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Coherence in Hypertext

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1 Introduction

At first sight hypertext does not look like a good subject for research on coherence. Hypertext is non-linear text, and coherence is typically defined for linear text. So coherence does not seem to be involved in hypertext at all. But on closer inspection it emerges that some of the basic structural problems with hypertexts *are* classical problems of coherence.

My central question for this paper is: What does hypertext show us about coherence? But of course the direction of enquiry could easily be reversed by asking: What does the theory of coherence teach us about the properties of hypertext? It is interesting to see that until recently much of the literature on hypertext has been written by computer specialists, specialists in technical documentation and educational psychologists (e.g. Shneiderman 1992; Kuhlen 1991; Horton 1990; Hofmann and Simon 1995; contributions to Jonassen and Mandl 1990). Many of these authors have little contact with pragmatics and text linguistics. As a consequence, some of the aspects which are central to a pragmatic view of language use still seem to be under-represented in research on hypertext. It might therefore be useful to see what the hypertext world looks like from the vantage point of a pragmatic theory of texts. The following remarks are intended to take a few steps in this direction.

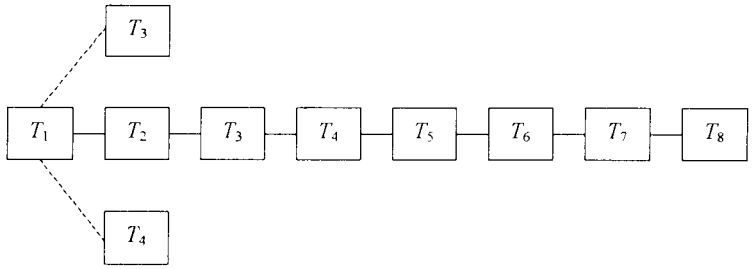
For my theoretical framework I shall assume an action-theoretic concept of text and dialogue (cf. Fritz 1982).[1] In this framework coherence is regarded as a guiding principle for text production and as the basis for understanding texts. *Understanding* a text consists in seeing the relevant internal and external connections of textual elements. *Interpreting* a text consists in searching for and pointing out its relevant connections. According to this theory, coherence is based on the interaction of different organising principles of texts or dialogues. In the prototypical case, authors and readers make use of the whole bundle of organising principles to produce a use or a reading of a text which has strong coherence properties. Such a reading is functionally coherent, topically coherent, it is coherent in its knowledge management, and its

coherence is signalled by the appropriate use of cohesive ties. In accordance with these different organising principles we can distinguish different *aspects* of coherence and coherence failure, and we can diagnose different *degrees* of coherence.

2 What is hypertext?

The difference between text and hypertext mainly concerns the following structural and pragmatic properties: A text is a sequence of textual elements T_1 ... T_n (i.e. sentences or sequences of sentences) which can be used to perform a sequence of linguistic acts, including the development of a topic. From the point of view of its author a text can be represented as a pruned tree, as shown in diagram (1).

(1)

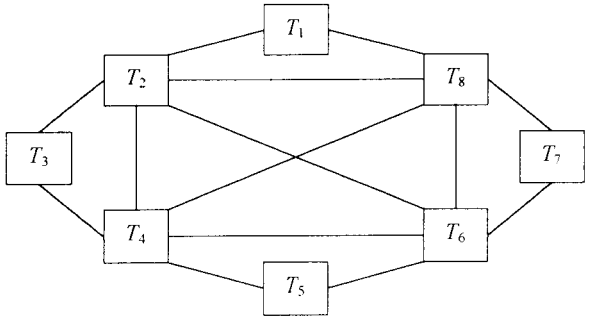


At every node the *author* has to make up his mind which textual element to position at this particular decision point. From the point of view of the *reader* the textual elements simply form a fixed sequence.

Hypertext, on the other hand, is basically a network of textual elements, sometimes with hierarchical structures built in. These elements are usually called *topics* and the connections provided between the topics are called *links*. Diagram (2) shows the structure of a hypertext consisting of the textual elements T_1 ... T_8 connected by various links.

