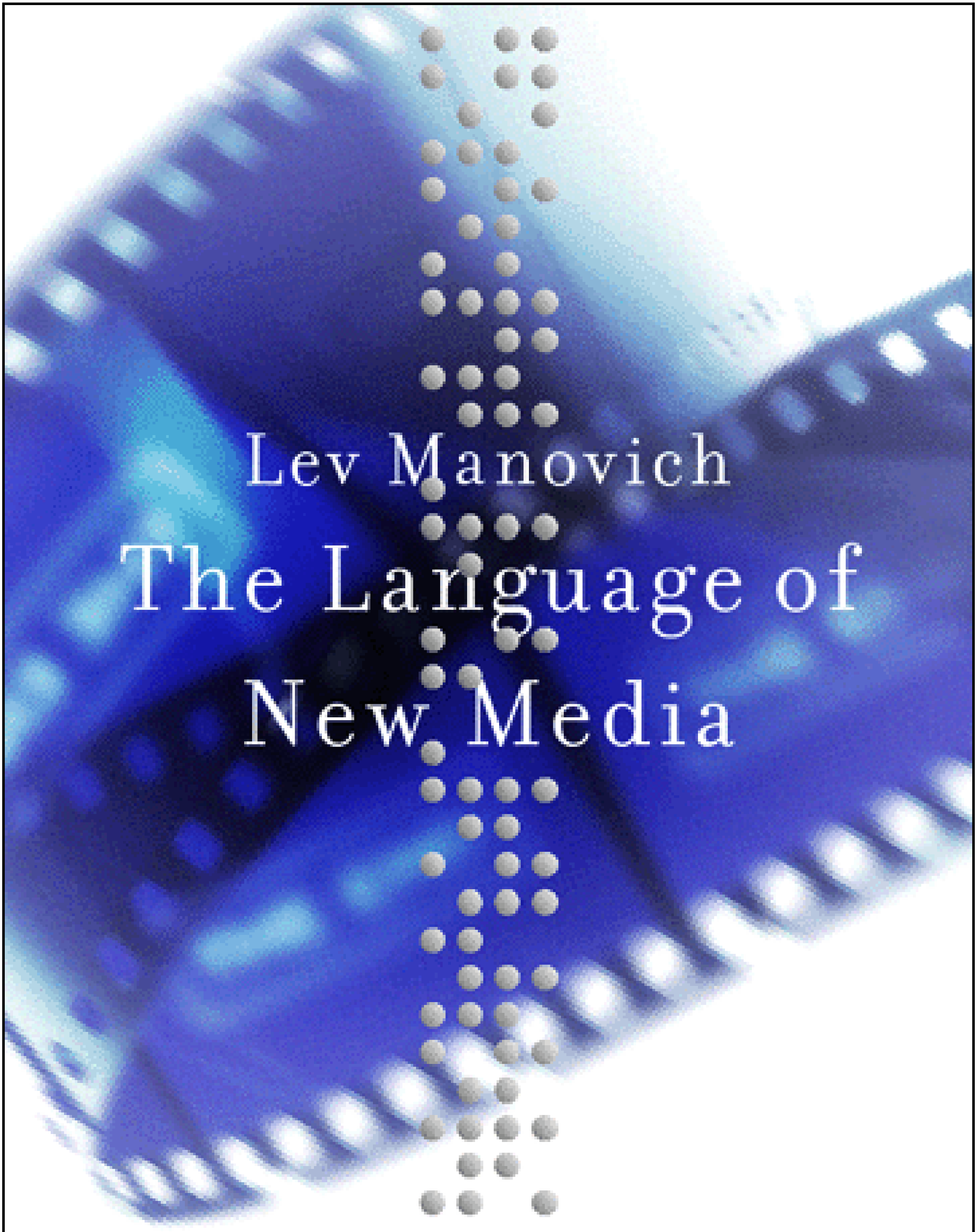
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The Language of
New Media

IV. The Illusions

Zeuxis was a legendary Greek painter who lived in the fifth century BC. 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 begun to fly down trying to eat from the painted vine.[190]

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.[191]

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.)

Continuing our bottom-up trajectory in examining new media, we have now arrived at the level of appearance. Although industry's obsession with illusionism is not the sole factor responsible for making new media look they way they do, it definitely one of the key. Focusing on the issue of illusionism, the sections of this chapter address different questions raised by it. How is the "reality effect" of a synthetic image different from that of the optical media? Is computer technology redefines our standards of illusionism as determined by our earlier experience with photography, film and video? "Synthetic Realism as Bricolage" and "Synthetic Image and its Subject" provide two possible answers to these questions. These sections investigate the new "internal" logic of a computer-generated illusionistic image by comparing lens-based and computer imaging technologies. The third section, "Illusion, Narrative, and Interactivity," asks how visual illusionism and interactivity work together (as well as against each other), in virtual worlds, computer games, military simulators and other new interactive new media objects and interfaces.

The discussions in these sections do not by any means exhaust the topic of illusionism in new media. "Compositing" and "Digital Cinema" sections in the preceding and last chapter, respectively, deal with this topic from other perspectives. As an example of other interesting questions which the topic of illusionism in new media may generate, I will list three below.

