Dynamic Representation of Exchange Structure

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Synopsis

An interactive dialog system requires a proper modelling of the options available at each point in a developing dialog. Such a system needs to show how the availability of speech options changes throughout an exchange. A synoptic model of dialog cannot adequately represent the "point-by-point" development of a dialog. This paper explores one means of exchange modelling based on a dynamic perspective.

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1. Modelling Exchanges

This present work is an outgrowth of the discourse analysis work of Berry (1981), and as extended by Ventola (1987), and Martin (1984, 1988). Berry started a movement away from synoptic ("all in one view") modelling of exchanges, working towards dynamic ("from each point in the exchange") modelling. O'Donnell: 1990 compared the dynamic vs. synoptic models of exchange. This paper assumes a dynamic approach, and presents a model for dynamic text analysis[1].

1.1 What is an Exchange

To get things done, the easiest option is often to do it ourselves - to perform the action which directly satisfies our need. Often though, our needs are more easily satisfied with co-operation from other people. If we want information, it is easy to ask some-one who knows that information. If we have a physical task to be done, it may be possible to get some-one else to perform the task for us.

Co-operation is not something we can assume - it needs to be negotiated between the participants. One participant may make a request, the other participant can either comply with it, or reject it.

This report focuses on the structure of these social interactions, which will here be called **exchanges**. The following is a typical exchange negotiating information:

> 1.   *A:*   *Where are you going?*
>
>   *B:*   *To the shop.*
>
>   *A*   *Oh.*

1.2 Dynamic vs. Synoptic Modelling

Within conversational analysis, there have been two contending approaches to representing exchange structure. The distinction is between models which view the exchange as a completed whole (synoptic perspective - what types of exchanges can we have), and those which view the exchange from each point within the exchange (dynamic perspective - what types of move can come next).

It has been shown in various places that synoptic representation is inadequate for the representation of inter-active phenomena, such as exchange structure or generic structure (cf. O'Donnell:1990, Ventola:1983, 1987, Martin:1984, 1988, Sefton et al.:1991). Particular phenomena which cause problems for the synoptic model are *linear recursion*, *availability of options over a stretch of time,* and *discontinuous units* (cf O'Donnell:1990). A synoptic model can accommodate most, but not all, of the moves in a dialog.

A dynamic model does not fall prey to the above-stated problems. The flexibility of a dynamic model allows total accountability (all moves in the dialog are accommodated). However, dynamic models do have their own limitations, in particular, a failure to provide a perspective on the exchange as a single unit (useful for comparing exchanges).

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[1]Some of the improvements in the exchange model in this paper over my prior publication are due to comments by Petie Sefton. He continues to give insightful critiques of the model.

The synoptic exchange model included in the main report attempts to avoid the above-stated problems by using a hybrid model - a synoptic description to describe those parts of the exchange which can be modelled synoptically, and some "dynamic moves" to describe those phenomena which the synoptic model fails to capture.

However, no formalism has yet been provided which adequately links the dynamic and synoptic components of the model. In particular, there is no statement of the conditions under which the dynamic moves are available.

To give a total account of the dialog (as is necessary in a computer-human dialog system), we have thus provide here a dynamic account of exchange structure.

2. Moves and Exchanges

A **move** is described in terms of both an ideational (propositional) and an interactional (speech-functional) component. Ideationally, the move provides some contribution towards the completion of a **proposition**, or proposition-complex (for more detail on propositional structure, see the discussion on the ideational base in O'Donnell, Sefton, Matthiessen:1991).

For example, *Where are you going?* is a move which partially completes a proposition. The structural representation of this proposition may look like the following:

Process:	[material:non-directed:motion-process:go]
Actor:	HEARER
Event-Time:	future
Destination:	???

In this propositional specification of a move, we have a number of roles (Process, Actor, Event-Time and Destination). Each role has a specified filler (normally the types of the entity, except for the Actor role which is filled by a specification that the hearer is the actor).

As well as providing information, a move also functions interpersonally. Interactionally, a move realises a set of **speech-functional** features, such as *give* or *demand*, i*nformation* or *action,* etc. The move example above draws upon the speech-functional options of *[initiate:elicit:information:content]* (these terms will be discussed below). The present paper will largely focus on the speech-functional aspects of the exchange model.

A set of moves which together complete a single proposition (or propositional-complex) is termed an **exchange**. An exchange is the unit in which the speech-participants negotiate a proposition. For instance, the following three moves form an exchange in which a single proposition is co-operatively developed:

a	A:	*Where are you going?*
b	B:	*To the shop.*
c	A	*Oh.*

In this exchange we have A partially completing a proposition (Proposition-base), B then completes the proposition, and then A voices his acceptance of the completed proposition (cf. Berry:1981).

Both propositional and speech-functional specifications can be related downwards into the grammar. For a discussion of mapping speech-functional categories onto grammatical structure, see O'Donnell:1991.

Conversational moves can also be related upwards, to their role in fulfilling the tasks on the agenda for the particular interaction. For discussion, refer to O'Donnell, Sefton, Matthiessen:1991.

3. Speech Functional Options

We will first discuss the type of moves we can have in an exchange. Later, we shall how these moves are ordered in relation to each other.

Figure 1 shows a network of speech-functional options based on a negotiatory model of the exchange. The model is extended later to handle such phenomena as interruptions and suspensions of exchanges.
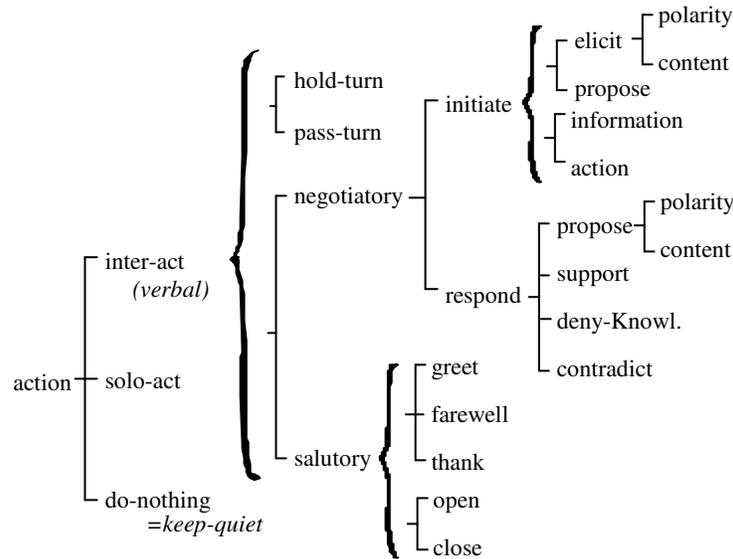
Figure 1: Speech Function Network

3.1 Categories of Actions

We will here define the terms introduced in the speech-function network of figure 1. Note that a move consists of a set of speech-functional options - a complete specification of speech function for a move requires one feature chosen from each system in a path from left to right. Where there is a curly bracket, a choice must be made from all systems contained in the bracket. For instance, [*speech-function:inter-act:hold-turn:salutory:greet:open] forms* a speech-function specification for a single move.

