Multipublication and the Design of Hypermedia Documents

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Abstract

The forms of hypermedia documents vary considerably depending upon the platforms that carry them; but the rules that constitute the design of hypermedia messages may only be indirectly technology-dependent. The following reports on an attempt - in collaboration with the Kon-Tiki Museum in Oslo, Norway - to publish material on three different digital platforms based in a common design model. First, problems with features of hypermedia documents and their building blocks — the various information types — are discussed, then a general design model is presented, following which different technological platforms are described. The paper closes with a discussion of the general perspective in relation to experiences with crosspublishing the Kon-Tiki material.

Introduction

The digital turn in information technology is beginning to change the way we conceive of publication. Given the situation where multiple media information about same and related topics is coded and stored in digital form, such information can be displayed or published in various contexts. In relation to the museum environment, we encounter three different platforms for hypermedia publication:

- the isolated, stand-alone application (information kiosk) on display as a more or less integral part of the museum exhibition
- the duplication and distributed application, for sale both in and outside the museum (CD-ROM, CD-I)
- the networked application. Access to a museum's server via Internet/World Wide Web using a browser such as Netscape.

These are three different, but related kinds of publication that any museum interested in digital communication technology might put into use. The question we must seek to answer is how they relate and in what way material should be edited and produced to take advantage of all three publication forms. Contemplation concerning a strategy for hypermedia multipublication is needed.

Creating a hypermedia document

Unlike existing and matured media forms such as novels, feature films and television-documentaries, which have developed over long periods of time and within relatively stable media institutions (literature, cinema and broadcast television), multimedia and hypermedia documents have not yet stabilised as media forms with enduring conventions and genre groupings. It takes considerable time and effort to develop a document form in a new medium. This may be particularly difficult in a medium where the technological basis is changing so rapidly. But as far as I can see the technological aspect is not the only reason why we still have not seen the fully fledged hypermedia document that extensively exploits the integration and interaction of information types and take advantage of multiple media conventions.

One obstacle is the integration of information types. Hypermedia designers must find a way of combining the two strong and basically independent traditions of media integration: the literal tradition, founded in book technology which combines verbal text and image, and the audio-visual tradition which conjoins moving images and sound. In their own separate branches, these two traditions have elegantly solved the task of seamlessly combining two or more information types into fully integrated documents. However, the two traditions again have not yet been as seamlessly integrated in environments of hypermedia documents. Too often we experience the reading[1] of hypermedia documents as a constant and confusing shift between established media forms. Video on the computer screen in a hypermedia environment is too often presented within the conventions of traditional video watching and thus experienced as a document on its own rather than as an element of an integrated multimedia message.

From my point of view, one major task to be solved in the theory and practice of hypermedia is to create (and experiment with) documents that take full advantage of this integration and interaction of information types. Documents that presents themselves as unified wholes where the information types and the sructure of the technological features primarily serves the communicational purpose, and only subsidiary are experienced as technological solutions. For a while now — in this introductory phase —

1 'Reading' is used as a general term for 'looking', 'watching', 'listening' 'experiencing', that is for the general aquisition of information and meaning stored in documents.

it might be necessary then to make the technological means 'invisible.' A first step in this approach, is to develop a general model for hypermedia design.

Design — the craft of creating and giving shape to things, whether books, clothes or houses — derives from the verb to designate (= to name, to conceive, to organise). By a design model I mean a model for the organisation of a document's shape and form. A model of design must focus on composition and structure; in other words: the rhetorical, aesthetical and narratological aspects of creating hypermedia documents. In this paper I will limit my discussion of the design model to the internal distribution and use of information types (image, verbal text, sound and moving images) in the hypermedia document. However, it is first useful to address some considerations concerning the nature of information types.

Some characteristics of information types

Information types, such as images, written verbal text, various forms of sound and moving images, can be described according to a series of oppositions: they are either *verbal* (speech and writing) or *nonverbal* (images, moving images, music); either *visual* (images, written or printed text, moving images) or *auditory* (speech, music); either *static*, that is stable over time (text, image) or *dynamic*, those which changes over time (speech, music, moving images). (Other dichotomies are also relevant: "hot"/"cool", analogue/digital, active/passive etc.)

Figurative and nonverbal information types, and still and moving images are thought to qualities such as rich and ambiguous (polysemic), while verbal information types are low on meaning but on the other hand very high on precision in the act of communication.

