A Theory of Discourse Structure and Discourse Coherence

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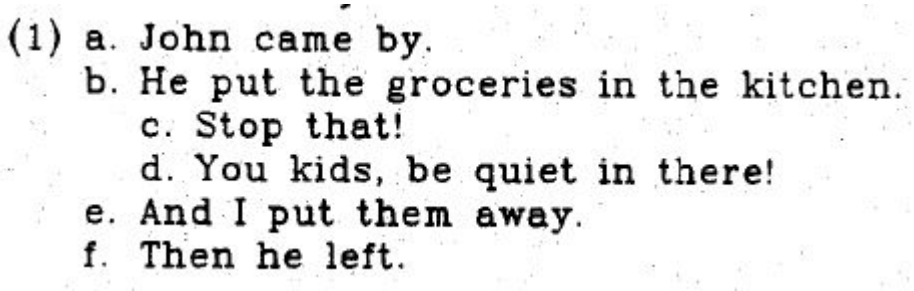
The DDM: a Model of Discourse Structural and Semantic Relations

Discourse & DDM



(1) a. John came by.
b. He put the groceries in the kitchen.
c. Stop that!
d. You kids, be quiet in there!
e. And I put them away.
f. Then he left.

- Everyday talk is interrupted, repaired and resumed. Despite disfluencies, discontinuations, apparent incoherence and complexity of everyday language use, speakers can flawlessly recover anaphoric references, correctly interpret spatial and temporal deixis and consistently display a clear orientation in their utterance.
- Dynamic Discourse Model (DDM): a comprehensive theory of discourse structural and semantic relations, provides much of the machinery necessary to account for the complex segmentation processes above the level of the sentence.
    - Discourse parser:
        - Input: clause encoding a single proposition
        - Output: Discourse History Parse Tree (recursive embedding of discourse constituents)

The Discourse Unit Type Hierarchy

in a hierarchy of discourse constituents of various Types:

Formal units of linguistic structure

- Clauses (primitive proposition-carrying units)
- Discourse constituent unit DCU
- Discourse Unit (genre unit): stories, adjacency pairs, task-oriented dialogs, arguments
- Speech event and Interaction (extra-linguistic units)

Except Interaction, these Types have sub-Types and their associated Grammars. The Grammar specifies for each unit of that type its legal constituents and their permissible orders.

Modelling Discourse Structure by means of a Discourse Parser

- Parser makes use of individual Type and sub-Type Grammars
  - No limit number of times each individual parser might be used of
  - nor constraints placed on the order

➔ Insoluble problem: anything can happen in any discourse.

➔ Discourse Structure must account for the highly individual possibly and unexpected structure of any given discourse, meanwhile speakers are normally clear about the kind of discourse activity underway and have very definite expectations about what is likely to happen next.

Discourse Coordination & Subordination

Coordination

- topic chain, narratives and other list structures, sequences of moves in Discourse Units and Speech Events and sequences of independent Interactions.

- Constraints:

1. Between a completed Discourse Unit, Speech Event or Interaction and a unit of the same Type.

2. Between two Moves of the same Discourse Unit or Speech Event if the new Move is a legal Next Move according to the grammar of the Type of Discourse Unit or Speech Event being parsed.

3. Between two dcu's or Discourse Units if the propositional content of the New unit and the propositional content of its prospective sister(s) bear a similar Instantiation relation to a common propositional element: justifying, motivating, making more specific, repairing, or otherwise expanding on the content of that element.

Subordination

- interruptions, elaborations, asides and parentheticals.
- Disturb the orderly development of some ongoing discourse activity
- Unconstrained.

3 The “Discourse constituent unit”: building block of discourse

3 Overview of DCU

- In DDM, the discourse constituent unit(DCU) is the "building block" of a discourse.
- several types identified: List DCU, Elaboration DCU, Expansion DCU
- recursive: multiple DCUs form larger DCUs by means of coordination and subordination

3.2 The Topic Chain

3.2.1 Simple topic-chain dcu

(2) a. John is a blond
b. He weighs about 215
c. He's got a nice disposition
d. He works as a guard at the bank.

(2) e. He has 100,000 white cells, **or**
f. He is a spy for the Other Side, **or**
g. He used to be a compulsive joke teller.

