ACCORD
CONVERSATION CLICHÉS FOR COOPERATION [1]

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Abstract

Clichés—conversation stereotypes—are state transition machines that control the sequencing of dialogue events in a conversation between two participants. Clichés are represented in the language of *ACCORD*—a framework for dialogue representation systems using commitment and legality. The notion of contract—mapped to Winograd's *Conversation for Action* diagram—is presented as an example of the framework's ability for representing conversation clichés for cooperative work.

Keywords

Cliché, Negotiation, Commitment, CSCW, Dialogue, Contract

1 Introduction

Cooperation requires conversation. Conversations, particularly bureaucratic ones, tend to be structured and repetitive. Clichés are state transition machines that control the sequencing of dialogue events between two participants in a conversation. A cliché restrains the unfolding of a conversation. Hence, it is possible to use specific clichés for reaching specific results.

This paper proposes the use of conversation clichés for structuring cooperative work. These clichés are built using the dialogue primitives of ACCORD. In this framework, a dialogue is a sequence of dialogue events; a dialogue event is a tuple consisting of

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a locution, and the speaker and the hearer of that locution. A locution is a locution modifier applied to one or more sentences.

In section 2 of this work the notion of cliché is introduced. ACCORD is described in section 3. In section 4, the notion of contract—mapped to Winogrado's Conversation for Action diagram (Winograd 1988)—is presented as an example of the framework's ability for representing conversation clichés with a view to cooperative work. In section 5 a car buying is presented as an example of negotiation. In section 6 a Negotiation Cliché prototype is presented. Finally, the conclusion and future extensions are presented in section 6.

2 Conversation Clichés

We could define a Conversation Cliché for a specific situation as the collection of the relevant conversations for that situation.

Let us consider that only two participants are involved in an (verbal or written) exchange that we call dialogue. Conversation is defined as the sequence of dialogue events.

Clichés are modelled as state transition machines. They can be sub-divided into clichés or dialogues. They start from an initial state, traversing through intermediate states, until reaching a final state. The transition from one state to another state can only be achieved by the triggering of a dialogue event. Each path traversed in a cliché is associated to a valid dialogue.

Representing conversation clichés for cooperation using *ACCORD* has the benefit of the recording, in the commitment stores, of the commitments undertaken by each participant during the dialogue. The content of the commitment stores mirror the content of the dialogue.

The notion of contract—a widespread form of social binding envisaging cooperation—is presented below as an example for the application of conversation clichés.

3 ACCORD

ACCORD, a framework for dialogue representation systems using commitment and legality is proposed as a means for representing some of the negotiation aspects characteristic of cooperative work (Fuks 1991). It is a two-tiered framework comprising a Commitment Calculus (CC) and a Dialogue Action Component (DAC).

The modelling of each participant's range of information about the dialogue, and its interaction with the other participant, is represented by the commitments generated during the conversation process. Each participant has a commitment store where its commitments are placed. The calculus is responsible for dealing with the consequences of having commitments inside the commitment stores. Its rules envisage consistency preservation inside the commitment stores. The semantics of this calculus is based on the notion of commitment membership, i.e. the truth and falsity of formulae is defined by their membership status in the commitment stores.

DAC dictates the dialogue's etiquette, and the way that the conversation affects and updates the commitment stores. It has axioms of the form <Participant_AtoParticipant_B, Location>, where Participant_A (currently the speaker) and Participant_B (currently the hearer) are the participants in the dialogue and Locutions are the application of a finite set of locution modifiers to statements. Pre and Post are the pre- and post-conditions of the locutions performed by the participant.

At the current stage of this work our dialogues are limited to two participants, justifying the sense of direction given to our locutions: AtoB (from Participant_A to Participant_B). However, in the future we would like to envolve to a N-party framework.

Below, we introduce the part of the framework which is relevant for this article.

3.1 Locutions

Locutions consist of a statement and a modifier, represented as locution modifier(Statement). Statements are constructed in a propositional language which includes negation, conditional, disjunction and conjunction of statements. Locution modifiers are as follows:

Assertions
to be read as "It is the case that Statement", notationally **asserts**(Statement);

Questions
to be read as "Is it the case that Statement?", notationally **questions**(Statement);

Withdrawals
to be read as "I am not sure that Statement", or "No commitment to Statement", notationally **withdraws**(Statement);

Challenges
to be read as "Why is it to be supposed that Statement" or "How is it known that Statement", notationally **why**(Statement);

Justifications
to be read as "Statement is a justification for the Challenge", notationally **justifies**(Statement);

Denials
to be read as "I deny that it is the case that Statement", notationally **denies**(Statement);

Resolution Demands
to be read as "Resolve this set of Statements against this specific Statement", notationally **resolve**(Set_of_Statements/Statement).

3.2 Dialogue Events

Dialogue events are represented as <P_1toP_2, Locution>, where P_1 and P_2 are participants. A dialogue is composed by a sequence of dialogue events, which is stored in an event record.

There are legality axioms that define the validity of a dialogue event in a specific situation. There are commitment axioms that define the commitment stores modifications when a dialogue event occurs.

3.3 Commitments

Having a commitment establishes a family of ways for a participant to behave, in a manner consistent with the information available and with the role that that participant performs in its community. A commitment is an engagement or involvement that restricts freedom of action. If one is committed to something, one should stick to it. For a better understanding of our notion of commitment, the reader is referred to (Fuks, Ryan and Sadler 1989, Fuks 1991). There are other notions of commitment in the computing literature (Cohen and Levesque 1987, Koo 1988, Woo 1990, Bond 1990). Our notion of commitment could be seen as a proper subset of Bond's concept of commitment. Although we agree on the behavioral aspects of commitment, we have different views about retracting commitments. Moreover, we provide a calculus for dealing with commitments.

Commitments are placed in commitment stores, which are represented in the following way: Participant(C(<Set of sentences>), D(<Set of sentences>)). For the sake of clarity, each participant will not only have a commitment store for its positive and negative commitments—C part of the commitment store—but also a D part of the commitment store as a place for the statements which the participant is not committed to.

