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A Dynamic Model of Exchange

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Abstract: The terms *synoptic* and *dynamic* have been a focus of interest in the systemic-functional framework in recent years. This paper compares these two approaches to representation, exemplified in terms of an exchange (conversation) model. The distinction is between models which view the exchange as a completed whole (synoptic perspective) , and those which view the exchange from each point within the exchange (dynamic perspective).

The synoptic model is presented in terms of Berry's (1981a-c) model of exchange. Three phenomena which presents problems for such models are then discussed: *linear recursion*, *phasal availability of options*, and *suspension*.

This model is then re-represented in a dynamic formalism, one which does not fall prey to the above-mentioned problems. A two strata model is presented, consisting of a level of context (representing the various possible points of exchange development), and 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 criteria 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.

1. Introduction[1]

Linguistic models have evolved in the description of phenomena which reflect a degree of global planning, for example the clause or unit thereof, or, in text-linguistics, written texts. For such phenomena it is possible to treat the datum as a finished product, something to be contrasted with other finished products of the same sort. This approach to language is termed a synoptic perspective (cf Martin:1985).

For conversation, a different approach is needed. The structure of the text is not decided all at once. Rather, at various points of the text-event participants

[1]Thanks to Jim Martin, Christian Matthiessen, Radan Martinec, Gillian Perret for comments on earlier versions of this paper. Any comments on this version would be appreciated at the above address.

are faced with sets of alternatives from which they choose. Features of the text are selected *interactively*. Models which view the text as *process* rather than product take a *dynamic* perspective.

There are advantages to both approaches. Synoptic representations provide a global 'all at once' view of the text, useful when texts are to be compared. Dynamic representations on the other hand allow a clearer representation of the actual processes involved in the production of texts.

This paper discusses a way in which the *systemic model* can be modified to allow dynamic representation. I will show how synoptic models are inadequate for representing three dynamic phenomena (phase, suspension, linear recursion), and then introduce extensions to the systemic model which allows dynamic representation.

I will base the discussion of synoptic/dynamic issues around Berry's model of exchange (see Berry:1981a-c, Martin:1985 and Ventola:1987). Most discussion of the synoptic/dynamic issue has been in regard to this area of description, and Berry's model is fairly widely known within the systemic tradition. Note though that the discussion can be generalised to other dynamic phenomena, such as genre.

2. Berry's Exchange Model

An exchange gains its name from the fact that it is the unit in which some commodity - either information or goods and services - passes from one participant to the other. Berry notes that the structures of both information and goods/services exchanges are similar (Berry:1981c), so the present discussion can be simplified by centering on only one of these types, which will be the information type as more work has been done in this area.

The following are typical information exchanges (labels explained below):

1 a K1 A: It's ten o'clock.
b K2f B: Oh.

2 a K2 B: Is she dead yet?
b K1 A: Not till ten o'clock.
c K2f B: Oh.

3 a dK1 A: What is the capital of Italy?
b K2 B: Rome.
c K1 A: Correct.

Berry's discussion centres around exchanges which fit a '*polite consensus-collaborative*' model, where it is assumed that participants provide the move expected of them on the basis of the previous move. Her model assumes two participants, one of which is the *primary knower* (PK) - the one who is supposed to know the information which is the basis of exchange - and a *secondary knower* (SK) - the one who is supposed to receive it (whether they do or not can be

negotiated - SK might already know it). She notes a few generalisations about the structure of such exchanges:

a) Either the primary or secondary knower may initiate the exchange (1, 3 are PK initiated; 2 is SK initiated).

b) As an initiating move, PK may either state his/her knowledge outright (inform e.g. 1) or he may first attempt to elicit SK's state of knowledge, typically by asking SK if they know (e.g. 3). A secondary knower can only initiate by elicitation (e.g. 2).

c) The primary knower will, at some stage of the exchange, either state the proposition being exchanged, or confirm SK's statement of it (for exceptions see later). In 1a PK states the proposition outright, in 2b PK states in reply to SK's initiation and in 3c PK confirms SK's completion of the proposition.

Note that if SK in (3) had not known the answer then PK could have completed the proposition for him, as in (4)...

4 a dK1 A: Why did the chicken cross the road?
b K2 B: Why?
c K1 A: To get to the other side.
d K2f B: Oh.

d) The final moves in exchanges (1), (2) and (4) (labelled K2f) are optional, the secondary knower may choose to feed back his attitude towards the information, but doesn't have to.

Berry has labelled the moves of the exchanges with labels reflecting these generalisations:

- K1: The primary knower's statement/confirmation of the proposition, 'K' indicating it is a move in a knowledge exchange, '1' indicating it is a move by the primary knower. To quote Berry, the K1 slot is

  "where the primary knower indicates that he knows the information and where he consequently confers upon the information a kind of stamp of authority" (Berry:1981a:126).

  K1, as mentioned in (i) above, is an obligatory element in every successfully completed exchange.

- K2: The move where the secondary knower indicates his own state of knowledge to the proposition before PK does. For instance, in 2, SK indicates his ignorance by attempting to elicit the information, in 3 he indicates his knowledge by replying correctly to PK's elicitation.

- dK1: The move where the PK attempts to elicit SK's state of knowledge. PK 'delays' stating his/her own knowledge.

- K2f: The move where SK can indicate his attitude to PK's K1 move. This may consist of a reinforcement of the indication given in his K2 move (as in 2), or, if there was no K2 move, represent a late indication of his state of knowledge in regard to the proposition given in K1. 'f' stands for 'follow-up'.

Section three will discuss a formal synoptic representation of this model, and some of the limitations of synoptic representation. Section 4 will propose an alternate model which avoids these limitations - a dynamic representation of exchange.

3. Synoptic Representation

3.1 the 'Polite Consensus' Model

A synoptic representation of 'polite consensus' exchanges can be provided using a *structure potential* formalism:

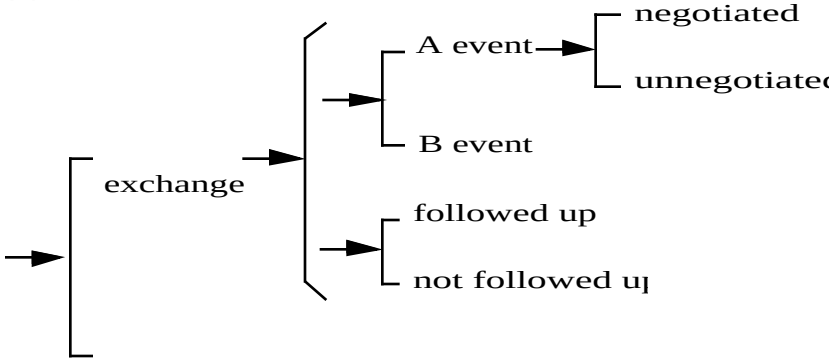
((dK1 ^) K2 ^) K1 (^ K2f)

Notation: ( ) : optional element(s)
^ : linear order

Structure potential representations intermix both syntagmatic information (the elements and their order), and paradigmatic information (the structural choices e.g. optionality).

