

Chapter 12
**Supporting Navigation in Digital
Environments:
A Narrative Approach**
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You do not see narrative and navigation in the same sentence every day. This theoretical paper tries to work out the connections between the two concepts and how studies on narratives can assist those on navigational issues in digital environments. I will argue that some dimensions of navigation and narrative overlap and that a narrative mode of organizing digital information environments, may be helpful and supportive for users disfavored by other modes of organization, e.g. spatial and semantic. Finally I will present some concrete design suggestions.

Supporting Navigation in Digital Environments: A Narrative Approach

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ABSTRACT

You do not see *narrative* and *navigation* in the same sentence every day. This theoretical paper tries to work out the connections between the two concepts and how studies on narratives can assist those on navigational issues in digital environments. I will argue that some dimensions of navigation and narrative overlap and that a narrative mode of organizing digital information environments, may be helpful and supportive for users disfavored by other modes of organization, e.g. spatial and semantic. Finally I will present some concrete design suggestions.

INTRODUCTION: ORGANIZATIONAL MODES OF ENVIRONMENTS

Unlike real geographical space, digital environments can be manipulated and designed to an amazingly large degree. Depending on how the designer chooses to organize the environment, it will give rise to different types of experiences in the user/player/reader/navigator. Dourish & Chalmers (1994) identifies three major modes of information navigation used in present interfaces.

Some systems embrace the *spatial* paradigm and structure the information according to some geographical, 'real space' notion. For instance, in '3D' graphic CD-ROMs, visual muds and chat software or *Cooperative Virtual Environments* (CVE) and immersive environments, the objects are related spatially, like *left-right*, *upwards-downwards*, *below-above*, *outside-inside*, *in front of-behind* etc.. Here the navigator moves between the objects on the basis of their spatial connections and the experience is exclusively of a (geographically) spatial nature. These systems seek to simulate real-world 'geographical' space in order to exploit spatial competence in the user, and thereby support navigation and orientation in the information environment.

Another 'space' parameter that is attracting interest is *social navigation*, where the movement from one item to another is cued by the activity of another or a group of users (see e.g. Benyon & Höök, 1997; Dieberger, 1997a & 1997b). If you could apprehend what other people in general or specific individuals were doing (e.g. what node they are visiting, if a node is crowded or not), this could influence your own goals and navigational strategies (cf. muds and CVEs). This experience would be less spatial and more like moving around in a public environment, attending to other people's behavior and intentions (e.g. crowding).

Probably the most common structure, however, is *semantic* organization, where the objects in the environment are related through some semantic connection like *similar*, *alike*, *more/less general*, *associated*. Here the navigator moves between objects on the basis of the semantic interpretation of the content in the nodes (the web, many CD-ROMs, software help systems etc.). The navigator, I would argue, does not primarily apprehend the connections between the nodes in spatial terms (*left*, *below*, *upwards* etc.) but semantically. This navigational experience is thus less spatial, but more like experiencing an encyclopedia or a book.

In most digital environments, Dourish & Chalmer's modes are of course more or less intermingled. What is important to emphasize here is, however, that different modes not only generate different experiences but also exploit, or are depending on, different abilities in the user. Spatial environments exploit spatial competence; semantic environments make use of semantic competence etc.. This is of course also to say that users with low spatial ability will be less successful in a system that exploits spatial competence. Hypermedia, data bases and hierarchical file systems have been found to be of a spatial character in this sense, disfavoring navigators with low spatial ability (Dahlbäck et al., 1996; Benyon & Murray, 1993; Vicente & Williges, 1988).

In this context *narrative* is one alternative organizational mode that may turn out to be beneficial to some users in some situations. It is the purpose of this paper to examine what a narrative organization might look like and how it might be supportive. Before we go into an

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analysis of narrative reception, however, we have to take a quick look at the processes involved in navigational activity.