For example, $P_1(C(\mathrm{s1},\mathrm{s1}\rightarrow\mathrm{s2}))$ & $P_2(C(\mathrm{s1}),D(\mathrm{s3}))$ indicates that <*s1*> is in C part of the commitment stores of participants P_1 and P_2, that <*s1*→*s2*> is in C part of P_1 commitment store and finally that sentence <*s3*> is in D part of P_2 commitment store. We could read from that, that P_1 is committed to both *s1* e *s1*→*s2*, while P_2 is committed to *s1* and is not committed to *s3* (figure 1).

Commitments can be explicits or implicits. Explicit commitments are those generated by the dialogue process. Implicit commitments are those infered by the commitment calculus. In the prior example the participant P_1 is committed implicitly to *s2*.

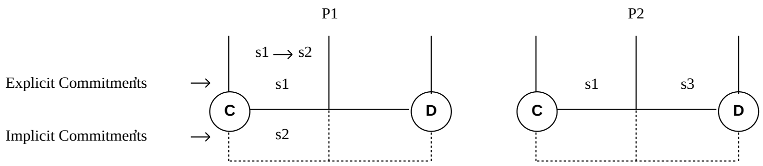

Figure 1: Graphic representation of the commitment stores

3.4 Dialogue Representation

Dialogues have the following format:

Pre $\longrightarrow$ [$P_i$toP_j, Locution]^n Post

where i and j $\in$ {1,2}, i $\neq$ j; n $\geq$ 1 and Pre- and Post- are the conditions respectively holding before and after the dialogue has taken place. Pre- and Post- are written in the language of commitments plus the constants *healthy* and *error*. While the former indicates that the state of the dialogue is valid, the latter indicates that the state is not a valid one.

3.5 Commitment Axioms

Commitment axioms define the changes in the commitment stores and the health of the post-conditions caused by the uttering of each specific locution.

healthy $\longrightarrow$ [P_1toP_2, **asserts**(a)] $P_1(C(\text{a}))$ & $P_2(C(\text{a}))$

After P_1 uttered **asserts**(a) to P_2, then given that Pre is a healthy state prior to the assertion, both participants are committed to <a>. A participant is committed to anything stated by another participant. In other words, a participant can not deny having heard what the other said.

healthy $\longrightarrow$ [P_1toP_2, **withdraws**(a)] $P_1(D(\text{a}))$

After P_1 uttered **withdraws**(a) to P_2, then given that Pre is a healthy state prior to the withdrawal, P_1 is not committed to <a>. The situation above reflects the awareness of the statement that comes from a comment like I am not so sure that. It is weaker than a commitment to the negation of the same statement.

$P_1(C(\text{a}))$ $\longrightarrow$ [P_1toP_2, **withdraws**(a)] $P_1(D(\text{a}))$

After P_1 uttered **withdraws**(a) to P_2, then given that P_1 is committed to <a> prior to the withdrawal, P_1 is not committed to <a>. The situation pictured above typifies the way that a participant gets rid of a commitment that was probably—but not exclusively—placed there as the result of an assertion uttered by the other participant .

healthy $\longrightarrow$ [P_1toP_2, **questions**(a)] *healthy*

After P_1 uttered **questions**(a) to P_2, then given that S is a healthy state prior to the question, S' is a healthy state. Both commitment stores remain the same.

$P_1(C(\text{a}))$ & $P_2(C(\text{a}))$ $\longrightarrow$ [P_1toP_2, **why**(a)] $P_1(C(\textbf{why}(\text{a})), \sim C(\text{a}))$ & $P_2(C(\text{a}))$

After P_1 uttered **why**(a) to P_2, then given that both parties are committed to <a> prior to the challenge, P_1 is committed to <**why**(a)>—but not to <a> any more—and P_2 remains committed to <a>.

$P_1(C(\textbf{why}(\text{a})))$ & $P_2(C(\text{a}))$ $\longrightarrow$ [P_2toP_1, **justifies**(b)]
$P_1(C(\textbf{why}(\text{a}),\text{b}\rightarrow\text{a},\text{b}))$ & $P_2(C(\text{a},\text{b}\rightarrow\text{a},\text{b}))$

After P_2 uttered **justifies**(b) to P_1, than given that P_1 is committed to <**why**(a)>

and P_2 is committed to <a> prior to the justification, P_1 is committed to <**why**(a)>, <b→a> and <b>, and P_2 is committed to <a>, <b→a> and <b>.

$$P_2(\text{contradictory}) \longrightarrow [P_1 \text{to} P_2,\ \mathbf{resolve}(\mathrm{C}(\Gamma)/\mathrm{C}(\mathrm{a}))]\ P_2(\text{contradictory})$$

After P_1 uttered **resolve**(C(Γ)/C(a)) to P_2—the set of commitments designated by Γ and the specific commitment <a> being proved to be contradictory by the sole application of a commitment calculus rule—then given that P_2 has this form of contradiction in his commitment store prior to the resolution demand, both commitment stores remain the same after it.

4 Negotiation Cliché

ACCORD represents dialogues using the notions of commitment and legality. Commitments implies in responsabilities and is a concept that has a relation with the notion of contract. This notion is used in this section to define a conversation cliché where two persons negotiate a contract to perform an action.

According to the *Enciclopædia Brittanica* (Vol. 6, pp 424-431, 1965), 'The simplest definition of a contract is that it is a promise enforceable by law. ... An usual requisite of a contractual promise is that it must be the product of a bargain; *i.e.*, the person to whom the promise is made (the promisee) must give to the person making the promise (the promisor) something in exchange for the promise. The thing given in exchange (called consideration) may be an act, like payment of money ... the making of a contract requires mutual assent of two or more persons. This means that ordinarily there must be an offer by one person (the offeror) and an acceptance by another (the offeree). ... An adequate description of a contract must include the legal consequences as well as the facts necessary to its creation. The traditional term used to describe these consequences is obligation. Obligation here means legal duty. One who makes a contractual promise to do an act comes under the legal duty to do the act.'

