P-Elab)

10. $F^P_A \rightarrow F_A$: F^P_A is an invitation (council, suggestion) or an offer of action. This offer is formulated in the form of choice or of possibility of action with B. It does not create a goal nor of commitment for the addressee B but commits A which can thus help B to make this choice. Examples:

F^P_A : Je peux vous proposer la salle Bleue ou la salle Lafayette	
Possibles continuations	Rm
F^S_A : Vous aviez pris la salle Bleue la dernière fois	(Elab:explanation)
La Bleue me semble plus appropriée pour vous	(PQAP)
Lafayette est la plus grande	(Elab:precision)
F^{FS}_A : Avec le même matériel qu'hier ?	(Elab _q)
Ce sont bien des salles de réunion que vous voulez ?	(Q-Sub:clarification)

	A moins que vous en vouliez une autre ?	(Q-Sub:incidence)
F ^F _A :	Vous vous inscrivez ici	(R-Elab)
	Faxez-moi vos contraintes	(Elab)
	Commencez à remplir ce formulaire	(PRAP)
	Vous me le ferez savoir plus tard	(R-Elab)
F ^A _A :	<i>without object</i>	
F ^D _A :	Vous devez d'abord me donner votre nom	(R-Elab)
F ^P _A :	Je peux vous proposer aussi du matériel	(C)

11. **F^S_A → F_A**: F^S_A is an assertion. The propositional contents of this assertion are of epistemic nature. A can react to its own assertion (to affirm its commitment, in specifying certain aspects, to ask an evaluation B, to continue by saying other facts, to correct itself, to put questions of precision, of clarification, etc.). Examples:

F ^S _A :	La salle Lafayette est prise demain toute la journée (1)	
	Possible continuations	Rm
F ^S _A :	Il y a un congrès	(Elab:explanation)
	Je me méfie un peu des réservations par Internet	(Elab:correction)
	Mais elle est libre vendredi	(C)
F ^{FS} _A :	Mais le soir vous irait ?	(Q-Sub:precision)
	C'est vous qui avez réservé ?	(Q-Sub:incidence)
F ^F _A :	Remettez la réservation à plus tard	(P-Elab)
	Alors, cherchez une autre salle	(R-Elab)
F ^A _A :	Je demande à Dupond de reporter sa réunion	(P-Elab)
F ^D _A :	Vous devez l'inscrire sur votre agenda	(R-Elab)
	Pensez-y plus tôt la prochaine fois	(R)
F ^P _A :	Vous avez encore la salle Bleue ou l'Aquarium	(P-Elab) ?

12. **F^A_A → F_A**: F^A_A is an action which has an effect in the situation. It commits obviously its author and for this reason he can thus rectify it, to cancel, to affirm its commitment, to pursue by other actions, to ask B an evaluative reaction, to ask him a later collaboration, etc. Examples:

F ^A _A :	Je réserve la salle Lafayette pour demain mardi	
	Possible continuations	Rm
F ^S _A :	C'est la seule solution	(Elab:explanation)
	Pardon, demain n'est pas mardi mais mercredi	(Elab:correction)
F ^{FS} _A :	Mardi, c'est d'accord ?	(Q-Sub:clarification)
	A quel nom ?	(Q-Sub:incidence)
	Que voulez-vous comme matériel ?	(Elab _q)
F ^F _A :	Maintenant prévenez les participants	(R-Elab)
	Signez vous accord ici	(R-Elab)
F ^A _A :	J'ajoute le matériel aussi	(C)
F ^D _A :	Vous pouvez l'inscrire sur votre agenda	(R-Elab)
F ^P _A :	Prévenez les gens ou dites à mon secrétariat de le faire	(P-Elab)