A systemic representation separates the synatgmatic and paradigmatic components of the representation. The representation consists of a *system network*, detailing the possible structural choices within the phenomena (figure 1a), and a set of *realisation rules*, which relate these choices to their structural manifestation (figure 1b).

(a) System Network



(b) Realisation rules

[exchange] « +K1
[negotiated] « +dK1; +K2; dK1^K2^K1
[Bevent] « +K2; K2^K1
[followed up] « +K2f; K1^K2f

Figure 1: Systemic Representation of Polite Concensus Model

Figure 1 is similar to a network provided in Berry (1981c). However, Berry's labels are present tense ('initiate exchange', 'select A event' etc), reflecting her

underlying dynamic approach. I have substituted past tense (product) labels for these features, which is more in line with a synoptic approach.

The network consists of a set of *systems*, each system representing choices in paradigmatic opposition (mutually exclusive choices). Figure 1a contains four systems: [exchange/other activity], [Aevent/Bevent], [followed up/not followed up] and [negotiated/unnegotiated].

The ordering of systems from left to right in the network is read as more *delicate* classification. For instance, in figure 1a, activities are classified as [exchange] or [other activity]. [exchange] activities can be sub-classified as [A event] or [B event], and also as [followed up] or [not followed up]. A events can be [negotiated] or [unnegotiated].

A event and *B event* refer respectively to exchanges initiated by the primary knower and those initiated by the secondary knower (cf Labov:1972). A *negotiated* exchange is one where the primary knower attempts to elicit the other participants state of knowledge before providing the information themselves.

Realisation rules link system features to their structural realisation. The realisation rules of figure 1b demonstrate two types of structural operators (further types of realisation operators will be introduced later in the paper) :

(i) *insertion* e.g. [exchange] → +K1

This rule indicates that the feature [exchange] is realised by the presence of the K1 element in the exchange structure.

(ii) *concatenation* e.g. [followed up] → K1 ^ K2f

This rule indicates that the [followed up] feature is realised (partially) by the sequencing of the K2f element after the K1 element.

3.2 Extensions to the model

When we move away from the 'polite consensus' assumption, and attempt to handle the texts that actually occur in real life conversation, we can expect to encounter three phenomena which cause problems for synoptic models: *phase phenomena* - where choices are not ordered, but available prosodically; *suspension* - where one linguistic unit can occur within another unit of the same rank (without being a constituent of that unit); and *linear recursion* - where an item or chain of items can be repeated indefinitely.

3.2.1 Phase Phenomena

Phase phenomenon refers to the availability of some choice or choices over some stretch of a continuing process (e.g. a text) (cf Gregory and Malcolm:1981 on phase). For instance, in Mitchell's [1957/75] description of Cyrenacian auction procedure, the potential buyer can inspect auction goods at any stage up to the actual sale of goods. The option to 'inspect goods' is prosodically available through a 'phase' of the event beginning with the sale opening and ending with the acceptance of a bid. The option could be realised at any point of this phase, or

possibly not at all.

A synoptic model has difficulties representing such phenomena because it must allow for the option at every point where it is possible. A synoptic network of the event must include additional systems to cope with all permutations of order due to the prosodically available nature of the option.

This may not be so difficult in the auction example, but as will be seen, within the exchange problems arise.

An example of a prosodically available option within the exchange is 'abort'. At any point of the exchange, either participant may decide to terminate the exchange. Abort can be done in two ways - by keeping quiet when some response is required (5), or by initiating a new exchange before the present one is finished (6):

5 a dK1 A: What is the capital of Italy?
b B: <silence>

6 a K2 A: Do you wanna come back to my place, babe?
<B starts new exchange>
b K1 B: Piss orf, knucklebrain.

Note that another type of termination is possible - a speaker, having finished a move, may realise its futility and begin a new exchange before the other has responded e.g.

7 a K2 A: Do you want anything at the shop?
<beginning new exchange>
b K1 A: ...Oh, it's probably shut.

In summary, either speaker may abort at any point between initiation and utterance of the final obligatory element of the exchange (K1). It is for this reason that I consider the abort option to be phasally available.

Allowing for exchange termination thus requires the following additional possibilities to be generated:

dK1
dK1 ^ K2
K2

If the synoptic representation is to handle the early terminations detailed above, then some reorganisation is called for. Figure 2 extends figure 1 to cope with abort either by SK or PK.

Note however that much of the simplicity and clarity of the earlier network (fig. 1) is lost. The complexity becomes even more unmanagable when we attempt to handle queries and contradictions discussed below.

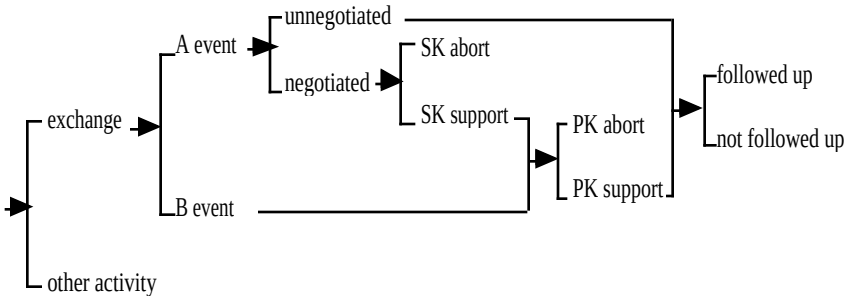


Figure 2: Handling Abort

3.2.2 Linear Recursion

A further form of challenge to the 'polite consensus' model occurs when one participant contradicts the proposition the previous speaker has just completed. This can be done by a primary knower...

8 a dK1 *A: What is the capital of Italy?*
b K2 *B: Madrid?*
c K1 *A: No its not.*
d K2f *B: Oh.*

...or by the secondary knower...

9 a K1 *A: Rome is the capital of Italy*
b K2f *B: No its not!*
c K1 *A: Yes it is.*
d K2f *B: Oh.*

After a contradiction, the contradicted participant can accept the contradiction (as in 8), or try again, either by re-asserting (9), or by attempting an alternative answer[2]:

10 a dK1 *A: Why did the chicken cross the road?*
b K2 *B: To get to the other side?*
c K1 *A: No.*
d K2 *B: Because the light was green?*
e K1 *A: No.*
f K2 *B: She forgot her luggage?*
g K1 *A: Yep.*

Contradictions thus introduce the possibility of recursion into the exchange – some elements may occur more than once.

