# The Digital Revolution is a Revolution of Random Access

It is 1981. They show me a videodisc. They explain what it is and how it works. And I realize that the language, the possibilities, the significance of cinema is forever changed. This is how it is: cinema communicates on the basis of one frame following another. First, frame sequence gives us the illusion of motion (because of "the persistence of vision" or some such), then the sequences of moving pictures demand sequencing themselves. Shot sequence; then a defined, determinable relationship of image to sound. And in the shrieks of Herrman's violins against Anthony Perkins upraised knife/cut to the swinging lightbulb/cut to Vera Miles face ... we get cinema. Our stomachs tighten, we *feel* something, there in the dark, and everyone around us, to a greater or lesser degree, feels the same thing. The *power* of this medium! And they all agree, from Bordwell to Heath to Kracauer to Zizek, from Dickinson to Eisenstein to Pudovkin (not to mention the filmmakers), that a necessary condition of the power of cinema is . . .

. . . montage.

What do all the great commercial filmmakers want? Do they insist on writing the script? Or even rewriting it? No. The final cut. Control over the edit. For in the edit is the language, the meaning, the music, the emotion, the *expressivity* of the medium.

Give up control of image sequence and you give up the cinema we know.

Videodisc is now an outdated, passé vinyl disc. It's too big for the late 90s. Like an LP. It stores its data in analogue fashion (microscopic pits in the plastic surface), for one thing, and, for another, you can't fit a videodisc player into the housing of a standard computer. Its light grey prismatic surface and 12 inch diameter even look old. Like those spinning tops that use hologram techniques to make patterns hover above them as they spin. But
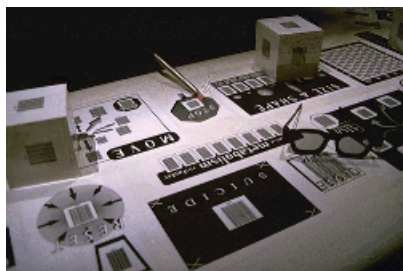
Perry Hoberman "Bar Code Hotel

the digital media (at this point anyway . . . we haven't seen "DVD" yet) offer limited motion, inferior little images in a fraction of the monitor screen. Images are already inferior on monitors compared with light projected through transparent celluloid. Not even fast enough (in frames per second) to give a real "persistence of vision," the irony of the product name "Quick Time" is lost in the babble of hype, the chatter of metaphors for leisure and freedom and non-accountability that pepper the world of computer technology. Quick Time movies are slow and inferior. It is hard to imagine them carrying the power of the cinematic in their stopwatch-sized rectangles.

The videodisc made it possible for the images embedded in its surface to appear in sequences other than that in which they are recorded. Instead of having to go through frames 1 to 100 to reach frame 101 - the serial access imposed by videotape or film - with a videodisc we can first display frame 101, then frame 6, then frame 14, etc. The videodisc gives us, through the computer control of a videodisc player, random access to each image in the sequence. So the sequence of images can be determined at presentation time, rather than during the process of production. Suddenly the viewer can have some control over the montage.

Pathways through a landscape

If it is true that montage is at the center of cinematic meaning, this potential shift in control has profound significance. **The interactive filmmaker's task becomes that of producing a set of film materials and plotting some pathways through it.** The viewer then follows the pathways, deviating or continuing in a line as the mood takes him. The filmmaker becomes more the designer of a pattern of trails through a landscape of images, less the tour bus driver. And maybe, in the process, the filmmaker gives up controlling what his work means - or, alternatively, the nature of cinematic meaning is transformed in the process.

What can a system of pathways through a moving image landscape be like? And what kind of image set can be mapped in this way? What kinds of vehicle do the explorers of this landscape use? To what extent are the pathways paved and laid, to what extent are they tracks we cut with a virtual machete, as opposed to open landscapes traversed by all-terrain vehicles?

For the last 15 years, I've attempted practical answers to these questions, in a series of what I call **'interactive cinema'** installations. In my pieces, the landscapes are composed of narrative and music, the pathways through them montage sequences plotted before a viewer enters, and the vehicles of exploration are touch screens, frames to point through, and surfaces to walk on, while the windows into the depicted world are monitors or projection screens. By far the most difficult issue I've taken on has been that of developing a structure or shape for the interactive narratives, a narrative architecture that requires that a viewer explore it rather than experience it from a (literal and/or metaphorical) sitting position. **The question of who retains control over what the piece is saying comes up at every turn** - it is possible that an artist one might disagree with the overall sense of his own work.

