

Lev Manovich

Computer Simulation and the History of Illusion

Zeuxis was a legendary Greek painter who lived in the fifth century BC.¹ The story of his competition with Parrhasius exemplifies the concern with illusionism which was to occupy Western art throughout much of its history. According to the story, Zeuxis painted grapes with such a skill that the birds began to fly down trying to eat from the painted vine.²

RealityEngine is a high-performance graphics computer which was manufactured by Silicon Graphics Inc. in the last decade of the twentieth century AC. Optimized to generate real time interactive photorealistic 3D graphics, it is used to create computer games and special effects for feature films and TV, to run scientific visualization models and computer-aided design software. Last but not least, RealityEngine is routinely employed to run high-end VR environments -- this latest achievement in West's struggle to outdo Zeuxis.

In terms of the images it can generate RealityEngine may not be superior to Zeuxis. Yet it can do other tricks, unavailable to the Greek painter. For instance, it allows the viewer to move around virtual grapes, touch them, lift them on a palm of a hand. And this ability of a viewer to interact with a representation may be as important in contributing to the overall reality effect as the images themselves. Which makes RealityEngine a formidable contender to Zeuxis.

In the twentieth century art has largely rejected the goal of illusionism, the goal which was so important to it before, and, as a consequence, it lost much of its popular support. The production of illusionistic representations became the domain of mass culture and of media technologies -- photography, film and video. The creation of illusions was delegated to optical and electronic machines.

Today, everywhere, these machines are being replaced by new, digital illusion generators -- computers. The production of all illusionistic images is becoming the sole province of PCs and Macs, Onyxes and RealityEngines.³

¹ This article uses some material which, in earlier form, appeared in my articles "Paradoxes of Digital Photography," in Photography After Photography, edited by v. Amelunxen, Stefan Iglhaut, Florian Rötzer, 58-66. München: Verlag der Kunst, 1995; and "The Aesthetics of Virtual Worlds: Report from Los Angeles," in Digital Delirium, edited by Arthur and Marilouise Kroker (New York: St. Martin's Press, 1997).

² For a detailed analysis of this story, see Stephen Bann, The True Vine. On Western Representation and the Western Tradition (Cambridge: Cambridge University Press, 1989).

³ Onyx is a faster version or RealityEngine which was also manufactured by Silicon Graphics.

This massive replacement is one of the key economic factors which keeps the new media industries expanding. As a consequence, these industries are obsessed with visual illusionism. This obsession is particularly strong in the field of computer imaging and animation. Its annual SIGGRAPH conventions is the competition between Zeuxis and Parrhasius on the industrial scale: about 40,000 people gather on a trade floor around thousands of new hardware and software displays, all competing with each other to deliver the best illusionistic images. The industry frames each new technological advance in image acquisition and display in terms of the ability of computer technologies to catch up and surpass the visual fidelity of analog media technologies. On their side, animators and software engineers are perfecting the techniques for synthesizing photorealistic images of sets and human actors. The quest for a perfect simulation of reality drives the whole field of Virtual Reality (VR). In a different sense, the designers of human-computer interfaces are also concerned with illusion. Many of them believe that their main goal is to make the computer invisible, i.e. to construct an interface which is completely “natural.” (In reality, what they usually mean by “natural” is simply older, already assimilated technologies, such as office stationary and furniture, a car, VCR controls, or a telephone.)

Although industry’s obsession with illusionism is not the sole factor responsible for making new media objects – games and CD-ROMs, computer-based films and virtual spaces -- look they way they do, it definitely one of the key. This article addresses different questions raised by the switch of all illusion-generation technologies to being computer-based. The the first three sections sketch three different theoretical questions. In the last two sections I consider in more detail two questions: traditional visual illusionism versus simulation of all aspects of reality in new media; and the effect of interactivity of reality effect.