1.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.[192] 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 imaging was mostly abstract because it was algorithm-driven and the technologies for inputting photographs into a computer were not easily accessible.[193] 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.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). As I will discuss in the following two sections, 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 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.)

Other aspects of the new logic of computer images can be derived from the general principles of new media (see "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 interactive interfaces (thus an image is something we expect to enter rather than to stay on its surface); and so on. 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 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.[194] 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).
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).[195]

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 pnenomena, anthropomorhic 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, 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, ultimately, the fully "realistic" simulation of a human being requires not only completely fulfilling the vision of the original AI 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 (on the concept of image as interface, see "Cultural Interfaces" section; on image-instrument, see "Teleaction" section.) Image becomes interactive, i.e. it now functions as an interface between a user and a computer or other devices. The user emplys 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.

Synthetic Realism and its Discontents

"Realism" is the concept which inevitably accompanies the development and assimilation of 3D computer graphics. In media, trade publications and research papers, the history of technological innovation and research is presented as a progression toward realism — the ability to simulate any object in such a way that its computer image is indistinguishable from a photograph. At the same time, it is constantly pointed out that this realism is qualitatively different from the realism of optically based image technologies (photography, film), for the simulated reality is not indexically related to the existing world.

Despite this difference, the ability to generate three-dimensional stills does not represent a radical break in the history of visual representation of the multitude comparable to the achievements of Giotto. A Renaissance painting and a computer image employ the same technique (a set of consistent depth cues) to create an illusion of space — existent or imaginary. The real break is the introduction of a moving synthetic image — interactive 3D computer graphics and computer animation. With these technologies, a viewer has an experience of moving around the simulated 3D space — something one can't do with an illusionistic painting.

In order to better understand the nature of "realism" of the synthetic moving image it is relevant to consider a contiguous practice of the moving image — the cinema. I will approach the problem of "realism" in 3D computer animation starting from the arguments advanced in film theory in regard to cinematic realism.

This section considers finished 3D computer animations which are created beforehand and then incorporated in a film, a television program, a Web site or a computer game. In the case of animations which are being generated by a computer in real-time, and thus are dependent not only on available software but also on hardware capabilities, somewhat different logic applies. The example of a new media object from the 1990s which uses both types of animation is a typical computer game. The interactive parts of the game are animated in real time. Periodically, the game switches to a "full motion video" mode. "Full motion video" is either a digital video sequence or a 3D animation which was pre-rendered and therefore has higher level of detail — and thus "realism" — than the animations done in real time. The last section of this chapter, "Image, Narrative and Illusion" considers how such temporal shifts which are not limited to games but are typical of interactive new media objects in general, affects their "realism."

Technology and Style in Cinema

The idea of cinematic realism is first of all associated with André Bazin, for whom cinematic technology and style move toward a "total and complete representation of reality."[196] In "The Myth of Total Cinema" Bazin claims that the idea of cinema existed long before the medium had actually appeared and that the development of cinema technology "little by little made a reality out of original 'myth'."[197] In this account, the modern technology of cinema is a realization of an ancient myth of mimesis, just as the development of aviation is a realization of the myth of Icarus. In another influential essay, "The Evolution of the Language of Cinema," Bazin reads the history of film style in similar teleological terms: the introduction of depth of field style in the end of 1930s and the subsequent innovations of Italian neorealists in 1940s gradually bring a spectator "into a relation with the image closer to that which he enjoys with reality." The essays differ not only in that the first interprets film technology while the second concentrates on film style, but also in their distinct approaches to the problem of realism. In the first essay realism stands for the approximation of phenomenological qualities of reality, "the reconstruction of a perfect illusion of the outside world in sound, color and relief."[198] In the second essay Bazin emphasizes that a realistic representation should also approximate the perceptual and cognitive dynamics of natural vision. For Bazin, this dynamics involves active exploration of visual reality. Consequently, he interprets the introduction of depth of field as a step toward realism, because now the viewer can freely explore the space of film image.[199]

Against Bazin's "idealist" and evolutionary account, Jean-Louis Comolli proposes a "materialist" and fundamentally non-linear reading of the history of cinematic technology and style. The cinema, Comolli tells us, "is born immediately as a social machine...from the anticipation and confirmation of its social profitability; economic, ideological and symbolic."[200] Comolli thus proposes to read history of cinema techniques as an intersection of technical, aesthetic, social and ideological determinations; however, his analyses clearly privilege an ideological function of the cinema. For Comolli, this function is "'objective' duplication of the 'real' itself conceived as specular reflection" (133). Along with other representational cultural practices, cinema works to endlessly reduplicate the visible thus sustaining the illusion that it is the phenomenal forms (such as the commodity form) which constitute the social "real" — rather than "invisible" to the eye relations of productions. To fulfill its function, cinema must maintain and constantly update its "realism." Comolli sketches this process using two alternative figures — addition and substitution.

