Pragmatics and linguistic encoding. Evidence from the conceptual/procedural distinction

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1. Introduction

This paper is about how linguistic encoded information interacts with contextual information in order to trigger explicatures and implicatures, than is aspects of full pragmatic interpretation. These aspects are either truth-functional or non-truth-functional, regarding the level at which their occur (explicatures are truth-functional, implicatures are not) on the one hand and either propositional or non-propositional on the other, depending on the type of entities described (events are propositional, individuals are not).

After a brief survey of the relationship between language and communication (§2) and a reminder of the classical conceptual/procedural distinction (§3), I will propose a model of pragmatic interpretation of discourse relations about eventualities, called the Directional Inferential Model (DIM) (§4). DIM is a very simple device devoted to the computation of time direction in discourse. The hypothesis is that Directional Inferences (DIs) are the by-product of both linguistically encoded information and contextual information. This is nowadays generally accepted, but details of the processes involved are not consensual. DIM assumes that general principles apply here, some being universal for language use interpretation, others being specific to languages. The short version of DIM claims that contextual information is stronger than linguistically encoded information (principle A), and that among linguistically encoded information, procedural information is stronger than conceptual information (principle B). Empirical and theoretical evidence will be given to support this claim. As a fourth step (§5), I will propose a new formalism accounting for the representation of discourse relation interpretation, Mental Representation Theory (MRT). MRT is a Relevance Theory sub-module devoted to the treatment of reference to individuals and eventualities, and presents a version of temporal relations that is simpler than in classical Discourse Semantics like Discourse Representation Theory (DRT) or Segmented Discourse Representation Theory (SDRT). Finally (§6), I will make some practical propositions about the description of procedural information, and more precisely French tenses and connectives within DIM and MRT.

2. Language and communication

Communication is traditionally defined as the transfer of information from a source to a destination via a channel, which can be disrupted by noise. This classical definition belongs to what Sperber & Wilson (1995) call the *code model*. Whether language can or cannot be described in terms of the code model of communication is not the object of this paper. Relevance Theory has given very serious arguments against it. What is more, Gricean pragmatics had shown before that verbal communication cannot be a mere matter of encoding and decoding, but needs inference. The inferential model proposed by Sperber & Wilson thus aims to complete the code model, and the division of labour between linguistics and pragmatics is just the consequence of two different cognitive processes: a linguistic

and modular process, including phonological, syntactic and semantic decoding, and a pragmatic and non-modular one (the central system of the thought) in which inference takes place.

The difference between modular cognitive processes and central cognitive ones has been defended in Fodor's theory of modularity of mind. Though Fodor strongly claimed that investigating the central system of the mind is impossible, Sperber & Wilson have made the very strong hypothesis that the study of pragmatics could shed light on the central system properties.

The new definition of communication proposed by Relevance Theory implies a two stages process, which can be illustrated by the following schema (Figure 1):

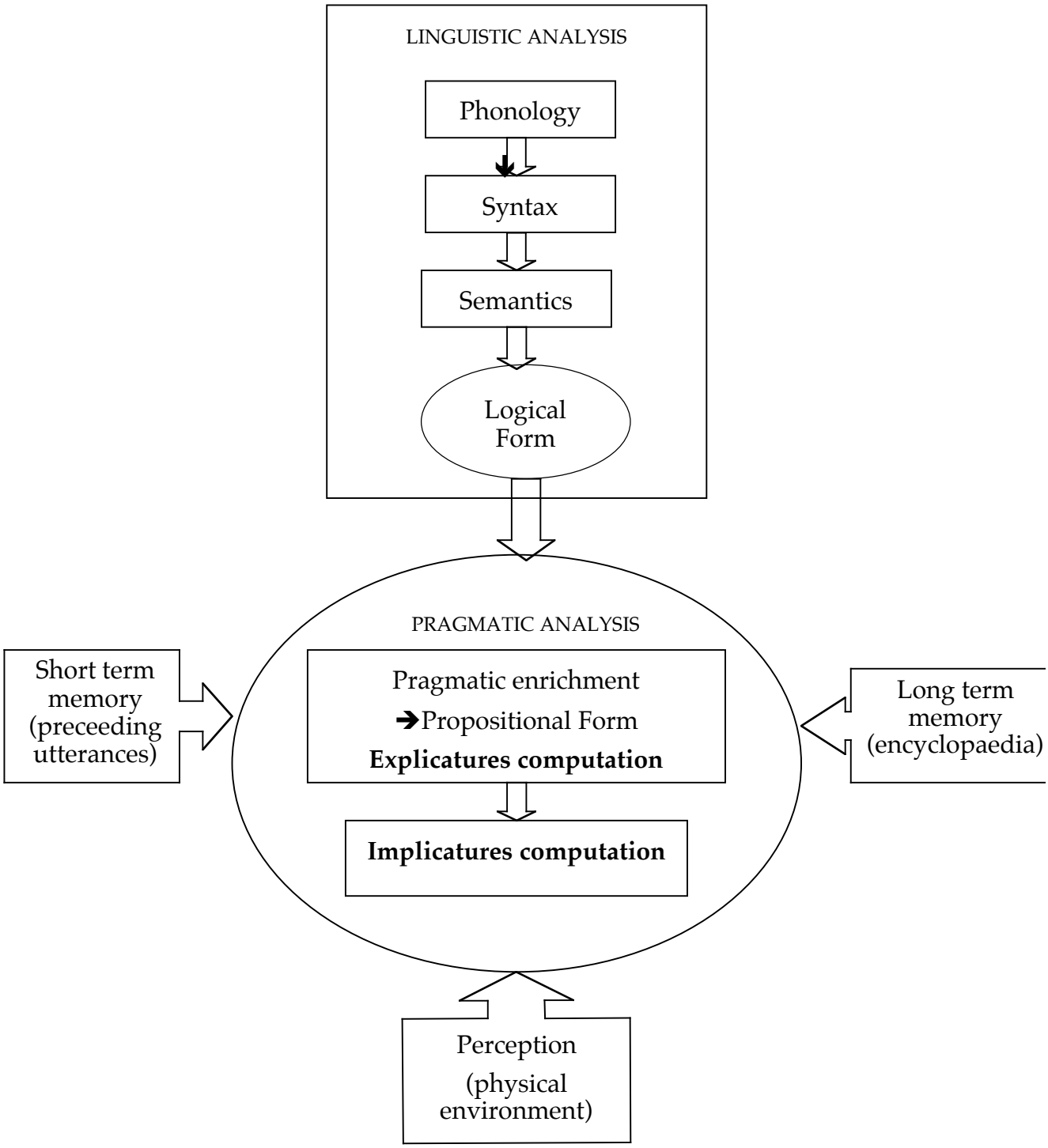


Figure 1: a hierarchic analysis of linguistic and pragmatic processes

This two stages model of analysis has two purposes: explaining how pragmatic enrichment happens, and specifying the types of information contributing to the process. The assumptions of Relevance Theory are that informations coming from difference sources are relevant here: linguistic information and non-linguistic information, coming from short-term and long-term memory as well as from perception of the physical environment.