1. The Turn to Representation

A parallel can be established between the gradual turn of computer imaging towards representational and photorealistic (the industry term for synthetic images which look as through they were created using traditional photography or cinematography) images throughout the end of the 1970s – beginning of the 1980s and the similar turn towards representational painting and photography in the art world during the same period.⁴ In the art world we witness photorealism, neo-expressionism, “post-modern” “simulation” photography. In computer world, during the same period, we may note the rapid development of the key algorithms for photorealistic 3D image synthesis such as Phong shading, texture mapping, bump mapping, reflection mapping and cast shadows; also the development of first paint programs in mid 1970s which allowed manual creation of representational images and eventually, towards the end of the 1980s, software such as Photoshop which, for a while, made a manipulated photograph the most common type of imagery created on a computer. In contrast, from the 1960s until late 1970s computer

⁴ I am grateful to Peter Lunenfeld for pointing out this connection to me.

imaging was mostly abstract because it was algorithm-driven and the technologies for inputting photographs into a computer were not easily accessible.⁵ Similarly, art world was either dominated by non-representational movements, such as conceptual art, minimalism and performance, or at least was approaching representation with a strong sense of irony and distance, in the case of pop art. (Although it is possible to argue that 1980s “simulation” artists also used “appropriated” images ironically, in their case the distance between the media and artists’ images became visually very small or non-existent.)

2. Computer Image as a Meeting of Human Intelligence and Alien Intelligence

In the twentieth century, a very particular looking image created by still photography and cinematography came to dominate modern visual culture. Some of its qualities are linear perspective, depth of field effect (so only a part of 3D space is in focus), particular tonal and color range, and motion blur (rapidly moving objects appear smudged). Considerable research had to be accomplished before it became possible to simulate all these visual artifacts with computers. And even armed with special software, the designer still has to spend significant time manually recreating the look of photography or film. In other words, computer software does not produce such images by default. The paradox of digital visual culture is while all imaging is shifting towards being computer-based, the dominance of photographic and cinematic looking images is becoming even stronger. But rather than being a direct, “natural” result of photo and film technology, these images are constructed on computers. 3D virtual worlds are subjected to depth of field and motion blur algorithms; digital video is run through the special filters which simulate film grain; and so on.

While visually, these computer-generated or filtered images are indistinguishable from traditional photo and film images, on the level of “material,” they are quite different as they are made from pixels or represented by mathematical equations and algorithms. In terms of the kinds of operations which can be performed on them, they are also quite different from images of photography and film. These operations, such as “copy and paste,” “add,” “multiply,” “compress,” “filter,” reflect first of all the logic of computer algorithms and of human-computer interface; only secondly they refer to the dimensions inherently meaningful to human perception. In fact, we can think of these operations as well as Human-Computer Interface (HCI) in general as balancing between the two poles of computer logic and human logic, by which I mean the everyday ways of perception, cognition, causality and motivation – in short, human everyday existence. Or, to the use the terms of the present exhibition, we can say HCI balances between two logics – that of human intelligence and alien intelligence of a computer.

Other aspects of the new logic of computer images can be derived from the general principles of new media: many operations involved in their synthesis and editing are automated; they typically exist in many versions; they include hyperlinks; they act as

⁵ For a good overview of the early history of computer art which includes the discussion of the “turn to illusionism,” see Frank Dietrich, "Visual Intelligence: The First Decade of Computer Art," in Computer Graphics, 1985.

interactive interfaces (thus an image is something we expect to enter rather than to stay on its surface); and so on.⁶ To summarize, the visual culture of a computer age is cinematographic in its appearance, digital on the level of its material, and computational (i.e., software driven) in its logic. What are the interactions between these three levels? Can we expect that cinematographic images (I use this phrase here to include images of both traditional analog and computer-simulated cinematography and photography) will be at some point replaced by some very differently images whose appearance will be more in tune with their underlying computer-based logic?

My own feeling is that the answer to this question is no. Cinematographic images are very efficient for cultural communication. Since they share many qualities with natural perception, they are easily processed by the brain. Their similarity to “the real thing” allows the designers to provoke emotions in viewers, as well as effectively visualize non-existent objects and scenes. And since computer representation turns these images into numerically coded data which is discrete (pixels) and modular (layers), they become subject to all economically beneficial effects of computerization: algorithmic manipulation, automation, variability and so on. A digitally-coded cinematographic image thus has two identities, so to speak: one satisfies the demands of human communication, another makes it suitable for computer-based practices of production and distribution.