In terms of technological developments, the history of realism in the cinema is one of additions. First, additions are necessary to maintain the process of disavowal, which for Comolli defines the nature of cinematic spectatorship

(132). Each new technological development (sound, panchromatic stock, color) points to the viewers just how "un-realistic" the previous image was and also reminds them that the present image, even though more realistic, will be superseded in the future — thus constantly sustaining the state of disavowal. Secondly, since cinema functions in a structure with other visual media, it has to keep up with their changing level of realism. For instance, by 1920s the spread of photography with its finely gradated image made cinematic image seem harsh by comparison, and film industry was forced to change to the panchromatic stock to keep up with the standard of photographic realism (131). This example is a good illustration of Comolli's reliance on Althusserian structuralist Marxism. Unprofitable economically for the film industry, this change is "profitable" in more abstract terms for the social structure as a whole, helping to sustain the ideology of the real/visible.

In terms of cinematic style, the history of realism in cinema is one of the substitutions of cinematic techniques. For instance, while the change to panchromatic stock adds to the image quality, it leads to other losses. If earlier cinematic realism was maintained through the effects of depth, now "depth(perspective) loses its importance in the production of 'reality effects' in favor of shade, range, color" (131). So theorized, realistic effect in the cinema appears as a constant sum in an equation with a few variables which change historically and have equal weight: if more shading or color is "put in," perspective can be "taken out." Comolli follows the same logic of substitution/substraction in sketching the development of cinematic style in its first two decades: the early cinematographic image announces its realism through an abundance of moving figures and the use of deep focus; later these devices fade away and others, such as fictional logic, psychological characters, coherent space-time of narration, take over (130).

While for Bazin realism functions as an Idea (in a Hegelian sense), for Comolli it plays an ideological role (in a Marxist sense); for David Bordwell and Janet Staiger, realism in film is first of all connected with the industrial organization of cinema. Put differently, Bazin draws the idea of realism from mythological utopian thinking. For him, realism is found in the space between reality and a transcendental spectator. Comolli sees it as an effect, produced between the image and the historical viewer and continuously sustained through the ideologically determined additions and substitutions of cinematic technologies and techniques. Bordwell and Staiger locate realism within the institutional discourses of film industries, implying that it is a rational and pragmatic tool in industrial competition.[201] Emphasizing that cinema is an industry like any other, Bordwell and Staiger attribute the changes in cinematic technology to the factors shared by all modern industries — efficiency, product differentiation, maintenance of a standard of quality (247). One of the advantages of adopting an industrial model is that it allows the authors to look at specific agents —

manufacturing and supplying firms and professional associations (250). The latter are particularly important since it is in their discourses (conferences, trade meetings and publications) that the standards and goals of stylistic and technical innovations are articulated.

Bordwell and Staiger agree with Comolli that the development of cinematic technology is not linear, however, they claim that it is not random either, as the professional discourses articulate goals of the research and set the limits for permissible innovations (260). According to Bordwell and Staiger, realism is one of these goals. They believe that such definition of a realism is specific to Hollywood:

> “Showmanship,” realism, invisibility: such cannons guided the SMPE [Society of Motion Picture Engineers] members toward understanding the acceptable and unacceptable choices in technical innovations, and these too became teleological. In another industry, the engineer's goal might be an unbreakable glass or a lighter alloy. In the film industry, the goals were not only increased efficiency, economy, and flexibility but also spectacle, concealment of artifice, and what Goldsmith [1934 president of SMPE] called “the production of an acceptance semblance of reality.” (258)

Bordwell and Staiger are satisfied with Goldsmith's definition of realism as "the production of an acceptance semblance of reality." However, such general and transhistorical definition does not seem to have any specificity for Hollywood and thus can't really account for the direction of technological innovation. Moreover, although they claim to have successfully reduced realism to a rational and a functional notion, in fact they have not managed to eliminate Bazin's idealism. It reappears in the comparison between the goals of innovation in film and other industries. "Lighter alloy" is used in aviation industry which can be thought of as the realization of the myth of Icarus; and is there not something mythical and fairy tale-like about "unbreakable glass"?

Technology and Style in Computer Animation

How can these three influential accounts of cinematic realism be used to approach the problem of realism in 3D computer animation? Bazin, Comolli, and Bordwell and Staiger offer us three different strategies, three different starting points. Bazin builds his argument by comparing the changing quality of the cinematic image with the phenomenological impression of visual reality. Comolli's analysis suggests a different strategy: to think of the history of computer graphics technologies and the changing stylistic conventions as a chain of substitutions functioning to sustain the reality effect for audiences. Finally, to follow Bordwell and Staiger's approach is to analyze the relationship between the character of realism in computer animation and the particular industrial organization of the computer graphics industry. (For instance, we can ask how this character is affected by the cost difference between hardware and software development.) Further, we should pay attention to professional organizations in the field and their discourses which articulate the goals of research and where we may expect to find "admonitions about the range and nature of permissible innovations" (Bordwell and Staiger, 260). I will try the three strategies in turn.