Inter-act/act/do-nothing: The participant has a choice between verbal (symbolic) *inter-action* where the two participants co-operate in achieving some goal, or solo *action* where the participant performs some action as an individual. Alternatively, the participant may choose to do nothing. Note that the term *exchange* applies only to inter-acts. An exchange is the unit of inter-action.

Hold-turn/Pass-turn: When a speaker utters a move, they often indicate through tone and pausing whether they intend to continue speaking (*hold-turn*), or whether they expect the other participant to take a turn (*pass-turn).*

Negotiatory/Salutory: two kinds of inter-action:

Negotiatory exchanges: Exchanges where the participants jointly construct a proposition. The result of a successful negotiatory exchange is jointly shared information.

Salutory Exchanges: Exchanges where the result of the exchange is phatic rather than informative. For instance, exchanging greetings, farewells, and thankyous. These exchanges may be seen as a means of solidifying the relation between the participants. People are considered rude if these exchanges are not provided appropriately.

3.2 Negotiatory Exchanges

This speech-functional model is based on a negotiatory model - that an exchange is the unit in which some proposition (or proposition-complex) is negotiated between the participants (cf. Coulthard&Brazil:[1981:10] "the exchange is the unit concerned with negotiating the transmission of information.", Berry:[1981:139]: "the minimum amount of information for an exchange is a completed proposition").

(a) initiate/respond

An important choice in the speech-functional networks is between *initiating* a new exchange, or *responding* to an already open exchange. An *initiating* move introduces a new proposition for negotiation, while a *responding* move further develops an existing proposition. Looking at the realisation of these categories into the grammar, *responding* moves demonstrate a fairly high degree of ellipsis (e.g., *I am.*), while ellipsis in *initiating* moves is rarer.

(b) elicit/propose/contradict/support/deny-knowledge

Berry:1981 offers one model of (synoptic) exchange structure based on three exchange slots:

proposition base - the move that provides "a basis for the completed proposition by predicting the form of the completed proposition" (Berry: 1981:140). In such a slot, one participant offers a partially completed proposition, with some indication (e.g., wh- words) of the missing content. These moves are typically realised by a question.

proposition completion - the move that completes the proposition. Typically a statement.

proposition support - once the proposition is completed, the participant who did not complete it may show their agreement with the proposition by supporting it. For instance, "I agree", "oh", "okay and "yes".

In our model, we are not looking at slots, but rather at types of moves. We will thus use the following terms in place of Berry's:

elicit	proposition base
propose	proposition completion
support	proposition support

Berry's categories are based on a *polite-concensus* assumption - where it is assumed that the expectations set up by the prior speaker's move is always met by the following speaker. Thus an elicitation is met by an answer, and an answer by support. However (as she notes) the polite-consensus model does not fit the real world too well. Two speech-functions need to be added to the model

deny-knowledge	proposition completion refused
contradict	proposition support refused

These speech-functional categories will be explained below:

elicit: the speaker asks the other to complete the specification of a partly specified proposition. Either polarity or content is left unspecified. The eliciting move must thus set up the structure of the proposition, and include an indication of the parts of the proposition yet to be provided.

For instance, the question "Where are you going?" corresponds to the following partial proposition. Note that the question marks in the destination field indicates that this is the field to be negotiated.

Process: [material:non-directed:motion-process:go]

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Actor:	HEARER
Event-Time:	future
Polarity:	positive
Destination:	???

This type of elicitation is termed a *content* elicitation. Another sort of move attempts to elicit just the polarity of a proposition, e.g., "Are you going to Sydney?"

Process:	[material:non-directed:motion-process:go]
Actor:	HEARER
Event-Time:	future
Polarity:	???
Destination:	Sydney

propose: the speaker completes a proposition. The proposition is thus completed but not mutually supported (the completer's support is implicit). This may be an initiating move (a statement e.g. *I am going to Newtown*.) or may be in response to an elicitation, in which case some ellipsis may be present , as in example 3:

3.	A:	*Where are you going?*	[initiate:elicit:content]
	B	*To Newtown.*	[respond:propose:content]

Note also that proposals provide either content and/or polarity. An initiating proposal provides both content and polarity. A responding proposal provides either polarity or content, depending on the question it is responding to.

deny-knowledge**:** Following an elicitation, a participant is expected to complete the proposition. Often however, if the participant doesn't know the answer to the question (and is unable or unwilling to guess), then they can just deny knowledge, e.g.

4.	A: Is Caringbah in the Sutherland Shire?	[initiate:elicit:polarity]
	B: I'm not sure.	[respond:deny-knowledge]

Support**:** The speaker agrees with the proposition. The proposition is thus mutually supported. The proposition thus enters the shared knowledge base of the participants. Only the person who did not complete the proposition can provide the *support* move. Typical supporting moves from the dialogs are *uhuh, right, okay, yes, yeah, yep, oh, hmm*. Note that these categories can be further distinguished into 'agreeing' types (*true* - 'I know that') and 'accepting' types (*oh* - 'I didn't know that, but I will accept it'). Many are fairly neutral between these extremes.

Support is often given implicitly. Rather than providing the support move, a participant can imply support by not challenging the proposition, and continuing on, e.g.

5.	A:	*I'm going out now.*	[initiate:propose:content]
	B:	*What time will you be back?*	[initiate:elicit:content]

contradict: Here we take another step away from the polite-consensus model. The model is extended closer to the real world by allowing participants to *contradict* the prior speaker's proposition completion. The option to contradict is thus an alternative to *support*.

