New Aesthetics and Practical Venues for Rendered CGI images in Studio Art

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In traditional media, the artist usually does not wonder about the physical nature of pigments or the proper molecular consistency of oils or acrylic, except for the right combination of ingredients almost in a sort of studio recipe that is constantly revisited or recreated. However, in terms of critical experiences for an artist that starts a new project in the studio environment, the space of reflection is given by an intuitive process of searching and trial and error along the proper semantics of materials and components. The fact that the studio artist creates a new idea from the empty surface of the canvas is due to the engaging space between the concept and the practical exercise to mutate the original idea in an unexpected series of variations. This group of situations can be arranged in a more general set of behavior that the artist can perform inside the studio with more or less freedom. However, the inquiring of artist about the nature of the materials is limited to its quality performance, but the boundary traced avoided is prevented for going beyond its natural performance or effects and is encouraged for better stay in the realm of the evident or granted as artistic material. To this respect, can the use of computer graphics paradigms be considered a component that can elevate the aesthetic experience of an artist even more in search of the image making realization?

The artist embracing the computer graphics environment

A big leap in studio arts is that artists can’t interact with digital tools, depending exclusively on the nature or efficiency of the digital resources. The semantics of them at first create in him a sort of neutral impression based mainly in the way of how the studio environment is not reproduced with the same accuracy as he wanted. At first glance it seems there is no way to replace the studio paradigm with a computer or software that recreates at least the familiarity of recognized tools. This sort of expanded extension of computer technology
toward the fine arts realm seems very promising and productive, however, years of indifference from the artist’s space or studio placement confirms the confusion installed from the beginning about the idea of using computer graphics in the generation of images. The desire of the artist usually acts on behalf the idea that he is using secluded tools to generate Art.

A more critical view is related with the idea of being conscious about the performance of digital tools and how they were created for precisely specific visualization or renditions of scientific phenomena. In this field the science has been very assertive, dealing with the specific process of visualization or depiction of physical properties of colors or shapes, causing the field of computer graphics to develop incredible opportunities to expand the studio art scope of production. However, the discussion about the legitimacy of computer generated images is still existent inside the fine arts realm basically due to the lack of interaction between the nature of the digital images and its semantic process of creation.

At this point the very importance of the artist's compromise to engage aesthetic experiences and consistent resources of computer generated images is fundamental. Once the liaison is consumed, the interest of the artist can exponentially grow. Perhaps his interest can be naïve at first, later becoming disenchanted by the complexity of the syntactic of the new media he is interacting with, causing this to be an uncharted territory for him. The following experiences will be decisive to engage an even more conceptual statement of work, with the legitimacy of the tool seeming irrelevant due to the overwhelming set of possibilities that he no longer is able to grasp or follow within the natural disdain of the studio’s unrestrained setting.

In a more general sense, the idea of studio art production is not very different from the research timetable that a computer engineer can schedule about the creation of a system based on allowable code. Usually the process of research has to do with improvements and problem
solving, rather than aesthetic overtones regarded as secondary remnants. But in this process of problem solving related with digital renditions of phenomena, the realm of computer generated images has created this extension toward fine arts in a more straightforward basis. This forthright way can be defined as an array of methodologies not only categorized as programming, coding, interface, visualization, or rendition but as an exhaustive inquire about how artists during the ages have created different kinds of surfaces to represent depth or the quality of overlapped layers. In fact, for scientists or computer engineers the lessons given by the aesthetic aspect in paintings, drawings, sculpture, and even in architecture has been compelling. However, though the interesting aspect is that the results of these experiences have not been relegated to the mere surface of the art pieces, the initiative is in fact going to a much deeper idea of how computer generated images can provide a new set of aesthetic insights.

Figure 1. Caravaggio. Harvest.

Derived by the initial study of the concept of penumbra shrouded in dim lighting in Caravaggio’s still life (fig. 1), chiaroscuro and sfumato have given room for a more expanded set of terminologies and phenomena simulated with computer graphics. Indeed, without the effort of hundreds of years of artistic production, computer graphics would not have these set of amazing resources to depict or render a scene. The artist can utilize this emphasis toward the
observation of natural phenomena, but his interest can be very exhaustive, however in a non-scientific basis. Computer generated images can help understand the interest of Zurbaran (fig. 2), Velazquez or Seurat in order to describe the natural phenomena of lighting.