Though the breakthroughs in the use of computers in communication is often described as a "digital" revolution, I believe that for cinema, if not for other communication forms, the more fundamental breakthrough is in random access to data. Digitization in the movies has brought about a remarkable series of changes in the production and manipulation of images, so that many things look photographic even though they are created without a lens anywhere in the production path. **But nothing achieved on the basis of digitization is different in kind from what was created before binary encoding of images and sound: the new material is simply better.**

The most important social effect of the digitization of images is in the photographic image's epistemological status. The fact that the photographic is indistinguishable from the non-photographic changes the status of photograph as evidence. Photographs are no longer indicators of the truth what they depict, a change that we have yet to adjust to. To take an obvious example: the effect that the shifting truth status of the photograph will eventually have on the Porn Industry is mind boggling. When the consumer can no longer fantasize along the causal chain of photographic reproduction back to the events or physical relationships represented in the image, the erotic potential of pornographic images will fizzle. But the epistemological shift hasn't sunk in yet. Not even on the internet - though photographs where the digital manipulation is not subtle enough are quickly condemned.

Digitization has streamlined and automated production processes, enabling detailed and repetitive work that twentieth century human beings do not have the patience, the attention to microscopic detail, the ability to repeat precise tasks, in a word: the time for. But the binary encoded image remains an image, produced by the same class of techniques, with the same look and the same way of representing reality; but with a shifted truth-status.

The film *Jumanji*, for example, could not be made without computer generated imagery, and the special effects in that film (of a wild animal stampede, for example) are absolutely convincing. However, this represents no more than a difference in degree from what was achieved without computers: for example in *Star Wars* or *King Kong*. Without doubt the effects in the ⧉ Star Wars remake, which is being released as I write this in February 1997, will be much more spectacular, as were the explosions of *Independence Day* and the robots of *Terminator 2*. But it is better, not different. In contrast, **random access brings about a different cinema**: a cinema different in what it can say and how it says it, in the manner it represents reality and the aspects of reality it can represent.

Deemphasizing the sequence of the images

To repeat: random access allows the sequence of images to be determined at the time of presentation, rather than fixed during the production process. This implies that the viewer, by some method or another, or other external factors (weather conditions, the time, the sound level in the viewing space . . . the possibilities are endless), can determine the sequence. Obviously a work that makes use of this potential needs a structure, a shape, an architecture, a content that can benefit from it.

The structure of a film is determined by the sequence of its elements. But if sequence is an aspect of the film no longer determined by the filmmaker, what kind of structure is available? If the author of a work is to retain his authority, sequence must be deemphasized since it is an aspect of the experience that the filmmaker, to a greater or lesser degree, is passing on to the viewer.

So the first structural issue is to find a cinematic or narrative form that deemphasizes sequence. In an earlier paper ⧉ In The Ocean of Streams of Story, I referred to the dream interpretations of Freud as examples of narrative structures that make the same sense and have the same narrative effect whatever the sequence in which they are recounted. The psychoanalytic analysand is deeply committed to the construction of narrative, but the order in which the elements of the narrative arrive in the psychoanalytic dialogue, though not random, is certainly

determined by factors extraneous to the story-structure. Freud insists that the elements of the dream are present, all at once, and that the sequencing necessitated by the linearity of writing adds an imprecision to the description of the dream-analysis.

> ▶ [The] task [of forming a synthesis from fragments that emerge in the analysis of a patient] ... finds a natural limit when it is a question of forcing a structure which is itself in many dimensions onto the two-dimensional descriptive plane. I must therefore content myself with bringing forward fragmentary portions, which the reader can then put together into a living whole.
> *Sigmund Freud, From the History of an Infantile Neurosis*

A problem with a text already organized into a linear structure, especially when the writer is someone who handles prose as delicately as Freud, is that it is difficult, if not impossible, to "put together a living whole" that diverges in sense or interpretation from the text presented. Freud's brilliant organization of his material into narrative blocks, replete with drama, suspense and surprise, presupposes a particular set of criteria as to what counts as successful dream analysis. Without Freud's "reading"- and subsequent writing of the associations produced by his patient, it is unlikely that a casual reader would place the sighting of the parental copulation at the center of the analysis of the Wolf Man's gorgeous dream image of staring white wolves sitting in a walnut tree. The heuristic that Freud wishes to communicate in his analyses may easily be lost in a hypertextual version of the case history, where the weights accorded to the various elements of the interpretation would be equalized. So, in the spirit of the Freudian tradition, there is something of a split between would Freud says he wishes for and the putative results of his wish being fulfilled. On the other hand, there is much to be said for the idea of transferring to the reader the burden of coming to a general interpretation of a set of image/sound/textual material.