Generally, a reader may go through the network in any direction he or she chooses. For the user hypertext is therefore not really non-linear but multi-linear. A sequence produced by travelling through such a network is called a *path*. In the context of this paper it is paths that I am particularly interested in, for a path is something like a text and therefore it can be evaluated for its coherence properties.

(2)



Incidentally, it is revealing that the basic building blocks of a hypertext should be called *topics*. This terminology lacks the sophistication that was reached in studies on coherence some 20 years ago. It is common knowledge in text linguistics that individual segments of text - sentences or paragraphs - can be used not only to present a topic but that they are also used in a function. In other words, a certain paragraph is not only *about*, say, matters of environment but it also functions as a description, as a narrative or as an explanation. Recent work in hypertexts has caught up in this respect by introducing the concept of "typed topic". A typed topic is something like a topic with a functional tag like "argument" or "explanation" or "example" etc. In the following I shall not use the term *topics* to refer to the basic building blocks of texts. Instead, I shall use the expression *textual elements*.

3 Paths in hypertext

In discussing the construction of paths through a network I shall mainly address the following question: How do users of a hypertext make sense of the path they are following? Generally speaking, within the chosen framework the answer to this question is: Users make sense of a path or a segment of a path by seeing sequences of textual elements as realisations of sequencing patterns and by drawing inferences on the basis of their local and general knowledge. But I should like to be somewhat more specific than that.

Basically, paths are produced in two different ways, either as *pre-defined paths*, which the author presents to the user, or as *self-selected paths*, which the user himself chooses from different options available at the individual nodes within the chosen network. In a way, self-selected paths are the real *raison d'être* for hypertext as an interactive medium. Here the responsibility for making sense of paths is largely shifted to the user. The fact that the user

himself chooses from alternatives reminds one of the activities of a speaker in dialogue. Therefore the structure of dialogues obviously provides a useful object of comparison for the interactive aspect of hypertext.

In most hypertexts for instructional purposes, like online help-systems or teaching materials, we find a mixture of self-selected and pre-defined paths. As a rule these systems combine search procedures for reference information, a network of individual instruction elements and so-called guided tours or tutorials as the following contents of "Word Help" show:

(3)

Word Help Contents

To learn how to use Help, press F1.

Using Word
Step-by-step instructions to help you complete your tasks

Examples and Demos
Visual examples and demonstrations to help you learn Word

Reference Information
Answers to common questions; tips; and guides to terminology, commands, and the keyboard

Programming with Microsoft Word
Complete reference information about the WordBasic macro language

Technical Support
Available support options so that you can get the most from your Microsoft product

Pre-defined paths are closely related to normal linear text. Therefore their conditions of coherence are quite similar to those of ordinary text. I shall give two examples, both from the Windows 3.1 online help system, the first one quite successful, the second one much less so.

Example 1: If you want to know how to create a table in Winword 6.0, you go to the index of the help system and click your way through to the following overview "creating a table".

(4)

Creating a table

Examples and Demos

Use tables to organize information and create interesting page layouts with side-by-side columns of text and graphics. In a table, as on a spreadsheet, you work with rows and columns of cells.

To create a table

1. Position the insertion point where you want to create a table.
2. On the Standard toolbar, click the Insert Table button.

Insert Table button

A grid appears below the button.

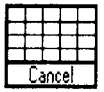


Table grid

3. Drag over the grid until you've selected the number of rows and columns you want, and then release the mouse button.

Word positions the insertion point in the first cell of the table. You can immediately type text in the table. For more information, see Typing or deleting text in a table.