NAVIGATION

Navigation is a mental and physical activity involving an environment (geographical, informational or social) and a navigator, where the navigator is attending to or monitoring the environment along some form of goal (more or less specified). With this goal in mind, whether it be a geographical place or a task, the navigator chooses a path or otherwise interact with the environment in order to reach this goal. All these activities might be assisted by some earlier conceptualization of the environment (cognitive maps etc.) or with some form of tool (maps, signs, other people). Sometimes the quality of the goal in mind is rather poor at the beginning of the navigation, i.e. abstract and vague, but is improved during the way.

It is not my purpose here to define the concept of navigation but the above will do for the moment. It fits well with Downs & Steas's (1973) definition of wayfinding: orienting oneself in the environment, choosing the correct route, monitoring this route, and recognizing that the destination has been reached. It harmonizes with the research on geographical world navigation within cognitive psychology, where the navigator apprehends the environment in terms of *landmarks, paths* and *regions*, and forms mental conceptualizations (or cognitive 'maps') of the environment in these terms. It broadens the perspective from only geographical cases to other environments (social and informational), which includes navigation in hypermedia, libraries, data bases and in society (although these spaces for sure implies different kinds of navigational activities - cf. Dahlbäck et al., 1996). It takes into consideration Benyon & Höök's (1997) distinction between *wayfinding* and *exploration*, where the former term refers to the situation where the navigator has a clear and quite precise goal or task, and the latter applies when the navigator only has vague notions of the goal or just want some general overview (or even just want to explore some objects) - cf. also Darken & Sibert's (1997) terminology. In order to be a navigational instance, however, there has to *some* form of goal on part of the navigator. Thus, evaluating a navigational tool not only includes how fast or effective the tool is in situations with clear and specified goals, but also how well the tool support the navigator in formulating a more qualitative goal ('what one really wants' - cf. for instance *Alta Vista* and *Yahoo* on this point).

The definition above also emphasizes navigation as an cognitively active process (monitoring, goal formulating, choosing route etc.), marking distance visavi the case of *transportation* where the subject knows the way extremely well or just follow some marked track or other people. Going by car to your new job might include navigation. Going there for the thousandth time does not. Neither if you go by taxi. The definition also excludes those instances when the subject travels in and monitoring some form of space but cannot interact with it or physically choose routes (cf. cinema or fictive space)

Navigation also often includes emotions of uncertainty or safety. If the environment or the tool does not give any positive feedback ('You're on the right track', 'Right now you are here and going in this direction') or if the navigator fail to attend to those, then the navigator will probably experience some form of anxiety and a feeling of being lost.

The navigational experience also includes some amount of *learning* the environment, and this will be the focus of this paper. By remembering landmarks/nodes and their interconnections, i.e. forming some conceptualization or model of the traversed environment, the navigator will be able to make a number of navigational activities: if coming to a dead end, the navigator does not have start all over again but only go back a couple of steps to a landmark and then take another path; take short cuts in the environment; perform better on next navigational session in the environment; be able to describe the way to others.

Generally then, my hypothesis is that the more connections between objects and landmarks a navigator constructs during a navigational session, the better she will accomplish these tasks. Making connections between landmarks will produce a richer mental representation of the environment and thus enhance memory (which will enhance navigation). This *mental network* will be a powerful mental tool in upcoming navigating situations.

Such connections can be triggered by different cues. They can be more or less *explicit* in the environment. Walking down a path may explicitly connect two landmarks in the navigators environmental model. A link between two nodes in a hypermedia may cue a connection in the mind of the navigator. And connections may have to be inferred on the basis of the position of other landmarks or nodes.

But, most importantly, the connections are of different types depending on the organizational mode of the environment. Spatial environments will cue spatial links and semantical environments will generate mainly semantic connections. Again, the type of environmental organization will demand different types of abilities and competence on part of the navigator, and some modes will

fit some navigators (and situations) better than others. If the environment mainly seeks to trigger the mental construction of a spatial network, then navigators with low spatial ability may have problems in this construction work. It is in this context narrative organization becomes an interesting alternative.