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Care should be taken in the coding of *contradict* moves, properly distinguishing the move which contradict from moves which offer an alternative completion. The *contradict* move is taken to be only moves which deny the proposition. Note the coding of the following exchanges:

6. A: *George is coming on Tuesday*   [initiate:propose]
   B: *No, he is not*   [respond:contradict]

7. A: *George is coming on Tuesday*   [initiate:propose]
 B: *No,...*   [respond:contradict]
    ...he's coming on Wednesday   [respond:propose]
                    (B has attempted an alternate completion)

8. A: *George is coming on Tuesday*   [initiate:propose]
 B: *No,...*   [respond:contradict]
    ...You're an idiot   [initiate:propose]
                    (B has started a new exchange)

Note that the negotiatory options do not freely mix with the choices of *initiate* and *respond* - one can only *elicit* as an *initiating* move, and only *support*, *contradict* or *deny-knowledge* as a responding move. *Propose* is available both as an initiating or responding move.

(c) Polarity/Content

Discussed above. The distinction between moves negotiating *content* (participants, processes or circumstances) or *polarity* (truth value of the proposition). This system applies to *eliciting, proposing* and *contradicting* moves.

(d) Information/Action

The matter being negotiated in an exchange may be either information (*let's agree that this is true)* or action (*let's agree that this should be done*). It is an important distinction, because it controls what results from the negotiation. As an example, note the following:

A: *Will you go to the store?*

This move can be interpreted in two ways: as an *[elicit:information]* move: *I want to know whether you are going to the store,* or as an *[propose:action]* move: *I want you to go to the store*. The speaker's intention can only be interpreted when we know whether the domain of the question is *information* or *action*.

3.3 Salutory Exchanges

As stated above, the salutory exchanges are those in which no propositions are developed, yet some phatic function is served. The types of moves we are concerned about are *greeting*, *farewell* and *thankyous*.

Greeting&Farewell: Apart from their phatic function, these moves serve an organisational function within the discourse. Greetings mark the opening of communications, and farewells mark the completion of the interaction. The initiation and response in these types of salutations are usually of the same kind - a *hi* is responded to with another *hi*, or perhaps a *hello,*

Thankyou: Thankyou performs a phatic function but forms a slightly different class from the other moves of this class. In a thankyou, one participant marks their appreciation of some service (verbal or non-

verbal) done for them by the other. Typically, some acknowledgment of the thankyou will follow (*Don't mention it* or *You're welcome)*.

    Open/Close: Salutory exchanges have a two-part structure - an opening, and the response (closing).

4. Separating Negotiation and Performance of Actions

In some exchange models, physical actions are treated as alternative means of fulfilling exchange turns, e.g.

9.	A:	*Pass the salt, please*	[initiate:elicit:action]
	B:	*<passes salt shaker>*	*[respond:perform:action]
	C:	*Thanks*	[respond:support]

In this model, however, the exchange is seen purely as a means of negotiation (excepting salutations, etc.). Any action is to be seen as a consequence of the negotiation. If someone says "pass the salt" and the addressee does so, it is only because (s)he has implicitly accepted the proposal.

In the following, the verbal behaviour is taken to be a single exchange - the negotiation as to whether the action will take place. B then goes on to perform the action he has agreed to do. This is a separate exchange-unit [2](note the box bracketing).

10.	A: *Pass the salt, please?*	[propose:action]
	B: *Sure!*	[support:action]

<passes the salt shaker>	[act]

Note that B's support will often not be verbalised. His acceptance of the proposal may be implied by his performance of the action. In such a case we reject the usual assumption that the action is fulfilling the *support* role. Rather, the *support* role is unrealised, implied by the action.

An *[action]* exchange is thus treated as a unit for <u>negotiating</u> the performance of action, not for the actual performance of an action.

This approach avoids a problem brought up in the exchange analysis literature, concerning linguistic services (cf. Ventola:1987) - Someone may ask *tell me about your holiday*. Under the old model, the ensuing discussion must be treated as the filler of the *provide* (or a1) slot. Under my model, the exchange concerns only whether or not the addressee will do so, the demanded action is to be modelled in its own right, e.g. (a1, a2 and k1 are notations in Berry's model):

Old model:

11.	A:	a2		*Tell me about your holiday?*	
	B:	a1	| k1	*It started well,*	|
			| k1	*Then everything went wrong.*	|
			| k1	*The hotel was invaded by Martians,*	|
			| k1	*..and the service was lousy.*	|

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[2]Exchange is really only appropriate terminology for the negotiatory structures. However we at present lack appropriate terminology. Suggestions?

New Model*:*

12.	*A:*	*a2*	*Tell me about your holiday?*
	B:	*a1*	*<support is ellipsed - but implied by the ensuing dialog>*
		k1	*It started well,*
		k1	*Then everything went wrong.*
		k1	*The hotel was invaded by Martians,*
		k1	*..and the service was lousy.*

One motivation for Ventola's approach is the desire to show that the recount above serve a single function. However, these K1 moves are not bound together at the exchange level, but rather at a rhetorical level - they together serve one rhetorical function - a recount. One should not try to explain too much in the exchange model.

Because action negotiations are interpreted slightly different from the information exchanges, we will re-gloss the negotiation functions more specifically:

elicit:action: the speaker asks the other to complete the specification of a partly specified action-proposition. Either polarity or content is left unspecified. In the polarity type, the speaker's question does not imply either the acceptance or rejection of the action.

propose:action: the speaker completes a proposal for action. In so doing, the speaker states their position on the proposal. The proposition is thus completed but not mutually supported.

support:action: the speaker agrees with the proposed action. The proposition is thus mutually supported.

Note that in none of the above discussion have we mentioned who is to be the actor in the negotiated proposition. It could be the speaker, the listener, or some other (the actor is specified in the propositional component of the move). This will be important in the interpretation of the moves. It will distinguish between *orders* and *permission* (actor=other) and *offers* and *promises* (actor=self). Some instances of the different alternatives: if a speaker proposes an action where he himself is to be the actor, it could be a request for permission, or an offer. If someone supports a proposal of their own action, it is a promise to act.

Explaining the proper interpretation of action-negotiations is an important part of an inter-action model. However, the present report will not explore the topic fully due to the low incidence of such phenomena in the target domain.

5. Exchange Context: Conditioning the Availability of Speech-Functional Options

The various speech-functional options are not freely available - they are constrained to particular discourse environments. We can only answer a question when one has been asked, and only (sensibly) initiate an exchange when someone else is listening. In this section, we examine the situational parameters which condition the availability of the various speech-functional types.