One of the main challenges of pragmatics is to contribute to the analysis of the interaction between linguistic and non-linguistic informations. In this paper, I would like to address this issue through a special emphasis on the classical distinction between conceptual and procedural information.

3. Conceptual and procedural information

In cognitive sciences, at least in the cognitivist paradigm, it is currently accepted that two types of information have to be computed in order to access a mental representation: information about mental representations (notably concepts) and information about operations applicable to them. Regarding the first type, mental representations corresponding to concepts can be either Generic Mental Representations (GMRs), delimitating categories, or Specific Mental Representations (SMRs), corresponding to individuals. Mental Representations (Mrs), whether generic or specific, contain different fields or entries, some of which may be left empty : an *address*, a *logical entry*, a *spatial* entry locating the entity to which the MR refers, and a *lexical entry*[1]. As a first approximation[2], we can represent a MR as follows:

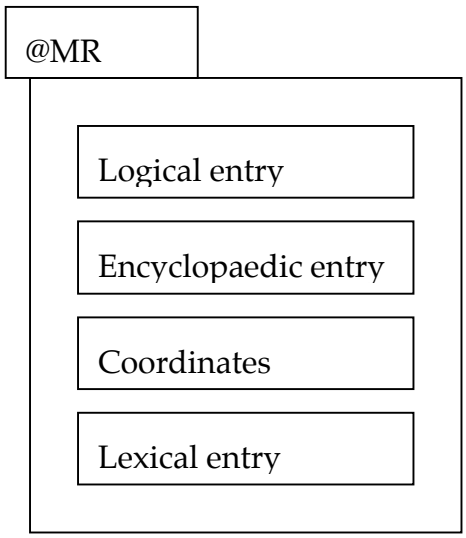


Figure 2: the structure of a MR

The second type of information concerns the operations that can be applied to MRs. Those are the following: creation, grouping, extraction, merge and fusion. These operations can be triggered by informations from perception and from utterances, i.e. linguistic information. Linguistic information can take two forms: *conceptual* and *procedural*. These are generally seen as originating in different classes of morphemes: open class morphemes for conceptual information, closed class morphemes for procedural information. Though this is an oversimplification, in that the same morpheme can have both conceptual and procedural content, it is supported by one fact at least: RMs, whether generic or specific, generally correspond to open classes morphemes; however, operations on them can be triggered by both conceptual and procedural information. We will here be mainly

[1] For a more complete description of the Theory of Mental Representations (TMR), see Reboul 2000.

[2] I will give a much more precise description of conceptual information in the chapter devoted to Mental representation Theory.

concerned with the cases where they are triggered by procedural information. Concepts corresponding to closed classes lexical items, which are the paradigmatic cases of procedural lexical items, are not dealt with in TRM, which of course does not mean that they are not mentally represented. Their representations should include lexical information as well as logical information, but, given that they do not correspond to individuals, they do not include encyclopaedic or spatial entries.

In the next section, I will make the assumption that logical entries of procedural items can be accounted for in a featural way: procedural information bears features, and the type of featural properties I will present is time direction, that is, the fact that procedural information encoded in discourse connectives and tenses bear directional features. For instance, I will make the hypothesis that the French connective *et* (*and*) bears a strong forward feature (*F*) and French Simple Past encodes a weak forward feature (*f*).

If the distinction between conceptual information and procedural information seems justified at both linguistic and cognitive levels, the question whether some lexical item could be conceptual and procedural is worth asking. In Moeschler (to appear), I proposed to represent this situation by the following figure:

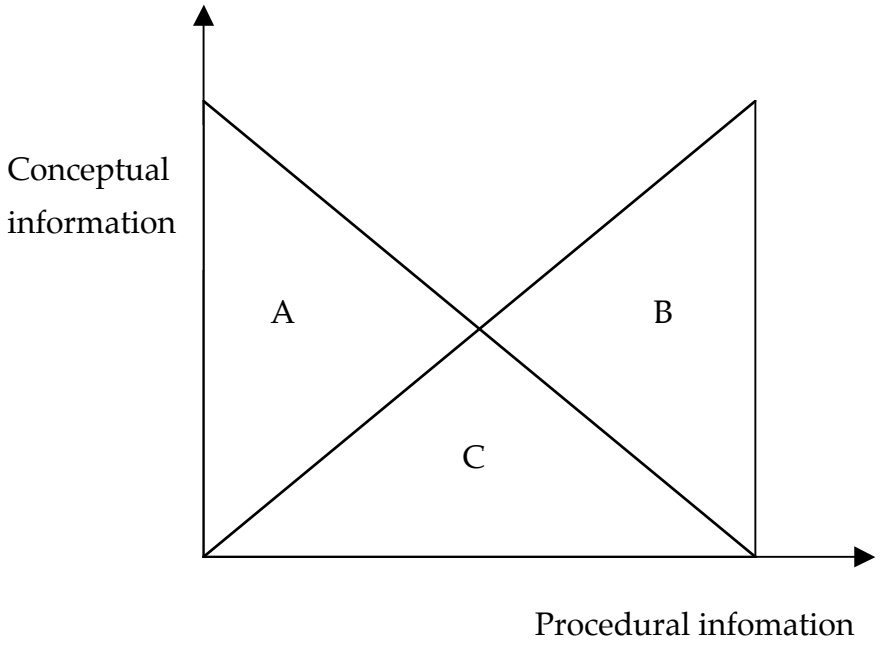


Figure 3: conceptual and procedural information

Three surfaces are here visible (A, B and C), showing the possible combination of conceptual information and procedural information. Let us suppose that any point on these surfaces is defined by a function from a degree *x* of conceptual information onto a degree *y* of procedural information. Two main surfaces are thus defined:

1. Triangle A defines conceptual lexicon: the weakness of procedural information is proportional to the strength of conceptual information.
2. Triangle B yields procedural information: the more the conceptual information diminishes, the more procedural content increases.