NARRATIVE

The study of narratives has for the last eighty years been concerned with a wide variety of issues, but one important perspective is *reception studies*, dealing with the cognitive and emotional effects a narrative has on its reader/listener/spectator and how the reader actively applies different kinds of knowledge or cultural models on the text, draws inferences beyond the information given in the text and thereby construct some sort of coherence or understanding/interpretation of the information. This approach - let us call it *constructivism* - unites a wide range of scholars from cinema studies (Bordwell & Thompson, 1993; Bordwell, 1985; Smith, 1995), literature (Zwaan, 1993), communication studies (Messaris, 1994; Höijer, 1992) and psychology-linguistics (Graesser, Singer & Trabasso, 1994; Trabasso & Magliano, 1996; Bower & Cirilo, 1985; Mandler, 1984; Messaris, 1994; Bruner, 1990). In this approach narrative understanding arises in the mind of the reader in the interaction between some external structure 'out there' (text/discourse) and an interpretative instance (the reader/spectator/listener) with all its psychological and cultural etc. dispositions (e.g. schemas). The reader is actively searching for meaning and *coherence*, i.e. aspires to make a meaningful whole (*fabula* or *story*) out of a series of disparate events presented in the text (*syuzhet* or *plot*), assuming that there is some communicative *intention* behind the presentation of the events (from the author-narrator). Let's take a couple of examples.

"A woman is dreaming about cars. A window breaks. A profit is being made."

In this text the reader has difficulties relating the events presented. The causal, temporal and spatial connections between them are very vague and indeterminate. For most readers I would assume, there is no sense or coherence in the text as it stands. Consider, however another description of the same events:

"Sandra had dreamed about a new car for several months and last week she bought one down town. The next morning as she was going to work, the car wouldn't start. She got so angry she smashed the window of the car and her hand started to bleed. Next week she sold the car - with a profit."

Now we have a narrative coherence. The reader can relate the events *spatially*: Sandra buys the car down town; the window is probably being broken outside Sandra's house. Most importantly however, the reader is able to understand that the three events in the first text are a part of a series of *causes* and *effects*. Sandra's dream about buying a car is causing her to buy one; the broken car makes Sandra disappointed and angry which in its turn causes her to smash the window of the car; this causes her bleeding; and the whole event causes Sandra to reconsider her dream and sell the car. In this example the reader is also able to organize the events *temporally*: first she dreams; then she buys the car; the day after that she smashes the window; a week after that she sells the car.

Coherence and meaning are thus achieved when all/most elements in a text can be related causally, temporally and spatially. Psychologists like to see this coherence as some form of mental representation constructed by the reader - *mental text model*, or *situation model* (Graesser, Singer & Trabasso, 1994) - which includes text events and the explicit or inferred connections between them (like a network with nodes and links). The more established connections in the mental text model, the more 'tight' and coherent is the reader experiencing the text. If the connections, on the other hand, are loose or few, the narrative is experienced as loosely structured or even non coherent (as in many modern and post-modern narratives). Of course, there is no 'right' or 'objective' coherence for a given text, but this is all a matter of *interpretation*, that is, dependent on psychological, cultural, social etc. dispositions in the reader (which however might be similar for a great number of people; think of perceptual competence).

Of course the connections between the events might more or less explicit, demanding more or less inference work on part of the reader. For instance, the causal relation between smashing the window and the bleeding hand might be cued in many different ways (in order of degree of explicitness):

Smashing the window *caused* her hand to bleed.

The hand started to bleed *since* she smashed the window.
 She smashed the window *and then* her hand started to bleed.
 She smashed the window *and* the hand started to bleed.
 She smashed the window. The hand started to bleed.
 etc.

In the last examples, there is no causal relation *explicit* in the text, but this connection has to be inferred by the reader on the basis of knowledge about text markers ("and", ".," etc.) as well as smashing windows and the danger it involves.