If we follow Bazin's approach and compare images drawn from the history of 3D computer graphics with the visual perception of natural reality, his evolutionary narrative appears to be confirmed. During the 1970s and the 1980s, computer images progressed towards fuller and fuller illusion of reality: from wireframe displays to smooth shadows, detailed textures, aerial perspective; from geometric shapes to moving animal and human figures; from Cimabue to Giotto to Leonardo and beyond. Bazin's idea that deep focus cinematography allowed the spectator a more active position in relation to film image, thus bringing cinematic perception closer to real life perception, also finds a recent equivalent in interactive computer graphics, where the user can freely explore the virtual space of the display from different points of view. And with such extensions of computer graphics technology as virtual reality, the promise of Bazin's "total realism" appears to be closer than ever, literally within arms reach of VR's user.

The history of the style and technology of computer animation can also be seen in a different way. Comolli reads the history of realistic media as a constant trade-off of codes, a chain of substitutions producing the reality effect for audiences, rather than as an asymptotic movement toward the axes labeled "reality." His interpretation of the history of film style is first of all supported by the shift he observes between the cinematic style of the 1900s and the 1920s, the example I have already mentioned. Early film announces its realism by excessive representations of deep space achieved through every possible means: deep focus, moving figures, frame compositions which emphasize the effect of linear perspective. In the 1920s, with the adaptation of panchromatic film stock, "depth (perspective) loses its importance in the production of 'reality effects' in favor of shade, range, color" (Comolli, 131). A similar trade-off of codes can be observed during the short history of commercial 3D computer animation which begins around 1980. Initially, the animations were schematic, cartoon-like because the objects could only be rendered in wireframe or facet shaded form. Illusionism was limited to the indication of objects's volumes. To compensate for this limited illusionism in the representation of objects, computer animations of the early 1980s ubiquitously showed deep space. This was done by emphasizing linear perspective (mostly, through the excessive use of grids) and by building animations around rapid movement in depth in the direction perpendicular to the screen. These strategies are exemplified by computer sequences of Disney movie Tron released in 1982. Toward the end of the 1980s, with commercial availability of such techniques as smooth shading, texture mapping and cast shadows, the representation of objects in animations approached much closer the ideal of photorealism. At this time, the codes by which early animation signaled deep space started to disappear. In place of rapid in-depth movements and grids, animations begun to feature lateral movements in shallow space.

The observed substitution of realistic codes in the history of 3D computer animation seems to confirm Comolli's argument. The introduction of new illusionistic techniques dislodges old ones. Comolli explains this process of sustaining reality effect from the point of view of audiences. Following Bordwell and Staiger's approach, we can consider the same phenomenon from the producers' point of view. For the production companies, the constant substitution of codes is necessary to stay competitive. As in every industry, the producers of computer animation stay competitive by differentiating their products. To attract clients, a company has to be able to offer some novel effects and techniques. But why do the old techniques disappear? The specificity of industrial organization of the computer animation field is that it is driven by software innovation. (In this, the field is closer to the computer industry as a whole, rather than film industry or graphic design.) New algorithms to produce new effects are constantly developed. To stay competitive, a company has to quickly incorporate the new software into their offerings. The animations are designed to show off the latest algorithm. Correspondingly, the effects possible with older algorithms are featured less often — available to everybody else in the field, they no longer signal "state of the art." Thus, the trade-off of codes in the history of computer animation can be related to the competitive pressure to quickly utilize the latest achievements of software research.

While commercial companies employ programmers capable of adopting published algorithms for the production environment, the theoretical work of developing these algorithms mainly takes place in academic computer science departments and in research groups of top computer companies such as Microsoft or SGI (formerly Silicon Graphics). To further pursue the question of realism we need to ask about the direction of this work. Do computer graphics researches share a common goal?

In analyzing the same question for film industry, Bordwell and Staiger claim that realism "was rationally adopted as an engineering aim" (258). They attempt to discover the specificity of Hollywood's conception of realism in the discourses of the professional organizations such as SMPE. For the computer graphics industry, the major professional organization is SIGGRAPH (Special Interest Group on Computer Graphics of the Association for Computing Machinery). Its annual conventions, attended by tenths of thousands, combine a trade show, a festival of computer animation and a scientific conference where the best new research work is presented. The conferences also serve as the meeting place for the researchers, engineers and commercial designers. If the research has a common direction, we can expect to find its articulations in SIGGRAPH proceedings.

Indeed, a typical research paper includes a reference to realism as the goal of investigations in computer graphics field. For example, a 1987 paper presented by three highly recognized scientists offers this definition of realism:

> Reys is an image rendering system developed at Lucasfilm Ltd. and currently in use at Pixar. In designing Reys, our goal was an architecture optimized for fast high-quality rendering of complex animated scenes. By fast we mean being able to compute a feature-length film in about a year; high quality means virtually indistinguishable from live action motion picture photography; and complex means as visually rich as real scenes.[202]

In this definition, achieving synthetic realism means attaining two goals: the simulation of codes of traditional cinematography and the simulation of the perceptual properties of real life objects and environments. The first goal, the simulation of cinematographic codes, was in principle solved early on as these codes are well-defined and few in number. Every current professional computer animation system incorporates a virtual camera with variable length lens, depth of field effect, motion blur and controllable lights which simulate the lights available to a traditional cinematographer.