![Figure 2. Francisco de Zurbarán, Still Life with Lemons, Oranges, and a Rose, 1633.](image)

In their different aspects, these masters could represent a very important principle in their renditions of scenes even if they sought to create realistic or naturalistic settings. In this work we can organize the questions about the problem of CGI images production in an aesthetic basis from the categories or processing, rendition, and visualization.

**The process of conceiving a CGI image**

The decision of embracing the computer as a tool to generate images by any studio artist can be explained better by the influence of an impressive and overwhelming stream of visual information given by movies, advertisement, or digital media available on Internet. These constant influxes of images are powerful enough to motivate an interest in enjoying the benefits of the digital process that computer software can produce. In this case many artists could insist that computers are just tools that likely work better as helpers than the master device. In fact, it seems that it is always expected that the paradigm of real studio media cannot be subdued by any
digital tool or computer advanced technique. In this territory, artists get caught in a very ambiguous memento described as the awe in front of the computer. This resource can be capable to perform, but at the same time they admit their reliance in mimicking real surfaces.

Perhaps this over emphasis in the simulation has been the answer about why this synthetic recreation of what real materials can do sounds so overused; that the sincere process of doing or creating an image is just a process of mimicking not the reality but the effectiveness about how the computer resource can reproduce what is hard to get using traditional materials. This discussion can be judged as something candid at this time, especially if there is over twenty years of hardware and software progress, since they can promote an even more impressive level of the image making process.

Nevertheless, in order to verify the prowess of computer graphics in the communication industry, beautifully crafted pieces are displayed everywhere in Graphic Design, Advertising, Motion Pictures, and TV effects. In this work, the discussion about the advanced effects in movies that use an array of 3d compositing, and live video that blends footages along with CGI characters among others ingenuities, can be reoriented or displaced to another context, which better explain the practical extents of the entertaining industry rather than the production of an artist workshop.

My interest is to focus in how the artist in the studio can introduce himself or herself in the creation of images using computer graphics tools. The conclusive path to generate these kinds of images is the use of 3d software or the environment provided by CGI techniques, when involving a family of languages, technologies, and systems that are compromised exhaustively in the entertainment industry. However the artist can enjoy the same power of creation, if the process can be recreated inside the studio as a much more arthistory related performance than a
vague set of references provided by movies using 3d generated characters enacting conventional narrative. In fact, the creation process of these images in its first stage is the modeling of frozen scenes not assumed in a further animated sequence.

However, this setting can be thought for a hybrid piece that could include interactivity or a stereographic view helped by wearing special glasses. The visualization can be as critical as the creation, since the display can be even more engaging in the perception of content in a volumetric environment. But returning to the motivation of creating images based on master’s painting, this can be a real incentive: not only as an exercise of mimicking but a matter of wondering why artists on all accounts were so concerned about the physical environment of their compositions.

Figure 3. Jan Davidszoon de Heem, Still-life with Books and Skull (Vanitas), 1629.

This preoccupation is understood in terms of lighting settings, depth, atmosphere, and drama. The Still lives of Caravaggio or Jan Heem (Fig. 3) offer a full realism that cannot be regarded as photorealism, and perhaps more interestingly they wanted to have a full control over the setting like a theatrical scene, where the objects are still performers immersed in an iced environment, however bathed with a well-studied array of light sources. It is difficult to scientifically explain the lighting setting’s nature of these scenes, but they belong more to
a planning that responds much more to a dramatic arrangement rather than a naturalistic effort in mimicking the reality.

It is interesting to find more precise elements about techniques and systems utilized by computer/scientist artists that basically give us clues about how to organize a semantic work in generating CGI images for art. One of these personalities is John Devebec, as mentioned in the article “From Memory Arts to the New Code Paradigm” written by Jack Merrit.

In his article, Merrit describes the work of Devebec in the context of visualization and interactivity, but the interesting fact about Debevec's work derives in how he used the Image Based Lighting technique to capture a full range of luminosity given by photographs, mainly to illuminate the scene of his work that represented the struggle of Galileo Galilei with Catholic Church (Merrit 407) (Fig. 4)

Figure 4. Paul Devebec. Fiat Lux. Sigraph 1999.