We are not interested in capturing all the aspects of a contract as defined above. Concepts like consideration and obligation were intentionally left out of this work. Fuks, Ryan and Sadler (1989) proposes the existence of a link between having commitments and being obliged to perform actions for realizing these commitments. Here we are interested in showing that *ACCORD* is capable of representing and recording the promise and offer exchange, together with the commitments originated from.

The *Conversation for Action* diagram presented in figure 2 was taken from (Winograd 1988, pp 628). Observing the diagram it is possible to identify three phases which are similar to those of a contract. The first one is the Negotiation Phase, were the desired action is specified. The second one is the Performance Phase, and the third one is the Completion Phase. For our example we will stick to the first phase.

In the following sections we define a *Negotiation Cliché* wich corresponds to the Negotiation Phase of the diagram. This cliché is divided into two other clichés namely, *Negotiation With Agreement Cliché* and *Negotiation Without Agreement Cliché*.

Figures 3, 4 e 5 present a taxonomy for the Negotiation Cliché.

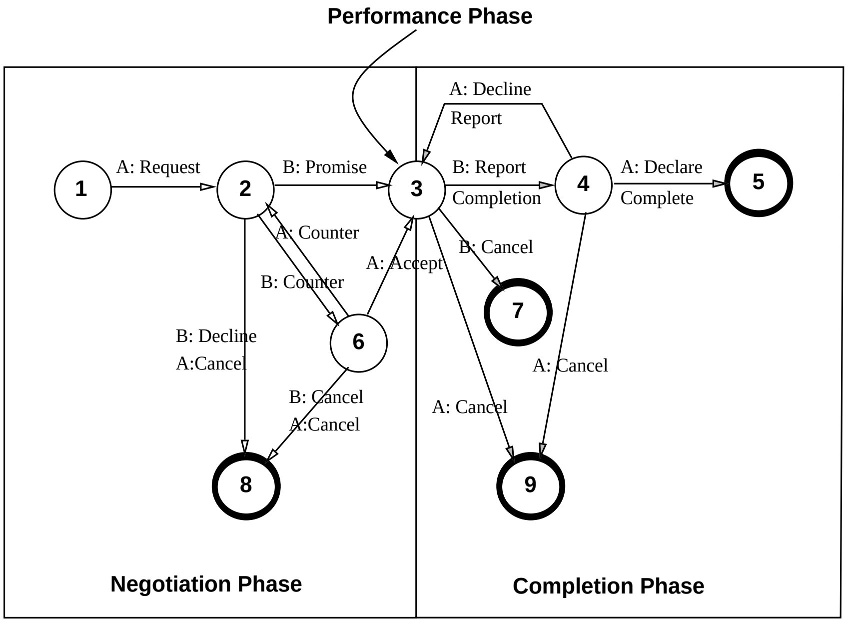

Figure 2: Conversation for Action Diagram

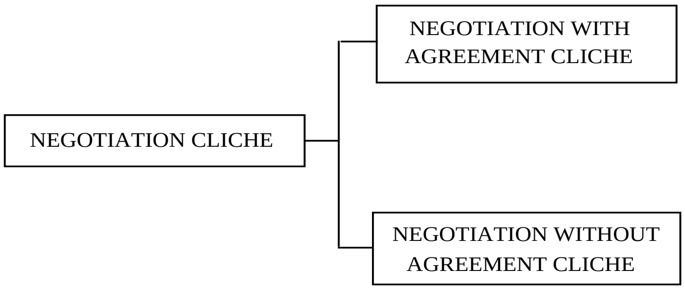

Figure 3: Negotiation Cliché taxonomy

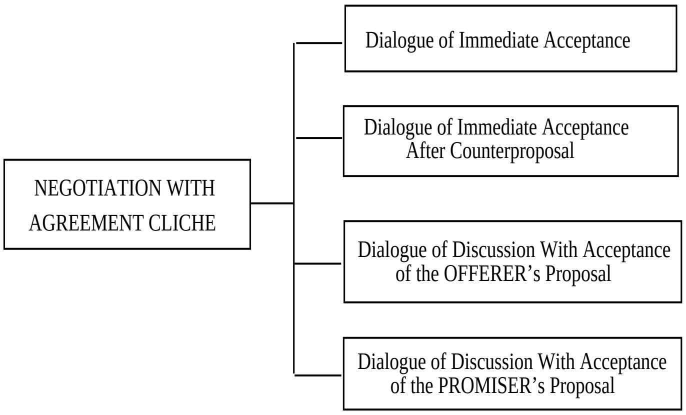

Figure 4: Negotiation With Agreement Cliché taxonomy

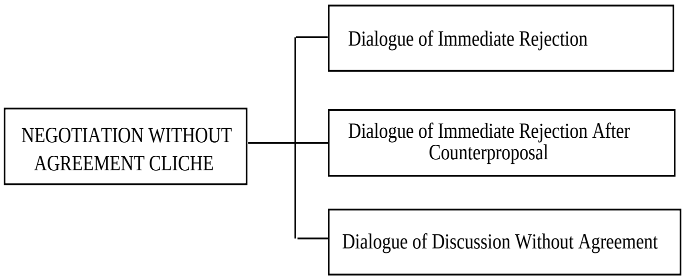

Figure 5: Negotiation Without Agreement Cliché taxonomy

The Negotiation Cliché comprises seven dialogues, all of them starting with an offerer's request. According to Searle (1979), to request is a directive i.e., speech acts where the speaker wants the hearer to perform some action. In terms of *ACCORD*'s locution modifiers, **questions** perfectly suit the task, for it does not alter the commitment stores and forces the promiser to give an answer that commits itself.

The negotiation without agreement cliché is defined by the dialogues that take place between offerer and promiser, whenever there is no agreement about the terms of the contract. The negotiation with agreement cliché is defined by the dialogues that take place between offerer and promiser, whenever there is an agreement about the terms of the contract.

For the analysis below we replace 'A' (from the diagram) by 'offerer' and 'B' by 'promiser'. We also consider that there are only two proposals at stake, one per participant. We refer to the offerer's proposal as <a> and to the promiser's counterproposal as <b>. At the end of each dialogue, only one, or none, of the two proposals is accepted by both participants.