- some "generally known and knowable property of John at the present time"
- restrictive structure: Topic-Chain dcu specify complex semantic constraint sets by the constituent of DCU

3.2 The Topic Chain

3.2.2 Chronologically ordered topic-chain dcu

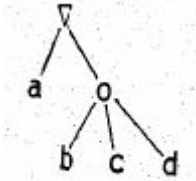
(3) a. Jim took all the home ec courses in high school.
b. He was a cook in the army.
c. He took the Cordon Bleu course in France last year.

- relation by asserting a sequential step in a process

3.3 The Expansion DCU (1)

- proposition encoded in 1 dcu is expanded upon semantically by the propositional content of clauses making up an immediately following dcu.

(4) a. Jim is a great cook.
b. He took all the home ec courses in high school.
c. He was a cook in the Army.
d. He took the Cordon Bleu Course in France last year.

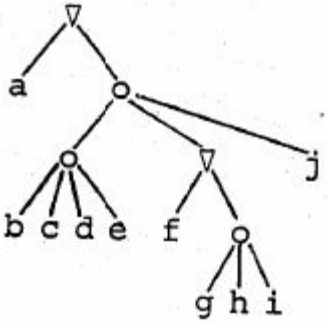


[Figure 4A]

- DDM treats a dcu which expands on a proposition encoded in the discourse in an immediately preceding clause as subordinate to the clause on which it expands
    - chronologically ordered topic-chain DCU b-c-d (coordination) is subordinated with respect to a

3.3 The Expansion DCU (2) more complex

(5) a. Tell me about the young men in town.
b. John is a blond.
c. He weighs about 215.
d. He's got a very nice disposition
e. He's a very good athlete, too.
f. Jim is a great cook.
g. He took all the home ec courses in high school.
h. He was a cook in the Army
i. He took the Cordon Bleu Course in France last year.
j. and Harry is the scholar in the group. etc.



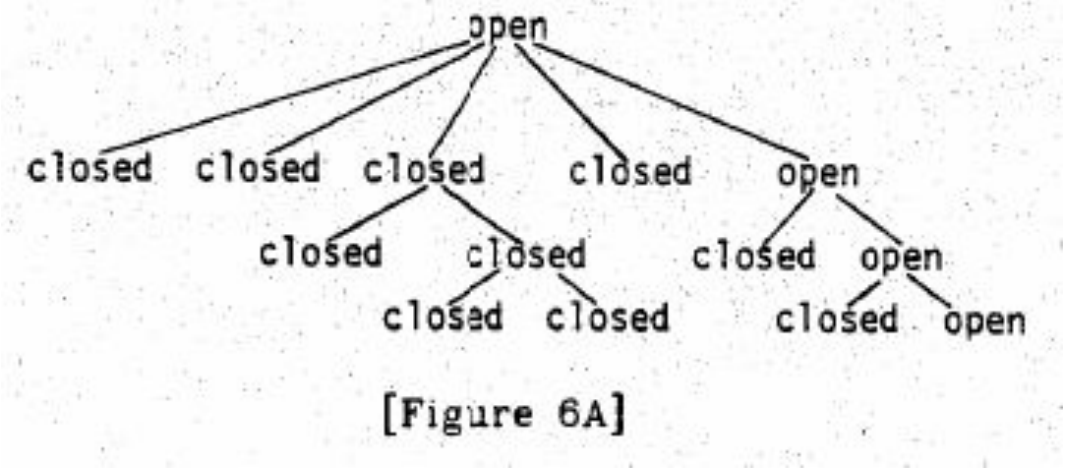
[Figure 5A]

- List DCU: John-dcu, Jim-dc and Harry-dcu -> appropriate reply to a
  - set/element Relation exists between the extension of the NP in the request dcu and the topics of the 3 constituents of the List dcu which suppletes the requested information