Information types also differ considerably in the way they exist over time and the manner in which they force the reader/user to behave and interact. In acquisition of information succession is central. The use of pieces of information and the generation of meaning always takes place over time But the behaviour of the reader and the interaction between the information marker (the message material) and the reading subject vary depending on which information type is dominant. Still images are read subjectively and time independent in the sense that they do not change over time, while the acquisition of sound is totally constrained and made possible by the passing of time.[2]

In the everyday use of information types, as encountered in traffic, posters, newspapers, television etc., we must (at one level) be more active when reading pictures and text, than we are when looking

2 For a discussion of information's types and succession see Liestøl (1993)

at moving images or listening to audio (or a combination of the two). When watching film or television a machine generates the existence of the information types and conditions the tempo of the sequence. As recipients we 'just' watch and listen, we do not have to generate the document on our own as we do reading a book or watching a picture. When reading still images and text the subject is the 'machine'. Users are, however, not merely passive recipients.

The features of information types and their traditional combinations makes them suitable for different kinds of communicational work. Video and audio gives the viewer a quick introduction to a topic (ref. television news), but are traditionally not well suited if the user wants more in-depth information on specific topics for detailed studies. In such cases it would be more relevant to obtain the information by means of text and images.

To decide how the different information types should be distributed and put to use in hypermedia documents we must distinguish between the structure of the information, the way it is stored and made available and the structure of the user's acquisition (activity), and the way it is actually used. In traditional linear media the structure/order of acquisition and the structure/order of the document is identical, while in hypermedia communication this identity is abandoned.[3]

However, it is obvious that despite the use of hypermedia technology we want to tell stories, and especially within the museum environment. At the same time we want the user to interact with the information based on their individual interest and need. The balance between linearity and multilinearity, constraints and freedom is important. To establish this balance it is relevant how and where in the document we implement the various information types and particularly the relationship between them.

A design model

This model, seen as a stored structure of information elements, consists of levels illustrated as concentric circles, according to which different information types and user-relationship are dominant:[4]

3 For a discussion of user's narratives, see Liestøl (1994)

4 Note that the 'design model' presented here is not a theoretically consistent construct, but a tentative approach, and for practical use.

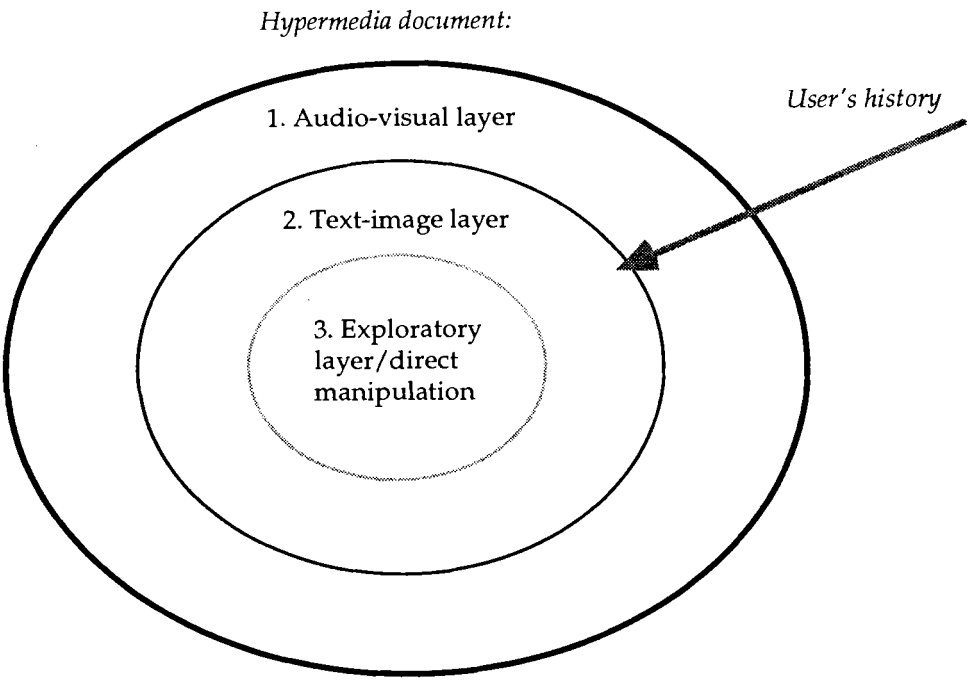

Fig. 1: Design model for multimedia document

The user enters the document from the outside and must pass through the audio-visual layer before moving to the text dominated layer.