3. The Challenge of Simulation

The available theories and histories of illusion in art and media, from Gombrich’s Art and Illusion and Andre Bazin’s “The Myth of Total Cinema” to Stephen Bann’s The True Vine, only deal with the visual dimensions.⁷ In my view, most of these theories have three arguments in common. These arguments concern three different relationships, respectively: between an image and physical reality (1); between an image and natural perception (2); between present and past images (3):

- (1) illusionistic images share some features with the represented physical reality (for instance, the number of an object’s angles);
- (2) Illusionistic images share some features with human vision (for instance, linear perspective);

⁶ I discuss these general principles in my article "New Media: a User's Guide" in NET.CONDITION (ZKM / Zentrum für Kunst und Medientechnologie Karlsruhe and The MIT Press), forthcoming.

⁷ Andre Bazin, What is Cinema? (Berkeley: University of California Press, 1967-71); Stephen Bann, The True Vine: on Visual Representation and the Western Tradition (Cambridge, England, and New York: Cambridge University Pres, 1989).

- (3) each period offers some new “features” which are perceived by audiences as “improvement” over of the previous period (for instance, the evolution of cinema from silent to sound to color).⁸

Until the arrival of computer media these theories were sufficient since the human desire to simulate reality indeed focused on its visual appearance (although not exclusively – think, for instance, of the tradition of automata). Today, while still useful, the traditional analysis of visual illusionism needs to be supplemented by new theories. The reason is that the reality effect in many areas of new media such only partially depends on image’s appearance. Such areas of new media as computer games, motion simulators, virtual worlds and VR, in particular, exemplify how computer-based illusionism functions differently. Rather than utilizing the single dimension of visual fidelity, they construct the reality effect on a number of dimensions, of which visual fidelity is just one. These new dimensions include active bodily engagement with a virtual world (for instance, the user of VR moves the whole body); the involvement of other senses beside vision (spatialized audio in virtual worlds and games; use of touch in VR; joysticks with force feedback; special vibrating and moving chairs for computer games play and motion rides), and the accuracy of the simulation of physical objects, natural phenomena, anthropomorphic characters and humans.

This last dimension, in particular, calls for an extensive analysis, because of the variety of methods and subjects of simulation. If the history of illusionism in art and media largely revolves around the simulation of how things look, for computer simulation this is one goal among many. Besides their visual appearance, simulation in new media aims to realistically model how objects and humans act, react, move, grow, evolve, think and feel. Physically-based modeling is used to simulate the behavior of inanimate objects and their interactions such as a ball bouncing of the floor or a glass being shattered. Computer games extensively use physical modeling to simulate collisions between objects and vehicle behavior -- for instance, a car being bounced against the walls of the racing tracks, or behavior of a plane in a flight simulation. Other methods such as AL (Artificial Life), formal grammars, fractal geometry and various applications of the complexity theory (popularly referred to as “chaos theory”) are used to simulate natural phenomena such as such as waterfalls and ocean waves, and animal behavior (flocking birds, school of fish). Yet another important area of simulation which also relies on many different methods is virtual characters and avatars, extensively used in movies, games, virtual worlds and human-computer interfaces. The examples are enemies and monsters in Quake; army units in WarCraft and similar games; human-like creatures in Creatures and other AL games and toys; and anthropomorphic interfaces such as Microsoft Office Assistant in Windows 98 -- an animated character which periodically pops out in a small window offering help and tips. The goal of human simulation in itself can be further broken into a set of various sub-goals: simulation of human psychological states, human behavior, motivations, and emotions. (Thus,

⁸ On the history of illusionism in cinema, see the influential theoretical analysis by Jean-Louis Comolli, "Machines of the Visible, The Cinematic Apparatus, edited by Teresa De Lauretis and Steven Health (New York: St. Martin Press), 1980.