Another advantage secured by presenting the non-sequenced narrative as a tightly wound ball of data to be unwoven through interaction is that the sense of simultaneity is preserved. As viewer, the very fact that I have produced an element implies that its logical or expressive or evidentiary weight is equal to that of another element that I might have accessed. It is my action that pulled this piece of data out now, so its significance is no greater than the piece I pull out instead, the piece I pull out next. **The burden of making relationships between the parts of a work has shifted from author to viewer.**

An interactive Narrative?

But does eliminating fixed sequence eliminate narrative? Narrative is, after all, story-telling, not a database; and stories lead to closure - some narratologists believe that stories are structured by closure - which implies a linearity of temporal structure. The negative answer to this question can only be demonstrated practically, by making a work that proves the point. And this is what I have taken on as my general project as an artist. Through my work I want to say: . . .

. . . yes we can have a narrative that is essentially interactive, that respects the necessity of closure for story-telling, and shifts the responsibility for its overall temporality from the maker to the viewer.

Nonspecific sequence is one instance of the more general notion of non-linearity. With non-linearity comes a dynamic between the viewer's time with the piece (which in any single session is, by definition, linear and continuous), and the space of the work, which is probably in some sense continuous. The viewer's experience will be of a narrative that in its representation of a fictional world is interrupted and affected by its viewers. To repeat - I have conceived my task as an artist as discovering or inventing depicted worlds that demand representation non-linearly - either because they are multi-faceted and must be looked at from many angles, or because the temporal flow is non-sequential.

In my work there is always a fixed database of material to be traversed in various ways determinable by a viewer, and this results in a temporally nonlinear representation playing against the linear time of the viewer's experience. Because I am by temperament a filmmaker, my major interest is to create audiovisual data, then plot pathways through it. The viewer accesses the material along my pathways, which can be quite variable because multiple elements can be brought into play at any moment - e.g. all kinds of audio, including music, sound effects and voices, treated as independent malleable entities, separate from visual material; images - which can be combined in the space of the screen, or follow one another, played slow or fast or frozen; and text, that can at any moment be superimposed over images. This is a very rich palette, and can lead to a broad range of expressive possibilities.
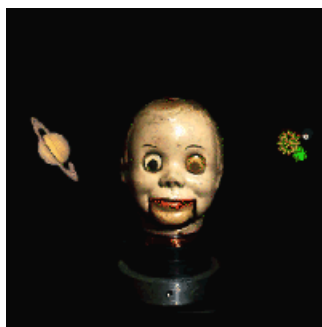
There is a section in *Sonata*, for example, where Tolstoy's anti-hero wife-killer Podsnyshev returns home from a trip to find his wife playing *The Kreutzer Sonata* with the violinist he suspects is her lover. Podsnyshev listens in the next room while he goes about his routine tasks-correspondence, bills, his diary, exercises. But the emotion of the music has such an intense effect on his mental state that he eventually bursts into the music room and stabs his wife to death. The scene is played so that a viewer can see either the calm, focused performance of the musicians or the frenzied activity of the husband.

In the recent version of *Sonata* the physical setup is a frame through which viewers look at a projected image. If the viewer points a finger through this frame, it interrupts a grid of infrared beams, and it is this pointing that provides the interface for the piece. In the music/murder scene, the viewer can determine what percentage of each room is seen on screen. Wherever a viewer points, the image is divided with a soft edge, on one side of which can be seen the activity in the music room, on the other the crazed jealous husband, pacing distractedly in his study. Pointing to the upper left of the screen jumps the action forward to the moment when the husband roars into the room and stabs his pianist-wife to death. Both the music-playing and Podsnyshev's activities continue, irrespective of what is shown on screen, but the composition of the image (in crude terms, what percentage of each scene is on screen) is determined by the viewer. In this instance, I have provided image materials for this dramatic scene, but the montage (i.e. what is seen at any moment) is determined by the viewer. Narrative time is always moving forward, and a viewer is always aware of the imminent closure, which he or she can activate with a single gesture. The tension between the activity in the two spaces portrayed, and the fact that the more you see of one room the less you see of the other, motivates the viewer to constantly change the scene arrangement, and kindles a sense of tension similar to that attributed to the protagonist. This is a kind of expression that can only be accomplished by means of interactivity, which connects the viewer with the jealous rage felt by the protagonist in a way that is not possible within the confines of the traditional cinema.

For *Sonata* I provide all the audiovisual materials, and plot a network of potential montage paths through them. Viewers navigate through the piece along these montage paths. However, it is important to understand that there is always a sense of continuity as the image changes, achieved by the same kinds of technique that are used in film editing. My system of equipment allows me to treat sound and image as separate elements, so that sound can change while video continues, or (more commonly) vice versa. The sound (music or dialogue) often continue swhile the image changes because of viewer input, giving a sense of fluidity to the experience and continuity to the narrative. Relying exclusively on random access does not imply that one must move through a piece in clunky quickstep.