In the A-V layer, audio and video are the dominant, but not the only information markers. Video and audio are suited when it is important to give the user a meaning rich (figurative) 'picture' of a situation. The fact that we use the term 'getting the picture' as a way of describing the generation of overview and context, concerning some incident or topic, supports the use of figurative information types in introductory phases of 'reading' documents. The AV-layer including with moving images accompanied by speech has the perfect means for providing the user with the right 'picture' and the suited context for further investigations into the document.

On the other hand, the reading of text often requires a pre-existing interest in the topic treated by that text. In the everyday competition between information types trying to catch our attention, plain text often looses, especially to the combination: moving images and sound, commercials are a good example of such attention-grabbing messages. In the model's second layer, text in combination with images dominate in the telling of the story.

The AV-layer can be characterised as fast/passive: it gives a lot of general and meaning-rich information very quickly without requiring too much activity from the reader. The text-image mode on

the other hand is slow/active: it presupposes enough interest and motivation from the user to *do* the reading, and as a consequence has relatively longer duration. We could apply McLuhan's distinction between 'hot' and 'cool' media to these layers respectively: "Hot media are, (...) low in participation, and cool media are high in participation." (McLuhan 1964: 36).

In practical implementation the separation between the layers is not absolute, as this is more a question of dominance. There are elements of text and images in the AV-layer and visa versa:

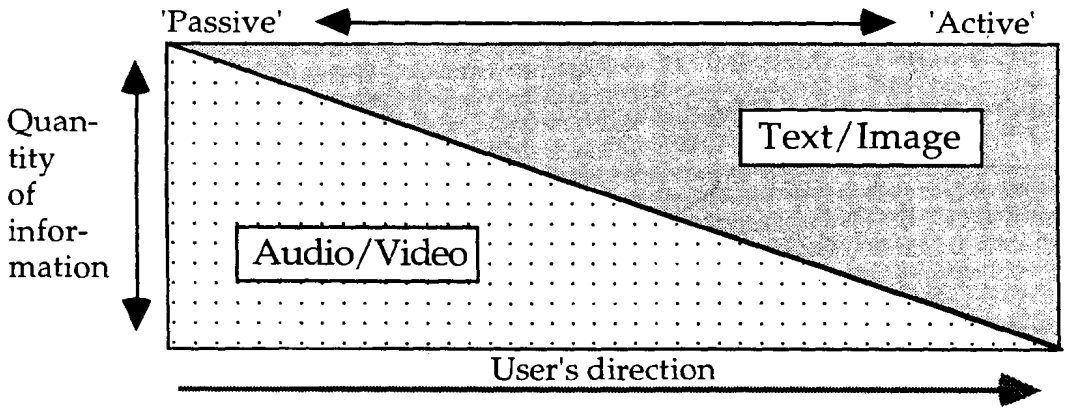

Fig. 2: Transition from video dominant to text dominant levels in multimedia

The purpose of the AV-layer is to generate enough interest in the user so that he or she is willing to look for more information by means of text (and images) at the next layer.

In the central layer no information type is dominant, rather we have a direct and manipulative interaction with the computer. This would mean more game like features or navigation in simulated 'real world' environments. At this level the use of dynamic 3D representations are relevant, both in object and environment mode, see later discussion. In the case of the Kon-Tiki material this level of the document, this stage in the user's history, contain simulations of archaeological excavations. In general, the third layer is a 'cool' level, it might be even more slow/active than the text dominated-layer.

The information types that 'carry' the information vary, but at another, semantic level the story becomes the unifying element in the overall document. The story is the fugue that keeps all the pieces in the 'mosaic' together as a whole.