4.1 Dialogue of Immediate Acceptance

This dialogue takes place when the promiser immediately accepts the offerer's proposal. After the initial questions(a) posed by the offerer, in order to commit itself to <a>, the promiser asserts(a), introducing that way the offerer's proposal <a> into the C part of both commitment stores.

healthy $\longrightarrow$ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **asserts**(a)]
OFFERER(C(a)) & PROMISER(C(a))

4.2 Dialogue of Immediate Rejection

This dialogue takes place when the promiser immediately rejects the offerer's proposal. After the initial questions(a) posed by the offerer, in order to show that it has no commitment to <a>, the promiser withdraws(a), introducing that way the offerer's

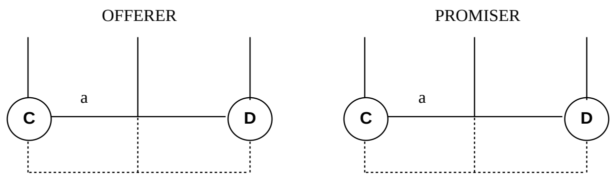

Figure 6: Dialogue of immediate acceptance - commitment stores

proposal <a> into the D part of its commitment store. To finish off the dialogue, the offerer also withdraws(a)—its own proposal, introducing it into the D part of its commitment store.

healthy $\longrightarrow$ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **withdraws**(a)]
[OFFERERtoPROMISER, **withdraws**(a)]
OFFERER(D(a)) & PROMISER(D(a))

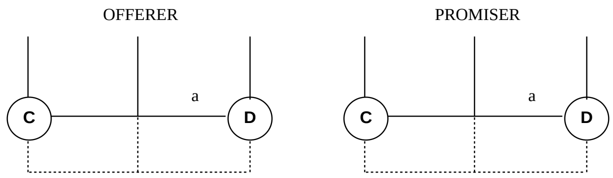

Figure 7: Dialogue of immediate rejection - commitment stores

4.3 Dialogue of Immediate Acceptance After Counterproposal

This dialogue takes place when the promiser poses a counterproposal to the offerer's request, and the offerer immediately accepts it. After the initial questions(a) by the offerer, promiser replies with an asserts(b), introducing that way its counterproposal <b> into the C part of both commitment stores. The offerer shows its acceptance to the promiser's counterproposal by withdrawing its own proposal <a>—placing it into the D part of its commitment store. To finish off the dialogue, the promiser also withdraws(a)—the offerer's proposal, introducing it into the D part of its commitment store.

healthy $\longrightarrow$ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **asserts**(b)]
[OFFERERtoPROMISER, **withdraws**(a)]
[PROMISERtoOFFERER, **withdraws**(a)]
OFFERER(C(b),D(a)) & PROMISER(C(b),D(a))

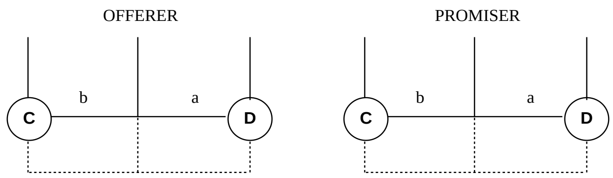

Figure 8: Dialogue of immediate acceptance after counterproposal - commitment stores

4.4 Dialogue of Immediate Rejection After Counterproposal

This dialogue takes place when the promiser poses a counterproposal to the offerer's request, and the offerer immediately rejects it. After the initial questions(a) posed by the offerer, the promiser replies with an asserts(b), introducing that way its counterproposal <b> into the C part of both commitment stores. The offerer shows its rejection to the promiser's counterproposal by withdrawing the promiser's counterproposal <b>—placing it into the D part of its commitment store. To finish off the dialogue, the promiser also withdraws(b)—its own proposal, and both of them withdraw their own proposals, thus introducing them into the D part of both commitment stores

healthy ⟶ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **asserts**(b)]
[OFFERERtoPROMISER, **withdraws**(b)]
[PROMISERtoOFFERER, **withdraws**(a)]
[OFFERERtoPROMISER, **withdraws**(a)]
[PROMISERtoOFFERER, **withdraws**(b)]
OFFERER(D(b,a)) & PROMISER(D(a,b))

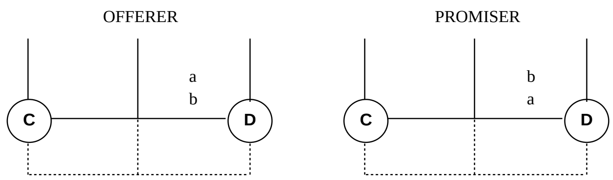

Figure 9: Dialogue of immediate rejection after counterproposal - commitment stores

4.5 Dialogue of Discussion With Acceptance of the OFFERER's Proposal

This dialogue takes place when the promiser poses a counterproposal to the offerer's request, the offerer accepts to engage in a debate, and after the discussion the promiser accepts the offerer's proposal. After the initial questions(a) posed by the offerer, promiser replies with an asserts(b), introducing that way its counterproposal <b> into the C part of both commitment stores. The offerer shows its intention to engage in a debate issuing an asserts(a), introducing its own proposal <a> into the C part of both commitment stores. At this moment starts the discussion and the offerer's proposal is challenged by the promiser. The offerer justifies its own proposal and its justification is accepted by the promiser. To indicate its acceptance the promiser withdraws its own proposal after the justification given by the offerer.

healthy ⟶ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **asserts**(b)]
[OFFERERtoPROMISER, **asserts**(a)]
[PROMISERtoOFFERER, **why**(a)]
[OFFERERtoPROMISER, **justifies**(c)]
[PROMISERtoOFFERER, **withdraws**(b)]
[OFFERERtoPROMISER, **withdraws**(b)]
OFFERER(C(a,c→a,c),D(b)) &
PROMISER(C(why(a),c→a,c),D(b))

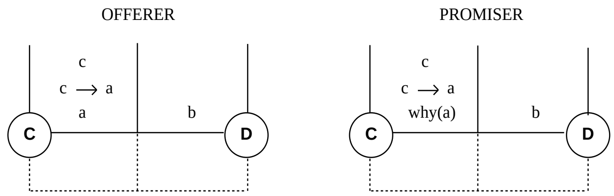

Figure 10: Dialogue of Discussion With Acceptance of the OFFERER's Proposal commitment stores