The interesting point is that a new triangle can be defined as the intersection of A and B (triangle C). In this surface, we meet coordinates being (i) strongly procedural-weakly conceptual, (ii) weakly procedural-weakly conceptual and (iii) mid-

procedural and mid-conceptual. I claim that discourse connectives belong to C. Broadly speaking, I make the hypothesis that these three domains correspond respectively to lexicon (conceptual information), tenses (morphological procedural expressions) and connectives (propositional procedural expressions), as shown in figure 4:

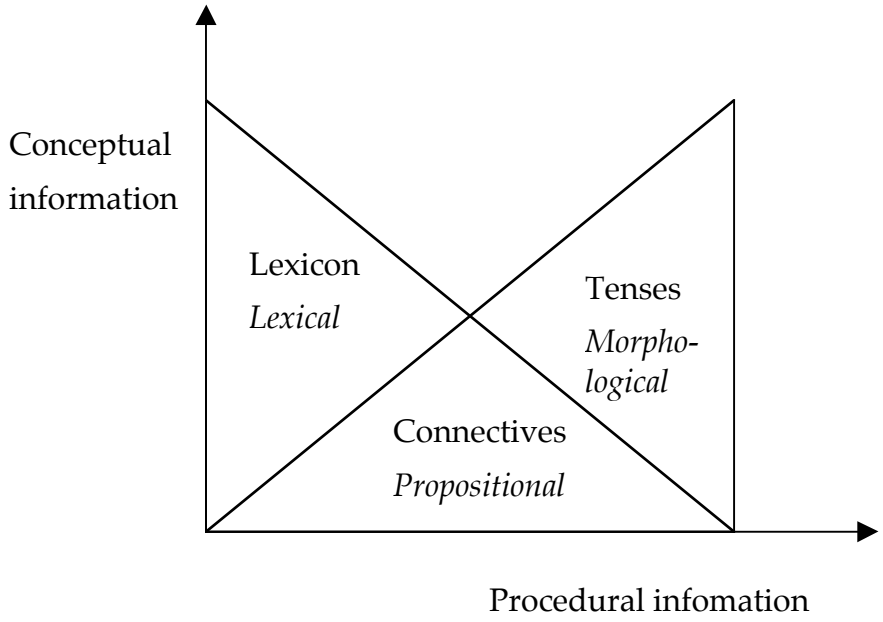


Figure 4: types of information

The relevant point is that for any type of category, we can define three subtypes, depending on whether they share strongly and/or weakly their procedural or conceptual properties. Here, for each category so defined, there are three subdivisions:

Conceptual	Procedural	Weak		Medium	Strong	
Weak		Lexicon (AUX)	Connectives (*et*)	Connectives (*ensuite*)	Connectives (*mais*)	Tenses (PS)
Medium		Lexicon (entities)		Connectives (*parce que*)	Tenses (PRES)	
Strong		Lexicon (events)		ø	Tenses (IMP)	

Figure 5: sub types of conceptual and procedural information

This classification is mainly tentative, and its purpose is to see to which extent the conceptual/procedural properties can be defined as functional. But one prediction can be made from this picture: a strong property is not enough in itself and must be completed by its converse, and a weak one by its strong converse.

Let us now introduce our model of pragmatic inference computation, the Directional Inferential Model (DIM).

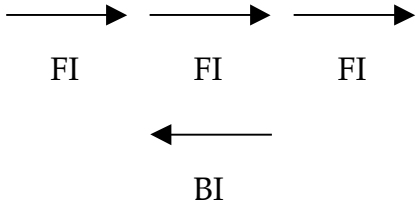
4. Directional Inferential Model

DIM is a pragmatic device devoted to the computation of directional inferences, that is time directions triggered by discourses about events. The main assumption of DIM is that event's interpretation is mainly a question of time direction, not of time

location. In other words, we do not compute time through temporal coordinates, but though general directions. DIM reduces the time directions to *forward direction* and *backward direction*, giving rise respectively to *forward inference* (FI) and *backward inference* (BI).[3] The following schemata represent different possible discourse configurations:

a. 

Yesterday, I went to th e Geneva airport, got my boarding card and flew to Luton.

b. 

Yesterday, I went to the Geneva airport and got my boarding card. I had no flight ticket with me. Then I flew to Luton.

Figure 6: FI and BI in discourse

In DIM, we assume, moreover, that Directional Inferences (DIs) are the result of directional features attached to different types of information. The nature of lexical items bearing directional features is crucial, because they do not have the same force.

In DIM, we assume that two main hierarchies organise the types of information active in processing DIs: contextual information vs. linguistic information on the one hand, and procedural vs. conceptual information on the second. Among procedural informations, we further distinguish scopes: propositional vs. morphological. We obtain the following hierarchy of information:

A. Contextual information (CI) is stronger than linguistic information.
B. Procedural information (PI) is stronger than conceptual information.
C. Propositional procedural information is stronger than morphologically incorporated procedural information.

These three principles organise the linguistic system and its use. Principle A means that a contextual assumption can defeat a DI inferred on the basis of the sole linguistic information. Principle B states that tenses are stronger than concepts, for instance causally related concepts. Finally, principle C claims that all functional materials in C or higher than T in the syntactic tree are stronger than tenses located in the head of TP.[4] Let us illustrate these principles.

[3] Following Kayne's antisymmetry principle (Kayne 1994), BI is not the converse of FI.

[4] We assume that principles A and B are universal, whereas principle C is not. The distinction between incorporated and propositional information can be irrelevant in many languages. For instance, Swahili is a language (cf. Kang'ethe 2002) in which incorporated tense markers are strong directional features.

Principle A

In (1) and (2), time direction comes from the projection of a causal rule (3) onto a contextual assumption (4):

(1) Marie a poussé Jean. Il est tombé. FI^{ok}, BI*
Mary pushed John. He fell.

(2) Jean est tombé. Marie l'a poussé FI*, BI^{ok}
John fell. Mary pushed him

(3) (push, x, y) CAUSE (fall, y)

(4) If Mary pushed John, then he fell.