Table of the monological relations

act 1: vertical axis → act 2: horizontal axis

	F ^{FS} _A	F ^F _A	F ^S _A	F ^A _A	F ^D _A	F ^P _A
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F_{A}^{FS}	[1] Q-Sub:clarific. Q-Sub:incidence Elab _q C	[2] R-Elab	[3] Elab:clarification Elab:explanation PQAP	[4] Elaboration P-Elab	[5] R-Elab	[6] P-Elab
F_{A}^F	[7] Q-Elab Q-Sub:clarific. Q-Sub:incidence C Elab _q	[8] R-Elab P-Elab C	[9] Elab:explan. Elab:clarific. PRAP	[10] P-Elab	[11] R-Elab	[12] P-Elab
F_{A}^{S}	[13] Q-Sub :precision Q-Sub:clarific. Q-Sub:incidence	[14] R-Elab ? P-Elab ?	[15] Elab:explanation Elab:correction Elab C	[16] P-Elab	[17] R-Elab R	[18] P-Elab
F_{A}^A	[19] Q-Sub:clarific. Q-Sub:incidence RAP Elab _q C	[20] RAP R-Elab C	[21] Elab:explanation Elab:correction	[22] P-Elab C	[23] R-Elab	[24] P-Elab
F_{A}^D	[25] Q-Sub:clarific. Q-Sub:incidence	[26] R-Elab C	[27] Elab:explan. Elab:clarific	[28] P-Elab	[29] R-Elab C	[30] P-Elab
F_{A}^P	[31] Q-Sub:clarific. Q-Sub:incidence Elab _q	[32] R-Elab P-Elab Elab PRAP C	[33] Elab:explanation PQAP Elab :precision	[34]	[35] R-Elab	[36] C

4. Formalisation of Rhetoric Relations

We distinguish five groups of rhetoric relations:

- Relations of the questioning: (a) epistemic family of the QAP and (b) action family of the RAP and (c) in these two plans the subordinate questions Q-Sub,
- Elaboration of knowledge, Elab, and their derivative,
- Relations using a level of planning: plan elaboration, P-Elab and/or of goal, R-Elab,
- The continuation, C,
- The counterparts R, incidences I, phatic, meta-discourse related to the management itself of the communication or related to the roles of participants.

One can also classify the different relations according to knowledge invoked to detect itself:

- Domain knowledge and ontology: QAP, IQAP, PQAP, RAP, IRAP, PRAP, Elab_q, Elab, I, C
- Linguistic knowledge: Elab:explanation, Elab:precision, Elab:correction, Elab:clarification, Q-Sub:clarification,
- Task knowledge: Q-Elab, R-Elab, P-Elab

We present below the formal definition of each rhetoric relation (Kp indicates the semantic formula associated with p).

Semantics of the questioning

The semantics of the questioning in SDRT is defined by:

$$[[?]]_M ([[\lambda x_1 \dots \lambda x_n P(x_1, \dots, x_n)]])_M = \{ [[p]]_M : \begin{array}{l} (a) \exists [[\alpha_1]]_M \dots [[\alpha_2]]_M \text{ such as } [[p]]_M = [[\alpha_1]]_M \dots [[\alpha_2]]_M ([[\lambda x_1 \dots \lambda x_n P(x_1, \dots, x_n)]])_M \wedge \\ (b) [[\forall p]]_M \wedge \\ (c) [[\exists x_1, \dots, x_n (\forall p \Rightarrow P(x_1, \dots, x_n))]])_M \vee \\ \quad [[(\forall p \Rightarrow \neg \exists x_1, \dots, x_n P(x_1, \dots, x_n))]])_M \end{array} \}$$

The operator of questioning $?$ is interpreted in the world M ($[[?]]_M$) as a function which, with any pair (possible world, assignment) associates a set of extensions of proposals. What means [Asher 03, section 7.6.1] that a question is represented by a lambda-abstraction, who, when it is applied to the segment answer, provides a proposal p such as,

- (a) p replaces each λ -term x_i by a value α_i
- (b) p is true
- (c) either p implies $P(x_1, \dots, x_n)$ is true for certain particular values x_1, \dots, x_n
or p implies that there is not any value which satisfies $P(x_1, \dots, x_n)$.

The *Response* predicate formalizes the concept of resolving answer for a question α :

$$[[\text{Response}(\wedge K_\alpha, q)]]_M \text{ iff } [[q]] \in [[(\wedge K_\alpha)]]^3$$

This predicate connects the intension of the question (set of proposals) with the propositional term q .

The question-answer pairs: QAP, PQAP, IQAP

For these three relations, the first act of the pair is always a F^{FS} : one can answer a question by an assertion or an action: $F^{\text{FS}}_A \rightarrow F^{\text{S}}_B$ or $F^{\text{FS}}_A \rightarrow F^{\text{A}}_B$

QAP(p, q) : Question Answer Pair (complete answer)

Response($\wedge K_p, \wedge K_q$)

QAP includes the polarity questions and the questions with pronouns.