For this purpose, we set up a *context of exchange* - a representation of the various factors which influence move availability. Figure 2 portrays the relationship between these conditioning factors and the speech-functional options.
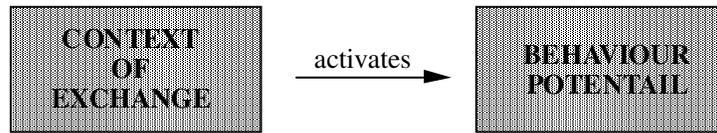
Figure 2: Context Activating Behaviour

5.1 Critical Contextual States

Figure 3 is a network detailing the various contextual states which condition the availability of speech-functional options. Discussion of the various systems follows.
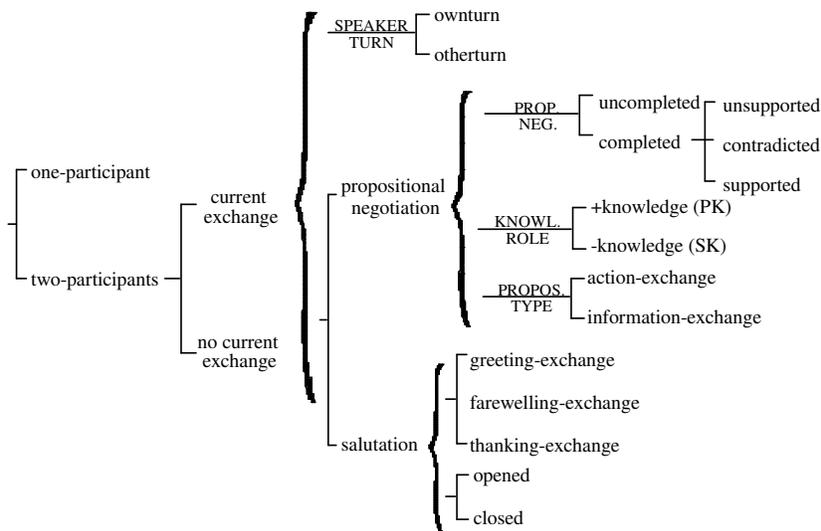
Figure 3: Exchange Context

Participant Number: one-participant/two-participants

The states of this system condition the availability of inter-action itself. One cannot interact when one is not in contact (visual, verbal or kinethesic) with another conscious being. Note that the system could be extended to include more than two participants.

Current-Exchange: current-exchange/no-current-exchange

Is there currently an exchange in development?

Exchange-Type: propositional-negotiation/salutation

Is the present exchange negotiating, or is it salutory?

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Stage of Propositional Negotiation: These systems represent the degree of completion of the proposition. There are four states:

Proposition Incomplete   (e.g. after an elicitation)

Proposition Complete - and unsupported

                          - and supported

                          - and contradicted

Proposition Type: action-exchange/information-exchange: The context records whether the negotiation concerns a proposed action, or proposed information. This distinction is important when we come to interpret the meaning of the proposition being negotiated. Is it something to be done, or is it something to be remembered?

Knowledge Role: +knowledge/-knowledge: The speaker's perceived state of knowledge with respect to the proposition affects their speech options. Someone who doesn't know the answer cannot give one. The roles here are *+knowledge* (the speaker believes they can complete the proposition), and *-knowledge* (the speaker cannot complete the proposition).

Note that each participant selects independently in this system. This information should be derivable from the knowledge base of each participant.

Note also that we might introduce *levels of knowledge* - while a participant may not *know* the answer to the question, he may:

• Have an idea of the right answer ("It might be Sweden.")

• Know what is *not* the right answer, allowing, e.g.

     13.   A: *Rome is the capital of Sweden*

         B: *No, it's not.*

         A: *What is it then?*

         B: *I don't know, but it's not Rome.*

This extension will be important, since the types of supporting responses vary depending on level of knowledge.

Speaker Turn: The exchange is a co-operative construction of a message. The participants take turns in providing elements of the message. Typically, one will provide the proposition base, the next will provide the completion, and the first will then support it[3]. A participant's options are influenced by this turn sequence - after one participant has spoken, it is for the other to respond.

Note that speaker turn is only important in regard to the current exchange - either speaker may initiate the next exchange, regardless of who spoke last.

Salutory Exchanges: Two conditions are important in salutory exchanges:

  Salutation-Type: greeting-exchange/farewell-exchange/thank-exchange

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[3]This is not to imply that there are no move complexes in the model. These can occur when consecutive moves in the a speaker's turn form part of distinct exchanges. For instance, a typical move complex from a speaker will consist of a sequence of *propose* moves, each forming a separate exchange. Alternatively, a speaker's *support* move may be followed by an *initiating* move. In general though I assume that the consecutive moves of a single exchange are produced by alternate speakers.

Salutation-State: opened/closed - whether or not the salutation has been reciprocated or not.

Discussion

(a) <u>Dynamic Context</u>: These contextual systems may seem different from those normally seen in systemic descriptions. Most systemic work has focused on 'global' or 'static' contextual variables - those which remain constant throughout the text (e.g., medium, power roles, institutional focus). The contextual variables shown here are dynamic - they change during the unfolding of the social process.

A more detailed account of exchange would take into account both dynamic and global contextual variables. Global variables also constrain the availability of exchange options. Power roles for instance will affect the availability of the initiate option (a private cannot initiate to the sergeant major).

(b) <u>Individual vs. Shared Context</u>: It is often assumed that the context is objective, existing independently of each participant but known to both. The present model treats context as subjective, each participant having their own conception of what is going on (although generally the participants will agree on most details).

For example, in a context where one participant has just contradicted the other's statement, he might consider the exchange ended. However, the other may assume the exchange to be still open, and be looking for an adequate reply. At this point, the participants' conceptions of exchange context have diverged.

Divergence of this nature is generally not a problem. The next utterance by either speaker will indicate to the listener where the speaker stands, because their selection of move options reflects the context which activated them. An initiating move informs the listener that the speaker considers the exchange finished.

More generally, the speech options we choose reveal to those listening to us our view of reality. This is part of the communicative process - meanings need not be explicitly coded (as propositions) but can be recovered by looking at the underlying assumptions of the speaker.

A prime function of dialogue is to negotiate agreement in our divergent models of reality - our linguistic choices reveal our beliefs and attitudes, which can be accepted or challenged by the listener. Where one participant uses options appropriate to an 'informal' relationship, they may be either encouraged or rebuffed, which is all part of the ongoing negotiation of reality.

The systems KNOWLEDGE ROLE and SPEAKER TURN reflect the individual nature of this contextual network - each participant makes a distinct selection from these systems. Typically, the participants will make the complementary choices for role and turn, though occasionally mix-ups will occur when both participants make the same choice (e.g., both participants choose to be +knowledge).