The normal contextual implication is thus (5):

(5) John fell after Mary pushed him.

Now we can imagine another contextual assumption, for instance (6). (1) and (2) would then have respectively a BI and a FI reading, allowing the new contextual implication (7):

(6) Mary pushed John and then John fell.

(7) Mary pushed John because John fell.

These readings are certainly less probable than the standard forward (1) and backward (2) ones, but could occur in appropriate contexts. Thus, Principle A explains not only standard cases, but also non-standard ones.

Principle B

French Passé Simple and Plus-Que-Parfait are the best illustrations of Principle B (*procedural information is stronger than conceptual information*). In examples (8) to (9), procedural information given by tenses either confirms or defeats conceptual information given by the *push-fall* causal rule:

(8) Marie poussa Jean. Il tomba FI^{ok}
Mary pushed John. He fell

(9) Jean tomba. Marie le poussa FI^{ok}, BI*
John fell. Mary pushed him

(10) Marie poussa Jean. Il était tombé BI^{ok}, FI*
Mary pushed John. He had fallen

(11) Jean tomba. Marie l'avait poussé BI^{ok}
John fell. Mary had pushed him

Note here that the constraints imposed by tenses differ from that imposed by the contextual assumption: no alternative reading to FI and BI are possible here. Optimal discourses will be those that violate less constraints. Thus (8) and (11) are better in terms of optimality than (9) and (10).

Principle C

What happens when we add functional material like temporal or causal connectives? The prediction is that DI is given by connectives, which implies that connectives can impose a time direction opposite to the one encoded by tenses. If this is the case, the discourse should be interpretable, but less optimal than in cases where PI is co-directional:

(12) Marie poussa Jean et il tomba FI^{ok}
Mary pushed John and he fell

(13) Jean tomba et Marie le poussa FI^{ok}
John fell and Mary pushed him

(14) Marie poussa Jean, parce qu'il était tombé BI^{ok}
Mary pushed John, because he had fallen

(15) Jean tomba, parce que Marie l'avait poussé BI^{ok}
John fell, because Mary had pushed him

In these examples, where PIs converge, (12) is more optimal than (13), and (14) more optimal than (13), because in (12) and (15), there is no conflict between CI and PI, whereas in (13) and (14) such conflicts arise. In examples like (16) and (17) where PIs diverge, interpretation processes become more difficult, and judgments of acceptability vary. For instance, (16) could be rejected from a normative point of view, whereas (17) is almost impossible to process because of the divergence between the time directions encoded by the connective (*et*) and by the tense (Plus-Que-Parfait):

(16) Jean tomba, parce que Marie le poussa BI^{ok}
John fell, because Marie pushed him

(17) Marie poussa Jean et il était tombé FI$^{??}$
Marie pushed John and he had fallen

We must now introduce two other principles to explain the way we combine in computation temporal and directional information. We have to introduce a new notion, that is, *directional feature*.

Directional features and principles D and E

Linguistic and non-linguistic informations are hierarchical in the sense given in principles A, B and C. But the computation of DI is based on atomic information encoded in directional features. We will examine here only two different features, forward and backward features. Features can on the other hand be weak or strong. So the DI device contains four types of features:

Features	Forward	Backward
Weak	f	b
Strong	F	B

Figure 7: types of Directional Features

The hierarchy of information given by principles A to C is not reflected in the typology of features, as Figure 8 shows. The reason is that we are looking for general principles and do not want to have an *ad hoc* hierarchy of features.

Information	Feature
Contextual	Strong
Procedural-propositional	Strong
Procedural-morphological	Weak
Conceptual	Weak

Figure 8: types of features and types of information

How can we then compute DI relatively to directional features? We must introduce two subsequent principles:

D. A strong feature wins over a weak feature or a string of weak features.

E. A weak feature or a string of weak features must be licensed by a strong feature.

These principles simply state that for a DI to emerge a strong feature must be accessible to license the DI. The following algorithm makes explicit the procedure of DI assignation:

Algorithm of DI assignation

1. assign to utterance U1 a directional feature in function of the directional features born by U1's linguistic expressions;
2. if possible, build a contextual assumption which is a development of a conceptual rule;
3. assign to utterance U2 a directional feature relative to directional features born by U2's linguistic expressions;
4. compute DI of discourse [U1-U2];
5. license DI via an accessible contextual assumption.

Here is an illustration of this algorithm, which gives a crucial role to contextual assumption in the licensing of DI:

(18) Jean tomba, parce que Marie l'avait poussé
John fell, because Mary had pushed him

1. assignation of directional feature to U1 (*Jean tomba*)
   tomba = $[f_{PS}]$
   U1 : $[f]_{U1}$
2. no contextual assumption can be formed from the concept *fall*
3. assignation of directional feature to U2 (*parce que Marie l'avait poussé*)
   parce que = $[B_{PQ}]$
   avait V-é = $[b_{PQP}]$
   poussé = $[b_P]$
   U2: $[B_{PQ}]$ & $[b_{PQP}]$ & $[b_P] = [B]_{U2}$
4. computation of [U1-U2]'s DI
   [U1-U2]: $[f]_{U1}$ & $[B]_{U2} = [B]_{U1\text{-}U2}$
5. license DI *via* an accessible contextual assumption: access to the contextual assumption "if Mary pushes John, then John falls", which licenses the interpretation $[B]_{U1\text{-}U2}$.

5. Mental Representation Theory

The question I would like to address now is the following: how can we represent events and event relations in discourse, and more precisely, how can we represent the result of discourse interpretation given in (18)? I will outline a simple way of representing eventualities and their relations in TMR.

I defined earlier a mental representation as a set of entries under an address. The representation of an event implies the following entries or fields:

a. an address;

b. a logical entry;

c. an encyclopaedic entry, containing an access to the concept (GMR), its participants (thematic roles constrained by the predicate) and the mention of the spatial-temporal circumstances;

d. a sequencing entry and

e. a lexical entry.