This work was presented at Sigraph 1999, and has probably had several analysis and comments by scholars, but the extent of this paper rescues the important fact that this artist
generated a system later used exhaustively by the commercial studios to assign a rendition of impressive lighting to animations and characters.

Image based lighting is probably one of the most effective synthetic or computer generated ways to illuminate a 3D generated scene. In this technique the lighting creates an indirect array of sources whose origin is in an environment image, however, the models can have images/textures that irradiate source lighting. In their article “Interactive Rendering of Translucent Objects,” Hendrik P.A Lensch et al. describes how surface light fielding a technique of Image Based Lighting can help the rendition of a scene by the irradiation of different objects placed in different views (H. P. A. Lensch et al. 197).

These specialized studies about illumination in 3D scenes perhaps modify substantially the classic paradigm of direct illumination in a possible arrangement of objects thought for a still life arrangement. These are the result of an accurate development of synthetic rendition of computational environment, but a relatively new element that projects a new aesthetic insight toward the digital 3D space. Can this be recreated with real materials or at least with mechanical or analog devices? The answer is probably not, since the laws of the computational environments can provide a more synthetic and mathematical calculation of what happens with illumination and shading. Since the computers are capable to calculate real or artificial world phenomena, they are able to provide more in depth studies about how these calculations are in fact the result of complex algorithm.

The theoretical models developed by computers allow us to understand the physical process of our environment, but are also able to generate even more in terms of a possible process that can work in terms of opposite or paradoxical situations. To generate CGI images the artist needs to first conceive the real setting or environment, and to later transfer the
components to the 3d digital space. The model always resides in the real world, but this time the problem of mimicking evolves to a simulation process that at first starts with the modeling of objects in wireframe based on a geometric fabric. At this point the discussion concerning the artist’s creation of a scene using vectors in 2d or 3d is essential. Since the classical representational space has been a canvas, the space now turns three dimensional even if the software can just go for vectors using a modest 3d set of tools included in Adobe illustrator or Photoshop.

The evolution of generating objects using 3d computer graphics space is fundamental since the object abandoning the condition of geometry soon embraces the basic shading, and the texture is finally assigned by a mapping process that corrects its proper placement along its surface or topology. Here the paradigm of the indirect illumination with Image based lighting is fundamental, and this is basically explained by the arrangement in depth of the objects. At this point one assumes that the still life represents the quintessential example. No longer do the objects in the scene need a direct source of lighting, or at least a network of virtual bulbs that irradiate illumination.

How does this computational resource help to provide a new focus or incipient paradigm in the way artists render the setting of a composition? The answer can be likely embedded in the pieces that a studio artist can produce using 3d software like Maya or 3d Studio Max. However, an artist can venture even much further in their interest in blending technology and studio practice by using code and scripts to generate unedited experiences in the generation of 3D images (Merrit 408). The use of such software facilitates the user interface creating a sympathetic view against the tool, as Merrit states to push the boundaries between aesthetics and commercial/work application (Merrit 407).
The dimension of an aesthetic gesture protruded from a 3d scene basically makes sense if it is connected with the semantic of computer graphics in an extent manner. Otherwise, a more general aesthetic theory can refute, or deny the expected outcome of the generated computer image. In his essay “Image, Process, Performance, and Machine: aspects of an aesthetic of the Machinic,” Andreas Broeckman explain this idea of a connection that points out toward the art world:

There is a notion of the digital that posits a deep break of digital aesthetics away from the aesthetics based on analog techniques. I will not pursue this discussion here; but I hope that the following will help to suggest that such an understanding of a digital aesthetics hinges on the technical aspects of artistic production. In contrast, an approach that highlights the experiential qualities of art, and the aspects of reception, is more likely to identify an aesthetic continuum between analog and digital aesthetics. This approach implies, in this respect, media art should not be discussed in separation from contemporary art in general.” (Brockman 194)

Brockman acquaints this sensible thought as a mandatory liaison that is not even overlooked, otherwise the illusion of creating a separate aesthetic would only be possible if the production of art is generated in a proprietary sense from computer engineers. We know for sure that this attempt is not possible without the collaborative work of artists.