Discourse Parsing

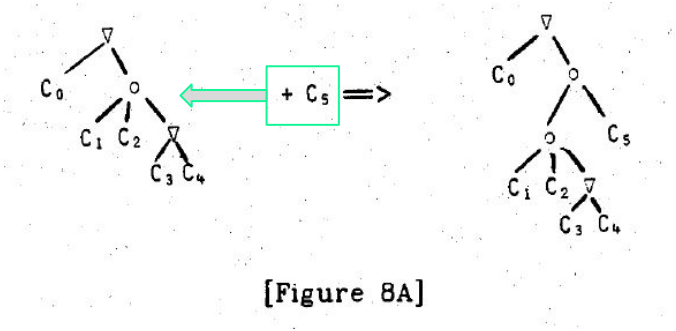
Structural Accessibility

- closed: completed or abandoned
- open: accessible to constituent by coordination or subordination



Discourse Adjoin

- a clause is subordinated relative to a DCU at a structurally accessible position, but cannot be coordinated to a unit dominated by that node because of a failure of semantic congruence
- the new unit may be adjoined to the existing unit at a new coordination node immediately dominating the accessible constituent



[Figure 8A]

Semantic Value Frame

- Semantic interpretation of a constituent helps to determine a given constituent is coordinated or subordinated.
- Sach Frame consists of slots which are filled by semantic parameters abstracted from the content, encoding form, and syntagmatic placement of each constituent parsed.
    - Parameters: Place, Time, Activity, Participant Set, Goals and Attributes
- In addition, the Frame may specify purely structural information, ie an alternation between good and bad attributes in list matching Attributes with Individuals

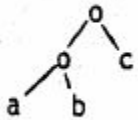
Discourse Coherence

The difference in acceptability: match between semantic development and clause placement

(2B)
a. John is a blond
b. He weighs about 215
c. He's got a nice disposition.
d. He works as a guard at the bank.
? e. He has 100,000 white cells.
?? f. He loves ice cream.

(2C)
a. John is blond.
b. He weighs about 215
c. He's got a nice disposition.
d. He works as a guard at the bank.
e. He loves ice cream
? f. He has 100,000 white cells.

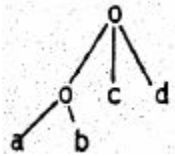
a <John, NOW, blond>



< John, NOW, GENERALLY KNOWN ATTRIBUTES>
<John, NOW, Character trait>

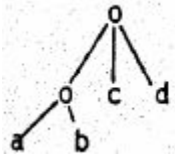
[Figure C]

<John, NOW, PHYSICAL ATTRIBUTES>
<John, NOW, weight>



< John, NOW, GENERALLY KNOWN ATTRIBUTES>
:John, NOW, Employment Attribute>

The difference in acceptability: match between semantic development and clause placement



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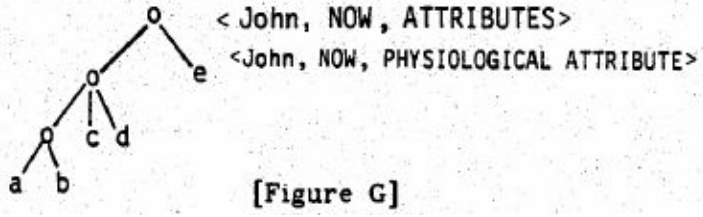
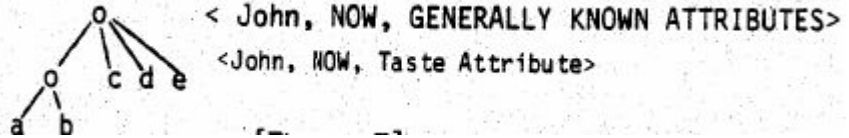
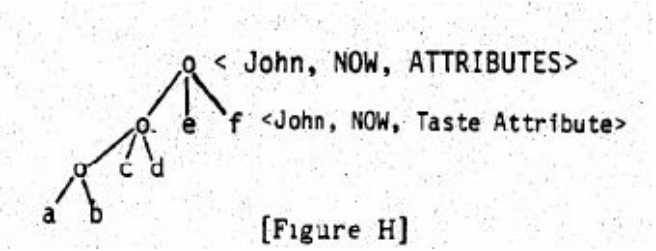
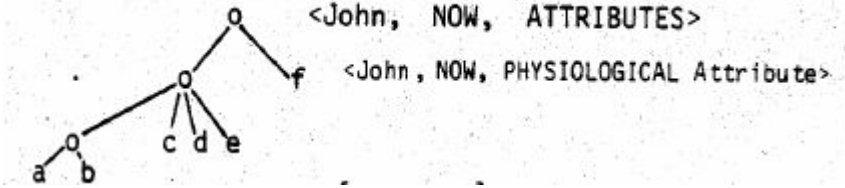