(c) <u>Negotiatory Context</u>: The four sub-systems of the Negotiatory context can be related to Halliday's Ideational/Interpersonal/Textual break-down of the semantic spectrum:

Ideational	:	Propositional Negotiation
		Proposition Type
Interpersonal	:	Knowledge Roles
Textual	:	Speaker Turn

5.2 Contextual Conditioning of Speech Functional Options

Table 1 below relates each speech-functional option to the contextual states which must be set before the option can be selected.

Option	Condition	Gloss
inter-act	two-participants	Two people needed for an exchange

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|		
act	<anytime>	Non-verbal action allowed anytime.

do-nothing	(:or one-participant
	   no-current-exchange
	   otherturn
	   (:and completed supported)
	(:and unsupported -knowledge))
		Can keep quiet a) when no exchange,
		b) during the other's turn.
		c) When the exchange is done
		d) -K need not support +K's move

negotiatory		no constraint
initiate	(:or no-current-exchange (:and completed supported) (:and unsupported -knowledge))	Can start a new exchange, a) when no exchange, b) When the exchange is done d) if -K, instead of supporting (implied support)
respond	propositional-negotiation	respond if negotiation under-way
elicit		No constraint. *elicit* avail. if initiate is.
initiate:propose		No constraint. *propose* avail. if initiate is.
respond:propose	(:or (:and ownturn uncompleted) contradicted))	Can complete proposition in your turn if unsupported. Either participant can complete after a contradiction (see below).
deny-knowledge	(:and ownturn uncompleted -knowledge)	Alternatively, can deny-knowl. if you don't know the info.
support	(:and ownturn unsupported)	Support just completed proposition
contradict	(:and ownturn unsupported)	Contradict just completed proposition
salutory		no constraint
open	(:or no-current-exchange (:and completed supported) (:and unsupported -knowledge))	Can initiate a salutory exchange under the same conditions as initiation
close	opened	Can close a salutation if one is open
close:greet	greeting-exchange	Can only close current type of salutation
close:farewell	farewelling-exchange	"
close:thank	thanking-exchange	"

A feature with no constraint cannot necessarily be selected freely, because it inherits the constraints of the speech-functional features which it specialises. For instance, *elicit* has no constraint itself, but inherits the constraints of *initiate* and *inter-act*.

One way of viewing this model is to look at the options available in a given context. Each context will activate a sub-potential of the general speech-functional options shown in section 3. For instance, given a context of

[current-exchange:propositional-negotiation:completed:unsupported:
    information:ownturn:+knowledge]

...a speaker has the following potential activated:

```
                                              ┌── support
                       ┌── inter-act ── negotiatory ──┤
                       │                 :respond      └── contradict
speech
function   ──────────┤
                       │
                       └── act
```
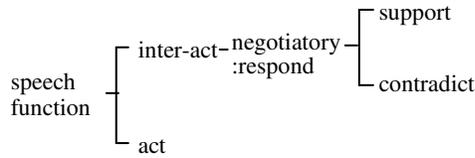
Note that this potential is a subset of the general potential. It represents the potential activated in a particular context a single-point potential.

Discussion

(a) Contradiction: Note that the respond:propose option is available in two contexts:

    i)   (:and ownturn uncompleted): In a participant's turn, if the proposition has not been completed, then they can complete the proposition.

    ii)   Contradicted: After a proposition has been completed, either participant may complete it. Usual turn-changing need not apply, e.g.

        14. Contradicter completes proposition:

A:	*Barcelona is the capital of Spain.*	[initiate:propose]
B:	*No,*	[respond:contradict]
	... Madrid is.	[respond:propose]

        15. Contradicted re-completes proposition:

A:	*Barcelona is the capital of Spain.*	[initiate:propose]
B:	*No, it's not*	[respond:contradict]
A:	*Is it Madrid then*	[respond:propose]
B:	*Correct!*	[respond:support]

This sub-section has introduced a method of linking behavioural options to the contextual conditions which activate them.

6. Modifying Context

In Martin's [1988:243] description of dynamic perspectives, he mentions that the description should be able to show how each choice effects the availability of choices at later points of the exchange. The present model, as so far presented, fails to do so.

All that has been done in the model is to provide a mechanism for displaying the options available **given a particular context.** It has been left to the model user to work out how we move from one exchange point to the next.

The following discussion introduces a means for making the contextual changes explicit. It involves making explicit the effect of a move on the exchange context, and thus the effect of that move on the behaviour potential immediately following.
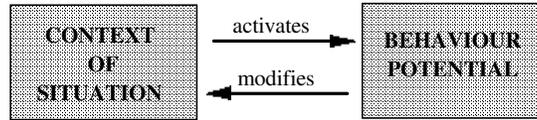
Figure 4: Interaction between Context And Action

Both Halliday and Hasan have suggested a step something like this:

"The social context of any conversation is continually being created and modified, by the course of the conversation itself as well as by other processes that may be taking place" (Halliday:1984:8)

"When the context is co-operatively negotiated, the text and context evolve approximately concurrently, each successive message functioning as an input to the interactants' definition of what is being achieved" (Hasan:1981:118)

6.1 Rules For Context Modification

We need a way of representing the effect of a verbal act on the context in which it is said. For the exchange context, this is fairly easy - we can associate each move option with the change in context that results from it (this could be seen as the perlocutionary force of the action). This introduces a bi-directional interaction between behaviour and context, with context 'activating' behaviour and behaviour 'modifying' context. I have divided the context changing rules up into sets, corresponding to the different systems of the context:

(i) Role Assignment

	Speaker
initiate:inform	+knowledge
elicit	-knowledge

(ii) Turn Allocation

	Speaker	Listener
inter-act	otherturn	ownturn

(iii) Propositional Development

elicit	uncompleted
provide	completed:unsupported
support	completed:supported
denyknowl	uncompleted (no change)
contradict	completed:contradicted
action	action-negotiation
information	information-negotiation

(iv) Salutation

greet	greeting-exchange
thank	thanking-exchange
farewell	farewelling-exchange
open	salutation:opened

close	salutation:closed

(v) aborting by silence

<u>ownturn</u>/do-nothing[4]	no current exchange[5]

<u>Discussion</u>

(a) <u>Contextual Modification</u>: When applying the contextual changes which result from a given move, contextual states which are not in conflict with the new states remain as before. The context should be seen as an object which is continuous, with parts been modified over time (a 'phase' perspective). For instance, a "don't know" move will leave the exchange context unchanged except for the change in turn.