ultimately, the fully “realistic” simulation of a human being requires not only completely fulfilling the vision of the original AI (Artificial Intelligence) paradigm but also going beyond it – since original AI was solely aimed at simulating human perception and thinking processes but not emotions and motivations.) Yet another kind of simulation involve modeling the dynamic behavior over time of whole systems composed from organic and/or non-organic elements (for instance, popular series of Sim games such as SimCity or SimAnts which simulate a city and an ant colony, respectively)

And even on the visual dimension – the one dimension which new media “reality engines” share with the traditional illusionistic techniques – things work very differently. New media changes our concept of what an image is – because it turns a viewer into an active user. As a result, a illusionistic image is no longer something a subject simply looks at, comparing it with her memories of represented reality in order to judge the reality effect of this image. The new media image is something the user actively goes into, zooming in or clicking on individual parts with the assumption that they contain hyperlinks (for instance, imagemaps in Web sites). Moreover, new media turns most images into image-interfaces and image-instruments. Image becomes interactive, i.e. it now functions as an interface between a user and a computer or other devices. The user employs Image-interface to control a computer, asking it to zoom into the image or display another one, start a software application, connect to the Internet, and so on. The user employs image-instruments to directly affect reality:, move a robotic arm in a remote location, fire a missile, change the speed of the car and set the temperature, and so on. To evoke the term often used in film theory, new media moves us from identification to action. What kinds of actions can be performed via an image, how easily they can be accomplished, their range -- all this plays part in user’s assessment of the reality effect of the image.

4. Alien Vision: Jurassic Park and Socialist Realism

Consider the film which played a key role in Hollywood’s acceptance of computer simulation in the early 1990s: George Lucas’s Jurassic Park. This triumph of computer simulation took more than two years of work by dozens of designers, animators, and programmers of Industrial Light and Magic (ILM), one of the premier company specializing in the production of computer animation for feature films in the world today. Because a few seconds of computer animation often requires months and months of work, only the huge budget of a Hollywood blockbuster could pay for such extensive and highly detailed computer generated scenes as seen in Jurassic Park. Most of the 3-D computer animation produced today has a much lower degree of photorealism and this photorealism is uneven, higher for some kinds of objects and lower for others. And even for ILM photorealistic simulation of human beings, the ultimate goal of computer animation, still remains impossible. (Some scenes in 1997 Titanic feature hundreds of synthetic human figures, yet they appear for a few seconds and are quite small, being far away from the camera.)

Typical images produced with 3-D computer graphics still appear unnaturally clean, sharp, and geometric looking. Their limitations especially stand out when juxtaposed with a normal photograph. Thus one of the landmark achievements of Jurassic

Park was the seamless integration of film footage of real scenes with computer simulated objects. To achieve this integration, computer-generated images had to be degraded; their perfection had to be diluted to match the imperfection of film's graininess.

First, the animators needed to figure out the resolution at which to render computer graphics elements. If the resolution were too high, the computer image would have more detail than the film image and its artificiality would become apparent. Just as Medieval masters guarded their painting secrets now leading computer graphics companies carefully guard the resolution of image they simulate.

Once computer-generated images are combined with film images additional tricks are used to diminish their perfection. With the help of special algorithms, the straight edges of computer-generated objects are softened. Barely visible noise is added to the overall image to blend computer and film elements. Sometimes, as in the final battle between the two protagonists in Terminator 2, the scene is staged in a particular location (in this example, a smoky factory) which justifies addition of smoke or fog to further blend the film and synthetic elements together.

So, while we normally think that synthetic photographs produced with computer graphics are inferior to real photographs, in fact, they are too perfect. But beyond that we can also say that paradoxically they are also too real.

The synthetic image is free of the limitations of both human and camera vision. It can have unlimited resolution and an unlimited level of detail. It is free of the depth-of-field effect, this inevitable consequence of the lens, so everything is in focus. It is also free of grain -- the layer of noise created by film stock and by human perception. Its colors are more saturated and its sharp lines follow the economy of geometry. From the point of view of human vision it is hyperreal. And yet, it is completely realistic. It is simply a result of a different, more perfect than human, vision.