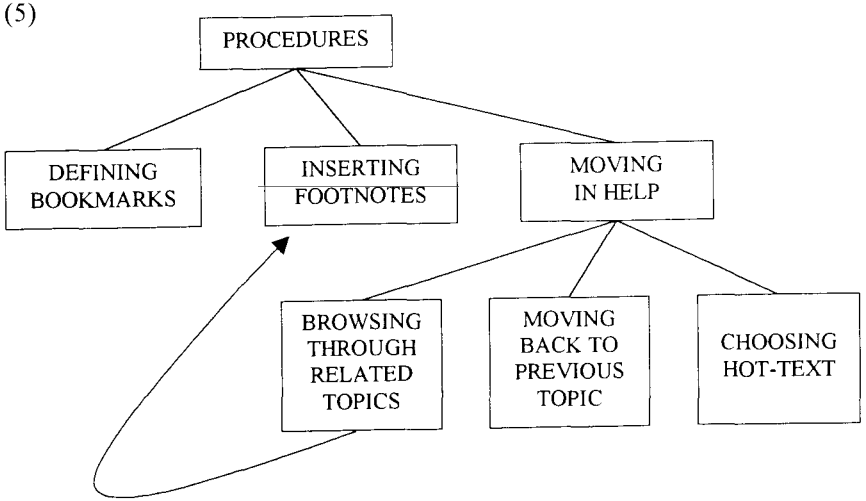
From this element links are provided to various other textual elements. The links are marked by underlined expressions.[2] If you choose "examples and demos" you move to a sequence of small two-part units, in which a step-by-step instruction is regularly followed by a demonstration of these steps. You go from instruction to demonstration by clicking on the button "next" and from there you go to the next instruction by clicking again on "next" and so on. What we have here is a functional sequence of the basic type: overview *followed by* instruction *followed by* demonstration. This is a type of functional sequence with which we are familiar from all kinds of teaching, for example in sports, but also from paper versions of technical documentation. So in this case the global coherence is grounded on a functional sequencing pattern and on the continuity of topic.

At this point I should like to digress to briefly discuss an interesting minor type of sequence which is well known in dialogue analysis. In (4) you find the word *cells* underlined in the fourth line. If, as a user, you happen not to know what a cell is you can click on the word *cells* and a little pop-up window

will tell you: "A cell is the basic unit of a table. In a table, the intersection of a row and a column forms one cell". If you already knew what rows and columns are, you now know what a cell is, if not, you will have to move back to the index and get the necessary information there. From the point of view of coherence these small explanatory elements are very similar to footnotes or parenthetical remarks in written text or to so-called side sequences in dialogue (cf. Jefferson 1972). Sequences of this type interrupt the ongoing dialogue for a clarification request, followed by a clarification, and lead directly back to the point of departure. As a kind of question-answer sequence they are themselves strictly coherent, and as a regular type of insertion they do not disturb the coherence of the ongoing dialogue either - unless they occur too frequently.

A second type of pre-defined path is a sequence of related topics that can be accessed by repeatedly clicking the "forward" button. This kind of path is of course subject to strict conditions of topic coherence. And if anything goes wrong there - which it easily does - the reader is justifiably upset. My second example comes from the introduction to Windows Help. This section of hypertext has a typical hierarchical structure which is, however, not actually shown to the user. In order to demonstrate what happens to the unsuspecting user I shall give a reconstruction of the respective hierarchy in the following tree diagram.

(5)



At a certain point in your path you reach the textual element "procedures", which contains subtopics like "defining bookmarks", "inserting footnotes in a help topic", "moving in help". Now let us assume you would like to know more about "moving in help". You click the button "moving in help" and this leads you to another button "browsing through related help topics". This sounds interesting, so you move to this topic. There it says that if you want to reach the nearest related topic you have to click on the "forward" button. So that is what you do. And what you get is the topic "Inserting a footnote" Unfortunately, this is not a closely related topic at all. It is far away on the next higher rung of the hierarchy and seems to have got into the pre-defined path by mistake. As a novice user you will either think that "Inserting a footnote" is a strange method of moving in the help system, which is a misguided hypothesis, or you will suspect that this is a blatant case of topical incoherence, which in fact it is. It is pleasing to know that this flaw is no longer found in later versions of the relevant software.

4 Coherence in self-selected paths

I shall now continue with a few remarks on coherence in self-selected paths, concentrating on two problems: 1. What difference does it make if one arrives at a textual element from different directions? 2. How does the forward-looking construction of coherence in search procedures work? At this point it is necessary to mention the most powerful factor that guides the user's search for coherence relations in the first place: "the simple fact that users *expect* purposeful, important relationships between linked materials" (Landow 1991: 83).