4.6 Dialogue of Discussion With Acceptance of the PROMISER's Proposal

This dialogue takes place when the promiser poses a counterproposal to the offerer's request, the offerer accepts to engage in a debate, and after the discussion the offerer accepts the promiser's proposal. After the initial questions(a) posed by the offerer, the promiser replies with an asserts(b), introducing that way its counterproposal <b> into the C part of both commitment stores. The offerer shows its intention to engage in a debate issuing an asserts(a), introducing its own proposal <a> into the C part of both commitment stores. At this moment starts the discussion and the offerer proposal is challenged by the promiser. The offerer justifies its own proposal, but the justification is refused by the promiser. Then a discussion about the promiser's proposal takes place and the offerer accepts the justification given by the promiser. To indicate its acceptance the offerer withdraws its own proposal after the justification given by the promiser.

healthy ⟶ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **asserts**(b)]
[OFFERERtoPROMISER, **asserts**(a)]
[PROMISERtoOFFERER, **why**(a)]

[OFFERERtoPROMISER, **justifies**(c)]
[PROMISERtoOFFERER, **withdraws**(c)]
[OFFERERtoPROMISER, **why**(b)]
[PROMISERtoOFFERER, **justifies**(f)]
[OFFERERtoPROMISER, **whithdraws**(a)]
[PROMISERtoOFFERER, **resolve**(C(c),D(a)/C(c→a))]
[OFFERERtoPROMISER, **whithdraws**(c)]
OFFERER(C(why(b),c→a,f→b,f),D(a,c)) &
PROMISER(C(b,why(a),c→a,f→b,f),D(c))

When the promiser, in the sequence of locutions above, utters the **resolve**, the offerer is committed to <c>, <c→a> and is not committed to <a>. *ACCORD* has a commitment rule (D→I1 rule) which establishes that if a participant is committed to <c> and it is not committed to <a> then this participant is not committed to <c→a> (figure 11). Given that the offerer is commited to <c→a>, its commitment store is not consistent at this moment. To resolve this fact the offerer utters **withdraws**(c).

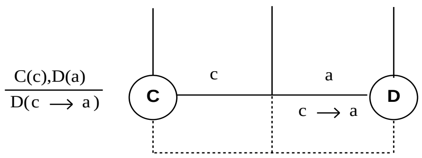

Figure 11: Commitment rule D→I1

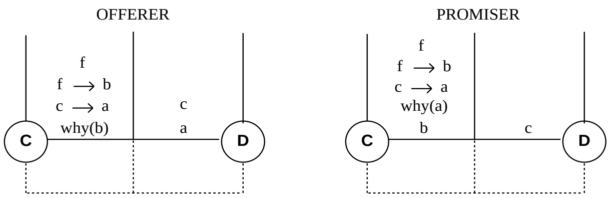

Figure 12: Dialogue of Discussion With Acceptance of the PROMISER's Proposal commitment stores

4.7 Dialogue of Discussion Without Agreement

This dialogue takes place when the promiser poses a counterproposal to the offerer's request, the offerer accepts to engage in a debate, and after the discussion there is no agreement among the participants. After the initial questions(a) posed by the offerer, the promiser replies with an asserts(b), introducing that way its counterproposal <b> into the C part of both commitment stores. The offerer shows its intention to engage in a debate issuing an asserts(a), introducing its own proposal <a> into the C part of both commitment stores. At this moment starts the discussion and the offerer's proposal is challenged by the promiser. The offerer justifies its own proposal, but its justification is refused by the promiser. Then a discussion about the promiser's proposal takes place and the offerer also refuses the justification given by the promiser.

healthy $\longrightarrow$ [OFFERERtoPROMISER, **questions**(a)]
[PROMISERtoOFFERER, **asserts**(b)]
[OFFERERtoPROMISER, **asserts**(a)]
[PROMISERtoOFFERER, **why**(a)]
[OFFERERtoPROMISER, **justifies**(c)]
[PROMISERtoOFFERER, **withdraws**(c)]
[OFFERERtoPROMISER, **why**(b)]
[PROMISERtoOFFERER, **justifies**(f)]
[OFFERERtoPROMISER, **whithdraws**(f)]
[PROMISERtoOFFERER, **withdraws**(b)]
[OFFERERtoPROMISER, **withdraws**(a)]
[PROMISERtoOFFERER, **withdraws**(f)]
[OFFERERtoPROMISER, **withdraws**(c)]
OFFERER(C(why(b),c$\rightarrow$a,f$\rightarrow$b),D(f,a,c)) &
PROMISER(C(why(a),c$\rightarrow$a,f$\rightarrow$b),D(c,b,f))

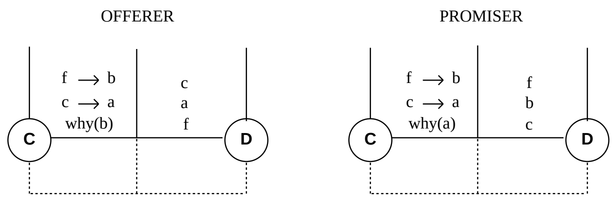

Figure 13: Dialogue of Discussion Without Agreement - commitment stores

5 Example

This section presents an informal example were a person (BUYER) wants to buy a car in a car shop. A negotiation between the BUYER and the shop clerk (SELLER) takes place.

Buying a car does not envolve a negotiation to contract an action but a negotiation to buy a thing, however the negotiation protocol is the same in both cases. There are not only two proposals at stake, but a set of proposals.

Informally we have the following dialogue:

BUYER - Good morning.
SELLER - Good morning.
BUYER - I would like to buy a new car. Do you have this model?
SELLER - Yes.