PQAP(p, q) : Partial Question Answer Pair (partial answer)

$q \subset r \wedge \text{Response}(\wedge K_p, \wedge K_r)$

IQAP(p, q) : Indirect Question Answer Pair (indirect answer)

$q \Rightarrow r \wedge \text{Response}(\wedge K_p, \wedge K_r)$

The subordinate questions Q-Sub

They are continuations of dependent questions, each one likely to receive an answer (subordination leaves each *question* node open). One can refine the semantics of this relation while distinguishing two sub-categories,

Q-Sub:clarification(p, q) : question on the part of p

Q-Sub:incidence(p, q) : question not carrying about the contents of p (nor on under part of p and is neither an elaboration of p) but remaining in the same topic. It acts of a *turning* in this case and not of a *way out*.

³ $\wedge K_\alpha$: proposition exprimée par la formule K_α .

The knowledge elaborations, Elab:clarification, Elab:correction

The **Elaboration(p, q)** relation classically involves a *part-of* left relational between the principal components of K_p and K_q .

One refines then this relation by the following distinctions:

Elab_q(p, q) : q is a question working out about the contents of p (question about a detail of p⁴)

Elab:Explanation(p, q) : there is a semantic relation of explanation between p and q. This semantic relation can be expressed by specific lexical markers (as because, etc.),

Elab:Correction(p, q) : q provides a correction of the sense, by substitution of a part of p,

Elab:Clarification(p, q) q brings a clarification or a precision on the contents of p, without adding information or modifying p.

The actions with delegation, RAP, PRAP, IRAP

These relations formalize the questioning on the axis of transactions. The first act of the pair is always a request for action F^F or an offer of action F^P . The speaker can answer it by an action or a contribution of knowledge being used to prepare this action: $F^F_A \rightarrow F^A_B$ or $F^F_A \rightarrow F^S_B$; $F^P_A \rightarrow F^A_B$ or $F^P_A \rightarrow F^S_B$

RAP (p,q) Request Answer Pair

$\text{Response}(\wedge K_p, \wedge K_q)$

PRAP(p,q) Partial Request Answer Pair

$q \subset r \wedge \text{RAP}(p,r)$

IRAP(p,q) Indirect Request Answer Pair

$q \Rightarrow r \wedge \text{RAP}(p,r)$

The relations related to the task planning

The Q-Elab relations, P-Elab, R-Elab are relations using a level of planning or transaction. Their formalization utilizes

- the goal b associated with the content p of A ,
- the response p' expected by A to p ,
- the plan a has to put in progress to achieve the goal b ,
- the mutual knowledge of A and B , K_{AB} , and the private knowledge of B , K_B .

Speaker A , seeks to obtain knowledge p' of the "plan" (i.e. *how to do*) that leads him to a situation where he can compute that by achieving the plan underlying by p' , he will achieve its initial goal b . This plan cannot however be calculated by mutual knowledge of A and B before the response of B [Prévo, 2004, p. 225]. We use the Executable(p) predicate which denotes an action p is executable.

We have :

Q-Elab(p,q) Question Elaboration

$\text{Response}(\wedge K_q, p') \wedge p'$ provides a plan a (or a sub-plan) which takes part in the resolution of the goal b associated with p .

⁴ We do not distinguish, as Asher the elaborations which are marked by a request (for us Elab_q includes Elab , from Asher).

R-Elab(p,q) Request Elaboration

b is the sub-goal denoted by p, Executable(q) \wedge $F^A_A(q)$ progress to Reached(b)
The execution of the answer q provides to A a goal that he has to reach in order to reach b.

Plan-Elab(p,q) Plan Elaboration

q is an element of the plan *a* to reach the goal b associated with p. q is an assertion.

For these three relations, Asher uses a cognitive level and a model of the goals, plans, beliefs and intentions of the speakers. To avoid the difficulty in modelling the intentions and the beliefs, we instantiate these relations from the model of task - depending on the domain of application.

The continuation C

It is a coordinating relation. In its dialogical form, when it connects pairs QAP, it represents the sequence of coordinated Q/R, i.e. sequences Q_i/R_i and not sequences $Q_1...Q_i/R_1...R_i$. In its monologic form, it connects acts in the same standard way following one another on the same topic (enumeration for example). This relation imposes the introduction of a topic subsuming the coordinated components.

The background

It is a particular relation allowing to “set the scene” of the discourse. We follow the same formalization as Asher. It is a subordinating relation.

The incidence I

We do not distinguish the various types of incidence (open or closed incidences, thematic incidences, dialogical incidences, etc.). In our modelling, most interesting are the closed incidences. It are subordinated under the same topic.