Seen as a static entity and structure, the document is heterogenous and divided into nodes of different incompatible parts. But as a document in interaction with a using subject, the reading action of the user integrates the document as the reading is carried out over time. The product of this reading action is the sequential, articulated story (which is different from the multisequential story that is stored as a potential

to be read). The user's action as story generator is the active combining element of hypermedia documents. Like the athlete of a triathlon competition, the hypermedia reader moves across various parts/fields which require different kinds of actions. But as a whole, the acting subject is the combining, unifying element that makes meaning, articulates the message and creates the path from the beginning to the chosen end:

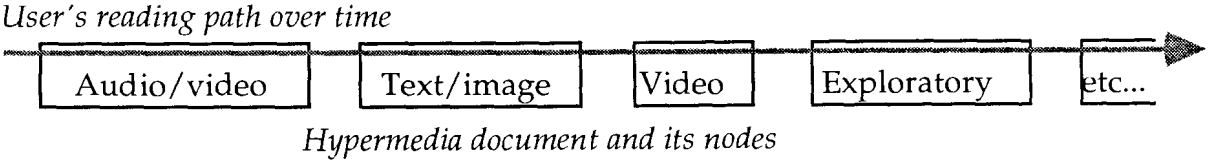

Fig. 3: User's history and layers of information types

User's history should always have a dramatical development and should not be accidental. The dramatical structure the user creates (user's history or 'discourse') must to some extent be implemented in the stored structure of the document. In this way it is possible to 'direct' (constrain) the user's activities while at the same time allow for interactivity and multiple choices.

This model of design suggests some rules for how to organise information types in a document. With the introduction of dynamic 3D information types in hypermedia messages the model needs to be extended. (This new information type, unique to the computer medium, clearly influences the model. 3D documents can either be environments or objects, as environment they are inclusive and could therefore constitute a level outside the AV-layer and/or occur at different parts elsewhere, particularly in the central exploratory level.) The question is how the implementation of this model is influenced by the technological constraints constituting the three publication platforms.

Publication platforms

The three platforms mentioned earlier differ in the way they retrieve the information presented to the user on the desktop (or to the interface). The kiosk solution is supported by the local hard drive; the CD-platform by an internal or external CD-ROM drive; while the networked application provides the user with information retrieved from a machine over the data network. A quick comparison, based on Maartmann-Moe (1993), shows the significant difference in sustained data rate between these platforms:

Platforms:	*Sustained data rate:*	
Information kiosk	15 - 20	Megabits/second
CD-ROM/CD-I	1.2 - 4.8	Megabits/second
Network	0.028 - 0.064	Megabits/second

Multimedia kiosks in museums normally read the information off the local hard drive. What is today considered a mid range multimedia Macintosh (68040/PowerPC) or PC (486/Pentium) has a sustained data rate to the desktop of about 15 - 20 Mbit/s. In special cases optimised solutions are able to transfer data from hard drives at a rate of up to more than 200 Mbit/s.

With CD-ROM and CD-i the 'bandwidth' narrows dramatically: A single speed CD-ROM and the standard CD-i for MPEG video playback gives a data rate of 1.2 Mbit/s. This is sufficient for the very effective hardware-supported decompression of MPEG video, which gives VHS-quality full motion, full screen playback. With common CD-ROM, the transfer rate can be increased to 7.2 Mbit/s using drives that spin the disc up to 6 times the speed. At present the use of double spin CD-ROM drives dominate while quadra-spin drives with a data rate of 4.8 Mbit/s seem to be the next level.

With publishing over network Internet and the World Wide Web-standard is currently the obvious solution. Since most museums want to communicate to the public at large we must take the solutions for household connections as our starting point. With ISDN the transfer rate is reduced to 0.064 Mbit/s, and using the fastest modems you can only achieve a data rate of 28.8 Kilobit/s, that is 0.028 Mbit/s over the analogue telephone line. Cable modems, fiberoptical cables and ATM with data rates of up to 155 Mbit/s will of course change this.

It is obvious that the sustained data rates are crucial to the creation and use of hypermedia documents. With documents read from a fast hard drive the limitations are few, even the use of high resolution dynamic 3D information is possible.

The limitations in data rate basically influence two aspects of the hypermedia document: 1) interactivity due to difference in seek and response time, and 2) the use of information types that require large data rates such as audio and particularly video.

A digital video movie (QuickTime format using the Cinepak codec) of about 1 minute playback time and with a low quality threshold could take up to an hour to transfer from server to user and shows how impractical it is to treat WWW as an independent and self-contained platform for real multimedia publication. Anyone who has tried to fetch a longer video sequence on the web will think twice the next time the option is there.