If only the usual types of systems are used, then model can only produce recursion through *rank recursion* – recursion through successive layers of constituency. However, the resulting description is unsatisfactory as it results in a maximal bracketing (binary branched) representation of the move complex,

[2]The alternative strategies taken by SK in examples 8 and 10 might be seen to reflect the tension between ideational and interpersonal structurings of the exchange. In 8, SK has chosen to produce an unmarked interpersonal structure (dK1^K2^K1^K2f), while in 10, SK has attempted to gain the elusive supporting move (ps), at the cost of interpersonal structure.

rather than the minimal bracketing structure preferred in systemics.

What is required here is *linear recursion*, which allows the recursive moves to be generated at the same level as the non-recursive ones. Within systemics there is a mechanism for generating linearly recursive structures - *recursive systems* (cf Hudson:1971:60-1). A recursive system allows one of its features to act as an entry condition to itself. The system can thus be entered multiply, with different selections being made on each pass (see fig. 3). The features selected on successive passes through the system are realised by inserting additional elements into the structure. The recursion ends when the [stop] option is selected.

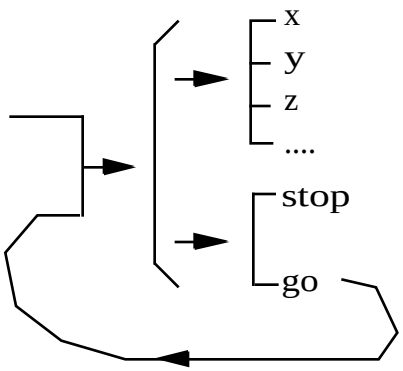


Figure 3 : A Recursive System

As a demonstration of how recursive systems might be applied within the present case, I will attempt to model one of the recursive options within the exchange - PK's option to reassert his K1 move after SK has contradicted it. The follow up system of figure 1 can be replaced with the systems shown in figure 4. This network subclassifies follow up moves into supporting and contradicting moves. Another system must be added to cater for the fact that, if contradicted, PK can either accept this contradiction (STOP), or reassert his K1 assertion.

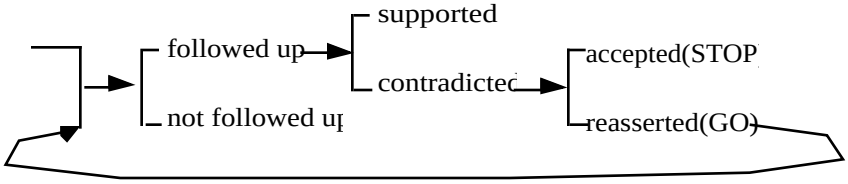


Figure 4 : Recursive System Handling SK Contradiction

If PK chooses the re-assert option, a new instance of K1 is produced, with possibility of a further K2f move and ensuing recursion. Recursive systems have seemed to provide adequate representation in this case, but this is deceptive for two reasons:

Firstly, we have examined one of the problem cases of the exchange in isolation from other cases. If we were to further modify the synoptic network to handle the other recursive option (SK reperforming a K2 move), and introduce systems to handle abort, and query (see 3.2.3), then the result is a highly complex network which bears little resemblance to Berry's clear and simple

network. Such synoptic solutions must thus be deemed inappropriate for representing the full complexity of exchange structure. However this does not deny the value of the synoptic approach in representing the 'ideal', or 'unmarked' exchange.

Secondly, there are many problems involved in recursive systems not brought out with the cursory demonstration above. As yet there has not been a satisfactory formalisation of recursive networks. It is notable that they have not been utilised in any of the systemic computer projects (Davey, Penman, Winograd, Patten etc) which have relied instead on rank recursion.

3.2.3 Suspension

In 3.2.1 it was shown that an exchange can be terminated by initiation of a new one. However, an interrupting exchange does not have to terminate the previous exchange – often they merely temporarily *suspend* the main exchange, which is taken up on the completion of the suspending one e.g.

11 a K1 A: Margaret Trudeau is boring.
b - K2 B: Who?
c - K1 A: Margaret Trudeau.
d - K2f B: Oh,...
e K2f ... obviously.

Note that the suspending exchange is itself a well formed exchange. This particular example of a *suspending exchange* is termed a *query* by Berry. In 11 the query repairs a fault in hearing. Martin (1985) notes another type of query where a participant interrupts the exchange to query the initiators reasons for negotiating the exchange:

12a K2 - B: Are you busy?
b - K2 A: Why do you ask?
c - K1 B: I need your help.
d K1 - A: In that case, I'm free.
e K2f - B: Great.

The queriers answer in the main exchange is dependent upon the information gained in the suspending one.

Any move in the exchange may be queried, and several queries may be made about a single move. Moreover, a query itself can be queried:

13a K1 A: Margaret Trudeau is boring.
b - K2 B: Margaret who is boring?
c - - K2 A: Sorry?
d - - K1 B: Margaret Who.
e - K1 A: Oh, Margaret Trudeau.
f K2f B: Yes, she is rather boring.

I note that informing exchanges can also suspend:

14	*a*	*dK1*	*A: Do you Know who the King of Sweden is?*
	b	*- K1*	*B: That's an easy one...*
	c	*K2*	*...Karl*
	d	*K1*	*A: Correct*

Suspending exchanges are a case of *non-rank shifted embedding* - one exchange is embedded within the other. Most embedding is rank-shift embedding, where a unit from a higher level functions as a unit at a lower level. This however is not the case here - the query is not functioning as a unit in the exchange. Rather it is a case where both the main exchange and the query are fully functional exchanges at the same rank. However the main exchange is realised discontinously, with the query interceding (see figure 5).

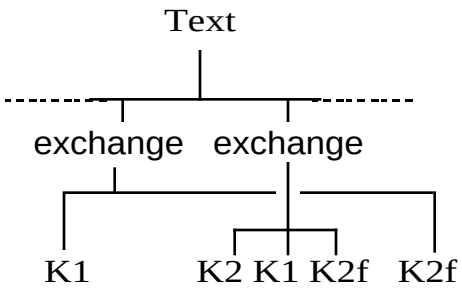


Figure 5 : Nested Exchanges

Unfortunately, there is no way to introduce non-rank shifted embedding in a systemic description. Elements can be introduced as constituents or as sisters (univariate relations). As discussed above, inserting the suspending exchange as a constituent involves rank-shifted embedding, which is unacceptable. The exchange could be introduced as a sister, but there is no systemic notation to specify that one sister appears *within* the other.

3.3 Summary of Problems

To sum up the limitations associated with the synoptic approach:

1. *Phase Phenomena*: Where a choice is available over some stretch of a social process, synoptic networks fail to capture the fact that it is the same choice available over and over again. Where phase phenomena occur, complicated synoptic networks result.
2. *Linear Recursion*: The mechanism used to incorporate linear recursion in synoptic descriptions (recursive networks) is highly problematic. Even granting their use, the networks that result in an exchange model allowing suspensions, aborts and contradiction are highly complex, losing the simplicity and clarity displayed in the 'polite consensus' model.
3. *Suspending*: Synoptic networks cannot generate the non-rank shifted embedding necessary to represent suspending exchanges.