Of course, the strive for coherence and meaning is present in comprehension of all types of discourses, not only narratives (e.g. scientific papers, poems, recipes, manuals, news etc.). What is characteristic about narratives, however, is that the events prototypically involve *characters*. Narratives deal with antropomorphisized individuals with some form of inner psychology (they *think, feel, believe* and have *intentions*), who acts and reacts on the surrounding environment (which often includes other characters). The causal connections established in narrative comprehension are thus not 'scientific' or between objects, but rather of a folk-psychology type, with a back and forth movement between the inner dimension (or landscape (Bruner, 1986:14) of character psychology and an outer landscape of action, behavior and events (see Persson, 1997). The mental states of characters have effects on external action: Sandra's dreaming causes an intention which causes her buying the car; Sandra's rage causes her smashing the car. And outer events/action affect the inner states of the character: the fact that the car will not start causes Sandra's fury; the whole event causes Sandra to change her mind about cars.

Narratives also involve emotional effects on the reader/spectator. In fact, one of the main purposes of experiencing narrative - why we pay for books and cinema tickets - seems to be the affect or *pleasure* it produces. We expose ourselves to narratives because we want to be entertained (Brewer & Lichtenstein, 1982), excited, surprised, bewildered or frightened. We want to laugh, cry, trill, identify with characters and feel suspense, etc.. It is no coincidence that genre categories in both literature and cinema often are named after what emotional pleasure it seeks to achieve: *comedy, tragedy, thrillers, weepies, horror*. How these pleasurable aspects relate to the more cognitive aspects of narrative comprehension is still a unresearched area in narrative theory.

NARRATIVE AND NAVIGATION

Narrative surrounds us. In news, gossip, tabloid papers, cinema, commercials and literature, people are involved in narrative reasoning and comprehension. Some scholars even suggest that narrative thinking is a fundamental way to apprehend our everyday reality (Bruner, 1986 & 1990). Perhaps it is through narrative reasoning we 'come to grips' with the chaotic and changing reality.

Anyway, my main point here, and what is important in the following, is that narrative experience, through the constructive and pleasurable processes, *enhance experience of coherence and thereby memory and learning*.

Firstly, connections between events or units of information improves the memory of these events. A list of disparate pieces of information, without any relations (like the first text above), will be better learned if the reader could establish those connections. Networking, or *association*, is better than non-networking, as far as memory and learning are concerned.

Secondly, narratives provide alternative types of connections in this network. In fact, narrative construction processes involves a extremely rich set of inference processes, including causality, spatiality and temporality. In order to make sense of the information provided by the narrative text, the reader has to make use of not only spatial and semantic knowledge, but also everyday common sense causal competence (e.g. 'broken dreams and expectations can cause anger' and 'anger may cause violent behavior' - cf. from the text above). Since narratives typically deal with characters, the causal knowledge activated by narratives most importantly includes conceptions of how people's behavior causally relate to internal, psychological states (feelings, intentions, perceptions etc.) - cf. *folk* or *common sense psychology* (Wellman, 1990; Persson, 1997). If information space could trigger and activate these types of knowledge, instead of semantic or purely spatial ones, then this would enhance learning and remembrance for people with high narrative/social ability. *Narrative* networks are thus better than *non-narrative* networks, as far as those users are concerned.

An thirdly, if experiences are connected with affective states, they will generally be remembered better. Narratives are indeed such emotional triggers. Of course, making navigation more like a narrative experience involving emotions, suspense, humor, interest, surprise, curiosity, melancholia etc., is of course a reason in itself to look deeper into narratives. Information space will most likely turn more and more into a social and pleasurable space in order to attract users.

Narratives have and will have a central position in these efforts. However, narratives will also enhance memory of the specific navigational session, since they involve emotional experiences. As far as memory is concerned, emotions are better than non-emotions.

All of these features of narrative enhance the capacity for learning an information environment, and could be an alternative for those with low spatial or semantical ability. Learning and remembering are of course important aspects of pedagogical and educational research, and there has been great efforts in exploring how a 'narrativization' or information might make learning more fun and stimulating, and thereby better (MENO, 1996; Ridsen, 1997). But what is the relation between enhanced learning and navigation?