The second goal, the simulation of "real scenes," turned out to be more complex. Creating computer time-based representation of an object involves solving three separate problems: the representation of an object's shape, the effects of light on its surface, and the pattern of movement. To have a general solution for each problem requires the exact simulation of underlying physical properties and processes. This is impossible because of the extreme mathematical complexity. For instance, to fully simulate the shape of a tree would involve mathematically "growing" every leaf, every brunch, every piece of bark; and to fully simulate the color of a tree's surface a programmer has to consider every other object in the scene, from grass to clouds to other trees. In practice, computer graphics researchers have resorted to solving particular local cases, developing a number of unrelated techniques for simulation of some kinds of shapes, materials, lighting effects and movements.

The result is a realism which is highly uneven. Of course, one may suggest that this is not an entirely new development and that it can already be observed in the history of twentieth century optical and electronic representational technologies, which allows for more precise rendering of certain features of visual reality at the expense of others. For instance, both color film and color television were designed to assure acceptable rendering of human flesh tones at the expense of other colors. However, the limitations of synthetic realism are qualitatively different.

In the case of optically-based representation, the camera records already existing reality. Everything which exists can be photographed. Camera artifacts, such as depth of field, film grain, and the limited tonal range, affects the image as a whole.

In the case of 3D computer graphics the situation is quite different. Now reality itself has to be constructed from scratch before it can be photographed by a virtual camera. Therefore, the photorealistic simulation of "real scenes" is practically impossible as techniques available to commercial animators only cover the particular phenomena of visual reality. The animator using a particular software package can, for instance, easily create a shape of human face, but not the hair; the materials such as plastic or metal but not cloth or leather; the flight of a bird but not the jumps of a frog. The realism of computer animation is highly uneven, reflecting the range of problems which were addressed and solved.

What determines which particular problems received priority in research? To a large extent, this was determined by the needs of the early sponsors of this research — the Pentagon and Hollywood. I am not concerned here to fully trace the history of these sponsorships. What is important for my argument is that the requirements of military and entertainment applications led the researchers to concentrate on simulation of the particular phenomena of visual reality, such as landscapes and moving figures.

One of the original motivations behind the development of photorealistic computer graphics was its application for flight simulators and other training technology.[203] And since simulators require synthetic landscapes, a lot of research went into the techniques to render clouds, rugged terrain, trees, aerial perspective. Thus, the work which led to the development of the famous technique to represent natural shapes, such as mountains, using fractal mathematics was done at Boeing.[204] Other well-known algorithms to simulate natural scenes and clouds were developed by the Grumman Aerospace Corporation.[205] The latter technology was used for flight simulators and also was applied to pattern recognition research in target tracking by a missile.[206]

Another major sponsor was the entertainment industry, lured by the promise of lowering the costs of film and television production. In 1979 Lucasfilm, Ltd., George Lucas's company, organized a computer animation research division. It hired the best computer scientists in the field to produce animations for special effects. The research for the effects in such films as Star Trek II: The Wrath of Khan (Nicholas Meyer, Paramount Pictures, special effects by Industrial Light & Magic,1982) and Return of the Jedi (Richard Marquand, Lucasfilm Ltd., special effects by Industrial Light & Magic,1983) have led to the development of important algorithms which became widely used.[207]

Along with creating particular effects for films such as star fields and explosions, a lot of research activity has been dedicated to the development of moving humanoid figures and synthetic actors. This is not surprising since commercial film and video productions center around human characters. Significantly, the first time computer animation was used in a feature film (Looker, Michael Cricton, Warner Brothers,1981) was to create a three-dimensional model of an actress. One of the early attempt to simulate human facial expressions featured synthetic replicas of Marilyn Monroe and Humphrey Bogart.[208] In another early acclaimed 3D animation, produced by Kleiser-Wolczak Construction Company in 1988, a synthetic human figure was humorously casted as Nestor Sextone, a candidate for the presidency in the Synthetic Actors Guild.

The task of creating fully synthetic human actors has turned out to be more complex than was originally anticipated. Researchers continue to work on this problem. For instance, the 1992 SIGGRAPH conference presented a session on "Humans and Clothing" which featured such papers as "Dressing Animated Synthetic Actors with Complex Deformable Clothes"[209] and "A Simple Method for Extracting the Natural Beauty of Hair."[210] Meanwhile, Hollywood has created a new genre of films (Terminator 2, Jurassic Park, Casper, Flubber, etc.) structured around "the state of the art" in digital actor simulation. In computer graphics it is still easier to create the fantastic and extraordinary then to simulate ordinary human beings. Consequently, each of these films is centered around an unusual character which in fact, consists of a series of special effects — morphing into different shapes, exploding into particles, and so on.