The subjective approach to the events of an art piece is a privilege for an artist. However, the code provided by computer generated images is somehow beautiful in terms of logical semantic that indeed can be possibly framed as an artistic object. The problem is that art cannot appropriate an exterior aspect of a system that owns various layers of complex syntax. In other words, art should not represent this element as if it were a computer portraiture, otherwise this would be the illustration of an exterior aspect of a much more complex symbolic system.
CGI images obviously assume a tight relationship with a specific manner of production, which the studio art concept assumes in this dimension in a non-conventional aspect or environment. It does not have to be necessarily arranged in the familiar setting of a painter studio, however, it can share some common devices shaped as metaphors. These metaphors go far beyond the idea of the easel, paintbrush, palette, or the spontaneity of a workshop. Inevitably, the multiplicity of components will make the idea of visiting contiguous media or creating hybrid pieces even more feasible, and in this moment the connection is even wider, like an expedite highway with different track, sharing different destines in multivalued and mutable semantic venues. Brockman offers the following clue about how computer generated images are evaluated from a new practice of perception:

It is worth to reconsidering the path of art history has taken from iconography- the study of the coded meaning of images- and iconology- the study of semantic and general speaking “social “conditions of producing and reading images. In these two approaches, the image is taken as is given; it is read in depth and contextualized. On the basis of modern hermeneutics, the approach of iconic (Ikonik in German) has sought to look more closely at the perceptual production of the image and to study its meaning as a result of the process of perception. Thus, temporal structures within images have come into view not as mere narrative dispositions, but as “programs” that need to be executed and thus actualized by the viewer. (Brockman 196)

Despite that, those images can be organized in an analog way. A still life generated in 3dis deemed as a disposition utilizing a traditional space organization notion. Although using a computer, the artist faces the paradigm of the flat screen in the shape of a digital canvas. The ambiguous sense of working in a virtual volumetric space from a conceptual stratum in this case
the software interface, revitalized the assumption that this can be a more traditional and familiar environment.

Once the artist realizes that an interface makes the digital generation of a composition possible, such familiarity is addressed. Perhaps the artist takes for granted the valuable help of the interface. Components such as the interactive manipulation by the viewer add more problems to the concept of a perceptive passivity of the generated piece. In the case of a 3d arrangement of objects regarded as still life in a traditional manner, the contribution of an interactive feature allows the immediate factual state of sense of this crucial aesthetic component: the piece can be transformed from its foundations. A still life created using 3d geometry is essentially the first stage of a much more complex exercise of dialectics between perception and sensory evaluation. We can actually change the values of the global illumination not only from the beginning, but also during its process of development. The imaged based lighting also can be intervened by altering or changing its values as generative image as well.

Inside the realm of 3d images creation, the ground for possible experiences following a real reference model can introduce the artist in a much more dense terrain of questions than certainties. The components involved in the modeling of a scene are governed by procedures that obey exclusively computational calculation. This processes also combine a protocols that query constantly the performance of the computer processor in such a task.

The final result of a 3d generated scene depends in extent of the computational resources available. However, if the hardware does not provide enough resources, the scene would not perform the expected outcome in terms of geometric complexity. This is an element that in analog context is surmounted easily if the materials are somehow feasibly combined or added. The geometric construction of a scene also relies heavily in the amount of random memory
available to complete the modeling process. The functionality of these components is soon correlated by the artist as a fundamental setting, organized atop the priorities required for the generation of the image.

It is at this point that the concept of synthetic production of images arise with a strong emphasis. It depends, however, on the scientific nature of computation as the main contextual venue. The production of 3d images no longer depends on the subjective gesture of artists, and it needs preoccupation during its semantic construction. The artist cannot ignore the process of image making, even if this remains in the geometric stage. The artist must explore and become familiar with such terms as Boolean operations, normals, surface shadings, UVs components, and a broad array of terms that introduce him to an even wider environment of conceptual computational terms.

It is required for the artist to understand how the fundamental functionality and the interface of the software application and its interface transform the unfamiliar universe of computer graphics semantic into a familiar environment for production. Oliver Grau in his book “Virtual Art, From Illusion to Immersion” develops the concept of a much broader epistemology of images:

  Particularly in art history, the oldest discipline engaged with images and media, the interrogation of the concept of the image has burgeoned; interestingly, this has been in parallel to the rapid development in the fields of the new media and their image worlds. Currently, to take an expression of Walter Benjamin’s media art history has the wind of world history in its sails.” The emerging discipline of a science of the image complements the history of the science of artistic visualization, the history of art and images of science, and particularly, the science of the image as it is pursued in the natural sciences. (Grau 12)
Naturally, when the image can be treated with scientific tools in terms of epistemology and aesthetic, the natural result is the feasibility of the production of materials for the construction of a parallel reflection of reality, if not a new reality in itself. However, these materials must be obtained from a rigorous process of computation and simulation, to build the foundations of a grid where it will be possible to protrude the algorithm that underlies the rendering paradigm. In this process of creating a synthetic layout, the quintessential material can be formulated as the geometric mesh. The mesh is a structural paradigm that conceives the surface of the object and its essential topology. It embodies the skin of the notion of a new structural material or a kind of molecular tissue. It is interesting to notice that most artists cannot conceive a foundational project without the paradigm of the mesh.

Perhaps, optional when the artist begins the modeling of naturalistic, or abstract compositions, the transparency created by the mesh determines an overlapped visibility in the whole scene (Fig 5). This can be interpreted as the possible metaphysical essence of the object in its very basic layout. Perhaps, some experiences done in op art by Bridget Riley, Jesus Soto and Francois Morellet explore the geometric forms from its surface, however suggesting the topology dynamics as its resulting effect. A particular effect is given by the object meshing with back faces that turn the shading surface null, like 3d generative software can do. This is performed by the artist, in the genuine interest that reveals the essence of the object with such undeviating visual aspect.
A vast array of literature for sure has been written and released promoting the polyvalence of a 3D artist in the virtual extent of sculpture or abstract architecture. But in this discussion, the conceptual framework of the image as the main synthetic mold that originates the real physical model continues to represent the imperative of the essential condition to produce the archetypical process of the 3D image making.

**The rendition of scenes. Photorealistic versus non- Photo-realistical render.**

The creation of 3d scenes and models involves a lot of computational calculation due to the amount of geometry generated. This can be augmented in an even bigger extent with the final shading of the scene. Movies and video games are constantly featuring the rendering aspect of characters and stories. However, the industry has populated the cultural landscape with rendering imaging through overwhelming effects developed by armies of artists and engineers.
Nonetheless, the heroic scene of an artist trying to implement his version of the corporate studio can be futile at least. Since computers and hardware are more attainable to implement as domestic workstations, studio artists can erect a sort of human scale studio (or better, a well suited environment for generative images supported by an unyielding array of resources for production.) However, the notion of the photo-realistic rendering aspect is omnipresent in every corner of the advertising arena, and this is well sold because of its synthetic generative effects. Lev Manovich in his essay “Abstraction and Complexity” defines the effectiveness of this domain as a consequence expected:

The cumulative result of all these developments-3d computer graphics, compositing, simulation of all media properties and interfaces in software- is that the images that surround us today are usually very beautiful and often highly stylized. The perfect image is no longer something that is merely hoped for or expected in particular areas of consumer culture- instead, it is an entry requirement.(Manovich 342)

Doubtless, Manovich states that these industries generate images well incorporated in the cultural catalog of contemporary stream media, and that they can be recognized as computer generated images even if they are well concealed inside a live video composite.

The process of rendering a scene in a 3d composition takes a number of components essentially arranged in a method. The image first modeled in wireframe must have a basic component of shading, which renders in its fundamental skin the surface of the object. Early rendering experiences using computational processes used limited amount of calculation in the rendition of 3d scenes. The photo-realistic aspect of the surfaces was in progress until the software packages, and computer engineers developed certain components that helped to create more credible surfaces, like the real world (Fig. 6).
This aspect of representational surfaces was the main aim of the industry in order to depict narrative environments for animation and advanced effects. However, the process of the rendition of photo-realistic surfaces took the shape of scientific studies about lighting irradiance from surfaces and their algorithmic calculation. This computational ingenuity is called Radiosity, a rendering system, was initially conceived for the representation of extreme photo-realistic surfaces. This is based on the thermal irradiance and the color bleeding of these surfaces. Enrico Gobetti et al. in his essay “Hierarchical Higher Order Face Cluster Radiosity for Global Illumination Walkthroughs of Complex Non-Diffuse” develops a proposal of how to apply an algorithm for highly tessellated meshes, which irradiates or moderates efficient glossy surfaces (Gobetti 570). Although his proposal is a thorough study about how the radiosity methodology can be strengthened, Radiosity’s classic algorithm constitutes the foundation for a notion of photo-realistic interpretation of a 3d scene based on global illumination. To this respect, he comments: “The most successful radiosity technique for dealing with complex scenes is currently hierarchical radiosity. The algorithm constructs a hierarchical representation of the form factor matrix by adaptively subdividing planar patches according to a user-supplied error bound.” (Gobetti 564) It seems that the process of rendering the 3d scene assumes a sort of
cascade metaphor, where the rendition of the scene is patched with blocks of interlacing pixels from top to bottom until they complete the highly detailed surfaces by orderly sequence.