The main problem here is *over-riding complexity*: If all the possible responses at each point of the exchange are considered, then the resulting network is useless as a descriptive device. The simple patterns observed in the majority of exchanges are obscured.

Besides these problems, a synoptic description fails to represent many of the interesting features of the exchange process. For instance, it fails to represent the exchange as a structure formed by two participants – it presents only a single set of role-neutral options. It does not show which participant makes the choice – which could be of interest. It could be that one participant is entirely responsible for shaping the structure of the exchange, as is the case when a sergeant major addresses a private – the private must conform to the polite consensus model, even the option of follow-up is fixed ('yes-sir','thank you sir' etc).

Also, it does not show at what point of the exchange the options are made. It is interesting to note that the structure of the exchange is largely determined at initiation. It is only by representing the options at the point at which they become available that such features of the exchange become salient.

4. Dynamic Representation

In a dynamic model, the focus is not on "what type of exchange can we produce", but on "what move can we produce next" (Martin:1988:243). We are looking at the development of the exchange move by move, not at the overall shape of the exchange . We focus on the options open to the participants at each decision point – the *dynamic potentials*.

4.1 Berry's Dynamic Model

Berry's 1981 papers (Berry:1981(a-c)] present a prototype attempt at dynamism in the above sense. On a light reading it is easy to miss the dynamic aspects of her model, since these dynamic aspects seem to be tacked on to her synoptic model, to handle problems which occur when the polite consensus assumption fails. In her model, the shape of the exchange is determined by the initiating options, assuming that the 'polite consensus' model will be followed. If, at a later point, a participant chooses not to support the prior move (e.g. abort, query etc.) then transformations are applied to the initial structure to correct it (see 1981a:135). There are a number of problems with her approach:

1. *Transformational*: Berry's dynamic formalism requires the use of transformations, a move which goes against the basic realisational principle of systemics.
2. *"Places in structure"*: A dynamic model needs a mechanism to condition the options available at each point in structure. Berry's model does this, with a set of labels ('dK1','K2','ai','pc' etc) which "mark the point at which a particular set of options becomes available, which is different from the sets available at other points" [1981a:128]. However, there are three problems with her labels:

   a) Confusion between 'functions' and 'places in structure': Berry calls these labels both 'functions' and 'places in structure'. However, there are differences in the roles each of these categories must play. A 'place in structure' marks the point at which various options become available, while 'function' refers to the role an item plays in relation to other items in the same structure. The function served by the next occuring item will depend on the options selected at that point. Note that various functions can occupy the same 'place in structure'. For instance, in the grammar, both subject and finite (functions) can occupy the first 'place in structure' of the clause. We thus need to separate the concepts of function and places in structure.

b) Lack of generalisability: Each of Berry's labels represents a number of different contitioning factors. "K2f" for instance, represents three factors: the move will be provided by SK, it will be a follow up move and it is part of a knowledge exchange. As the model gets more complex, it will become useful to link each of these factors independently to the move options they condition.

c) Opaqueness of labels: As labels of 'places in structure', Berry's labels are quite opaque: it is difficult to work out exactly what 'real world' factors these labels refer to.

3. *Proliferation Of Potentials:* Berry's model consists of a number of potentials, not only for each point of the exchange, but also for each of her three layers of structure (ideational, interpersonal, textual). The large number of these potentials makes her dynamic model difficult to use.

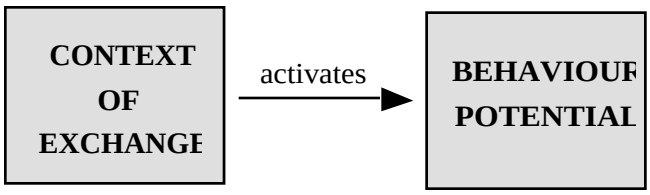
4.2 The Model Revised

The rest of this paper discusses a dynamic model which avoids the problems in Berry's model. The model is expressed first in terms of the polite-concensus model. Section 5 discusses the ability of the model to handle phase, linear recursion and suspension[3].

The model consists of two strata, a level of *exchange context*, representing the various points of the exchange structure, and a level of *move potential*, representing the dynamic potentials available at these points.

The exchange context is used for identifying points of exchange development. It replaces Berry's opaque point labels (dK1, K2 etc.) with a systemic network, setting out explicitly the contextual features which condition the availability of move options.

Move options are set out in a single network - a *generalised behaviour potential* (GBP), of which subsets (dynamic potentials) are available (activated) depending on the current state (context) of the exchange. Each configuration of contextual states activates a particular dynamic potential. The relationship between the strata can be represented as follows:



This approach avoids the proliferation of networks demonstrated in Berry's model. Structure is generated dynamically - move by move, thus avoiding the need for transformations.

[3]Note that the model as presented here is not intended to be used for analysis. My intention has been merely to demonstrate the dynamic approach, handling only those phenomena discussed in Berry 1981a, and a few additional problem areas. An analysis version of this dynamic model will be presented in a later paper.

4.3 Generalised Behaviour Potential: the move network

Each of the strata of the model is centred around a system network: a contextual network representing the possible states of the exchange, and a behavioural network representing the options available within the exchange. I will focus first on this behaviour network:

> "As members of a particular culture, with a particular social structure, each of us has available to him a range of behavioural options (a 'behavioural potential') for use in certain types of social context. The behavioural potential constitutes what we 'can do', and encompasses non-linguistic as well as linguistic behaviour." [Butler:1985:59]

In a synoptic model, the behavioural options represent choices between types of exchanges. One chooses to produce a negotiated exchange, or otherwise. In a dynamic model, the options concern choices between moves – our choice is to speak or not to speak, and if we speak, what type of move we make. Different types of exchanges are produced, but only as a consequence of the sequence of individual moves selected by the participants.

Some approaches offer a distinct behaviour potential for each point through the exchange – context specific behaviour potentials. Berry's model for instance makes use of five such potentials: 'systems at ai', 'systems at places after ai', 'systems at K2', 'systems at K1', and 'systems at K2f'. Such approaches result in a proliferation of networks, a problem which gets worse as we extend the model to handle naturally occurring data..

The present approach avoids the proliferation problem by bringing together the context specific behaviour potentials into a single network – a *generalised behaviour potential*, which represents all moves which can be performed. We can then derive context specific potentials from the general potential by making the availability of options context sensitive.

Figure 6 provides such a potential for the polite consensus model. The primary distinction is between initiating, responding or keeping quiet. Initiating moves can elicit (as PK or SK) or inform. Responding moves may be of three types (all being different varieties of Berry's [support] option):

(i) *inform* – a move which completes a proposition.