The counterpart R

Is regarded as refusal of role which involves the closing of the node $F_A: F_B = \neg F_A$
Dispute by B of the act of A, or rejection of the plan suggested by A (*plan-correction* in standard SDRT)

Note: Formalization of the semantic effects

The SDRT is interested primarily in the semantic effects of the relations i.e. the specific semantic contribution carried by the relation. Within the framework of the finalized man-machine dialogue, we focus ourselves rather on the pragmatic effects of the relations, i.e. their impact on the progress of the joint action.

5. Pragmatic effects of the rhetoric relations

Each rhetorical relation has a specific effect on structure SDRS, in particular by its influence on the structure of topic. The topic is at the same time a structural relation, and a discursive component which has as a role to gather subjacent information.

- For the subordinated relations, the subordinate component is the topic of the relation,
- The coordinated relations (as C for example) introduce a topic subsuming the components connected: it is a new composed component,

- QAP and RAP introduce Question-topics. This topic will receive the result of the application of the segment *answer* on the segment *question* [Prévot, 2004]. Thus sets of coordinated question/answer connect under the same topic Question-topics of respective pairs QAP. Indeed, the Question-topic contains the asserted information obtained by application of the segment *answer* on the segment *question*. In the case of the connected answers, the dominating Question-topic will contain the union of the assertions obtained by application of the answers on their respective questions,
- Elab (Elab_q, Elab:precision, Elab:clarification, Elab:explanation...) introduce a subordinated topic, who once solved goes up in the upper topic,
- A R closes the topics and,
- I remains in the same topic (with the restriction on the types of incidences announced higher).

We illustrate below the structure of topic in three different cases of question sequences.

Dialogue 1 :

- (A-q1) : Où a lieu la conférence ?
 (B-r1) : Dans la salle des colloques
 (A-q2) : C'est à quelle heure ?
 (B-r2) : A quatorze heures.

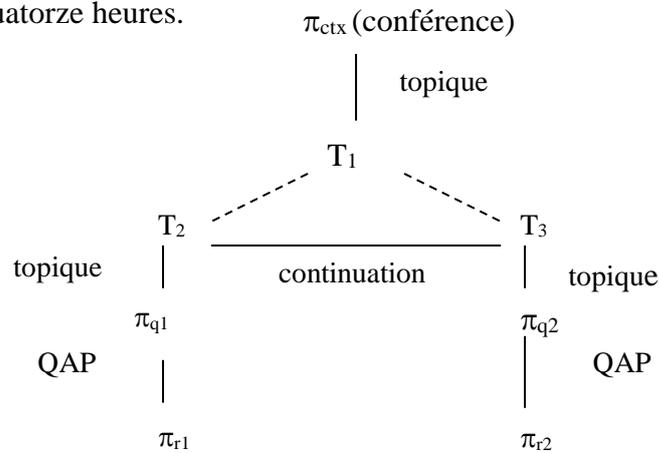


Figure 2. SDRS for the dialogue 1: a sequence of Q/R

Dialogue 2 :

- (A-q3) : Puis-je te voir la semaine prochaine ?
 (B-q4) : Es-tu libre mardi ?
 (A-r4) : Oui.

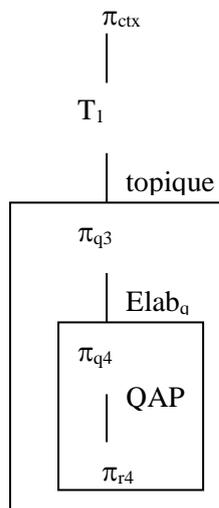


Figure 3. SDRS for the dialogue 2: subordinated questions

Dialogue 3 :

- (A-q5) : Pour quelle date voulez-vous réserver ?
- (B-r5) : Avant la fin du mois.
- (B-r6) : Un jeudi

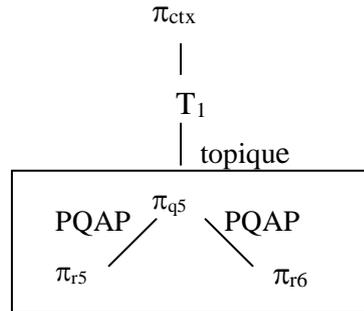


Figure 4. SDRS for the dialogue 3: the topic T_1 contains the set of resolutions $q5(r5)$ et $q5(r6)$

We use the topic as fundamental element for structuring dialogic exchanges: in the phase of updating the structure, we go up in the topic the whole of the referents and predicates established in the subjacent substructure (after resolution of the anaphora, and taken into account of the presuppositions). Along the running of the dialogue, the complete SDRS is built thus by progressive establishment of topics of increasingly high level (union of the element coordinated, or gone up elements subordinates), until the upper topic, constituted of the whole of the information established by the participants.