First, like I said before, if a navigator learns fast and remembers well the organization of an information structure, she will be better equipped to deal with dead ends and make shortcuts. Also upcoming navigational sessions will be handled more effectively than the first one, and the experience of *security* during the navigation (orienting oneself in the environment, and monitoring one's position) will probably enhance. Learning and remembering an environment are prerequisites for the navigator's familiarity with this environment. If a narrative organizational mode enhances memory and fastens learning of a given information structure, then this will probably also effect the navigational performance.

Secondly, if the navigator remembers the browsing session, she will be able to tell others about it later. Social navigation of this sort, where a navigator uses other people and their presumed knowledge as a navigational tool or filter, seems to be more common than has been thought of before (see cf. Dieberger, 1997a & 1997b). If narrative form enhances memory, then it will also facilitate for those processes taking place between browsing sessions and between people. Not only will the narrative mode make the navigator remember better, but it might also be more *describable* than other semantic-abstract modes. Everybody knows words for contents of a story, but not all will be familiar with terms for units in a semantic or abstract interface (think of *menus*, *index page*, *node* etc.).

Narrative seems to be a natural mode for interpersonal communication of this sort. Even in purely spatial descriptions, the narrative mode is sometimes used in order to facilitate memory. Höök (1991) collected and studied human route descriptions of Stockholm, directed at tourists with no experience of the environment. On some occasions the subjects added a little story to an important building or landmark, in order to facilitate memory of that landmark. Narrative seems thus to be a natural mode which people use in order to better memorize spatial descriptions, and if the system would support such narrative associations, many people would perhaps enhance their ability to memorize and generate descriptions as well as memorize them for own navigational purposes.

Making information space into a narrative space will thus, speculatively, generate a more emotional experience. Narratives will also in different respects enhance learning and memory for some people in some situations. This could support these people when navigating through what we today call 'information space'. But how is this to be implemented concretely? How can system developers trigger users to make narrative connections between information units (hypertext nodes or whatever)? How to make the browsing or navigational session less like a *traversal* and more like a *progression* or *development*, including narrative connections of different sorts?

First of all I think that the narratives have to be connected to the semantics of the information and not only to the formal structure. In a hypertext, for instance, there is not much point in having stories 'floating above' the information in the nodes, disconnected from what is said/shown in the nodes. It will be the narratives in association with the semantics that provide the enhanced memory effect. Although it does not have to be very tight and perfect, the mental connection or association between story and hypertext information has to be there.

Secondly, I believe that the narratives told has to be the same for everyone who comes to a particular node, and for every time. To change the structure in adaptive systems between visits has proven to generate confusion and feeling of being lost (Höök & Svensson, 1998). Carter (1996), for instance, pre-structured a hyperspace in several different ways, all reflecting the domain content. During the experiment, the system would switch structure when the subjects turned to a new question that would be more easily solved with the other structure. Users disliked the system and performed worse, possibly because they were unable to find their way back to landmarks and other navigational units that had been established and learned during the former sessions.

The analogy to narratives in information space is clear. If stories are to be used as 'landmarks' in a narrativized information space, they have to be rather stable and unchanging in order for the navigator to recognize them and orient oneself. If you suddenly change the appearance of these landmarks without warning, it will probably produce confusion and lessen the experience of security.

Thirdly, introducing narratives into an interface may seem like a laborious design project. There is, however, reason to believe that triggering narrative construction processes in the user may

be accomplished by very simple means, graphically or whatever. Heider & Simmel (1944) showed people an animated film with abstract black figures, like triangles and squares, moving about on a white screen. Afterwards, the subjects were asked to describe the happenings of the film. Although not encouraged use narrative terms, this was often included into the descriptions. In order to comprehend the abstract course of events, the subjects gave it a narrative form (the big triangle 'chased' the small one because the big one 'wanted to punish' the small one for what the small one had done to the square, etc.). Among other things, this experiment shows that people are eager to generate narrative interpretations of the environment, even though the 'interface' is rather poor and abstract. It does not take much to trigger imaginative processes in the user. *The Tamaguchi*, combining an enormous success and a VERY simple interface, is another example of this fact.