(ii) *deny knowledge* – a response to an elicitation which does not complete the proposition e.g. where SK says "I don't know" or similar.

(iii) *support* – moves where PK or SK agree with the just completed proposition. May take forms like "yes, it is" (confirming), or "Oh" (accepting).

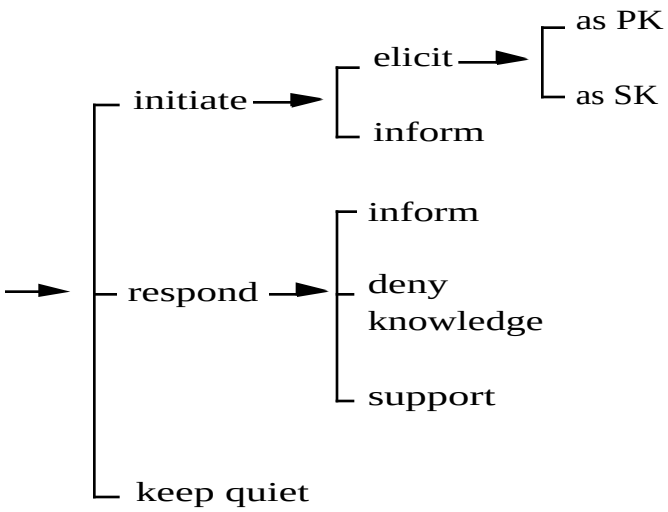


Figure 6 : The Move Network

It is yet to be shown how the participants are constrained to choose only those options appropriate at that point of time. Section 4.4 introduces a means for representing the various places in structure (the contextual network), while section 4.5 links each place to the moves available in those places.

4.4 Exchange Context

The availability of moves to the speaker is dependent on three variables, represented systemicly in the exchange context network of figure 7. These systems are drawn from across Halliday's metafunctional spectrum:

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

Discussion

(a) Propositional Negotiation: Berry's model of exchange consists of three layers of structure, of which the one we have been considering is the interpersonal layer. An exchange is also structured ideationally, as the interactive negotiation of a proposition. The three possible elements of ideational structure are:

proposition base - the move provides "a basis for the completed proposition by predicting the form of the completed proposition" (Berry: 1981a:140). This function conflates with eliciting moves, whether by PK as in examples 3,4,5,8 and 10, or by SK as in examples 2, 6 and 7.

proposition completion - the move that completes the proposition. This may conflate with a K1 move, as in examples 1a, 2b or 4c, or with a K2 move, as in 3b.

proposition support - once the proposition is completed, the participant who did not complete it may show their agreement with the proposition by supporting

it. This can be either a K1 move confirming the correctness of SK's K2 move, or a K2f move where SK agrees with PK's K1.

The options open to participants change as each of these elements is provided. I thus identify three stages of propositional negotiation:

Proposition Uncompleted (PU) (e.g. after an elicitation)

Proposition Completed

- and unsupported (PCU)
- and supported (PCS)

(b) Speaker Role: The knowledge role (PK or SK) assumed by the participant affects their choice of options. Primary knowers and secondary knowers have different choices available.

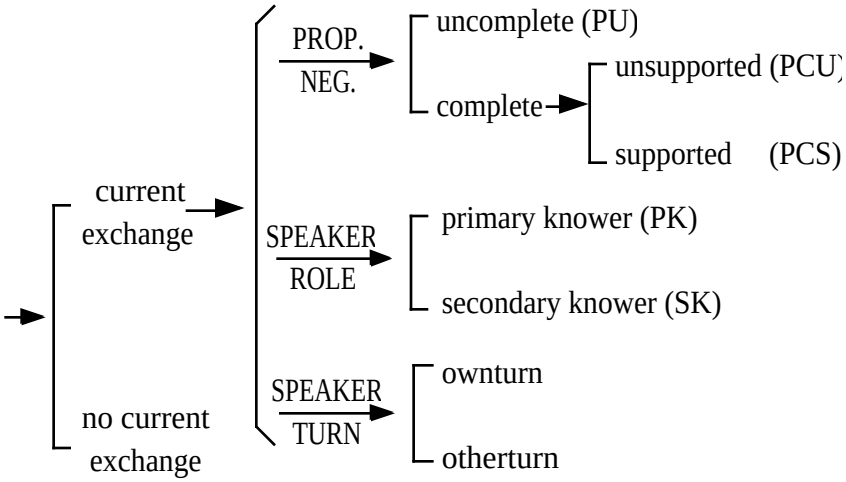


Figure 7 : Exchange Context

(c) 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.[4]. 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.

(d) Dynamic Context: 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.

[4]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 K1 moves, each forming a separate exchange. Alternatively, a speakers K2f 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.

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). Options vary over genres too - PK eliciting exchanges ([elicit:as PK]) seem to be more a product of quiz shows than of real life.

(e) Individual vs. Shared Context: 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 PK has just contradicted SK's statement, PK might consider the exchange ended (as at 8c), while SK may take the exchange to be still open, and be looking for an adequate reply (as in 10c). 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 SPEAKER 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 PK).

4.5 Contextual Activation of Dynamic Potentials

We have established above a model consisting of two strata - a strata representing exchange states, and one representing exchange options. It remains to represent the relationship between these strata - the contextual determination of exchange options:

> "It is the social context that defines the limits on the options available, the behavioural alternatives are to this extent context-specific" (Halliday:1973:64).

The systemic literature offers various ways to control contextual availability of behavioural options (cf Halliday:1973:62-65, Martin:1984b:64, Plum: 1986:78). These approaches fall into three classes:

(i) potential creating approaches: Initially, all options are 'inactive' or 'dormant', and are 'activated' by the presence of various contextual features e.g.

> "The semiotic features of the situation activate corresponding portions of the semantic system, in this way determining the register, the configuration of potential meaning that is typically associated with the situation type." (Halliday:1978:117).

(ii) potential restricting approaches: Initially, all options are 'active', but some are 'deactivated' by the presence of particular contextual features.

(iii) potential skewing approaches: Initially, each option is assigned an inherent probability (its 'context-free' probability), which is 'skewed' (made more or less likely) in the presence of various contextual features [Martin:1984b:64].

Of these approaches I will choose the potential creating approach. Contextual states are thus seen as preconditions for the availability of the various behavioural options. Activation can be *probabilistic* (activated options being more or less likely), or *categoric* (options on or off). To simplify discussion, I will assume categoric activation.

'Activation' is a type of inter-stratal relation. It differs from pre-selection in that pre-selection specifies that a given feature *must* be selected, while activation specifies a *range* of features, only one of which must be selected.