The preceding analysis applies to the period during which the techniques of 3D animation were undergoing continuos development: from the middle 1970s to the middle 1990s. By the end of this period the software tools became relatively stable; at the same time, the dramatically decreased cost of hardware led to the significant reduction of time it takes to render complex animations. Put differently, the animators were now able to use more complex geometric and rendering models, thus achieving stronger reality effect. Titanic (1997) featured hundreds of computer animated “extras” while %95 of Stars Wars: Episode 1 (1999) were constructed on a computer. However, the dynamics which characterized the early period of pre-rendered computer animation returned in new areas of new media: computer games and virtual worlds (such as VRML and Active Worlds scenes) which all use computer animation being generated in real-time. Here Bazinian evolution towards fuller and fuller realism which characterized the development of computer animation in the 1970s and the 1980s was replayed once again at a accelerated speed. As the speed of CPUs and graphics card kept increasing, computer games moved from flat shading of the original Doom (1993) to the more detailed world of Unreal (Epic Games, 1997) which featured shadows, reflections and transparency. In the area of virtual worlds which were designed to run on typical computers without specialized graphics accelerators, the same evolution proceeded at a much slower pace.

The icons of mimesis

While the privileging of certain areas in research can be attributed to the needs of the sponsors, other areas received consistent attention for a different reason. To support the idea of progress of computer graphics toward realism, researchers privilege particular subjects that culturally connote the mastery of illusionistic representation.

Historically, the idea of illusionism has been connected with the success in representation of certain subjects. The original episode in the history of Western painting, which I already invoked, is the story of the competition of Zeuxis and Parrhasiuss. The grapes painted by Zeuxis symbolize his skill to create living nature out of inanimate matter of paint. Further examples in the history of art include the celebration of the mimetic skill of those painters who were able to simulate another symbol of living nature — the human flesh. Not surprisingly, throughout the history of computer animation, the simulation of a human figure served as a yardstick used to measure the progress of the whole field.

While the painting tradition had its own iconography of subjects connoting mimesis, moving image media relied on different set of subjects. Steven Neale describes how early film demonstrated its authenticity by representing moving nature: "What was lacking [in photographs] was the wind, the very index of real, natural movement. Hence the obsessive contemporary fascination, not just with movement, not just with scale, but also with waves and sea spray, with smoke and spray."[211] Computer graphics researchers resort to similar subjects to signify the realism of animation. "Moving nature" presented at SIGGRAPH conferences have included animations of smoke, fire, sea waves, and moving grass.[212] These privileged signs of realism overcompensate for the inability of computer graphics researches to fully simulate "real scenes."

In summary, the differences between cinematic and synthetic realism begin on the level of ontology. New realism is partial and uneven, rather than analog and uniform. The artificial reality which can be simulated with 3D computer graphics is fundamentally incomplete, full of gaps and white spots.

Who determines what will be filled and what will remain a gap in the simulated world? As I already noted, the available computer graphics techniques reflect particular military and industrial needs which paid for their developments. The ability of certain subjects to connote mastery of illusionism also makes researchers pay more attention to some areas on the “map” and ignore others. In addition, as computer graphics techniques migrate from specialized markets towards mass consumers, they become biased in yet another way.

The amount of labor involved in constructing reality from scratch in a computer makes it hard to resist the temptation to utilize pre-assembled, standardized objects, characters and behaviors readily provided by software manufacturers — fractal landscapes, checkerboard floors, complete characters, and so on. As discussed in "selection" section, every program comes with libraries of ready-to-use models, effects or even complete animations. For instance, a user of the Dynamation program (a part of the popular Alias|Wavefront 3D software) can access complete pre-assembled animations of moving hair, rain, a comet's tail or smoke, with a single mouse click. If even professional designers rely on ready-made objects and animations, the end users of virtual worlds on the Internet, who usually don't have graphic or programming skills, have no other choice. Not surprisingly, VRML software companies and Web virtual world providers encourage users to choose from the libraries of 3D objects and avatars they supply. Worlds Inc., the provider of Worlds software used to create online virtual 3D chat environments, provides its users with a library of 100 3D avatars.[213] The Active Worlds which offers "3D community based environments on the Internet" allows its over one million users (April 1999 data) to choose from over 1000 different worlds, some of which are provided by a company and others were built by the users themselves.[214] As the complexity of these words increases, we can expect a whole market for detailed virtual sets, characters with programmable behaviors, and even complete environments (a bar with customers, a city square, a famous historical episode, etc.) from which a user can put together her or his own "unique" virtual world. And although companies such as Active Worlds provide end users with software which allows them to quickly build and customize their virtual dwellings, avatars and whole virtual universes, each of these constructs has to adhere to standards established by the company. Thus behind the freedom on the surface lies standardization on a deeper level. While a hundred years ago the user of a Kodak camera was asked just to push a button, she still had the freedom to point the camera at anything. Now, "you push the button, we do the rest" has become "you push the button, we create your world."

I hope that this section demonstrated that the accounts of realism developed in film theory can be usefully employed to talk about realism in new media. But that does not mean that the question of computer realism is exhausted. In the twentieth century, new technologies of representation and simulation replace each other in rapid succession, therefore creating a perpetual lag between our experience of their effects and our understanding of this experience. Reality effect of a moving image is a case in point. As film scholars were producing increasingly detailed studies of cinematic realism, film itself was already being undermined by 3D computer animation. Indeed, consider the following chronology.