One solution is to see the platforms in relationship, as outputs for the same overall document. This is especially relevant between CD-ROM and WWW. Already there are examples that take advantage

of this. The development of the 'Kon-Tiki interactive' CD-ROM with marked links to a WWW-server illustrates how these relationships between platforms may be structured.

Case Study: The Kon-Tiki material

i) In 1993 an information kiosk was installed at the Kon-Tiki Museum in Oslo. The main purpose of the application was to give the Museum's video material an interactive format compatible with the Museum's mode of displaying information. This format was named 'video album' (see Liestøl 1993). Due to the user's context in the museum situation, verbal text played a minor role in the application. Longer text sequences were always introduced after the user had moved through the AV-layer.

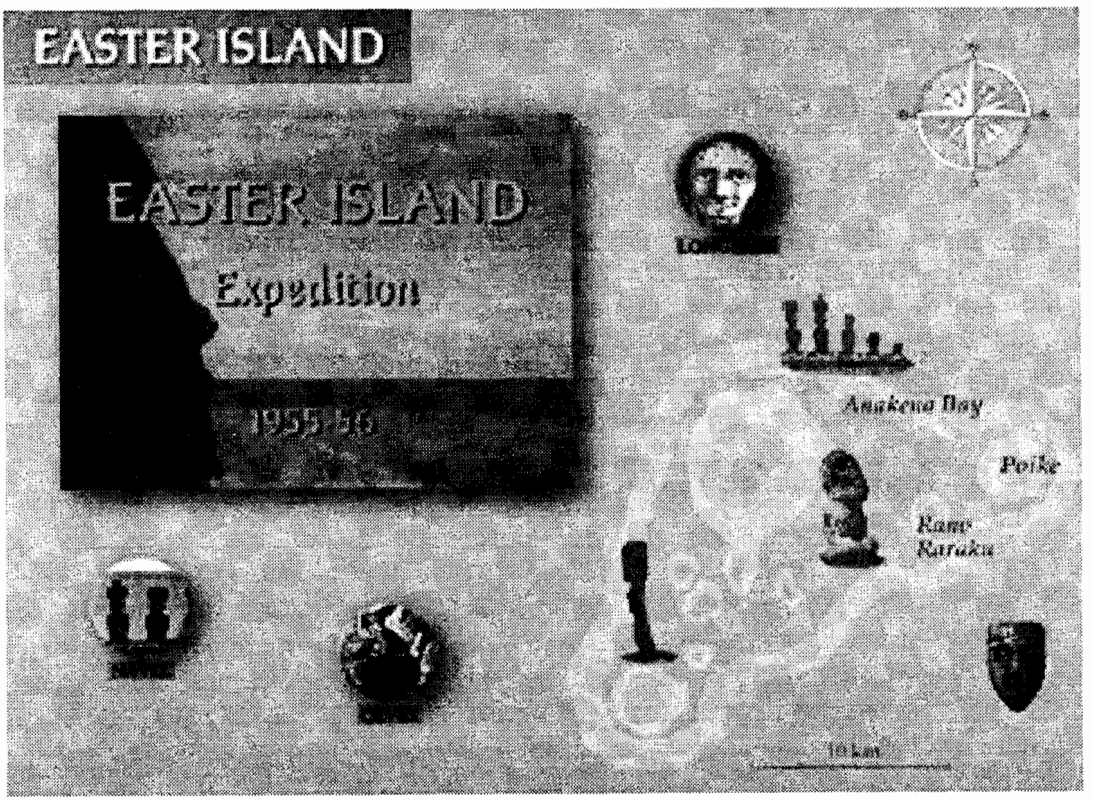

Fig. 4: Sample screen from "Kon-Tiki Interactive" CD-ROM

ii) In 1995 a Macintosh and Windows compatible CD-ROM was produced with the title "Kon-Tiki Interactive."[5] Based on the kiosk system, but completely redesigned, it has been extended with much more text and pictures; also included are interactive simulations of archaeological excavations. Because of the storage and the sustained data rate limitations of the CD-ROM platform, the videos are of poorer resolution and smaller window size than the kiosk version.