[Figure G]



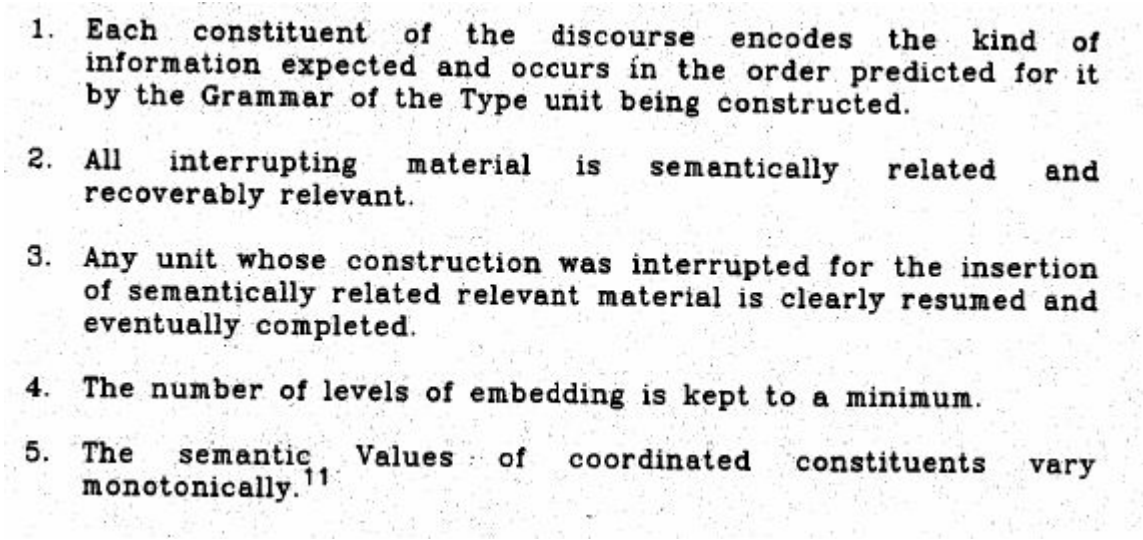


[Figure H]



Constraints on Discourse Coherence

- General rules: group essentially all units at the same level of structure in Discourse History Parse Tree whose Values permit contextualization under the same higher level unit.



1. Each constituent of the discourse encodes the kind of information expected and occurs in the order predicted for it by the Grammar of the Type unit being constructed.

2. All interrupting material is semantically related and recoverably relevant.

3. Any unit whose construction was interrupted for the insertion of semantically related relevant material is clearly resumed and eventually completed.

4. The number of levels of embedding is kept to a minimum.

5. The semantic Values of coordinated constituents vary monotonically.[11]

- When these constraints are met, structural coordination and subordination will match semantic congruence between the semantic values of the units involved. Discourse surface (syntactic) relations among units will match up with the underlying discourse semantic relations among the units.

Conclusion

- The author claims that discourse has the form of a Tree, and that human discourse processing involves an awareness of which constituents are resumable and which ones are no longer structurally resumable.
- Openness and closedness in discourse structural property (compared to Reichman's Context-Space formalism)
- Grosz's Task Oriented Dialogs (semantic tree which a discourse structure mirrored the structure of the instantiated Speech Event): anaphoric elements may refer back to the structurally accessible referents in the Discourse History Parse Trees.

1. determining the units initiated in English by There-sentences, wh- and it-cleft sentences, sentences with full nominals in subject position, sentences containing preposed temporal and locative adverbials and other marked sentential encoding forms. (See Ehrlich and Koster, 1983; Prince, 1980; Scha, 1982, 1984.)

2. explaining the functioning of discourse anaphora involving both pronomial and zero forms; and,

3. elucidating the scope and functioning of conjunctions, and the use of particles and lexical items such as well, so, anyway, etc. in English which clearly have discourse segmentation functions. (see Gulich 1970; Polanyi and Scha 1983, forthcoming; Schiffrin, forthcoming.)