Whose vision is it? It is the vision of a cyborg or a computer; a vision of Robocop and of an automatic missile. It is a realistic representation of human vision in the future when it will be augmented by computer graphics and cleansed from noise. It is the vision of a digital grid. Synthetic computer-generated image is not an inferior representation of our reality, but a realistic representation of a different reality.

By the same logic, we should not consider clean, skinless, too flexible, and in the same time too jerky, human figures in 3-D computer animation as unrealistic, as imperfect approximation to the real thing -- our bodies. They are perfectly realistic representation of a cyborg body yet to come, of a world reduced to geometry, where efficient representation via a geometric model becomes the basis of reality. The synthetic image simply represents the future. In other words, if a traditional photograph always points to the past event, a synthetic photograph points to the future event.

Is this a totally new situation? Was there already an aesthetics which consistently pointed to the future? In order to help us locate this aesthetics historically, I will invoke a painting by Russian-born conceptual artists Komar and Melamud. Called "Bolsheviks Returning Home after a Demonstration" (1981-1982), it depicts two workers, one carrying a red flag, who came across a tiny dinosaur, smaller than a human hand, standing in the snow. Part of "Nostalgic Socialist Realism" series, this painting was created a few years after the painters arrived to the United States, well before Hollywood embraced computer-generated visuals. Yet it seems to comment on such movies as Jurassic Park and on Hollywood as a whole, connecting its fictions with the fictions of

Soviet history as depicted by Socialist Realism, the official style of Soviet art from the early 1930s until the late 1950s.

Taking the hint from this painting, we are now in a position to characterize the aesthetics of Jurassic Park. This aesthetic is one of Soviet Socialist Realism. Socialist Realism wanted to show the future in the present by projecting the perfect world of future socialist society on a visual reality familiar to the viewer – streets, interiors and faces of Russia in the middle of the twentieth century -- tired and underfed, scared and exhausted from fear, unkempt and gray. Socialist realism had to retain enough of then everyday reality while showing how that reality would look in the future when everyone's body will be healthy and muscular, every street modern, every face transformed by the spirituality of communist ideology. This is its difference from pure science fiction which does not have to carry any feature of today reality into the future. In contrast, Socialist realism had to superimpose future into the present, projecting the Communist ideal into the very different reality familiar to the viewers. Importantly, Socialist Realism never depicted this future directly: there is not a single Socialist Realist work of art set in the future. Science fiction as a genre did not exist from early 1930s until Stalin's death. The idea was not to make the workers dream about the perfect future closing their eyes to imperfect reality, but rather to make them see the signs of this future in the reality around them. This is one of the meanings behind Vertov's notion of "communist decoding of the world." To decode the world in such a way means to recognize the future all around you.

The same superimposition of future onto the present happens in Jurassic Park. It tries to show the future of sight itself -- the perfect cyborg vision which is free of noise and capable of grasping infinite details. This vision is exemplified by the original computer graphics images before they were blended with film images. But just as Socialist Realist paintings blended the perfect future with the imperfect reality, Jurassic Park blends the future super-vision of computer graphics with the familiar vision of film image. In Jurassic Park, the computer image bends down before the film image, its perfection is undermined by every possible means and is also masked by the film's content. As I already described, computer generated images, originally clean and sharp, free of focus and grain, are degraded in a variety of ways: resolution is reduced, edges are softened, depth of field and grain effect are artificially added. Additionally, the very content of the film – the prehistoric dinosaurs which came to life – can be interpreted as another way to mask the potentially disturbing reference to our cyborg future. The dinosaurs are present to tell us that computer images belong safely to the past long gone – even though we have every reason to believe that they are messengers from the future still to come.