BUYER - How much does it cost?
SELLER - It costs 15000.
BUYER - But the price in other shops is 14200. I think that 15000 is too much. I have 14600 for immediate payment.
SELLER - Look, we have a lot of orders and this one is a rare model. I believe that 15000 is really a good price.
BUYER - Another shop has offered me this model for 14600 but they don't have a red one.
SELLER - Your proposal is too low. Have you got a car?
BUYER - Yes, I have this one.
SELLER - I offer 6000 for your car and you may get the new one if you give me 9000 more.
BUYER - You're crazy. My car is in good conditions and I could sell it for at least 6800. My proposal is my car plus 8000.
SELLER - We are not asking that much. Our model has a lot of accessories. I raise my proposal to 6400. Your car plus 8600.
BUYER - Look, I am the unique owner of my car and I never crashed. There is a deal if you accept my car plus 8200.
SELLER - OK. We have a deal. Your car plus 8200.

The following proposals are at stake:

- SELLER's proposals

<a1> - Sell a car receiving 15000 in money
<a2> - Sell a car receiving an old one plus 9000 in money
<a3> - Sell a car receiving an old one plus 8600 in money

- BUYER's proposals

<b1> - Buy a car giving 14600 in money
<b2> - Buy a car giving its old one plus 8000 in money
<b3> - Buy a car giving its old one plus 8200 in money

Each participant's proposals are substantiated by the following arguments:

- SELLER's arguments

<c1> - A red one model
<c2> - Lot of orders
<c3> - Rare model
<c4> - Lot of accessories

- BUYER's arguments

<f1> - Price in other shops is 14200
<f2> - Car in good conditions
<f3> - Unique owner
<f4> - Never crashed

According to the negotiation cliché defined in section 4, we divide the current example into three dialogues, each one involving two of the proposals presented by the participants.

The first negotiation, on proposals <a1> and <b1>, finishes without agreement. The second one, on proposals <a2> and <b2>, also finishes without agreement. The third and final negotiation, on proposals <a3> and <b3>, finishes with the acceptance of the BUYER's proposal. The final state of the commitment stores of each round of negotiation serves as input to the next round of negotiation.

Given that the kind of negotiation considered at this work is a cooperative one, negotiations that end without agreement are considered intermediate negotiations. On the other hand argumentation around these negotiations brings up new proposals formulated by the participants. Using *ACCORD* for representing the dialogues that take place during these negotiations, we keep a record of the commitments undertaken during the proposals' defense.

The participants' proposals at the end of a negotiation that finished without agreement are stored as no commitments into the D part of the commitment stores. When one indicates a no commitment to one's own proposal, one is showing that one is open to new proposals.

It is important to emphasize the diference between being 'not commited to do something' and being 'commited to not do something'. The former situation is a more flexible one and during a negotiation it indicates the possibility of reaching an agreement that takes into account the previous proposals. The D part of the commitment store may be used as a repository for *rationales*. Although 'no commitment to' is weaker than having a commitment, it shows that the participant knows about the subject.

6 Prototype

In this section we present a prototype of the negotiation cliché. This prototype was developed in Arity Prolog 6.0 and the user interface is menu driven. Figure 14 shows the seven possible paths of the negotiation cliché.

Figure 15 shows the initial prototype's screen containing a menu bar and four rectangles showing the contents of the commitment stores (areas C and D of both participants). The menu bar offers the following functions:

Conversation - the participant chooses one of the available options, indicating that way its next step in the cliché;
Negotiation_Log - shows the record of the previous steps of the negotiation;
Event_Record - shows *ACCORD*'s event record related to the negotiation;
About - shows the prototype's credits;
Exit - returns control to Arity Prolog.

Begining with the initial screen the participants navigate through the negotiation cliché choosing one of the *Conversation*'s options.

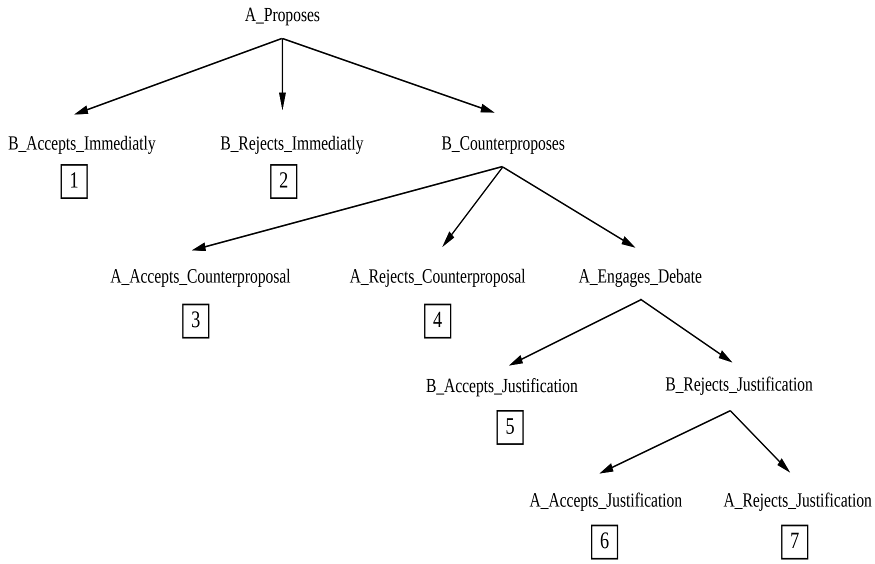

Figure 14: Negotiation cliché paths

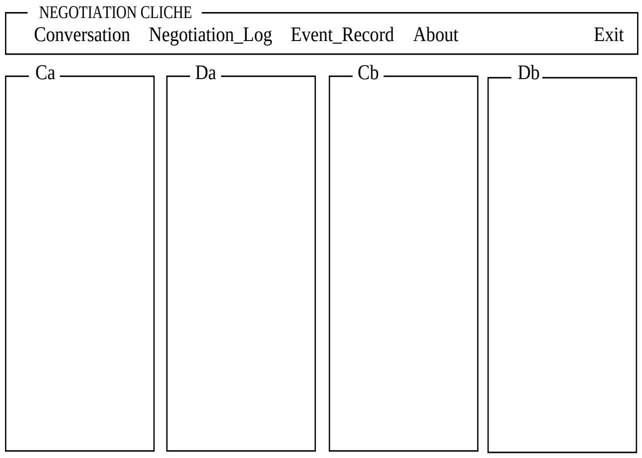

Figure 15: Initial screen

Now we present the path associated to the Dialogue of Discussion With the Acceptance of the PROMISER's Proposal (section 4.6, figures 16 to 21), which corresponds to path 6 of figure 14 which is: A_Proposes, B_Counterproposes, A_Engages_Debate, B_Rejects_Justification, A_Accepts_Justification.