"Kon-Tiki Interactive" is designed according to the design model described above. The AV-layer provides interactivity to video based on the 'footnote-convention' first developed in the kiosk system (Liestøl 1994b). One of the sections in the application tells stories about Easter Island. The first part of the AV-layer gives a short video introduction covering all major topics. This lasts for about 2 minutes. The introductory video also has sub videos linked by a reference to a micon. The user may access these to get more information on the topic mentioned in the main video sequence. The main video ends with a reference to a button that takes the user to the text level where extracts from Thor Heyerdahl's books are the dominant information type, but videos on specific topics are also included. The idea is that when the user has watched the introductory 2 minute video he or she has enough contextual information to enjoy the more specific content of the text nodes in the next layer. Within this layer there are hypertext links which offer the user a variety of choices in terms of navigation and selection of content.

With the Easter Island example the levels and information types are linked and combined by a common topic, but contain many separate individual stories. In the section about the Kon-Tiki voyage itself, the user can move from the introductory video to a subvideo telling about the constant danger of sharks surrounding the raft. At the end of that video node, one highly memorable incident is mentioned: during a storm one of the crew members fell overboard. The end of the story is not told in the video, but a link can be followed to the text layer where Heyerdahl's dramatic account can be read, thus following an old convention first used in literature and known as the 'cliff hanger.' The idea here is to distribute one single storyline throughout several information types. The story about a man falling overboard then becomes the combining element in this part of the document. If this approach is successful the user follows the story without giving any thoughts to which information type — 'hot' or 'cool' — delivers the information.

iii) Parallel to the the CD-ROM publication a "Kon-Tiki Web Server" has been installed for the Kon-Tiki Museum at the Dept of Media and Communication, University of Oslo. Due to the limited bandwith on Internet, it is not yet possible to conceive of the Web material in the same terms as a CD-ROM presentation. 'Hot' information types are not favoured on the platform of the Web. Consequently the "Kon-Tiki-server" basically contains text and pictures. However, in terms of design, it is possible to see the "Kon-Tiki Web-server" in relation to the "Kon-Tiki Interactive" CD-ROM. Not only is it possible

5 "Kon-Tiki Interactive" is published by Gyldendal in collaboration with the Kon-Tiki Museum (ISBN 81-05-23333-0, Internet: http://www.gyldendal.no/multimedia).

to say that these two platforms may be seen as having been developed in parallel, but their content can be considered as belonging to the same document. When reading about the 'kneeling statues' of Easter Island, and when the user has completed a simulated excavation of one of these statues, the user is referred to the academic paper that reports on the excavation. The convention of the footnote is used to signal that there is a link through a URL which when activated links to user to the "Kon-Tiki Web-server." As a result, the academic writings on topics encountered on the CD-ROM and following the expeditions themselves, may be accessed at the server. In this way, content on the server may be seen as a part of the text-layer in the overall hypermedia document. In addition, in time additional material may be added to the Web domain, thus supplementing the videos, photographs and text material contained in the CD-ROM.

Conclusion

Multi-publication is a relatively new communication strategy for museums and hence there are few obvious paths to follow. The attempts described above are offered as examples of attempts to examine and construct such multiple publication domains. Our experience in fashioning the linked systems of information booth, CD-ROM and Web server has repeatedly highlighted that in such new and cross referenced platforms it is often the actual implementation and use which indicate how we might and should proceed. There is no doubt that networked digital communication will outgrow CD-ROM platforms, but, perhaps for the next 5-10 years, the latter will be an important platform for electronic publishing. In addition, some problems have not yet been solved: networked hypermedia will have problems with interactivity and consistent feedback (especially concerning time) even with ATM. It is important, therefore, in the near future, to develop the potential of the hypermedia document as a media form, with its many possible conventions and genres, independent of which technical platform may succeed in the long run.

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Bibliography

Liestøl (1993): "The Digital Video Album. On the Merging of Media Types in Multimedia", i *Telektronikk* nr. 4 , 31-37. Kjeller: Norwegian Telecom Research (Also published on the Internet, World Wide Web, URL: http://www.nta.no/ telektronikk/4.93.dir/Liestoel_G.html)