(b) <u>Context Dependency</u>: In some cases the effect of an act is context dependent. Firing a gun in a shooting gallery would have a different effect than the same act in a crowded restaurant. For the exchange, we can find examples where this is true, keeping quiet when it is your turn has a different effect on the situation than keeping quiet between exchanges, or when the other participant is talking. Where needed, context dependencies have been incorporated in the context-changing rules, by including the contextual features (underlined) along with the triggering behavioural features e.g.

[<u>ownturn</u>/keep quiet]   ->   [no current exchange]

6.2 Example

The context: *[two-participants:no-current-exchange]* (there has been nothing said for a few minutes).

The Behavioural Options: *act*, *inter-act*, or *do-nothing*. If an *inter-act* is chosen, then it can be either *salutory* or *negotiatory*, but only the *initiate* or *open* options are available. Either participant may initiate.

The Choice: One participant asks a question to which he does not know the answer. For example, *Where are you going?: [negotiatory:initiate:elicit:information:content]*.

The Consequences: Looking at the contextual effects of the speech-options, we see the following exchange states are produced:

	<u>Speaker</u>	<u>Listener</u>
inter-act	otherturn	ownturn
elicit	-knowledge	
elicit	uncompleted	
information	information-negotiation	

....which results in the following contextual states:

Shared*:*   *[current-exchange: propositional-negotiation: uncompleted: information-negotiation]*

---

[4]Keeping quiet when some response is expected is one means of terminating the exchange.

[5]More Precisely, by keeping quiet when some reply is expected terminates the current exchange. We are thus left in a state of *no-current-exchange.*

Speaker*:*   *[otherturn: -knowledge]*
Hearer   *[ownturn]*

By including this component to take into account the effect of action on context, we have moved from a model which shows how participants <u>act in</u> an environment, to one which shows how participants <u>interact with</u> their environment.

7. Problem Cases

This section will examine some dialogic phenomena which give problems for this (and other) exchange models. Sometimes solutions are offered.

7.1 Terminated Exchanges

On occasion, exchanges do not reach completion. A participant may not like a question, and ignore it.Or a participant might ask a question, but immediately see that the question is meaningless, and goes on to an alternative question. Another example involves indirect speech acts, where the addressee sees the intention behind the question and rather than answer the question directly, satisfies the intention (see below).

All of these cases are a problem exchange models. It seems that at any point of the exchange, a participant can terminate by either keeping quiet when their turn is due, or by initiating a new exchange. This causes problems for the synoptic model because of the wide range of places in which these options have to be allowed for.

This is not a problem for a dynamic model, however. All we need to do is allow these two options - *do-nothing* and *initiate* - to be phasally available, i.e., available to either speaker at any point of the exchange. This can be achieved by loosening the contextual constraints on the two options, allowing these moves any time during an exchange, e.g., whenever *current-exchange* is set.

Since these options are usually activated by the contextual feature *no-current-exchange*, the condition for these moves can be simplified:

Option	Condition Before	Condition After
do-nothing	(:or one-participant no-current-exchange otherturn (:and completed supported) (:and unsupported -knowledge))	<any-time>
initiate	(:or no-current-exchange (:and completed supported) (:and unsupported -knowledge))	two-participants

7.2 Suspensions: Keeping a record of past exchanges

A new exchange need not terminate the previous exchange, but might only temporally suspend that exchange. When the suspending exchange is ended, the participants return to the interrupted exchange and continue where they left off, knowing whose turn it is, the proposition being negotiated, who is primary knower and so on.

Example: Suspending exchange embedded inside another:

16

12	A: Are you busy?	[initiate:elicit:information:polarity]
	B: Why do you ask?	[initiate:elicit:information:content]
	A: I need your help.	[respond:provide:content]
	B: In that case, I'm free.	[respond:provide:information]
	A: Great.	[respond:support]

(i) Exchange Context Stack

As the model has been described so far, there will be problems in modelling the dynamics of suspensions - the exchange context is changed by each new move and there is no way to re-instate the context that existed prior to the suspension.

To fix the problem, we have to introduce some way of **remembering** suspended exchange contexts until they are required again. Computing science provides a useful device for representing this - **stacks.** The current exchange context is always at the top of the stack. When we initiate a new exchange, a new context object is created and pushed on top of the prior context. The contexts on the stack thus represent a history of the dialog so far. Each context object on the stack records the state of negotiation which was achieved, whose turn it was, and the content of the proposition as developed so far.

When we wish to resume a prior, unfinished exchange, we need merely delve back in the stack to retrieve the relevant exchange context, and resume the exchange with this context as the current exchange. If an exchange has been suspended ('on the stack') for a fair while, the participants may lose details about its context, making it impossible for the participants to resume that exchange.

(ii) Move potential

The opening of a suspending exchange can be viewed - similarly to a terminating initiation - as a misplaced *initiate* option - the speaker chooses to initiate a new exchange when normally a responding move is expected.

The *respond* options of the speech-functional network have to be extended, to allow a participant to respond to either the current exchange, or to a prior suspended exchange[6]. Responding to a prior exchange lift that exchange up to be the current-exchange.
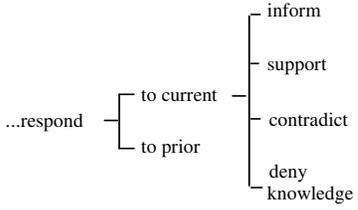

Figure 5: Extending Respond Moves to Handle Suspension

(iii) Activation

The discussion of terminating initiations above allowed *initiating* moves to be performed anywhere. No new changes need to be made here.

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[6] The present form of these systems is due to suggestions from Radan Martinec.

The [respond:to prior] option is activated whenever there is an exchange on the stack which is not complete. This includes any negotiatory exchange which is not *completed* and *supported*, and any salutory exchange which is *opened*. Note that the type of response a participant may make to a prior exchange depends on the context for that exchange, <u>not on the current context</u>. One chooses the option [respond:to prior], which will bring a prior exchange context to the top of the stack. One then chooses among those options activated by the re-instated context.

(iv) <u>Context Modification</u>

The effect of **initiating** a suspending exchange is to push a new context onto the stack[7]. The normal context changing rules are then applied to this new context:
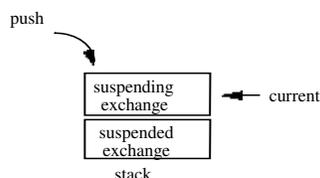

Figure 6: an Exchange Stack

The effect of selecting *respond-to-prior* is to be presented with a list of prior exchanges which are still open (ideally, the exchange which this exchange is suspending, or recursive). After selecting, the new context is brought to the top, and made 'current-context'. The move-choice is changed to *respond-to-current*. A further choice is then available between whichever of the respond options are activated by this old context.