Aesthetics of interactive works

Certainly there is a type of interactive work that depends exclusively on random access - usually with unpleasant results. The viewer of such a work is invited to make a choice from a menu of possibilities. The machine then delivers that material to the screen - it might be video, audio, text, or image files. Ken Feingold has compared this kind of interactivity to a candy machine. You put in your money, press a button, and the machine spits out the chocolate bar of your choice. The question is whether this model even deserves the designation "interactive." Feingold parodies this kind of work in his recent CD piece, ↗ JCJ-Junkman produced for the ArtIntact series of the ZKM. As we move further toward applications that have some expressive potential, we find that we need increasingly to use the power of the machine either to transform materials coded digitally or to combine materials in real time. *Sonata* uses an analogue video switcher/mixer device to combine video materials, because at this time analogue methods are still cheaper and more efficient than digital. In this case, effects that are easily accomplished for stills by the use of a digital image editor like Photoshop, can be better achieved for video in real time by a controlled manipulation of the video signal. Whether the effects require electronic manipulation of binary coded data or of variable waveforms is irrelevant - the point is that manipulation of the image in real time is necessary to achieve the effect. **The line between travel through a database and transformation of an image-set has been partially**

Ken Feingold "JCJ-Junkman"

erased. And here comes the digital again. For in interactivity, the concept of digitization allows the possibility of the formation of new materials by a user. This is a very different **concept of interactivity - it gives the viewer tools or an environment in which to work, an environment which generates materials according to rules described in advance by the maker.** Now we are not exploring an already existent dataspace, where the paths through the material and the nature of the data are the fundamental aesthetic issue - no, here we are in a world in which the user, in collaboration with the maker, creates something that the maker may not have predicted (though if it is based on algorithms or formulae, it is at least mathematically, if not intuitively, predictable.) Now we have an idea of an artist as making a pencil that can only draw in a certain way - what a future draughtsman will
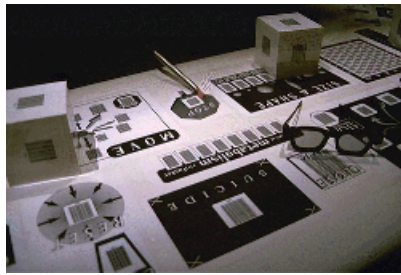
Perry Hoberman "Bar Code Hotel

draw with that pencil is unpredictable by the artist, though it is contained in the mathematical possibilities of the pencil. The VR artist describes the rules of an navigable depicted space: how people will move through it is not known by the artist in advance. Consider the funny and original ⧉ Bar Code Hotel, developed by Perry Hoberman between 1992 and 1994 at the Banff Center. His objects (teddy bears, paper clips, cheese wedges, bread loaves. . .) move around the virtual space, under the control of the bar code wands of the users in the room. The artist's work is to plot the objects' behaviours, define the limits of the space, determine what happens when they collide, etc, etc, so that all possibilities are accounted for. Then exactly what happens within the space is unrestricted, algorithmically determined but quite unpredictable.

The electronic artist ⧉ John F. Simon Jr. has created several works that are paradigmatic in this respect, in that they enable the user to operate and create ⧉ images, working within a space algorithmically defined by the artist. One of his projects is a set of digital brushes that can be used as tools for making images on a computer. The brushes are complex and fantastic, allowing the production of drawings like this with relatively few strokes of the stylus or mouse. The software is a delight to use, and the user quickly and easily produces interesting images. The odd thing is that in using one of these brushes one almost always seems to make a drawing that resembles one of John Simon's. In this way the project, apparently to provide a set of tools, in fact enables the artist who made the tools to practice his craft, generating his own images using the hands (and computers) of other people. It is as if Simon has made a machine to increase his output. Of course the question of authorship may be raised, especially if value or copyright gets attached to the work - but that is a separate issue. The project has a familiar ring to it, like a fairy tale in which a device that apparently does something for its finder in fact works in the interest of the person who misplaced it.
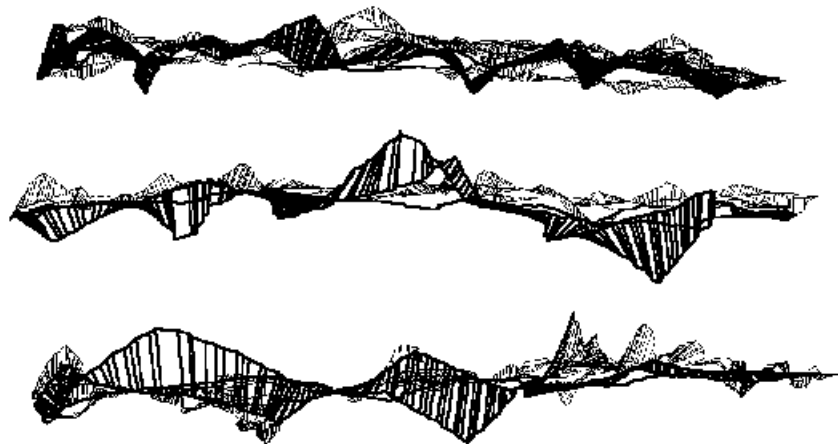
John F. Symon "Thick and Thin"