In that respect Jurassic Park and Terminator 2 are the opposites. If in Jurassic Park the dinosaurs function to convince us that computer imagery belongs to the past, the Terminator in Terminator 2 is more "honest." He himself is a messenger from the future. Accordingly, he is a cyborg who can take on the human appearance. His true form is that of a futuristic alloy. In perfect correspondence with this logic, this form is represented with computer graphics. While his true body perfectly reflects its surrounding reality, the very nature of these reflection shows to us the future of human and machine sight. The reflections are extra-sharp and clean, without any blur. This is indeed the look produced by the reflection mapping algorithm, one of the standard techniques to achieve photorealism. Thus, to represent the Terminator who came from the future the designers

used the standard computer graphics techniques without degrading them; in contrast, in Jurassic Park the dinosaurs which came from the past were created by systematically degrading computer images. What of course is the past in this movie is the film medium itself: its grain, its depth of focus, its motion blur, its low resolution.

This is, then, the paradox of computer illusionism. The images of 3-D photorealistic computer animation are not inferior to the visual realism of traditional photography. They are perfectly real -- all too real.

5. Illusion and Interactivity

Having analyzed computer illusionism from the points of view of its production and the longer history of visual illusion, I now want to look at it from a different perspective. While the existing theories of illusionism assume that the subject acts strictly a viewer, the new media more often than not turns the subject into the user -- an actant. The subject is expected to interact with a representation: click on menus or the image itself, making selections and decisions. What effect does interactivity has on reality effect of an image? Is the fidelity of simulation of physical laws or human motivation more important for "realism" of a representation than its purely visual qualities? For instance, is a racing game which uses a more precise collision model but poor visuals feels more real than the game which has richer images but less precise model? Or do the simulation dimensions and visual dimensions support each other, adding up to create a total effect?

In this section I will focus on a particular aspect of this more general question: production of illusionism in interactive computer objects. The aspect which I will consider has to do with time. Web sites, virtual worlds, computer games and many other types of hypermedia applications are characterized by a peculiar temporal dynamic: constant, repetitive shifts between an illusion and its suspense. These new media objects keep reminding us about their artificiality, incompleteness, and constructedness. They present us with a perfect illusion only to reveal the underlying machinery next.

Web surfing in the 1990s provides a perfect example. A typical user may be spending equal time looking at a page and waiting for the next page to download. During waiting periods, the act of communication itself -- bits traveling through the network -- becomes the message. The user keeps checking whether the connection is being made, glancing back and forth between the animated icon and the status bar. Using Roman Jakobson's model of communication functions, we can say that communication comes to be dominated by contact, or phatic function -- it is centered around the physical channel and the very act of connection between the addresser and the addressee.⁹

Jakobson writes about verbal communication between two people who, in order to check whether the channel works, address each other: "Do you hear me?," "Do you understand me?" But in Web communication there is no human addresser, only a machine. So as the user keeps checking whether the information is coming, she actually addresses the machine itself. Or rather, the machine addresses the user. The machine reveals itself, it reminds the user of its existence -- not only because the user is forced to

⁹ See Roman Jakobson, "Closing Statement: Linguistics and Poetics," in Style In Language, ed. Thomas Sebeok (Cambridge, Mass.: The MIT Press, 1960).

wait but also because she is forced to witness how the message is being constructed over time. A page fills in part by part, top to bottom; text comes before images; images arrive in low resolution and are gradually refined. Finally, everything comes together in a smooth sleek image -- the image which will be destroyed with the next click.

Interaction with most 3D virtual worlds is characterized by the same temporal dynamic. Consider the technique called "distancing" or "level of detail," which for years has been used in VR simulations and later was adapted to 3D games and VRML scenes. The idea is to render the models more crudely when the user is moving through virtual space; when the user stops, details gradually fill in. Another variation of the same technique involves creating a number of models of the same object, each with progressively less detail. When the virtual camera is close to an object, a highly detailed model is used; if the object is far away, a lesser detailed version is substituted to save unnecessary computation.

A virtual world which incorporates these techniques has a fluid ontology that is affected by the actions of the user. As the user navigates through space the objects switch back and forth between pale blueprints and fully fleshed out illusions. The immobility of a subject guarantees a complete illusion; the slightest movement destroys it.