Bazin's Evolution of the Language of Cinema is a compilation of three articles written between 1952 and 1955. In 1951 the viewers of the popular television show "See it Now" for the first time saw a computer graphics display, generated by MIT computer Whirlwind, built in 1949. One animation was of a bouncing ball, another of a rocket's trajectory.[215]

Comolli's Machines of the Visible was given as a paper at the seminal conference on the cinematic apparatus in 1978. The same year saw the publication of a crucial paper for the history of computer graphics research. It presented a method to simulate bump textures which is still one of the most powerful techniques of synthetic photorealism.[216]

Bordwell and Staiger's chapter Technology, Style and Mode of Production forms a part of the comprehensive The Classical Hollywood Cinema: Film Style & Mode of Production to 1960, published in 1985. By this year, most of the fundamental photorealistic techniques were discovered and turnkey computer animation systems were already employed by media production companies.

As 3D synthetic imagery is used more and more widely in contemporary visual culture, the problem of realism has to be studied afresh. And while many theoretical accounts developed in relation do cinema do hold when applied to synthetic imaging, we can't assume that any concept or model can be taken for granted. Redefining the very concepts of representation, illusion and simulation, new media challenges us to understand in new ways how visual realism functions.

Synthetic Image and its Subject

As we saw, the achievement of photorealism is the main goal of research in the field of computer graphics. The field defines photorealism as the ability to simulate any object in such a way that its computer image is indistinguishable from its photograph. Since this goal was articulated in the end of the 1970s, a significant progress has been made towards getting closer to this goal: compare, for instance, the computer images of Tron (1982) with those of Star Wars: Episode 1 (1999). Yet the common opinion still holds that synthetic 3D images generated by computer graphics are not yet (or perhaps will never be) as "realistic" in rendering visual reality as images obtained through a photographic lens. In this section I will suggest that this common opinion is mistaken. Such synthetic photographs are already more "realistic" than traditional photographs. In fact, they are too real.

This, at first sight, paradoxical argument will become less strange once we place the current preoccupation with photorealiasm in a longer historical framework, considering not only the present and recent past (computer imaging and analog film, respectively) but also both more distant past and the future of visual illusionism. For while the computer graphics field tries desperately to replicate the particular kind of images created by twentieth century film technology, these images represent only one episode in a longer history of visual culture. We should not assume that the history of illusion ends with 35 mm frames projected on the screen across the movie hall — even if a film camera is substituted by computer software, a film projector is substituted by a digital projector and the film reel itself is substituted by data transmitted over computer network.

Georges Méliès, the father of computer graphics

When a future historian will write about the computerization of cinema in the 1990s, she will highlight such movies as Terminator 2 and Jurassic Park. Along with a few others, these films by John Cameron and George Lucas were responsible for turning Hollywood around: from still being highly skeptical about computer animation in the early 1990s to fully embracing it by the middle of the decade. These two movies, along with the host of others which followed, Titanic, Star Wars: Episode 1 and so on, dramatically demonstrated that total synthetic realism seemed to be in sight. Yet, they also exemplified the triviality of what at first may appear to be an outstanding technical achievement — the ability to fake visual reality. For what is faked is, of course, not reality but photographic reality,

reality as seen by the camera lens. In other words, what computer graphics has (almost) achieved is not realism, but only photorealism — the ability to fake not our perceptual and bodily experience of reality but only its photographic image.[217] This image exists outside of our consciousness, on a screen — a window of limited size which presents a still imprint of a small part of outer reality, filtered through the lens with its limited depth of field, and then filtered through film's grain and its limited tonal range. It is only this film-based image which computer graphics technology has learned to simulate. And the reason we may think that computer graphics has succeeded in faking reality is that we, over the course of the last hundred and fifty years, has come to accept the image of photography and film as reality.

What is faked is only a film-based image. Once we came to accept the photographic image as reality the way to its future simulation was open. What remained were small details: the development of digital computers (1940s) followed by a perspective-generating algorithm (early 1960s), and then working out how to make a simulated object solid with shadow, reflection and texture (1970s), and finally simulating the artifacts of the lens such as motion blur and depth of field (1980s). So, while the distance from the first computer graphics images circa 1960 to the synthetic dinosaurs of Jurassic Park in the 1990s is tremendous, we should not be too impressed. For, conceptually, photorealistic computer graphics had already appeared with Félix Nadar's photographs in the 1840s and certainly with the first films of Georges Méliès in the 1890s. Conceptually, these are the inventors of 3D photorealistic computer graphics.

In saying this I do not want to negate the human ingenuity and the tremendous amount of labor which today goes into creating computer-generated special effects. Indeed, if our civilization has any equivalent to Medieval cathedrals, it is special effects Hollywood films. They are truly epic both in their scale and the attention to detail. Assembled by thousands of highly skilled craftsmen over the course of years, each such movie is the ultimate display of collective craftsmanship we have today. But if Medieval masters left after themselves the material wonders of stone and glass inspired by religious faith, today our craftsmen leave just the pixel sets to be projected on movie theater screens or played on computer monitors. These are immaterial cathedrals made of light; and appropriately, they often still have religious references, both in the stories (consider for example Christian references in Star Wars: Episode 1: Skywalker was conceived without a father, etc.) and in the grandeur and transcendence of virtual sets.