Incidentally, I have suggested elsewhere that the most popular mulitmedia software package, *Macromedia Director*, is similar in this respect: it brings a conception of interactivity or "multimedia" into every project it is used for. It is a conception of interactivity (centered around 'buttons' and a notion of 'choice' that I find deeply problematic. Advanced users of the software, of course, trick it, or bend it at least, into doing what they want it to do: but novice users repeat the same structure again and again. The difference is that in Simon's case, the brushes are conceived as limited tools to make a certain kind of drawing by making a certain kind of mark (he refers to Paul Klee on drawing and the nature of the line), while Director is marketed as an all-puroipose creative tool.

The Poetics of the OPen Work

I find in Simon's project many parallels with the music works by Berio, Stockhausen, Pousseur, and Boulez described by ▤ Umberto Eco in his trailblazing essay "The Poetics of the Open Work." Each of these works has the form of a set of instructions that leaves open a number of factors usually considered essential to musical composition-the sequence of musical elements, for example, or the pitch or tempo or rhythm of notes played within the clearly defined framework. In the works described by Eco, it is the performer of the music that responds to the score and determines the form of the piece - in the work by John Simon, it is the user of the

brushes that determines the final picture. In both cases the limits are clearly defined so that the authorship of the work is never in doubt, though performer in the case of the composers, and user in Simon's case, have much more control over the actual output that is usually the case in the production of art. Naturally there are exceptions and degrees of this, with John Cage in his most radical moments at one end of the scale, and jazz as a musical form which depends on improvisation at the other end.

"If a musical pattern no longer necessarily determines the immediately following one, if there is no tonal basis which allows the listener to infer the next steps in the arrangement of the musical discourse from what has physically preceded them, this is just part of a general breakdown in the concept of causation. [. . .] Multi-valued logics are now gaining currency, and these are quite capable of incorporating indeterminacy as a valid stepping-stone in the cognitive process. [. . .] From Malarmé's Livre to the musical compositions we have considered, there is a tendency to see every execution of the work of art as divorced from its ultimate definition. Every performance explains the composition, but does not exhaust it. Every performance makes the work an actuality, but is itself only complementary to all the other performances of the work. In short, we can say that every performance offers us a complete and satisfying version of the work, but at the same time makes it incomplete for us, because it cannot simultaneously give all the other artistic solutions which the work may admit. [. . .]

The possibilities which the work's openness makes available always work within a given field of relations. As in the Einsteinian universe, in the "work in movement" we may well deny that there is a single prescribed point of view. But this does not mean complete chaos in its internal relations. What is does imply is an organizing rule which governs these relations. Therefore, to sum up, we can say that the "work in movement" is the possibility of numerous different personal interventions, but it is not an amorphous invitation to indiscriminate participation. The invitation offers the performer the opportunity for an oriented insertion into something which always remains the world intended by the author."

If one replaces the terms "performer" with "viewer" in the above passage, Eco's ideas about the place of the author can easily be reapplied to interactive works, and his general ideas are a useful way to contextualize Interactivity within a larger cultural framework.

I have described interactive works of two kinds - the first based on the possibility of random access to material in a database, the second on digitization which leads to the computer's transformation of materials in real time. The larger question is: what aesthetic ends can be achieved by interactively exploring a database of material, using the potential offered by Random Access to cinematic materials? What does interactivity give us that we didn't have before?

Eco's answer is to describe a world-view underlying the need to develop works of this kind. A less general perspective might suggest that we can portray a an aspect of experience that has been missing from our representations, a depiction of the simultaneity of experience. Into the representation of events we can now incorporate our responses and the fact that, in everyday experience, our responses bring about change in what we are responding to. We are, after all, active participants on the world's stage (most of the time). Interactivity has the potential to depict humanness as an active condition.

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