Navigating a QuickTime VR movie is characterized by a similar dynamic. In contrast to the nineteenth century panorama that it closely emulates, QuickTime VR continuously deconstructs its own illusion. The moment you begin to pan through the scene, the image becomes jagged. And, if you try to zoom into the image, all you get are oversized pixels. The representational machine keeps hiding and revealing itself.

Compare this dynamic to traditional cinema or realist theater which aims at all costs to maintain the continuity of the illusion for the duration of the performance. In contrast to such totalizing realism, new media aesthetics has a surprising affinity to twentieth century leftist avant-garde aesthetics. Playwright Bertold Brecht's strategy to reveal the conditions of an illusion's production, echoed by countless other leftist artists, has become embedded in hardware and software themselves. Similarly, Walter Benjamin's concept of "perception in the state of distraction"¹⁰ has found a perfect realization. The periodic reappearance of the machinery, the continuous presence of the communication channel in the message prevent the subject from falling into the dream world of illusion for very long, making her alternate between concentration and detachment.

While virtual machinery itself already acts as an avant-garde director, the designers of interactive media, such as games, DVD titles, interactive cinema, and interactive television programs, often consciously attempt to structure the subject's temporal experience as a series of periodic shifts. The subject is forced to oscillate between the roles of viewer and user, shifting between perceiving and acting, between following the story and actively participating in it. During one segment the computer screen presents the viewer with an engaging cinematic narrative. Suddenly the image freezes, menus and icons appear and the viewer is forced to act: make choices; click; push buttons. The most pure example of such cyclical organization of user's experience is

¹⁰ Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction," in Illuminations, ed. Hannah Arendt (New York: Schochen Books, 1969).

the computer games which alternate between FMV (full motion video) segments and the segments which require user's input, such as Wing Commander series. Moscow media theorist Anatoly Prokhorov described these shifts in terms of two different identities of a computer screen: transparent and opaque. The screen keeps shifting from being transparent to being opaque -- from a window into a fictional 3D universe to a solid surface, full of menus, controls, text and icons.¹¹ Three-dimensional space becomes surface; a photograph becomes a diagram; a character becomes an icon. We can say that the screen keeps alternates between the dimensions of representation and control. What at one moment was a fictional universe becomes a set of buttons which demand action.

The effect of these shifts on the subject is hardly one of liberation and enlightenment. While modernist avant-garde theater and film directors deliberately highlighted machinery and conventions involved in producing and keeping the illusion in their works – for instance, having actors directly address the audience or pulling away the camera to show the crew and the set – the systematic “auto-deconstruction” performed by computer objects, applications, interfaces and hardware does not seem to distract the user from giving in to the reality effect. The cyclical shifts between illusion and its destruction appear to neither distract from it nor support it. It is tempting to compare these temporal shifts to shot / counter-shot structure in cinema and to understand them as a new kind of suturing mechanism. By having periodically to complete the interactive text through active participation the subject is interpolated in it. Thus, if we adopt the notion of suture, it would follow that the periodic shifts between illusion and its suspension are necessary to fully involve the subject in the illusion.¹²

Yet clearly we are dealing with something which goes beyond old-style realism of analog era. We can call this new realism meta-realism since it incorporates its own critique inside itself. Its emergence can be related to a larger cultural change. Old realism corresponded to the functioning of ideology during modernity: totalization of a semiotic field, "false consciousness," complete illusion. But today ideology functions differently: it continuously and skillfully deconstructs itself, presenting the subject with countless "scandals" and "investigations." The leaders of the middle of the twentieth century were presented as invincible; as being always right, and, in the case of Stalin and Hitler, as true saints not capable of any human sin. Today we expect to learn about the scandals involving our leaders, and these scandals do not really diminish their credibility. Similarly, contemporary television commercials often make fun of themselves and advertising in general; this does not prevent them from selling whatever they are designed to sell. Auto-critique, scandal, revelation of its machinery became a new structural component of modern ideology: witness the 1998 episode when MTV created an illusion on its Web site that somebody hacked it. The ideology does not demand that the subject blindly believes it, as it did early in the twentieth century; rather, it puts the subject in a master position of somebody who knows very well that she is being fooled, and generously lets her be fooled. You know, for instance, that creating a unique identity

¹¹ Private communication, September 1995, St. Petersburg.