A set of rules is provided to associate behavioural options (figure 6) with the contextual states which activate them (figure 7):

Notation : '[ ]' means 'activate behaviour options:*

Context		Activated Options
(a) [no current exchange]	→	*[initiate,keep quiet]
(b) [PU/ownturn]	→	*[inform]
(c) [PU/ownturn/SK]	→	*[denyknowl.]
(d) [PCU/ownturn]	→	*[support]
(e) [PCU/ownturn/SK]	→	*[initiate,keep quiet]
(f) [PCS]	→	*[initiate, keep quiet]
(g) [otherturn]	→	*[keep quiet]

Interpretation

(a) These are the options available while no exchange is open.

(b) Either participant can inform in response to an eliciting move.

(c) SK has the additional option of saying "I don't know".

(d) Either participant can support an inform move.

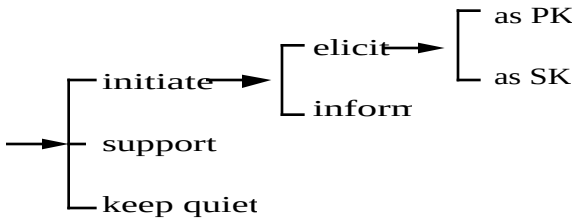
(e) SK need not support PK's informing move, but may start a new exchange, or keep quiet.

(f) Either participant can initiate or keep quiet after the proposition has been supported.

(g) Each participant keeps quiet during the others turn.

By convention, the activation of a non-terminal feature activates all systems dependent on that feature. Thus activating [initiate] activates [elicit], [inform], [as PK] and [as SK]. Also, the activation of a feature activates all less delicate features, thus the activation of [support] also activates the less delicate option [respond].

Note also that two or more activation rules may be triggered simultaneously. For instance, for SK in state [PCU/ownturn], both rules d and e apply, giving a combined behaviour potential for SK of:



Note that this potential is a subset of the general potential. It represents the potential activated in a particular context.

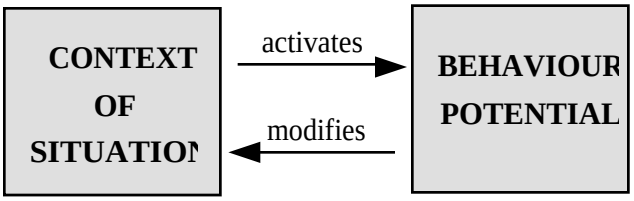
This sub-section has introduced a formalism which allows contextual states to be linked to the move features which they activate.

4.6 Modifying Context

In Martin's [1988:243] description of the 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. Berry's dynamic model fails to do so. The present model, as so far presented, fails also.

All that has been done in either 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.



For instance, an initiating move has the effect of causing a transition from a [no current exchange] state to a [current exchange] state.

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)

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 (a sort of realisation rule)[5]. 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 four sets, corresponding to the different systems of the context:

Notation : [<move>] → ![<change in context>]

(i) Role Assignment		Speaker	Listener
[initiate:inform]	→	![PK]	![SK]
[elicit:as PK]	→	![PK]	![SK]
[elicit:as SK]	→	![SK]	![PK]

(ii) Turn Allocation		Speaker	Listener
[initiate]	→	![otherturn]	![ownturn]
[respond]	→	![otherturn]	![ownturn]

(iii) Propositional Development			
[elicit]	→	![PU]	
[inform]	→	![PCU]	
[support]	→	![PCS]	
[denyknowl]	→	![PU]	(no change)

(iv) aborting by silence

[ownturn/keep quiet] → ![no current exchange]

Discussion

(a) Notation: The realisation operator '!' has been introduced to represent the

[5]Realisation rules such as these, which relate linguistic options to their effect on context, might be seen as a formalisation of the perlocutionary effect of the utterance.

effect of a move option on context. Note that this is not a preselection operation, but a 'modification' one. With this operator, the selection expression is left as it was before except for the noted change. 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) Context Dependency: 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.

[ownturn/keep quiet] → ![no current exchange]

(c) Individual Context: note that an action may have different consequences for each participant. When a participant chooses to initiate by informing, he assigns himself the PK role, but the listener takes on the SK role (see the role assignment rules above).

Example

After a previous silence (context: [no current exchange]), one participant asks a question to which he does not know the answer (as in example 2). The move here selects the following options: [initiate:elicit:as SK]).

The following modification rules are relevant:

[as SK] → speaker:![SK],
listener:![PK]

[initiate] → speaker: ![otherturn]
listener: ![ownturn]

[elicit] → ![PU]

The new context resulting from the application of these rules is:

speaker : [current-exchange:SK/PU/otherturn]

listener : [current-exchange:PK/PU/ownturn]

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

5. Handling Dynamic Phenomena

Section 3.2 introduced three phenomena which are problematic for synoptic models. In this section I will show how the dynamic model handles them.

5.1 Phase

In terms of the present model, a 'phase' is a stretch of social process during which a set of behavioural options remain available due to a particular activating context. A phase of behaviour potential begins when a particular contextual state starts, and ends when the contextual state ends.

It is important to note the difference between a *staged* approach to social process and *phasal* approaches. A staged approach (cf Hasan, Ventola on genre) works on the premise that at particular points of the social process the behaviour potential changes in toto. A phasal approach allows a number of phases to overlap, as contextual variables can change independently of each other. We can thus model a social process as a continually changing behaviour potential, corresponding to micro-changes in context[6].

In section 3.2.1, we discussed the phasal availability of the abort option - 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 caused 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 - keep quiet and initiate - to be phasally available i.e. available to either speaker at any point of the exchange. This can be achieved by introducing a single activation rule:

[current exchange] → *[initiate, keep quiet]

(gloss: in addition to other activated options, participants may initiate a new exchange or keep quiet at any point within an exchange)

Since these options are also activated by the contextual feature [no current exchange] (their normal range), a single rule can replace the two rules. The empty brackets indicate that the options are freely available:

[ ] → *[initiate, keep quiet]

5.2 Linear Recursion

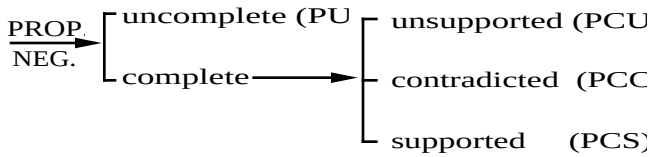
In section 3.2.2 it was shown that if we allow contradiction into the exchange model, linear recursive structures become possible (which is a problem for synoptic models). Linear recursion offers no problems to a dynamic model, because structures are extended linearly anyway. The following discussion shows how contradictions are incorporated into the model.

---

[6]We might introduce the notion of 'critical contextual variables' - contextual states upon which large sections of behaviour potential depend. A change in such a variable would produce stage-like changes.