A corner stone experience fundamental to the understanding of the computer rendition of a 3d scene is the Cornell Box. This model has been developed by the Cornell University's Program of Computer Science, and describes how an environment renders graphics from an advanced algorithm that can output a lighting network based on radiosity. The Cornell box represents one of the most important paradigms in digital illumination and rendering. This experience is credited to Joseph Cornell, an artist that clearly inscribes his work inside a powerful perceptual dimension of volume and lighting. His boxes would reveal to scientific and computer engineers how the surfaces can reflect the irradiance of lighting temperature. However, his perception for some authors is related with the tradition of the painting's representational space. In his article “Learning from The Cornell Box”, Simon Niedental states that the renderings of the virtual boxes “resemble like some of the paintings of Giorgio de Chirico.” (Niedenthal 250)

It is interesting to verify that such anecdotal associations can be very assertive if we review some of the De Chirico compositions (Fig. 7), where the rendition of the lighting is much dimmed in some of the outdoor scenes like the plazas and statues. His main preoccupation is the contrasting encounter between daylight and symbolic architecture that is metaphorically disposed. For De Chirico, the importance of lighting not only engages the sense of mystery but it also suggests a perceptual state of mind that reveals an underlying reality.
De Chirico's preoccupation in lighting is somehow an aesthetic component, if not rendered with scientific accuracy in paintings, and at least transforms the way in how perception and aesthetics coordinate the aspect of illumination in art. In the case of the metaphysical painting, lighting assumes an intrinsic component that renders a subjective emotion parented with the Eleusinian mysteries enacted by the Greeks in their Dionysian rites. Perhaps, the association with “Pittura Metafisica” goes a little off the importance of the Cornell box (Fig. 8) as an aesthetic paradigm. It is relevant how the Italian painters preserve this inclination for primitive structures in the shape of boxes. Regardless of this, those structures remain important devices of study of volume and lighting, and this can be seen in Giotto paintings and Duccio de Bounisagna.

The rendition of lighting has been throughout the world of art history as a sort of indirect metaphor that bathe the objects indirectly in a sort of reminder that this is a fundamental device in the production of images. According to Simon Niedenthal “in any environment, we might say that there are surfaces directly illuminated by light from sources and surfaces that are illuminated indirectly by the light reflected from other surfaces,” (Niedenthal 252)
fundamentally organizes a network of lighting that can have just a global source, and this will affect all the surfaces in the scene.

Artists definitely are the beneficiaries of this huge venture of research. In fact, the dialog between computer science and aesthetic is so dynamic and evolving that the inevitable association between artists and engineers is unavoidable, or at least converged in the sharing of visual scrutiny. Visual arts provide the fundamental information to initiate advanced studies about surfaces and lighting. Notwithstanding, the scientists are concerned with the physics phenomena of lighting and surfaces as well. Is it possible to assume that aesthetic paradigms in computer art are dictated from computer science? But who else other than an artist is able to render a scene with such amount of ambient properties and interrelated object effects? Perhaps, the mathematical construction of the algorithms is the fruit of a computer science engineer's intense research and lab work. But the interpretation and interpolation of these discoveries can be protruded in a synergetic basis by the artist's studio. 3d software packages today provide the fruit of all these experiments and scientific ventures.

3d software like Maya, 3d studio Max, and others are capable enough to organize the techniques and procedures using a relatively friendly interface. Even for students that enroll in
3d modeling classes, the procedures are available and they can experiment interactively with the use of complex algorithm by modifying parameters or combining settings. In fact, one innovative use of global illumination and radiosity in Maya is the Final Gathering command. Final Gathering is an interface name for the process of collecting points emitted by photons during the rendering process. This process can be performed as well using radiosity. However, the setting and adjustment of these points can create an array of non-photorealistic surfaces that mimic pictorial ones. If artists are interested in the rendering of surfaces with the irradiation of photons and other electromagnetic radiations, the photons can create a beautiful set of hues that not necessary and are deemed to portray classical glossy reflecting surfaces (Fig. 9)

Figure 9. Montenegro. Study after Edward hopper. Global Illumination with Gathering points.