¹² On theories of suture in relation to cinema, see chapter 5 of Kaja Silverman, The Subject of Semiotics (New York: Oxford University Press, 1983).

through a commercially mass produced style is meaningless -- but anyway you buy the expensively styled clothes, choosing from a menu: “military,” “bohemian,” “flower child,” “inner city,” “clubbing,” and so on. The periodic shifts between illusion and its suspension in interactive media, described here, can be seen as another example of the same general phenomenon. Just as classical ideology, classical realism demanded that the subject completely accepted the illusion for as long as it lasted. In contrast, the new meta-realism is based on oscillation between illusion and its destruction, between immersing a viewer in illusion and directly addressing her. In fact, the user is even put in much stronger position of mastery when she ever is by “auto-deconstructing” commercials, newspaper reports of “scandals” and other traditional non-interactive media. Once illusion stops, the user can make choices, re-direct game narrative or get additional information from other Web sites conveniently linked by the designers. The user invests into illusion precisely because she is given control over it.

If this analysis is correct, the counter-arguments that this oscillation is simply an artifact of the current technology and that the advances in hardware will eliminate it, would not work. The oscillation analyzed here is not an artifact of computer technology but a structural feature of modern society, present not just in interactive media but in numerous other social realms and on many different levels.

This may explain the popularity of this particular temporal dynamics in interactive media, but it does not address another question: does it work aesthetically? Can Brett and Hollywood be married? Is it possible to create a new temporal aesthetics, even a language, based on cyclical shifts between perception and action? In my view, the most successful example of such an aesthetics already in existence is a military simulator, the only mature form of interactive narrative. It perfectly blends perception and action, cinematic realism and computer menus. The screen presents the subject with an illusionistic virtual world while periodically demanding quick actions: shooting at the enemy; changing the direction of a vehicle; and so on. In this art form, the roles of a viewer and a actant are blended perfectly -- but there is a price to pay. The narrative is organized around a single and clearly defined goal: staying alive.

The games modeled after simulators – first of all, first person shooters such as Doom, Quake and Tomb Rider, but also flight and racing simulators – have been also quite successful. In contrast to interactive narratives such as Wing Commander, Myst, Riven, or Bad Day on the Midway which are based on temporal oscillation between two distinct states, non-interactive movie-like presentation and interactive game play, in these games these two states – which are also two states of the subject (perception and action) and the two states of a screen (transparent and opaque) -- co-exist together. As you run through the corridors shooting at enemies or control the car on the racetrack, you also keep your eyes on the readouts which tell about the “health” of your character, the damage level of your vehicle, the availability of ammunition, and so on.

As a conclusion, I would like to offer a different interpretation of the temporal oscillation in new media which will relate it not to the social realm outside of new media but to other similar effects specific to new media itself. The oscillation between illusionary segments and interactive segments forces the user to switch between different mental sets -- different kinds of cognitive activity. These switches are typical of using modern computer use in general. The user analyses the quantitative data; next she is using a search engine; next she starts a new application; next she navigates through space

in a computer game; next she may go back to using a search engine; and so on. In fact, the modern HCI which allows the user to run a number of programs at the same time and to keep a number of windows open on the screen at once posits multi-tasking as the social and cognitive norm. This multi-tasking demands from the user “cognitive multi-tasking” – rapidly alternating between different kinds of attention, problem solving and other cognitive skills. All in all, modern computing requires from a user intellectual problem solving, systematic experimentation and the quick learning of new tasks. Thus, just as any particular software application is embedded, both metaphorically and literally, within the larger framework of the operating system, new media embeds cinema-style illusions within the larger framework of an interactive control surface. Illusion is subordinated to action; depth to surface; a window into an imaginary universe to a control panel. From commanding a dark movie theater, this twentieth century illusion and therapy machine par excellence, a cinema image becomes just a small window on a computer screen; one stream among many others coming to us through the network; one file among numerous others on our hard drives.