Here is a canonical way of representing an event-MR:

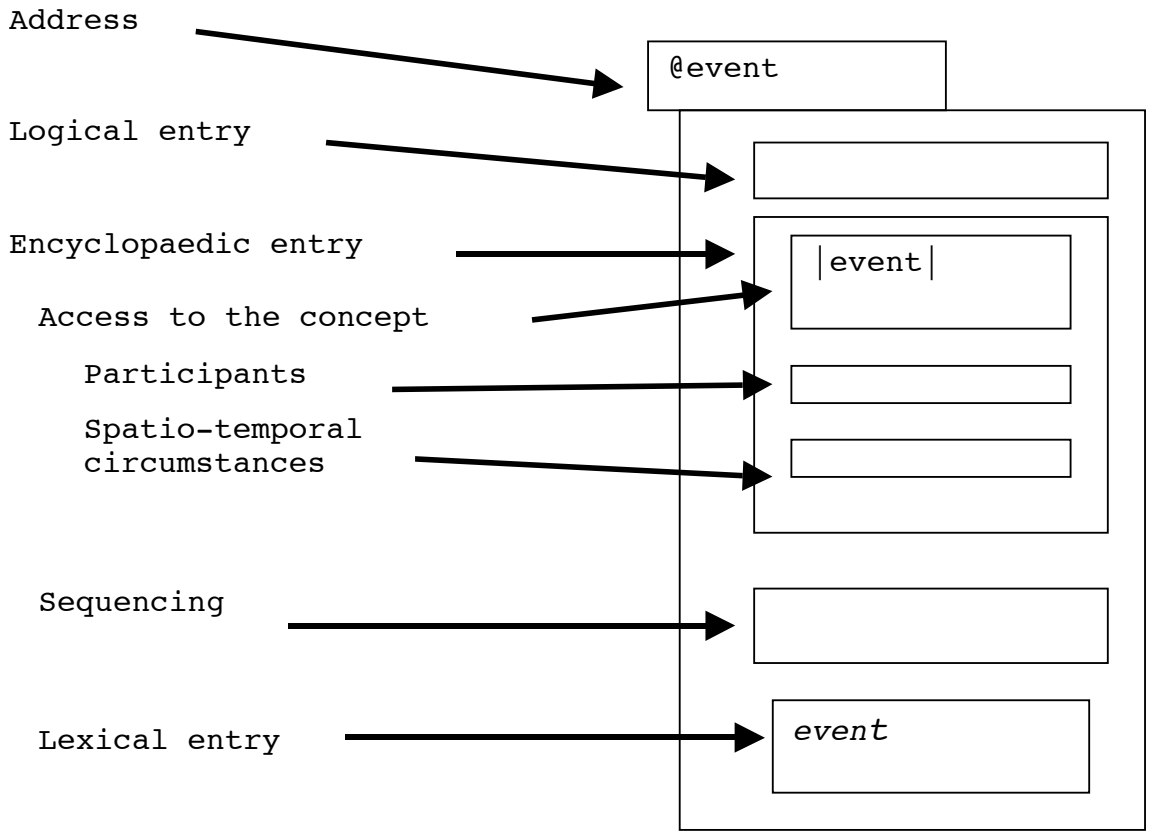


Figure 9: event-MR composition

As said above, operations on MRs include creation, grouping, extraction, duplication, suppression and merge. We will be mainly concerned here by grouping, which I will shortly describe, following Reboul (2000). Let us consider (19):

(19) a. A man and a woman came in the pub.

b. They sat at a table in front.

The interpretation of NPs *a man* and *a woman* is a two-step process:

1. Each of the referential expression triggers the creation of an object-RM, respectively [@man] and [@woman]. Figure 10 represents this first step:

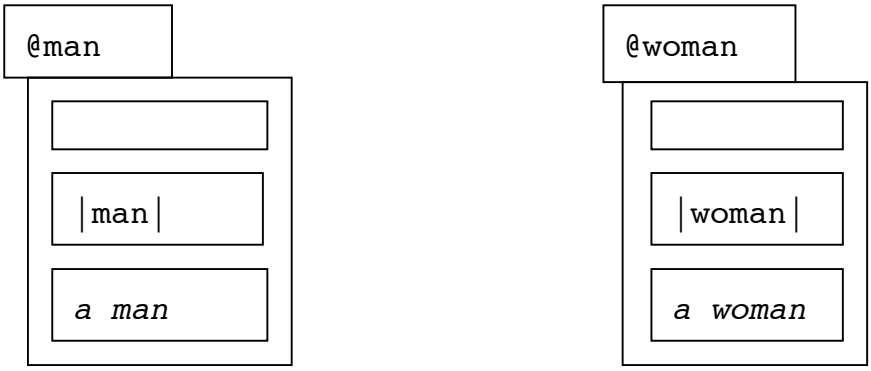


Figure 10: first step in the interpretation of a man and a woman

a. The second step is the grouping of these two MRs, an operation triggered by *and*. This operation creates a new MR, [@man&woman], the result of the union of the two original MRs.

Figure 11 represents the result of the grouping:

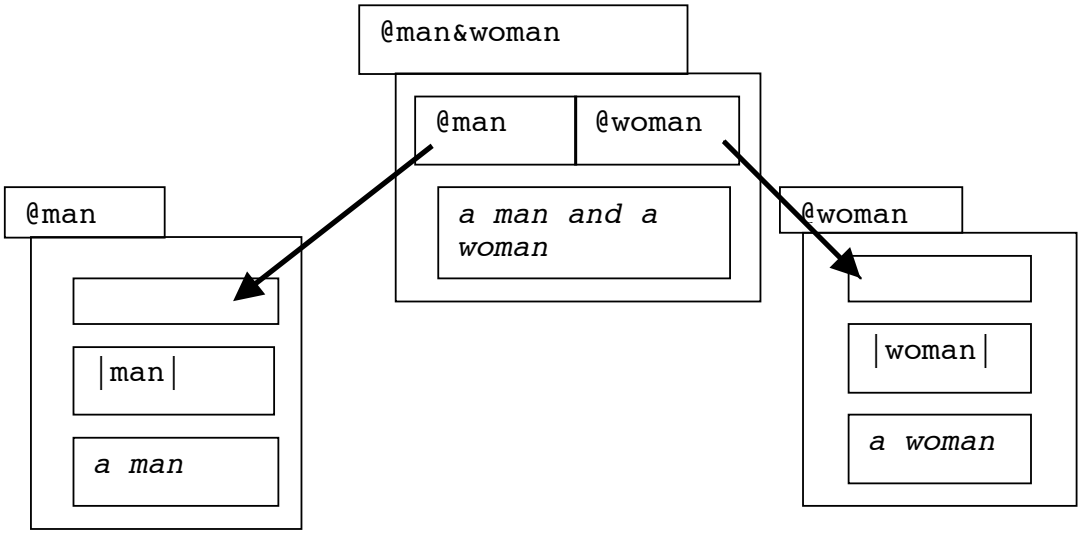


Figure 11: Grouping of two objects-MR

Now, we would like to examine how grouping operates on event-MRs. Let us take an example of FI, given in Louis de Saussure's thesis (Saussure 2000):

(20) The plane landed and the passengers came down.