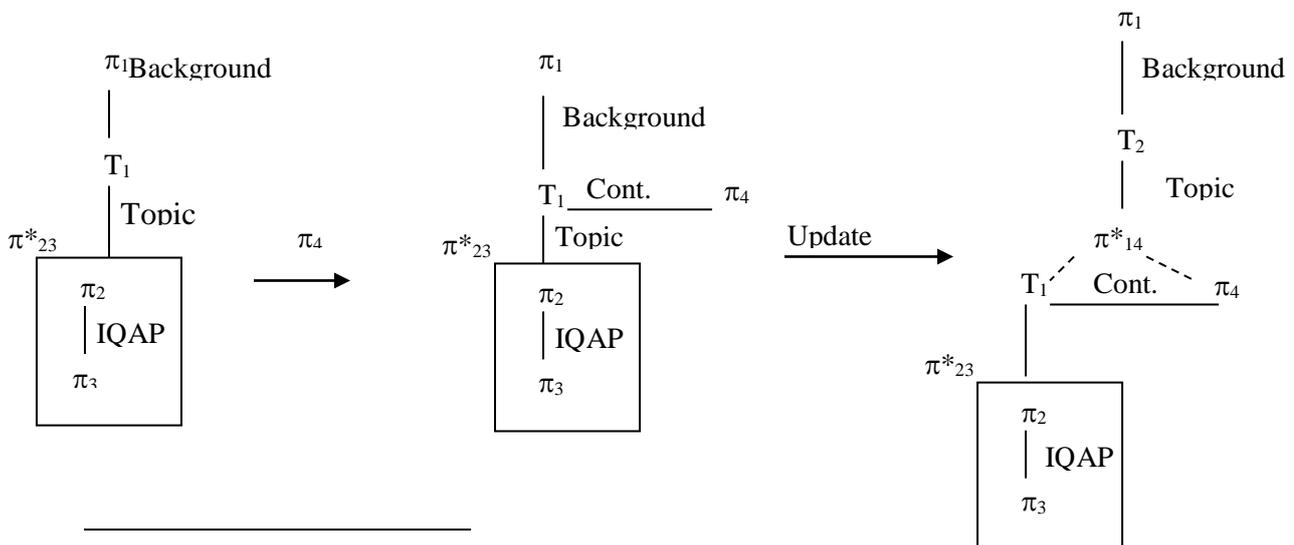
6. Dialogue structure : an example

Let us consider the short dialogue as following:

Dialogue 4 :

- A : Bonjour, Luc Blanc à l'appareil π_1
- Est-ce que la salle Apollinaire est disponible la semaine prochaine ? π_2
- B : Elle est disponible jeudi et vendredi π_3
- A : Bon et bien réservez-la moi π_4
- B : Quel jour ? jeudi ou vendredi ? π_5
- A : Disons vendredi π_6

The progressive model of the structure is⁵ :



⁵ π^*_{mn} are tags for complex constituents.