On account of the formal properties of networks, we can arrive at a certain textual element of a hypertext in the course of different paths. Therefore the same textual element may play different roles in different paths. From the point of view of the author this means that he must formulate the respective chunk of text in a way that is neutral in respect of different directions of access. In practice this means that he has to refrain from using anaphoric devices like pronouns, as the anchor for a backwards-looking cross-reference may not be available. From the point of view of the user it means that in constructing the coherence of the respective path he may have to attribute different functions to the textual element, depending on the preceding history of his path of reading. How is this possible? This is, in fact, quite easy to explain, because it is only a special case of a very general phenomenon, and a particularly interesting one. It is a well-known fact that a portion of text can be used in different ways, depending on the sequential position and the respective knowledge available to the addressee at a particular point in the history of a particular communication. In action-theoretic terms one could describe an example of this kind of situation as follows: *By* describing a certain procedure to someone who is not

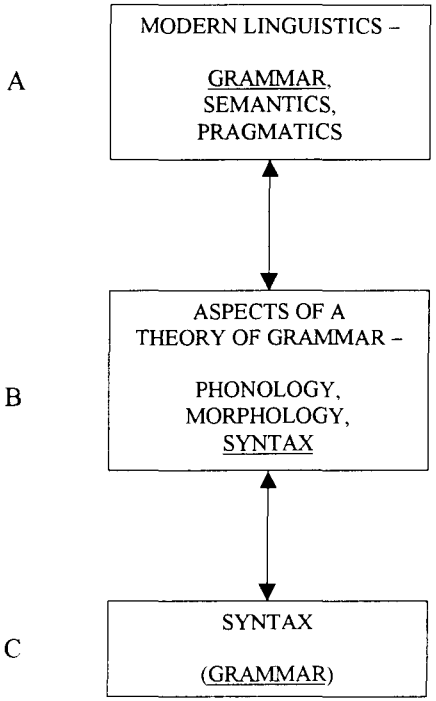
familiar with it, one can *explain* it to him. Or: *By* describing this procedure to someone who has read the description before, one can *remind* him of the content of this description. Both patterns are very frequent in instructional discourse. This kind of structure - explaining *by* describing - was called level-generation in Goldman's "Theory of Human Action" (1970) and has been an important element in other theories of action as well, e.g. in Heringer's "Practical Semantics" (1978). It is obvious that level-generation plays a very powerful role in the creation of coherent paths in hypertext. Level-generation also works for topics. Presupposing appropriate knowledge one can talk *about* X by talking *about* Y, e.g. one can talk about environmental problems by talking about heating systems.

Due to the hierarchical structuring of many hypertext topics, a very frequent difference of topic interpretation exists between a top-down or a bottom-up interpretation. If you move down a hierarchy in a sequence A-B-C, B will be interpreted as more specific than A, and C as more specific than B. Alternatively, if you move up the same hierarchy, B will be interpreted as more general than C, and A as more general than B. The following is a very simple example which is modelled on structures we frequently find in instructional hypertexts, e.g. in the teaching programme "Hyperlinguistics" (cf. Ansel and Jucker 1992; Suter 1995). A short paragraph containing the main aspects of a theory of grammar (e.g. phonology, morphology, syntax and lexicon) can be approached from two different directions, i.e. with two different questions in mind. If we read this paragraph as a partial answer to the question "What aspects of language does modern linguistics deal with?", its function is to specify these aspects. If, however, we read the paragraph as an answer to the question "Where does syntax belong in an overall theory of grammar?", it is embedded in a different topic. In the first case it belongs to the topic "aspects of language", in the second case it belongs to the topic "syntax".

All this is theoretically perfectly straightforward. In practice, however, the user must permanently monitor where he is moving in the hierarchical structure. And at times this is a very difficult task to perform.

The fact that one can approach textual elements from different directions also poses interesting problems for knowledge management. In writing good linear text we try to arrange information in such a fashion that one building block of knowledge is placed before the next. If understanding block B presupposes knowledge from block A, we position A in front of B and so on. Of course, basic conditions of understanding apply to hypertext in the same way as they apply to linear text. Therefore, as users of hypertext, we must often be prepared to compensate for the lack of systematic knowledge management. One of the strategies for this purpose is what David Lewis (1979) called "accommodation". If, for example, a bit of text begins with the statement "The

(6)



three major components of a grammar are syntax, morphology and phonology ..." we are entitled to infer that there are also minor components of grammar, which are however not dealt with in this particular paragraph. So we continue with this assumption, and perhaps at some point we will find out if the assumption is correct or not. Accommodation is one important type of inference for the construction of coherence.