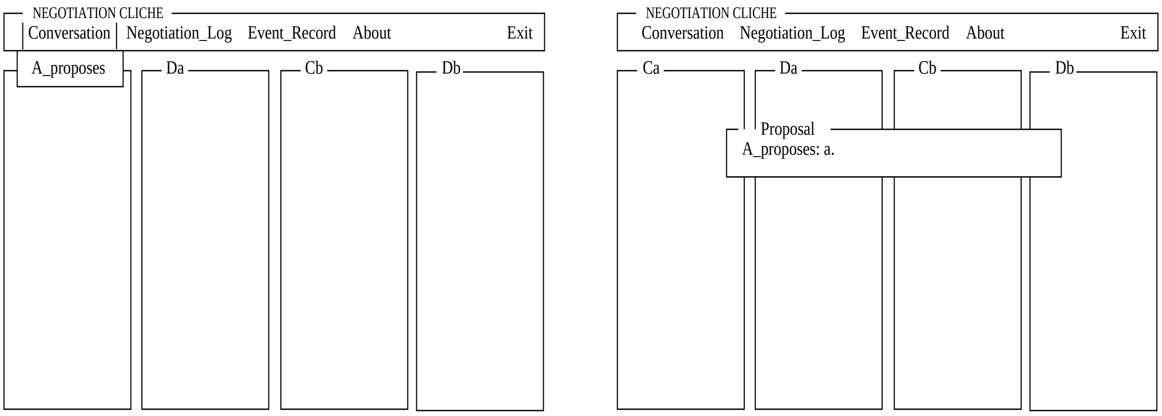

Figure 16: Participant A proposes <a>

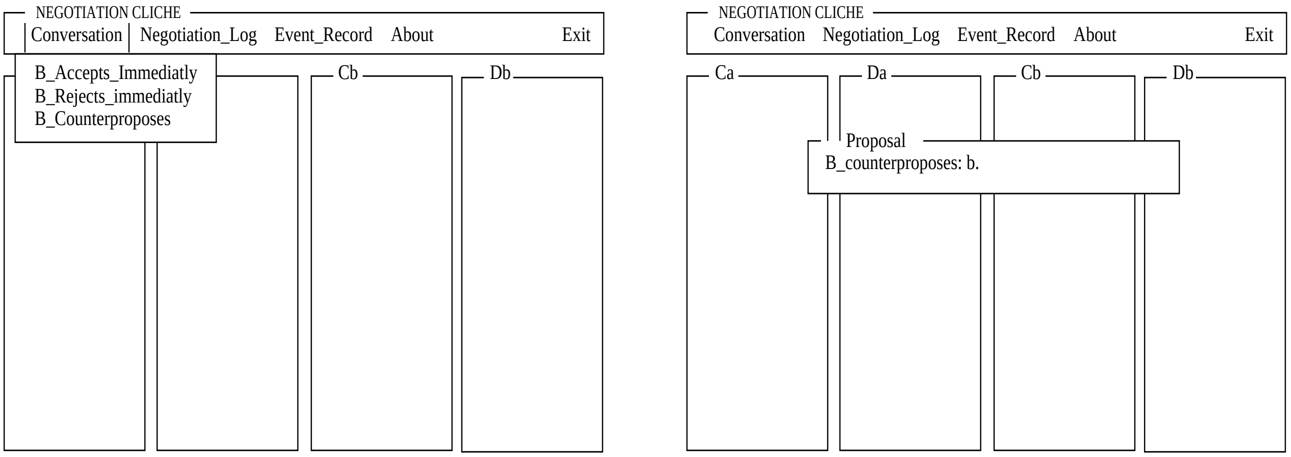

Figure 17: Participant B counterproposes <b>

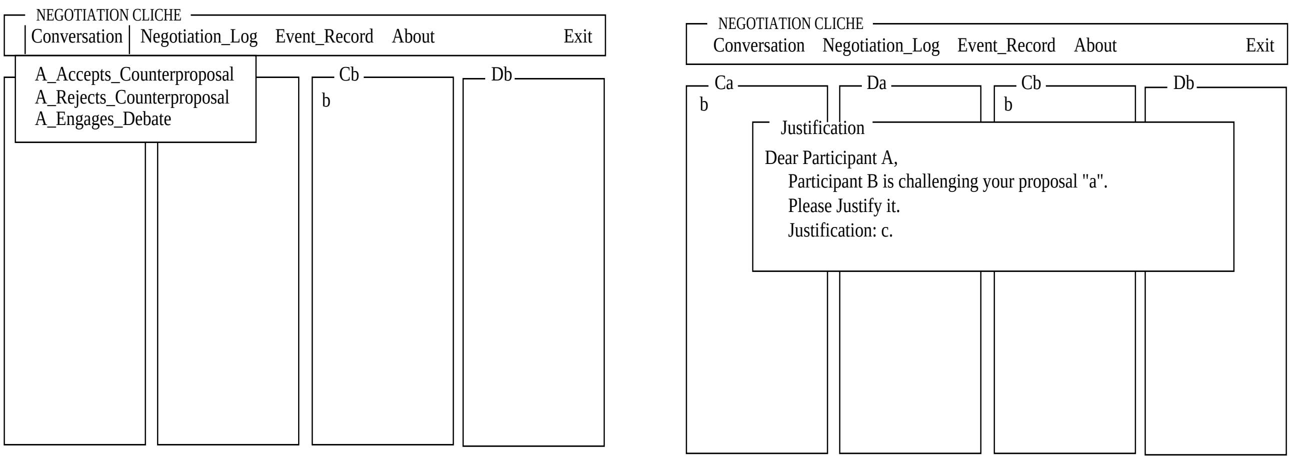

Figure 18: Participant A chooses the debate and justifies his own proposal with <c>