7.3 Suspensions within Moves: Content Checks

It is common in these dialogs for a speaker to break up information into chunks, to facilitate the hearer's understanding. The pauses between chunks allow time for the hearer to either provide support on each chunk, or to check their understanding by repeating it:

21	a	c:	*its nine four THREE*	[initiate:propose:information]
	b.	o:	*nine four THREE...*	[initiate:propose] <check>
	c.	c:	*one nine FIVE six...*	<continuing (a)>
	d.	o:	*one nine FIVE six..*	<continuing (b)>
	e.		*nine four THREE one nine five SIX*	[initiate:propose]
	f.	c:	*coRRECT*	[respond:support]

Note from this analysis that we take the multiple chunks by a speaker to be a single move, realised discontinuously. Note also that the *checking* moves here are not taken to be part of the same exchange (although they could be), but rather as a separate exchange.

7.4 Offers of Choices

An elicitation need not be for polarity or content: either/or questions are quite common:

| 22 | A: | *Is this a Range or a Medium?* | [initiate:elicit:choice] |
| | B: | *It's a Range.* | [respond:propose:choice] |

---

[7]In a prior model, each exchange was 'popped' off the stack as it was completed. The top exchange was always the current exchange. In the present model, exchanges are left 'on the stack' when they are finished. The stack thus represents a history of the dialog so far.

Example 23 shows the typical contradiction form for an either/or question:

23   A: *Is this a Range or a Medium?*   [initiate:elicit:choice]

      B: *It's neither.*   [respond:contradict:choice]

This option can be built into the polarity/content systems.

7.5 Indirect Speech Acts

It is not always the case that people say what they mean. A very common speech phenomenon involves a speaker indirectly approaching their intended goal. For instance, a caller to an information service may ask:

Caller:Can you tell me if there are any panel-beaters in Newtown?

From the surface form, this question could be an attempt by the caller to find out if the operator is capable of providing information. However, when we look at the way in which people typically answer such questions, (and the way in which the askers of such questions expect to be answered), we realise that there is in this utterance some aspect of similarity to the question:

Caller:What panel-beaters are there in Newtown?

This type of phenomenon is called an **indirect speech act**. Indirect speech acts occur as part of a speaker checking the conditions necessary to the success of some speech act. Gordon&Lakoff call these conditions *sincerity conditions*. An example of some sincerity conditions for making a request follows (the first condition is speaker-based, the second two are hearer-based):

For A to demand an action/information from B: (from Perrault&Allen:170)

(1) A wants the action/information

(2) B can provide the action/information

(3) B is willing to provide the action/information

Typically, when demanding information or action, we do not know whether the hearer-based conditions are true or not. This need not stop us making our demand - we can ask anyway, and be rebuffed (if the hearer either cannot or will not comply).

However, another strategy is possible. Before risking a rebuff (humans are sensitive creatures), we can attempt to elicit the state of the sincerity conditions. Thus, questions like *can you tell me the time?* or *Would you be willing to help me for a moment?* are quite common.

A dialog planning model set with the goal of discovering some fact might choose to verify the sincerity conditions first. The system may set the discovery of the values of the sincerity conditions as a pre-goal to the greater goal. Thus we may get exchanges such as:

16.   *O: Can you tell me your code?*
      C: Yes.
      O: Do you want to tell me?
      C: Yes.
      O: O.K. then, tell me!
      C: It's 678965.
      O: Thank you

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The fact that we don't (often) get discourse like this is due to a fact of human interaction - when we see a sincerity condition being checked, we can infer the intended goal, and leap forward to provide the required information or action. So more often, we will see exchanges like the following.

> 17. a O: *Can you tell me your code?*
>
>   b C   *it's 678965.*

It is my claim that we can only understand such exchanges if we judge it as two separate exchanges - 17*a* is eliciting polarity on the proposition *You are able to tell me your code?*. In *17b* the caller has inferred the asker's goal, so doesn't bother to complete the open exchange, but rather initiates a new exchange supplying the information the asker was heading for.

The response in 17 makes it appear that the true question being asked is *what is your code?* However, at other times, the response points to a literal interpretation of the question:

> 18.   A: *Can you tell me your code?*
>
>   B: *No, but John can.*

Sometimes the response is to both the literal and intended meaning, as in 19. *yes* answers the literal interpretation, *it's 678965* answers the intention.

> 19.   A: *Can you tell me your code?*
>
>   B: *Yes, it's* 678965.

Indirect speech acts can thus be seen in the first case as a means of checking that the intended act is achievable - checking whether the felicity conditions are met. Using this assumption, we can put forward a request by several means (Brown: 151]):

a) **Stating the speaker-based condition**: one strategy for requesting information or action is to state that you want it. Thus instead of saying *Are there any panel-beaters in Newtown?,* a speaker may state: *I'd like to know about panel-beaters in Newtown.*

Examples:

> C: *And I would like the nearest panel beater or spray painter or whatever it is [giggle] to fi-have a look at it.*
>
> C: *I need ah information on servicing a car.*
>
> C: *I need to get the boot of my car spray paintted*
>
> C: *and I need to know where I can get it fixed*
>
> C: *and I was wondering whether or not you could give me the name and numbers of three*

b) **Questioning Hearer-based conditions**:

 Ability: Before asking for information, a person may hedge by checking if the hearer knows the information:

> *Can you tell me if there are any panel-beaters in Newtown?*
>
> *Can you please repeat yourself?*
>
> *Do you have an account code for me?*
>
> *Is it possible for you to...*

 Desire: Alternatively, they may check if the hearer is willing to tell:

> *Would you tell me if there are any panel-beaters in Newtown?*

Would you /like me to /try to find out whether there's a suburb further in?

Would you like to tell me...

Summary

In the words of Perrault and Allen:

"We propose an account of indirect speech acts to request and inform based on the hypothesis that language users can recognise actions being performed by others, infer goals being sought, and cooperate in their achievement."

To handle indirect speech acts, we need to take into account two factors:

1. The addressee infers from the question what the speaker actually wants, and often short-cuts the process, providing the desired information before the request is made. Note that they may provide the literal answer to the indirect speech act - e.g. *yes (I do have the right time)* - before continuing to give the time. Alternatively, they may leave the literal exchange incomplete, and just provide the desired answer.

