

**THE NATURAL LANDSCAPE IN COMPUTER ART:
AN EXPLORATION OF NATURE-BASED SIMULATIONS IN
VIRTUAL REALITY**

A THESIS SUBMITTED TO THE FACULTY OF THE
COMPUTER ART DEPARTMENT IN PARTIAL FULFILLMENT
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BY

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INTRODUCTION



“ . . . [Ansel Adams] had thought of modernity and mountains as paired opposites, in starkest terms an illness and its cure. If a restoring excursion into nature was impossible for many frazzled urbanites, the next best relieving measure should be an art that brought the outdoors indoors.”

- Stephen Fox

From realism to impressionism, through the advent of photography to today, the natural scene in the world of art has been as ubiquitous as the still life. Landscape art has brought the “outdoors indoors” for centuries, rendering the beauty of nature more accessible within civilization and later providing a meditative escape from that civilization. At the end of the 19th century, as wilderness slowly began to be seen as a finite and endangered entity, the landscape even began to play a pivotal role in nature’s protection. Images were brought back from the wilderness to stand as evidence of the beauty that existed where many could not go. Photographs by artists like Ansel Adams helped garner support for the wild places they depicted and eventually helped launch the conservation movement. And now in computer art, the natural landscape will undoubtedly play similar roles. Through Virtual Reality (VR), which completely immerses the viewer into the natural scene by controlling all of the senses, the natural landscape will provide an educational tool and accessible escapist outlet unrivaled by any other mediums that came before it.

Three-dimensional, nature-based simulations will eventually become immersive and realistic enough to adequately simulate the serenity and emotional sanctity found in natural settings. Once that happens, computer art can make the natural landscape more emotionally powerful than ever before. What has always attracted humans to the landscape in other artistic mediums will be exponentially increased in VR. People will not only be able to see places they have never been, they could theoretically be immersed in them for as long as they like, whenever they like, building a

relationship and appreciation for the sanctity of the environment that previously could only be attained through physical visitation.

In order to better understand the potential of the natural landscape in computer art, it is necessary to explore what the landscape and the nature it depicted has meant to people since the 16th century. By examining the historical and continued importance of the landscape in art, I will illustrate how VR simulations have the potential to be an unequalled outlet of tranquility to the “frazzled urbanites” of the future and an instrument of salvation to the natural environment. The landscape in computer art will change the way people co-exist with nature in the following ways: VR can spread awareness of and respect for the remaining wild places on Earth amassing support for their preservation; it can help reduce the impact on these shrinking lands from millions of visitors annually; it can take people to places that they could heretofore never go; and it can provide the meditative, spiritual escape that the technology-saturated collective psyche craves.

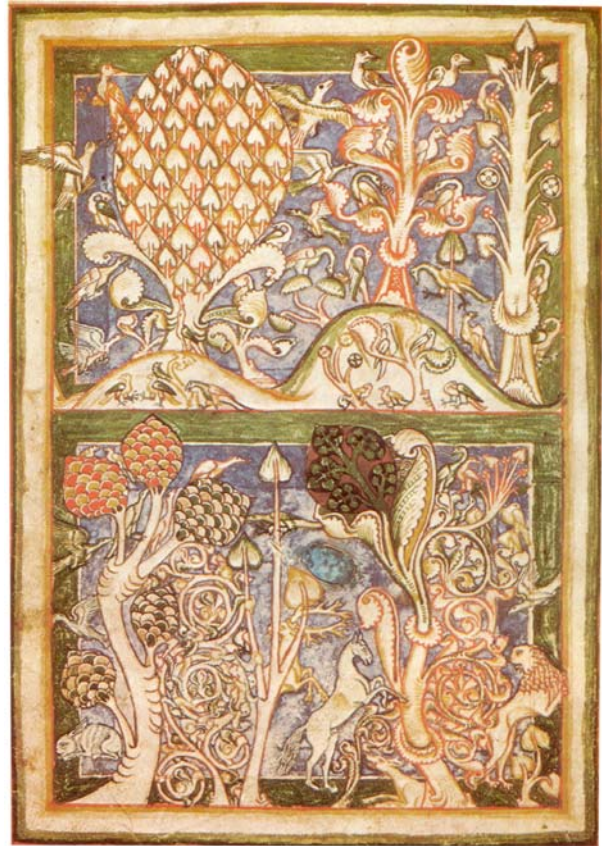
THE HISTORY OF THE LANDSCAPE



The appeal of nature to humans is indisputable. Whether inspired by a sunset, the night sky, or the vast, endless view from a mountain, just about everyone has been emotionally moved by a natural scene at some point in his or her lives. For most people, the aesthetic appreciation of nature is intrinsic. Even in many ancient cultures, nature was often viewed as the ultimate source of beauty (Corner 27).