CONCRETE DESIGN SUGGESTIONS

These are design principles, but before we come to an end I would like to sketch some concrete design ideas (which have been developed in cooperation with prof. David Benyon).

1. In a hypertext system you click on a link. A little dog (elephant, cat, vagabond, individual) appears, looking puzzled/happy. 'Oh right, you are going to check out what to find in Stockholm, are you? Be seeing ya!'and zooms off the screen.

You probably see this little dog quite often and over time get to know its character, facial expression, etc. He might pop up anywhere (rather unexpected and nonconsistently) and comment on the information in the destination node (on the basis of key word analysis). He might even suggest a story that in some vague sense is related to the site you are at ('Stockholm! I was in Stockholm once and I met the strangest man... Do you want me to tell you?' or 'I visited the Hedvig Eleonora church there three years ago! Are you able to find a picture of it somewhere?')

This storyteller would be equipped with a host of story lexicon, possibly with combinational possibilities (perhaps in contact with an on-line story-database, where stories are provided by users (see for instance <http://www.bubbe.com/> or <http://www.cyberenet.net/~sjohnson/stories/>). It would be possible to switch him/her on and off. I imagine the narrator to be visible in a particular space in the browser. Does it tell the stories in natural language or in images? Or both?

Of course, the user can be provided with different sort of background information of the storyteller. There could also be many different storytellers, each of them liking one genre of stories (comedies, tragic stories, action etc.). Thus the user can choose according to her genre preferences.

There would also have to be some sort of logging of what stories are told to a specific navigator, in order to avoid unnecessary repetition.

2. Another idea would be to have an ongoing narrative during the whole navigation session. For instance, on each page visited the narrator would present some progression or development of the story that in some sense was related to the information at that page. To continue our example from above, when coming to a site dealing with Stockholm sights, the narrator could (again on the basis of key word analysis) set the happenings of the narrative in a Stockholm environment, or introduce a character originating in Stockholm.

If the navigator want to go back to an earlier page, she may use the story and its progression backwards to find the right page. From there she might take another path, with a different angle to the story.

Eventually the narrative will come to an end and then the navigator has to choose to close the navigation session or to start another story.

How the story should be presented is an open question. Perhaps the narrator is telling you verbally, or maybe the narrator is absent and the story is told with moving or static images, or in a comic strip format.

This idea does not harmonize with the above principle concerning the stability of the structure: if you return to the same page on another occasion, the story told will most probably be of another one. Such an idea will not support social navigation.

3. Another, less ambitious idea, would be to create some form of narrator that informs the navigator what to find on adjacent nodes. The computer could check out all the links from a page whilst the user is reading the page, use a keyword count to measure the semantic content of those other pages and form that into a simple narrative. If it has knowledge of the individual user so much the better. You could imagine a system which counts occurrences of keywords, orders them by frequency and then uses a standard narrative structure to say something like..

well if you go to <link> you'll find lots of stuff about <keywords> whereas
<link> seems more concerned with <keywords>...

This could be combined with the *ALEXA* system idea: tracing other peoples' movements from the site you presently are on: 'Lots of people seemed to find Umeå University interesting when they visited the SICS site. Would you like to try?'

CONCLUSIONS

For many navigational and information seeking situations, a narrative organizational mode will for sure just be a disturbance. Users with high spatial and semantic ability the ordinary modes will be perfectly sufficient and probably a lot *more* efficient. When the goal of the navigator is clear and well specified, for instance a unique piece of information, the narratives in the information space will just be in the way. Narratives will not affect or support central navigational aspects (for instance how to formulate your goal, choosing the correct route, recognizing that your destination has been reached etc.).

However, when the user is spatially poor or when the goal of the navigation is just to explore a region of information space, then narratives may not only help, but also evoke pleasures, satisfaction and feelings of security. Users who perform badly in semantic or spatial modes of information organization, may perhaps use the narratives when identifying landmarks, taking shortcuts or going backwards.

Narrative modes of organizing environments will surely not be a substitute, but an additional complement.

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EXPLORING NAVIGATION

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