   A basic axiom is that every question has a motivation, so when we hear a question asked which seems trivial, we expect this question to be leading somewhere.

2. As speakers of the language, we are aware of how people react to indirect speech acts. So we may ask an indirect speech act, with the full expectation of getting the implied answer.

We have not at this stage attempted to incorporate the sincerity checks into this exchange model. At some later stage this will be attempted. We will need to work out what types of speech act call for indirection, and what contextual features condition their use. This work will probably focus mainly on demands, where particular tenor relations exist between participants (calling for politeness??), and where it is not certain that the addressee has access to the information, or is not certain to want to comply.

7.6 Responding with an Interrogative

Where the responder to a question, due to uncertainty, puts their response in the form of a yes-no question:

24	A:	*Who is the King of Italy?*	[initiate:elicit:content]
	B:	*Is it Alfred?*	[respond:propose:content]
	C:	*Correct?*	[respond:support]

No problem, a polar question is just one of the ways of grammatically realising *[respond:propose:content]*, particularly when the responder has a much lower power or knowledge role.

7.7 Eliciting Polarity or Prompting Support?

There is scope for confusion between some moves which elicit polarity, and similar moves where the speaker uses an interrogative to prompt the hearer's support of the proposal. For instance:

A: *Isn't it a nice day?*

B: *Yes, it is.*

There are two solutions to this problem:

1. Code [propose:polarity] if the speaker's question implies either the acceptance or rejection of the proposition. The move is thus prompting for support. Code [elicit:polarity] if there is no implication of acceptance or rejection in the move.

2. Code all yes/no questions as [elicit:polarity]. This approach may miss a real distinction between types of exchanges, but it does at least lead to a uniform coding scheme.

7.8 Stage Marking Moves

We have not yet (in this dynamic model) catered for the various moves in the dialogs which mark the beginning or end of generic stages, e.g.

> *Right*
>
> *Okay*
>
> *On to the next matter...*

8. Summary & Conclusions

This paper has presented a dynamic model of exchange. The model uses two strata, one a level of context (representing the various possible points of exchange development, and participant roles), the other a level of behaviour potential (more specifically, move potential - representing the various possible moves participants can make).

To qualify as dynamic, a model should (i) represent the options available at each point of time, and (ii) include a mechanism for moving from one point to the next. The first criterion is met by making the availability of move options context sensitive. A single point, represented by a configuration of contextual features, activates only a subset of the move potential. To meet the second criteria, the effect of a move on the context is represented. Each move is associated with the change in context that occurs if the move is enacted.

Appendix: Sample Coding of a dialog

The following table contains a coding of one of the dialogs recorded in the study. It is coded using the model described above. Key: The boxing in the Turn and Text fields indicates speaker turn. The boxing under the speech functional fields indicates exchange units.

Move No.	Turn	Text	Exchange Type	Initiative	Speech Function	Comm-odity
1	o:	good AFternoon ~	Salut.	open	greet	
2		inforMAtion SERvice	Neg.	initiate	propose	info
3	c:	YES ~	Neg.	respond	support	
4		I'd LIKE information on some PAnel beaters	Neg.	initiate	propose	info
5	o:	Ø on some PAnel BEAters?	Neg.	initiate	elicit	info
6	c:	HMM	Neg.	respond	propose	info
7		Øwhere you live LOcally	Neg.	initiate	elicit	info
8	c:	HMM ~	Neg.	respond	propose	info
9		CHIPpendale ~	Neg.	initiate	propose	info
10		YEH	Neg.	respond	support	
11	o:	in CHIPpendale?	Neg.	initiate	elicit	info
12	c:	YEH	Neg.	respond	support	
13	o:	just a MOment [typing]	Neg.	initiate	propose	action
14	c:	[silence]			do-nothing	
15	o:	not sure that we have anything for CHIPpendale	Neg.	initiate	propose	info
16		but I'll CHECK for you	Neg.	initiate	propose	info
17		while we're waiting for the computer to come up with that information do you have an account code for me?	Neg.	initiate	elicit	info
19	c:	MM'H (1 beat?)	Neg.	respond	propose	info
20a		its nine four THREE	Neg.	initiate	propose	info
21a	o:	nine four THREE	Neg.	initiate	propose	info
20b	c:	one nine FIVE six		<cont.>		
21b	o:	one nine FIVE six		<cont.>		
22		nine four THREEone nine five SIX	Neg.	initiate	propose	info
23	c:	coRRECT	Neg.	respond	propose	info
24	o:	RIGHT ~			mark	
25		just a MOment [computer noise]	Neg.	initiate	propose	action

26	c:	[silence]			silence	
27	o:	I think the nearest panel beaters are probably going to be in NEWtown	Neg.	initiate	propose	info
31	c:	YEH ~	Neg.	respond	support	
32		that's all RIGHT	Neg.	initiate	propose	info
33	o:	there's one in CHIPpendale	Neg.	initiate	propose	info
34		would that be.... ?	Neg.	initiate	elicit	info
35	c:	YEP ~	Neg.	respond	propose	info
36		GREAT	Neg.	initiate	propose	info
37	o:	uh it's cleveland motor BODy repairs	Neg.	initiate	propose	info
38	c:	HMM	Neg.	respond	support	
39	o:	one five three CLEVEland street	Neg.	initiate	propose	info
40	c:	RIGHT	Neg.	respond	support	
41a	o:	telephone number is six nine EIGHT	Neg.	initiate	propose	info
42a	c:	six nine EIGHT	Neg.	initiate	propose	info
41b	o:	TWO eight FOUR one		<cont.>		
42b	c:	two eight four ONE		<cont.>		
45		was that CLEVEland motor... ?	Neg.	initiate	elicit	info
46	o:	Øcleveland motor BODy repairs	Neg.	respond	propose	info
47	c:	ØBOdy repairs	Neg.	initiate	propose	info
48	o:	MMM	Neg.	respond	support	
49	c:	oKAY			mark	
50		one five three CLEVEland street	Neg.	initiate	propose	info
51	o:	YES	Neg.	respond	propose	info
52	c:	oKAY?	Neg.	initiate	elicit	info
53	o:	oKAY	Neg.	respond	propose	info
54	c:	thanks very MUCH	Salut.	open	thank	
55	o:	RIGHT	Salut.	close	thank	
56		BYE bye	Salut.	open	farewell	
57	c:	BYE	Salut.	close	farewell	

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