Studio artist’s experiences creating computer generated images must start this apprenticeship by learning the semantics of this set of effects provided by global illumination and indirect lighting. Indeed, this is the right path to transcend the candid analogy between the direct lighting emitted by bulbs or domestic devices and the built in resources available in 3D software. Global illumination can provide an expanded horizon of possibilities, whether those can be performed in extreme portraiture of the reality or to obtain beautiful abstract surfaces.
The paradigm of visualization

There are several venues that configure a strong and effective set of resources to render an image for the proper visualization of a project based on a 3D scene. These are somehow interrelated in terms of shared commands, and it is possible to create hybrid solutions for a much more advanced or sophisticated rendition of the scene. But without the knowledge borrowed from art history and the intuitive performance of casting lighting, volume or symbolic arrangements will only look like the pale illustration of a technique. The effort invested in mimicking a surface can be a setback for the original attempt to blend the studio practices and the computer simulation of the skin.

The available effect in 3D packages software makes the execution of a well designed commercial algorithm easier. However, the craftsmanship expected from the artist is basically to exceed the threshold pattern offered by the tool. The artistry goal thought for a range of computational paradigms transformed into aesthetic resources is to supersede the obvious analogy between the tools. It is important to emphasize in order to bridge the computational environment, and the artist’s studio (a reformulation of the procedures used traditionally), is required. The adjustment of the artist studio into a grid of programing components is inescapable.

A fundamental example of how an artist can start this reformulation is the conventional procedure to painting a surface. Perhaps, this still existing action that is required in some computer graphics applications must make room for much more decisive components. One of these components is the use of High Dynamic Range images. The fundamental media to create and use these kinds of images is photography. The painter must learn and manipulate with accuracy the exposure of several shots of the same picture that contain wide dynamic ranges of
light intensities available in nature. The images can be assembled through a process that blends the different exposures in a single file. Regardless, this contiguous technical procedure widened the intuitive knowledge about a naturalistic setting even more, and can be performed with exceptional accuracy.

The render accuracy provided by a High Dynamic Range image portraits a scene with incredible surface consistency, whether the scene was treated using photorealistic or non-photorealistic overtones. Although High Dynamic Images in conjunction with Image Based Lighting would be forcibly deemed as a technique, both represent a drastic change in the conceptual setting of the classic composition. The simulation of the studio's naturalistic effect is no longer determined by the artist's eye perception and how this is able to translate what he sees and he paints. In terms of figurative representation or abstract construction, the Dynamic Range Image will provide an intense amount of illumination that it will not be necessary to include a fictional or artificial source of lighting (Fig. 10)

![Cornell Box with High Dynamic Range image based illumination.](image)

Figure 10. Cornell Box with High Dynamic Range image based illumination.

The paradigm of visualization can be reformulated through the following construction: another image renders integrally another image to achieve an indirect revelation of the both.
These digital phenomena implement a procedure based on the accurate capture of fundamental elements from nature, and then they are digitized to be recycled in the visualization of a much more complex scene.

In conclusion, artist is encouraged to explore new venues in the CGI production. However, the aesthetic aspects of the CGI production imply a compromise that goes beyond the commercial craftsmanship. In order to visualize or identify how computational techniques are transforming the semantic of artistic languages, it is necessary to venture inside specific procedures, navigate inside the algorithmic network, and become familiar with what a computer scientist has achieved in utilizing a vast inspiration from art. The benefits for studio artists are immense, and these clues definitely open a wider venue to develop hybrid aesthetic experiences that are no longer relegated in the particular sphere of each discipline. How a Caravaggio’s scene determines a complex study about lighting depends on the amount of perception each artist invests in order to categorize the nature of the lighting contained in it. One should focus not only in how knowledgeable an artist must be about the computer graphics techniques and how efficiently they must be applied, but also in how he should identify the evolving and mutating procedural exchanges between computer graphics conceived by science and perceptual values assigned to nature by art. The use of computational procedures is a component that can elevate the aesthetic experience of an artist even more in search of the image making realization.
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