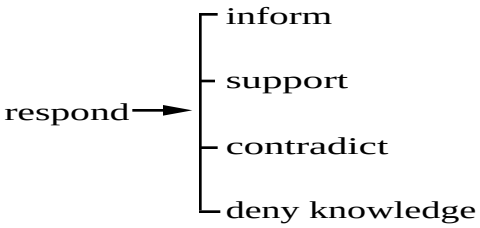
(i) Exchange Context

Previously, the model has allowed for three levels of propositional negotiation - proposition incomplete (PU), proposition completed but unsupported (PCU) and proposition completed and supported (PCS). The possibility of contradiction requires a new negotiatory state to be added to the context (figure 7), because the options open after a contradiction are different to those in these three states:



(ii) Move potential

The response potential in figure 6 must be extended to include the contradict option:



(iii) Activation

The [contradict] option is an alternative to the [support] option - they are the two possible responses to an informing move by the other speaker. The activating context for these options is thus PCU (a completed but unsupported proposition):

[PCU/ownturn] → *[support,contradict]

(gloss: An interactant can respond to the other participant's inform move by either supporting or contradicting it)

Following a contradiction (i.e. in state PCC), the options are different for each participant. The contradicted party has the option to try and complete the proposition again (as in 9 or 10), or to accept the contradiction and support it (as in 8). The following rule shows the potential activated by state PCC for the contradicted party:

[PCC/ownturn] → *[inform,support]

(gloss: An interactant can respond to the contradiction of his inform move by either attempting to complete the proposition once more, or by accepting the contradiction)

After a contradiction, the contradicter may themselves complete the proposition, as is shown in 15:

15a [elicit] *A: Who is the king of Sweden?*
b [inform] *B: Bjorn?*
c [contradict] *A: No,*
d [inform] *...Karl is.*
e [support] *B: Oh.*

For some reason the normal turn-taking approach to propositional negotiation is suspended in this case. PK, seeing that SK cannot supply the correct answer, supplies it himself. The possibility of this response following a contradicting move is activated as follows:

[PCC/otherturn] → *[inform]

(gloss: An interactant, having contradicted the others informing move, can choose to complete the proposition themselves)

(iii) Context Modification

The effect of contradiction on context is modelled as follows:

[contradict] → ![PCC]

(gloss: A contradicting move changes the state of propositional negotiation to one of 'proposition completed but contradicted))

The above discussion has shown how one linearly recursive phenomena is handled in a dynamic model. Basically, recursion can occur whenever it is possible for a series of actions to re-instate a previous contextual state, thus allowing the same action choices to be made again.

5.3 Suspensions

In section 3.2.3, it was shown that 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. The present section attempts to explain this phenomena in terms of a dynamic model.

(i) Exchange Context

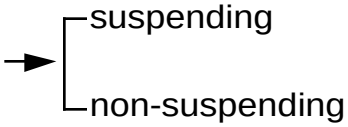
As the model has been described so far, there will be problems in modelling the dynamics of suspensions - the exchange context is changed by each new move and there is no way to re-instate the context that existed prior to the suspension.

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 - *push-down stacks.*

A push down stack allows the 'current' exchange context to be at the top of a (normally empty) stack of exchange contexts, each new interruption is *push*ed on top of the stack, becoming the new current exchange. When the suspending

exchange finishes, it is '*pop*ped off' the stack, allowing the suspended exchange to become once again the current exchange[7].

It is necessary to introduce a contextual system indicating whether the current exchange is suspending or not:

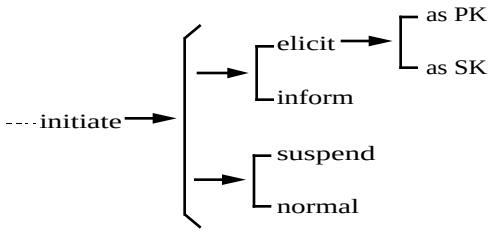


There can be only one non-suspending exchange on the stack, which will be the one at the bottom. The rest are suspending.

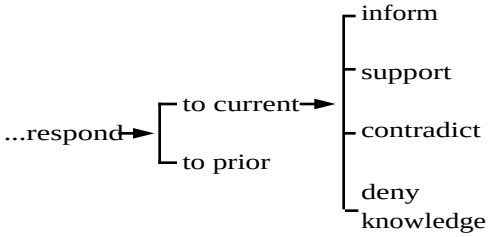
(ii) Move potential

The initiating move of a suspending exchange can be viewed - similarly to 'abort' - as a misplaced [initiate] option - the speaker chooses to initiate a new exchange when normally a responding move is expected (e.g. examples 11-14).

The suspending [initiate] differs from the abort [initiate] in that it does not terminate the previous exchange, so needs to be differentiated in the move network:



The response options also have to be extended, to allow a participant to respond to either the current exchange, or to a prior suspended exchange[8]:



(iii) Activation

As discussed in section 3.2.3, the suspend option is available anywhere mid-exchange:

[current-exchange] → *[initiate:suspend]

Suspending initiation is not allowed outside of the exchange, so the rule introduced in section 5.1 must be modified:

---

[7]If an exchange has been suspended ('on the stack') for a fair while, the participants may loose details about its context, resulting in the participants being forced to abort the exchange as soon as it becomes 'current'.

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

[ ] → *[initiate:normal, keep quiet]

The [respond:to prior] option is activated whenever there is a suspended exchange on the stack, which is true when the current exchange context is marked [suspending]:

[suspending] → *[respond:to prior]

Note that the type of response (inform, support etc) each participant may make to a prior exchange depends on the context for that exchange, not on the current context. One chooses the option [respond:to prior], which is realised by popping the top exchange off the stack, making the suspended exchange current. One then chooses from among those options activated by the re-instated context.

(iv) Context Modification

The effect of *initiating* a suspending exchange is to push a new context onto the stack:

[initiate:suspend] → !PUSH

The normal context changing rules are then applied to this new context. This includes marking the new exchange as a suspending one:

[initiate:suspend] → ![suspending]

The *termination* of a suspending exchange requires a 'pop' to be performed:

[respond:to prior] → !POP
[suspending/initiate:normal] → !POP

The first of these rules refers to a case where a suspended exchange is continued. The second rule caters for an aborting initiation, which will POP the suspending exchange, and also abort any suspended exchanges as well.