Jurassic Park and Socialist Realism

Consider one of these immaterial cathedrals: 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 3D computer animation produced today has a much lower degree of photorealism and this photorealism, as I shown in the previous section, 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 3D 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. Synthetic image is a result of a different, more perfect than human, vision.

Whose vision is it? It is the vision of a computer, a cyborg, a 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. <u>Synthetic computer-generated image is not an inferior representation of our reality, but a realistic representation of a different reality</u>.

By the same logic, we should not consider clean, skinless, too flexible, and in the same time too jerky, human figures in 3D 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, <u>if a traditional photograph always points to the past event, a synthetic photograph points to the future event</u>.

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 histroically, 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 <u>Jurassic Park</u> 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 panting, we are now in a position to characterize the aesthetics of <u>Jurassic Park</u>. 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 from 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 3D photorealistic computer animation. Its images are not inferior to the visual realism of traditional photography. They are perfectly real — all too real.

Illusion, Narrative 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. 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.[218]

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 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"[219] 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 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 opague. 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.[220] Three-dimensional space becomes surface; a photograph becomes a diagram; a character becomes an icon. To use the opposition introduced in "Cultural Interfaces" section, 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.[221]

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. It 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 beliefs 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 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 along 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 <u>Doom</u>, <u>Quake</u> and <u>Tomb Rider</u>, but also flight and racing simulators — have been also quite successful. In contrast to interactive narratives such as <u>Wing Commander</u>, <u>Myst</u>, <u>Riven</u>, or <u>Bad Day on the Midway</u> 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 exellance, 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.

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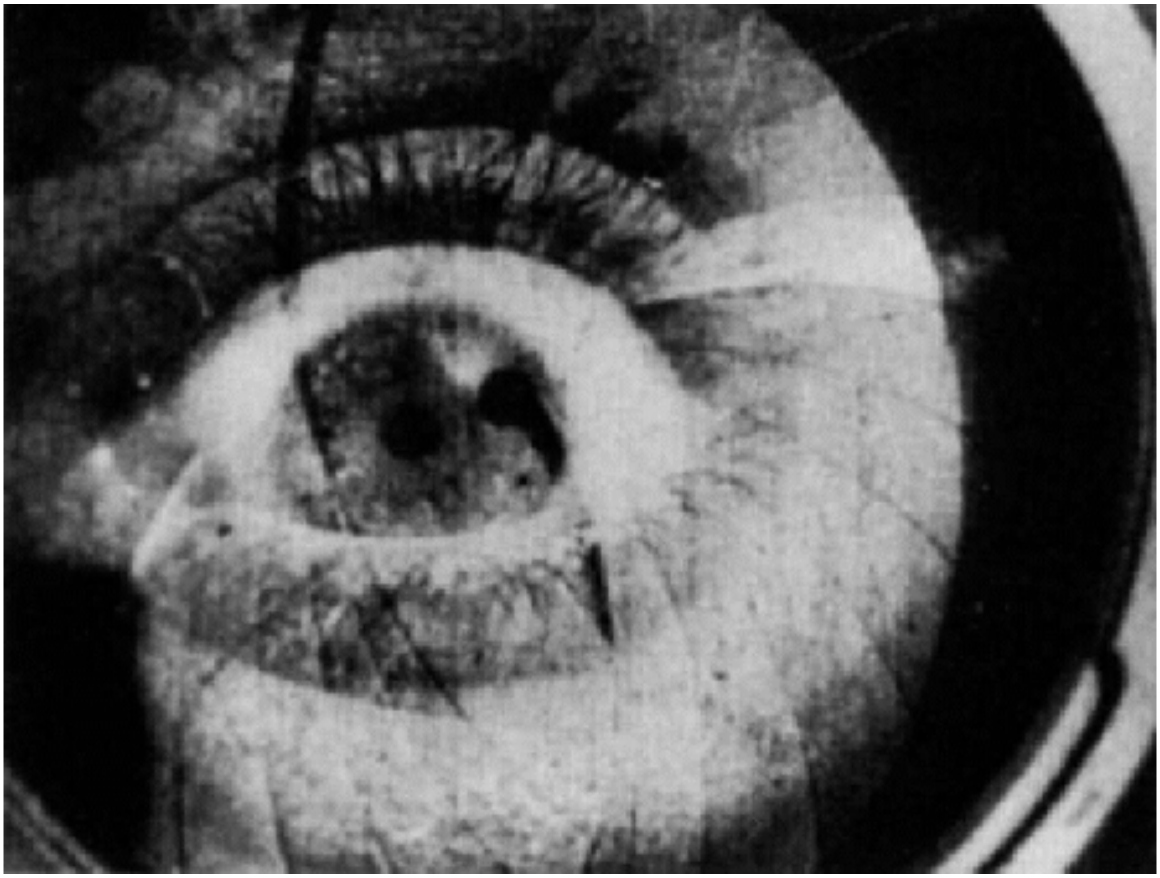
(Image from http://www.manovich.net/LNM/index.html)



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(Image from http://www.manovich.net/LNM/index.html)

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