In this example, we begin with two event-MRs that is, [@landing] and [@coming_down], respectively associated to the sentences *the plane landed* and *the passengers came down*. The second step of the processing is the grouping of the two events, whose purpose is mainly to give as output the sequencing of the events.[5] Figure 12 represents the grouping of the events, which allows the representation of the temporal relation:

[5] The question of the triggering of the grouping will be discussed in the next section.

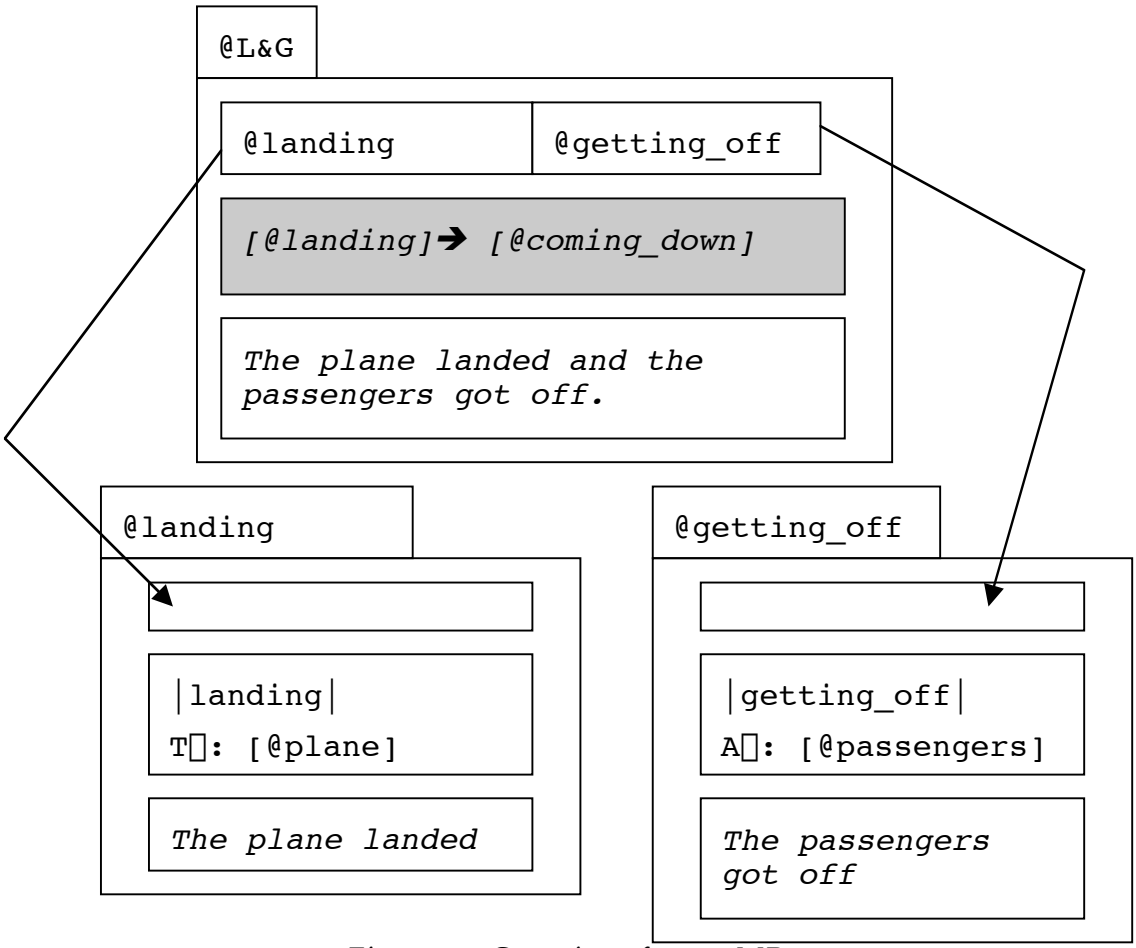


Figure 12: Grouping of event-MRs

Temporal sequencing is indicated by the arrow in the grey area in figure 12. The whole should be read as *the event corresponding to [@landing] precedes the event corresponding to [@coming_down].*

The grouping of the event could have occurred without the presence of *and*. Example (21) gives rise to the same DI, that is, FI:

(21) The plane landed. The passengers got off.

(22) e1 (*the plane landed*) < e2 (*the passengers got off*)

The question is now the following: what is the contribution of procedural information and conceptual information to the grouping of events? How does accessible contextual information interact with linguistic information?

6. Connectives and grouping

Here are some provisional answers:

1. Procedural information encodes operations on MRs (grouping for connectives) and types of sequencing (tenses).
2. Conceptual information gives rise to event-MRs, and allows the construction of Contextual Hypotheses, when a conceptual rule is inferable through the concept.

In what follows, I will not develop the procedural properties of tenses, but I will give some information about connectives. Following Moeschler (2001), connectives are procedural expression sharing the following properties:

a. Connectives contribute to discourse interpretation: they allow inferences that could not have occurred without them (Carston 1993).
b. The content of connectives is mainly procedural; whenever they have some conceptual content, the conceptual content is about the type of relation and the procedural content is about the computation of contextual effects.
c. Connectives bear strong features; when their conceptual content is about eventualities, their procedural content is a strong directional feature.
d. Connectives have as domain event-MR; their function is triggering MRs' grouping and sequencing.

Let us now develop these four points.

a. The first question is about the actual contribution of connectives to discourse interpretation. One of our hypotheses is that connectives allow inferences that could not occur without them. That about, then, the contrast between (23)-(24) and (25)-(26):

(23) The plane landed and the passengers came down.

(24) The plane landed. The passengers came down.

(25) John fell, because Mary had pushed him.

(26) John fell. Mary had pushed him.

At first sight, *and* and *because* do not seem to be involved in DI processes, because FI and BI can be drawn without them. Now, do they still contribute to inferential processes? The answer seems positive, relative to the permutation of connectives and the order of utterances:

(27) ?? The plane landed, because the passengers came down.