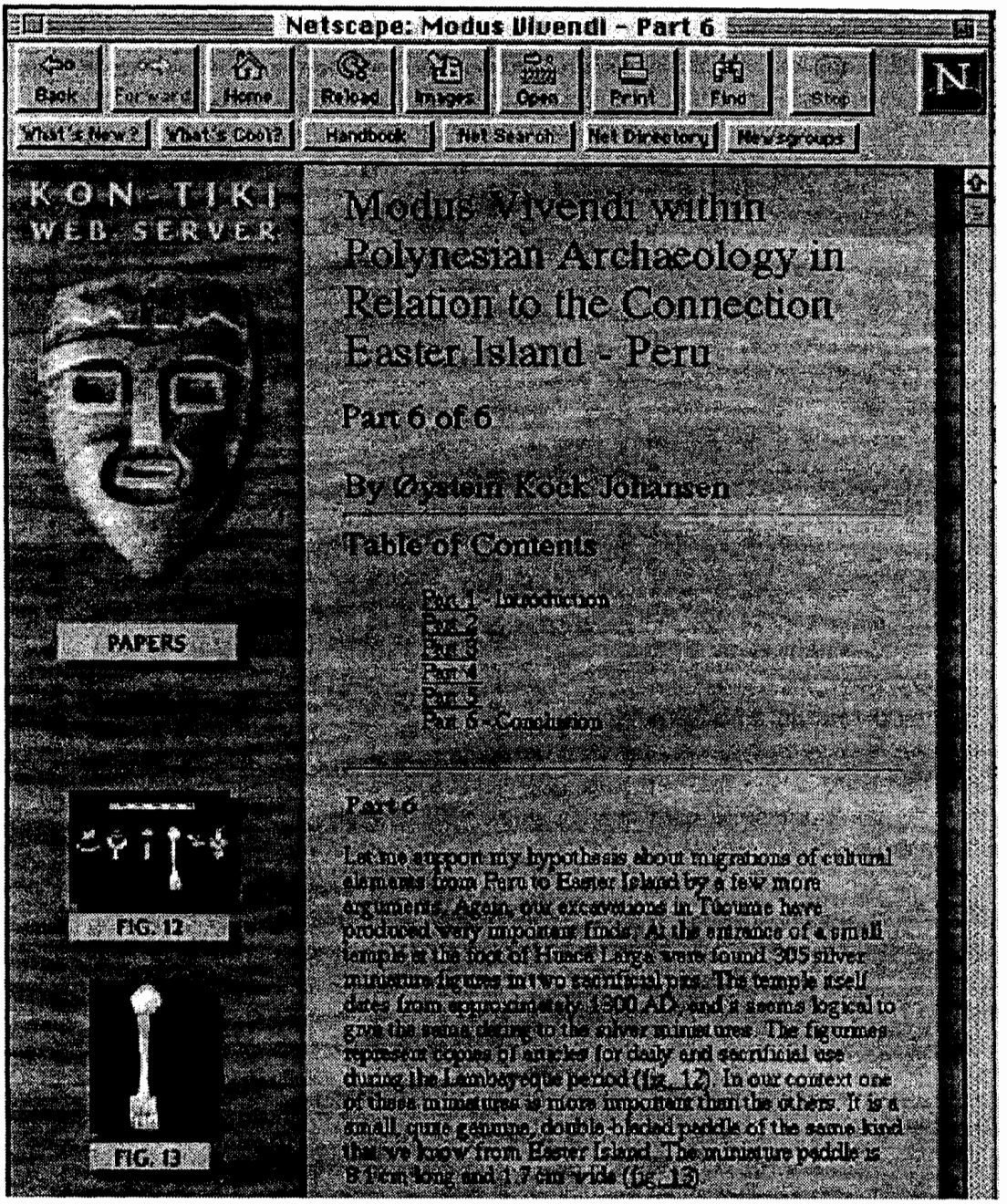

Fig. 5: Sample material from "Kon-Tiki Web-server"

(1994) "Wittgenstein, Genette and the Reader's Narrative in Hypertext" in Landow, G.P. (ed.) *Hyper/Text/Theory*, Baltimore and London: Johns Hopkins University Press, 87-121

Liestøl (1994b) "Aesthetic and Rhetorical Aspects of Linking Video in Hypermedia" *Proceedings of the European Conference on Hypermedia Technology 1994* (ECHT '94), Edinburg.

Maartmann-Moe, Erling (1993): "Telecommunications and CD-ROM friends or foes?" in *Telektronikk* no. 4, 27-31. Kjeller: Norwegian Telecom Research (Also published on the Internet, World Wide Web, URL: http://www.nta.no/ telektronikk/4.93.dir/Maartmann-Moe_E.html)

McLuhan, Marshal (1964) *Understanding Media. The Extensions of man*, New York.