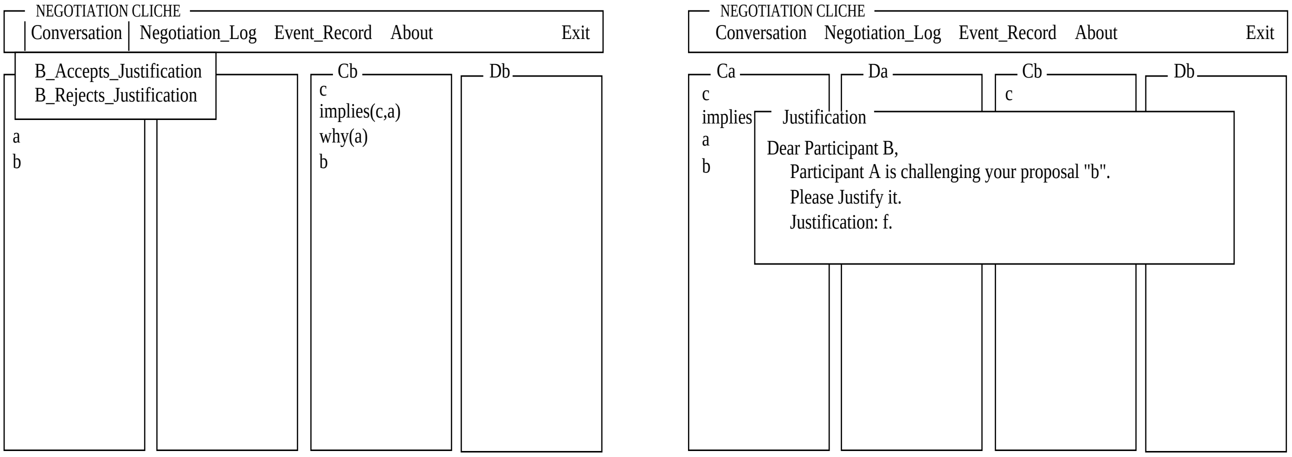

Figure 19: Participant B rejects A's justification and justifies his own proposal with <f>

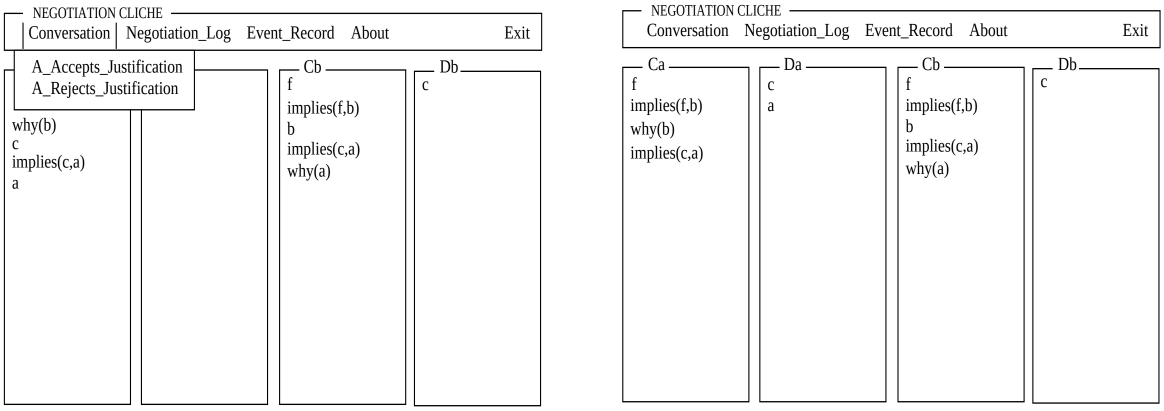

Figure 20: Participant A accepts B's justification - Resulting commitment stores

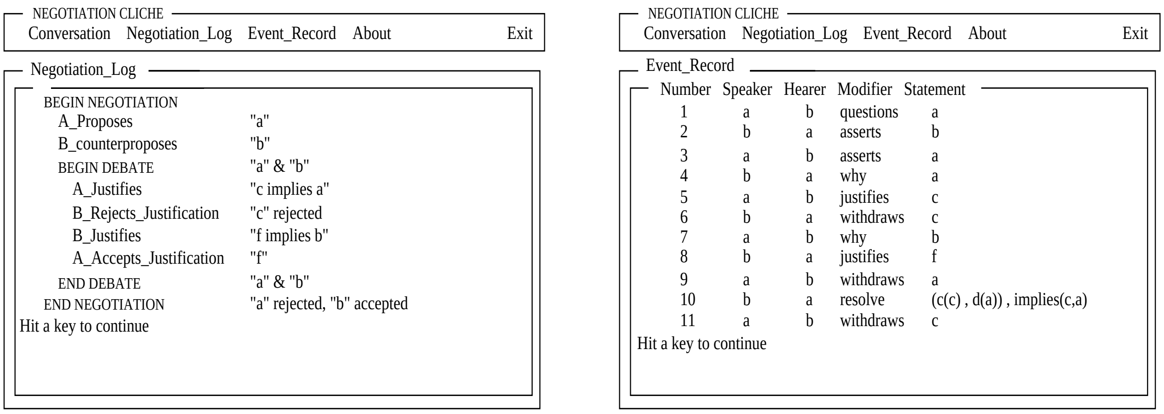

Figure 21: Negotiation_Log - Event_Record

7 Conclusion

Clichés—conversation stereotypes—are state transition machines that control the sequencing of dialogue events in a conversation between two participants. Clichés are represented in the language of *ACCORD*—a framework for dialogue representation systems using commitment and legality.

Conversation clichés, due to their restrictive nature, may help the automation of procedures based on verbal exchanges that take place in well defined and known situations. The definition of restricted paths may lead to more productive negotiations avoiding circular paths in specific phases of the negotiation process. However it also means a limitation on the set of possible negotiations.

Future work shall include the definition of negotiation clichés for requirement elicitation, cliché editors and clichés for more than two participants.

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