(28) ?? John fell and Mary had pushed him.

(29) ? The passengers came down, because the plane landed.

(30) ? Mary had pushed John and John fell.

The semantic contribution of connectives is far from null. But how is it then that the same inferences can be drawn with and without connectives? Here is our answer: a connective simply makes a connexion explicit. Now, a new question arises: what is the difference between an explicit and an implicit connexion?

b. The second problem is the nature of the information encoded by connectives. Here are our hypotheses about *and* and *because*:

   i. *and* encodes a strong forward feature F as procedural information and its conceptual content is restricted to the relation to events;

   ii. *because* encodes a strong backward feature B as procedural information and its conceptual information is the causal nature of the relation.

What seems to be important here is that the nature of the content encoded by *and* and *because* is not the same and they are not symmetrical: *because* makes causality and temporal inversion explicit, whereas *and* is only associated to temporal order. When causality is inferable, the reason lies in a conceptual rule, not in the presence of the connective, as example (31) shows:

(31) The glass fell and it broke.

(32) CAUSE(<fall, glass>, <break, glass>)

Moreover, causality is unidirectional, as examples (33)-(34) show it:

(33) ?? The glass broke and it fell.

(34) The glass fell, because it broke.

Now, we have a partial and negative response to the question. Using a connective to make explicit a connexion implies that there is no conflict between its procedural content and/or its conceptual content and an accessible causal conceptual rule. If such a conflict arises, the discourse is incoherent.

The positive answer is given in point c.

c. Connective bear strong directional features. This property is restricted to event relations. The reason why strong features are born by connective is empirical and theoretical:

i. The empirical motivation is the following: any connective imposes the reading its directional feature bears; thus in case of conflicts between its strong feature and the content of an accessible causal conceptual rule, the discourse is pragmatically unacceptable.

ii. The theoretical motivation is the following: if any connective bears a conceptual/procedural content, then this content must play a role in discourse interpretation.

Two different cases have been discussed. In the first one, the connective confirms what could have been drawn without it: the difference lies in the explicit (presence of a connective) or the implicit (no connective) nature of the relation. In the second case, the content of the connective is in conflict to other directional features (the result is generally odd). But there is a third case, in which without any connective, the interpretation of the discourse is not possible. It's this case which justifies the use of MRs, and more precisely MRs grouping and sequencing.

d. Our fourth proposition is that connectives connect events, and have as domain event-MRs. Two points must here been developed:

i. The first question is to which extent we can understand utterances whose content does not imply any causal or temporal relation. Let's contrast the following examples:

(35) Abi has stopped eating apple pie. Axel has begun to eat salad.

(36) Abi has stopped eating apple pie, because Axel has begun to eat salad.

The interpretation of (35) is totally underspecified: the speaker could have conveyed that the event <Abi has stopped eating apple pie> contrasts or precedes another event <Axel eats salad>, which is made explicit by connectives *but* and *and*:

(37) Abi has stopped eating apple pie, *but* Axel has begun to eat salad.

(38) Abi has stopped eating apple pie, *and* Axel has begun to eat salad.

What is then the function of a connective? A connective makes manifest, that is, explicit, a specific relation between events, when this cannot be inferred because *no conceptual or causal relation are shared by events*. In the case of (36), the addressee must infer a casual relation, and even if this process is not easy or obvious, he can justify it by some more or less manifest contextual

assumptions: for instance, Axel is eating salad in such a disgusting way that his sister gave up her dessert.

We can now make the following proposition: a connective contributes (i) to the drawing of conclusions which could not be derived without it, and (ii) to specify the nature of the temporal relation represented through event-MRs grouping.

ii. The second question is the precise nature of the contribution of the connectives' conceptual and/or procedural content to events grouping. Do they have a similar or a different role? Let's discuss this last point by comparing *and* and *because*.

And and *because* contrast on two points: on procedural content (DI) on the one hand (*F* for *and*, *B* for *because*), and on their strong (*because*) vs. weak (*and*) conceptual content on the other. The question is now how we can represent this difference.

Now, I would like to show how these information are translated in the MR format, for instance in order to give different event-MRs for discourses (39)-(40):

(39) John fell, because Mary pushed him.

(40) Mary pushed John and he fell.

The solution is to add to the grouping of event-MRs a new entry for the causal relation in the representation of (39), which will be absent in that for (40), as shown in Figures 13 and 14:

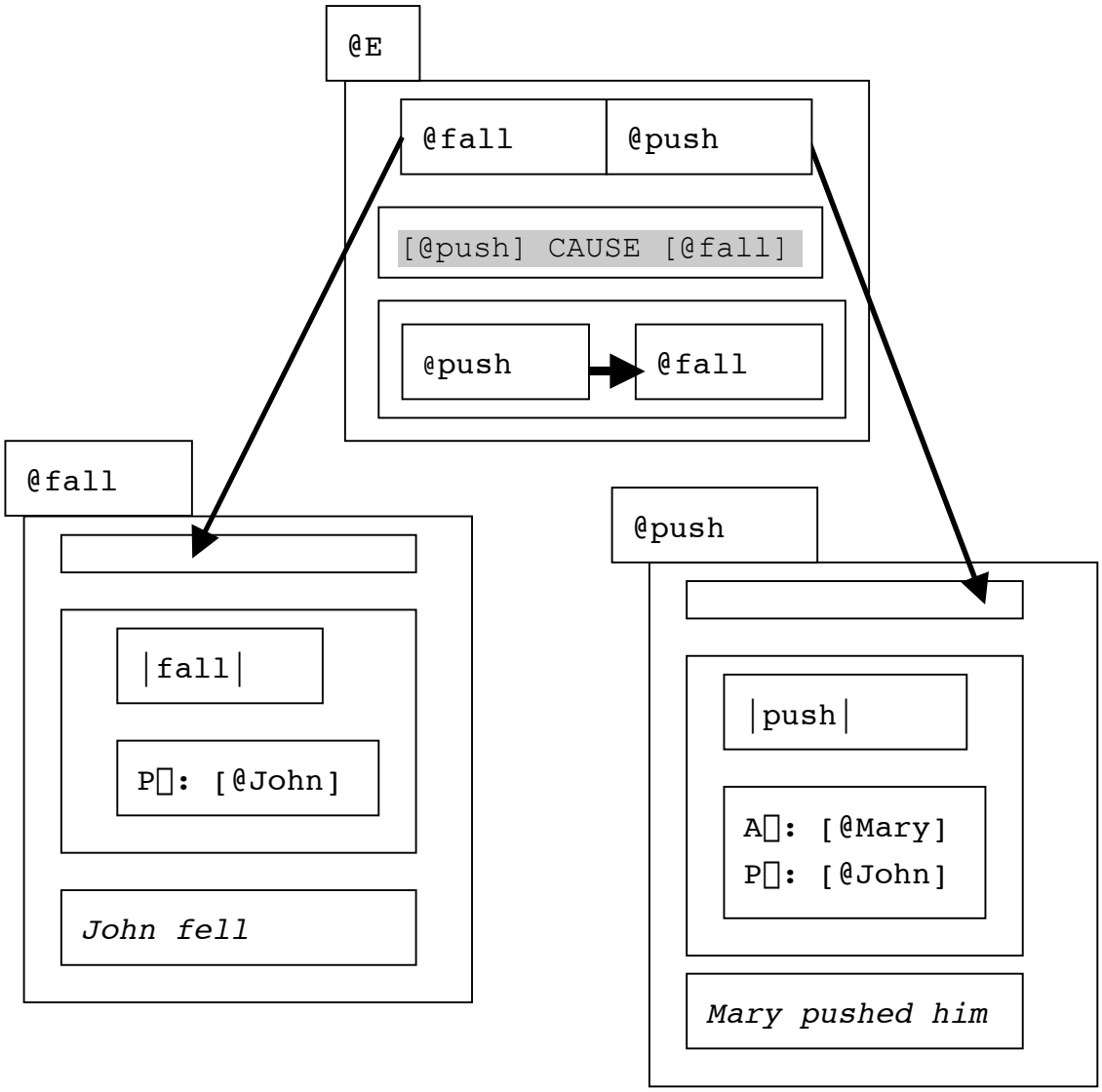


Figure 13: TMR-representation for (39)

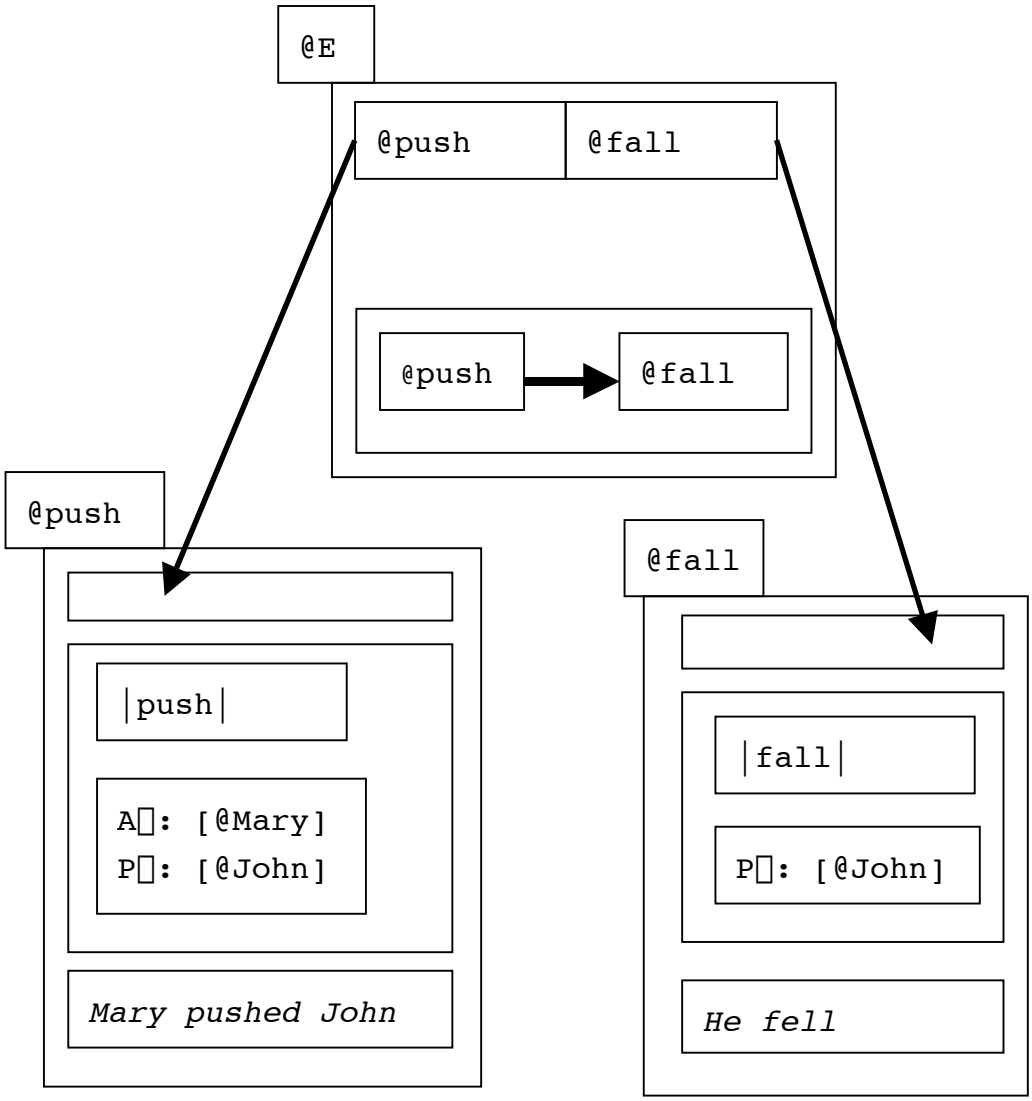


Figure 14: MR-format for (40)

7. Conclusion

We can now answer the question on the contribution of the connectives to interpretation of discourse: the contribution of connectives is relative to their conceptual and procedural contents. But, in any case, they trigger event-MRs groupings, which means that, depending on their conceptual and procedural content, they not only minimize processing efforts (Blakemore 1987), but also constrain the type of content they are connecting and interact with other procedural information in the utterances they connect.

This approach of procedural expressions must be, of course, improved at the empirical level and at the theoretical level. But if our basic assumptions are correct, our proposal should have at least one virtue: procedural and conceptual items differ with respect to the relative strengths of their conceptual and procedural contents.

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