Now I turn to forward-looking strategies of coherence construction. If you can navigate wherever you like in a network of textual elements, you have to provide coherence for yourself. This concerns local coherence as well as global coherence, including the particular problem of orientation in "hyperspace". Problems of coherence in free navigation are particularly interesting, because they lead us to the less prototypical forms of coherence where reliance on explicit indicators and standard sequences is reduced.

A case in point are the strategies we use in searching for information on a certain topic. If a user browses through a network in search of information, he has to employ a forward-looking strategy. He has to decide which textual

elements look like hopeful candidates for a useful continuation of his search. This is somewhat like bringing your interlocutor to make a relevant contribution to a conversation. Once the chosen chunk of text is presented on the screen the user has to decide whether it can be incorporated into his knowledge base as a useful contribution or not. To give an example: If you search the Internet for information on coherence, you will come across entries like "The role of coherence in ultrafast chemical reactions" or "coherence modulating reactive rates" in physics. Maybe your interest in coherence includes the term *coherence* and its different uses. In this case you might look at these topics. If not, you will look somewhere else. You might go to the homepage of a colleague and find a useful reference to her papers on "discourse markers". From there you could move on to information on the "Purdue University On-line Writing Lab". There you might get side-tracked a bit - but of course you realise that you are being side-tracked - and after a while you move back to other items on the list. Maybe you will modify your search topic as you go along and in so doing you will modify your criteria of coherence. And maybe you will learn new factual connections, and this may also change your criteria of coherence. If you document your search path you will probably be able to justify each individual move as a relevant step and therefore you will classify the whole path as coherent.[3] I realise that there are many open questions at this point. But I shall leave it at that.

5 Conclusions

The main results of my enquiry can be summarised as follows: In hypertext we get everything from very strong prototypical coherence in guided tours to minimal coherence in browsing. In self-selected paths forward-looking coherence construction plays an important role, whereas the role of classical cohesive ties between textual elements is minimised. As for the concept of coherence, my observations on hypertext seem to confirm the following picture: In creating coherence we standardly draw on a whole bundle of organising principles, but it is possible to deviate from this kind of prototype in various ways:

(i) It is obviously possible to reduce the amount of cohesive ties like pronouns, conjunctions and adverbs without losing too much coherence between textual elements. This loss in explicit marking of coherence relations is compensated by implicit factors, i.e. by the reader's knowledge of standard sequencing patterns like functional sequencing, topical progression and so on. Where this is not the case, lack of explicit marking will often be made up for by means of inferences.

(ii) A second type of deviation from the prototype consists in a reduction of the prominence of the functional aspect, which is effected by relying mainly or exclusively on the connection of topics. In such a case we can still understand a sequence of utterances as connected text. This kind of functional vagueness is quite common in the internal sequencing of descriptive texts. As many hypertexts are basically descriptive, it is not surprising that we should frequently find this property in them.

(iii) Within the field of topic-connectedness we find a gradient from strict topical coherence to fairly loose topical connections. In extreme cases we may see a connection between paragraphs on the basis of a simple reference to the same object, even if we would not accept this object as the actual topic of either of these paragraphs. This is a very weak connection but it may be enough for us to make sense of a sequence of textual elements. And that, of course, is what coherence is all about.

(iv) In many cases the use of criteria of relevance and coherence is dynamic. What we consider relevant and in which respect we consider it relevant may change as we go along, and therefore the way in which we interpret a sequence as coherent may also change as we go along. This is not to say that a judgement of coherence is a matter of arbitrary decision. If we had to justify such a judgement, we would have to explain our interpretation in terms of the organising principles of texts and dialogues.

Notes

1. Recent developments of this framework can be found in Fritz (1991), (1994), (1997).
2. Names of links are important cohesive elements in hypertext. As opposed to most cohesive ties in linear text, they are forward-looking.
3. For the connection between the concepts of relevance and coherence cf. Carlson (1983: 45f.) and Hintikka (1986).

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