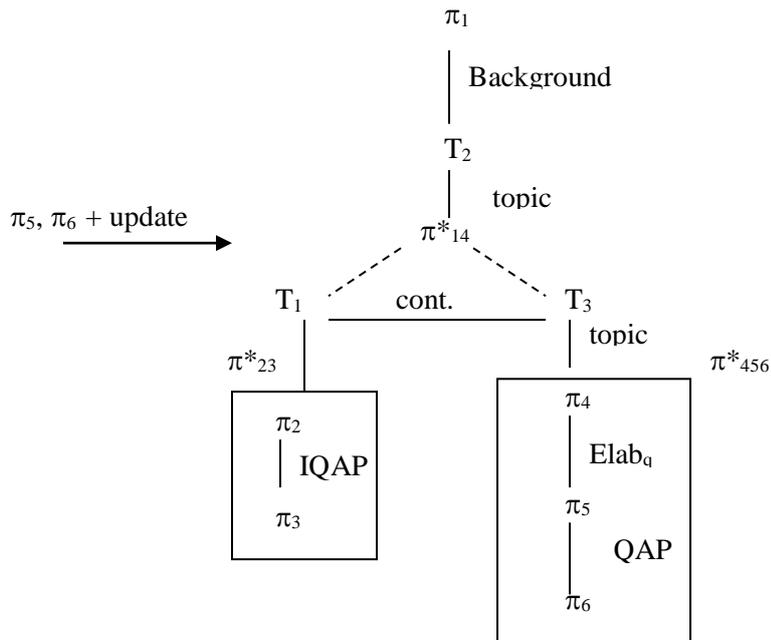


Figure 5 : Construction de la SDRS du dialogue 4

- The segments π_2, π_3 are bound by IQAP (indirect answer). It supposes that it should be made the inference that *jeudi* (Thursday) and *vendredi* (Friday) are part of the *next week*. The updating of IQAP(π_2, π_3) starts then the introduction of topics question T1. π_3 accessing π_2 allows the resolution of the pronominal anaphora *elle* (*it*). Topic T1 thus contains the assertion “*the Apollinaire room is available Thursday and Friday of the next week*”,
- π_4 is an act with potential opening (F^F) and it poses a new topic (reservation). π_4 binds to topic T1 by Continuation; the insertion of this relation starts the introduction of the T2 topic then dominating the component π^*_{14} formed by $C(T_1, \pi_4)$,
- π_5 binding to π_4 by $Elab_q$ (elaboration by question) starts the introduction of topics Question T3 dominating $Elab_q(\pi_4, \pi_5)$. The π_4 resolution by a segment answer "is deferred" to that from π_5 ,
- π_6 binding to π_5 by QAP remains under same topic T3. The resolution obtained by $K\pi_6$ ($K\pi_5$) goes up in topic T3,
- In the final structure the T2 topic contains the union of the referents and predicates established in the two topics that it dominates, T1 and T3.

7. Discussion

Why preserve the acts of language and use the formalism of the SDRT? For the two following reasons: (A) an act of language exists apart from any context and out of any discourse relation, (b) an act of language can be identified using the pragmatic markers and syntactic/semantic structures [Colineau, 1997]. It seems thus easier "to calculate" the rhetoric relations starting from a pair of acts of language.

The separation of the axis of knowledge of that of the transaction is never complete, in particular in the case of knowledge of common sense. In the following example:

A : Peut-on se voir la semaine prochaine ?

B : Es-tu libre mardi ?

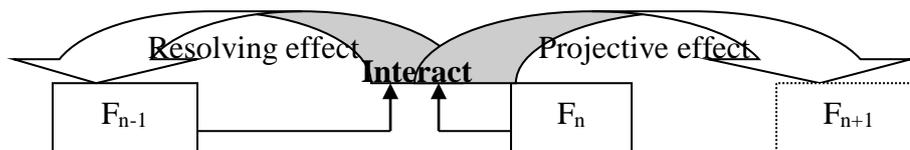
one can consider that A plans an appointment and that B is placed within a professional framework to raise its question which goes in the direction of the goal that it presupposes for A, but one can also consider that *mardi* (Tuesday) is quite simply a day of the next week where B is free without presupposing an unspecified plan for A. It is obvious that according to selected interpretation we will have either Q-Elab or Elab_q as possible rhetorical relations.

We can notice a relative symmetry between RR on the two axes:

Knowledge	Plan and actions	Type of axes
QAP	RAP	principal
Q-Sub	Q-Elab	subordinated
Elab	P-Elab	principal
Elab _q	R-Elab	subordinated

8. Conclusion

The following figure summaries the different effects for two consecutive acts:



It symbolizes the fact that a F_{n-1} act produced by a speaker becomes a *interact*, as soon as the other speaker produced in his turn the F_n act in reaction to F_{n-1} : this *interact*, constituted by this couple (F_{n-1}, F_n) roof entirely or partly expectations of F_{n-1} and projects on the future a certain goal or founds shared knowledge that the following act F_{n+1} will have to take into account. The rhetorical relations (RR) defined in the SDRT bind the current act to last by resolving the open links. Projective effects, on the contrary, are new links which open expectations for the following act. From this point of view, the SDRT models well these effects in which an act has a double potential at the same time resolving and projective (opening). The resolving component is attached preferentially on open nodes of the SDRS in progress, while the opening component possibly poses new potential expectation in a topic (which it still remains to model more finely than the paper describes it). This double function is based on the illocutionary force and the semantics of the propositional contents of the act - for example a F^{FS} attached by a relation of Elab_q to a former question will carry a potential closure (it took part in the resolution of the main question) and a potential opening (this resolution will be effective only after obtaining the response to this F^{FS}). From an operational point of view, the structure of topic allows to instantiate the dynamic process of interpretation.

Thus the SDRT offers a rich framework for modelling the man-machine dialogue. The management of the themes (constitutive of the task) and of the topics (computed during the phase of updating the SDRS) remains a next development and future work.

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