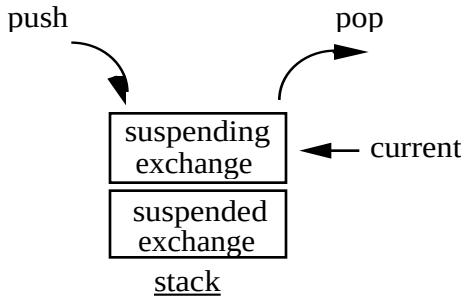
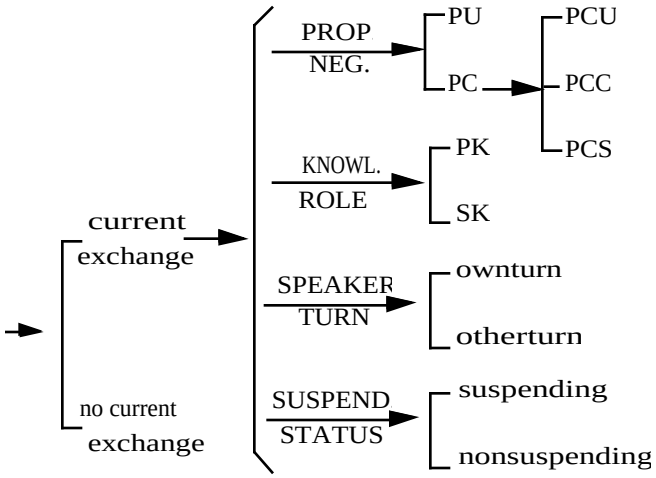


Figure 9: an Exchange Stack

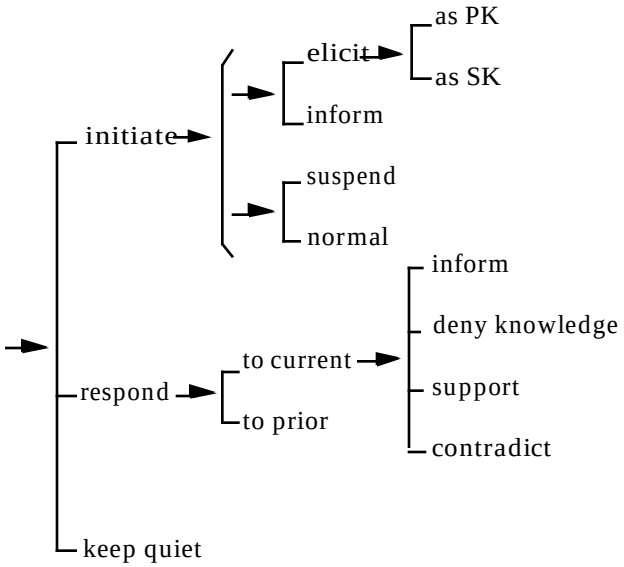
5.4 Final Model

The following summarises the model:

1. Context Of Situation



2. Move Potential



3. Move Activation

Context	Activated Options
[<always active>] →	*[initiate:normal,keep quiet]
[current exchange] →	*[initiate:suspend]
[PU/ownturn] →	*[inform,deny knowl]
[PCU/ownturn] →	*[support,contradict]
[PCC/ownturn] →	*[inform,support]
[PCC/otherturn] →	*[inform]
[suspending] →	*[respond:to prior]

4. Context Modification

(i) Role Assignment

	Speaker	Listener
[initiate:inform]	→	![PK] ![SK]
[elicit:as PK]	→	![PK] ![SK]
[elicit:as SK]	→	![SK] ![PK]

(ii) Turn Allocation

	Speaker	Listener
[initiate]	→	![otherturn] ![ownturn]
[respond]	→	![otherturn] ![ownturn]

(iii) Propositional Development

[elicit] → ![PU]
[inform] → ![PCU]
[support] → ![PCS]
[condradict] → ![PCC]
[denyknowl] → ![PU] (no change)

(iv) Aborting by silence

[ownturn/keep quiet] → ![no current exchange]

(v) Suspending Status

- *PUSH/POP applied first*

[initiate:suspend] → !PUSH
[respond:to prior] → !POP
[suspending/initiate:normal] → !POP

- *then initialise new exchange*

[initiate:normal] → ![nonsuspending]
[initiate:suspend] → ![suspending]

6. Summary & Conclusions

6.1 The Synoptic Model

I have attempted to show that synoptic models are not adequate for the representation of process-like phenomena such as exchanges. This is due to problems in representing three exchange complications - *linear recursion*, *suspension*.and *phase*

Recursive systems, at first glance, seem to allow the model to represent linear recursion. However, there are numerous questions as to their theoretical soundness, and to their practical implementability. They do not seem a viable representational resource in their present form.

As for *suspension* (non-rank shifted embedding), the position is less favourable. There is no mechanism within systemics for representing this phenomena.

There is no technical reason why *phase* cannot be represented synoptically. However, in practice, the networks which result from representing phase synoptically are quite complex, missing the descriptive simplicity of dynamic descriptions of phase.

6.2 The Dynamic Model

This paper introduces a dynamic model, suitable for the representation of exchange. This has been done before, using systems (Berry), or flowcharts (Martin, Ventola). However, both of these approaches require non-systemic means of representation - transformations in Berry's work and flowcharts in Martin's and Ventola's.

My method does not contravene any central tennets of the systemic tradition (with the exception of push-down stacks, which caters for a representational need lacking in systemics). The essentials of my model have all been at least suggested elsewhere:

Generalises Behaviour Potential: Butler:1985, Halliday:1978

Contextual Activation of Behaviour Potential: Halliday:1973:62-5, 1978:117, Martin:1984a:25, 1984b:64, Plum:1986

Dynamic Potentials (single point potentials): Berry:1981(a-c).

Dynamic Context: Hasan:1981

Text/Context Co-evolution: Halliday:1984, Hasan:1981.

While my model may seem strange, it is just that I have taken a lot of borderline (up-and-coming?) ideas and pushed them to their limits. Most have not been incorporated into formal models so new notation has been required.

A dynamic model has many advantages over synoptic models:

(a) *Representational Power*: There are many phenomena which the dynamic model can represent but which the synoptic model cannot. This has been demonstrated with three phenomena – phase, suspension and linear recursion.

(b) *Saliency*: A dynamic perspective reveals information about the social process missing from a synoptic perspective.

(i) *Interaction:* A dynamic model allows the interactive, and co-operative, nature of exchange to become salient. The acts of one participant will affect the shared context of situation and thus affect the options open to other participants. The model reflects the co-operative negotiation of situation, whereby the situation is co-operatively developed, with first one participants action changing the context, which becomes the base for the next participant's act, which in turn changes the context.

(ii) *Responsibility*: A dynamic model makes salient which participant is making which of the structural decisions within the exchange. It is thus possible to see who (if anyone) is primarily responsible for directing the social process.

(iii) *Location of Choices*: The dynamic model shows where in the exchange the important structural choices are made. Largely, the shape of the exchange is determined at initiation, although marked selections made at later points can change the structure.

6.3 Treatment of Exchange Structure

The following innovations in modelling the structure of exchanges have been suggested:

Suspending: The analysis has been extended to allow suspending exchanges to be informing exchanges as well as queries. The possibility of co-existing exchange contexts (using push-down stacks) has been introduced to represent suspended exchanges.

Contradiction: an attempt has been made to extend the treatment of contradictions, showing how they are distributed in relation to propositional development, and also the effect of contradictions on exchange context.

Abort: the 'abort' phenomena discussed by Martin and Ventola has been re-expressed as the prosodic availability of [keep quiet] and [initiate] options.

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