But in Western art, before the Renaissance and the Protestant Reformation in the 16th century, the landscape was rarely seen as anything but insignificant backdrops in religious, narrative paintings. Since the Catholic Church commissioned most works of art in that era, early landscapes often served merely as backgrounds to the human figure in a mythical or biblical setting. One of the

first exceptions of the artist depicting only the natural setting with some semblance of realism comes from the illuminated manuscript Carmina Burana, a collection of secular verse written in the late 12th century. One poem from this collection required the illustrator to visually depict the life of nature in the springtime. Without precedent from which to draw guidance, the artist filled the page with an anthology of Romanesque plant ornament interspersed with birds and animals (Janson 301). This decorative illustration is one of the earliest known examples of the natural scene dominating the work, a harbinger from which the modern landscape evolved several hundred years later when the creation of art for secular purposes became customary. It would take a widespread reformation of the Christian religion itself for art to break free of religious, symbolic and decorative constraints and open the door for the widespread creation of what we think of as a landscape today.



"Page with Summer Landscape," from Carmina Burana, Early 13th century.

Throughout the Middle Ages there were short-lived movements to reform the corrupt practices of the Catholic Church. But in 1517, when the German Martin Luther wrote his "95 Theses" condemning abuses of the Church, a sustained revolt and eventual reformulation of Christian religion was born. Protestantism rejected the corrupt and worldly opulence of Rome and strictly prohibited the use of imagery within the church. As Protestant culture expanded across Europe, church commissions as a whole started to drop off and artists were forced to cater to secular, popular tastes. Three secular themes became increasingly sought after: still lifes, scenes of daily life, and landscapes. The landscape was a rendition of beauty that required minimal prior

knowledge of art and no formal understanding of aesthetic sensibilities. Natural landscapes represented inherent beauty, untainted by the materialism of man, and consequently became increasingly sought after. Such paintings were eventually sold directly to the public in a free-market system, for the first time bypassing the commission process (Janson 629). Alongside this growing new secular patronage, the dawn of the Renaissance changed the way nature was perceived by artists. They were encouraged to use their imagination and natural creativity, a drastic change from when most artists were seen only as illustrators or copyists. In his work “Treatise on Painting,” Leonardo da Vinci [1452-1519] urged artists to be inventive and to study such things as clouds and light, as well as rocks and fire, and to use these natural elements as they saw them, to use their intellectual creativity (Buchan 13). As Renaissance thoughts spread across Europe, a Flemish painter, Joachim Patenier [d. c. 1524], started allowing the landscape to dominate all the other elements in his vast panoramic scenes, and the landscape painting as we know it was born (Buchan 14).

In the 18th century, natural landscape appreciation expanded rapidly across Britain. But here it should be noted, the intrinsic beauty of nature was not the only impetus for the landscape’s widespread appeal. Some of the attraction stemmed from a sense of nationalism and the prestige of land ownership. The rise of an increasingly prosperous and self-confident aristocracy demanded renditions of their English countryside with which to adorn their homes (Klonk 9). Regardless of the motivations, this era produced two of history’s greatest English landscape artists, Mallord William Turner [1775-1881] and John Constable [1776-1837]. Inspired by the Dutch realists who came before them, these artists raised landscape painting to new heights and helped make one of England’s most important contributions to classical art (Buchan 15).

In the 19th century, the Enlightenment evolved into Romanticism, a movement that revered nature. The Romantic artists, like Camille Corot [1796-1875] and Théodore Rousseau [1812-1867], often believed that God and nature were directly intertwined. Their philosophy was based on subjective experience, rather than rational thought; therefore, they attempted to transcribe the landscape as faithfully as possible, as opposed to forcing the landscape to conform to prescribed

ideas of beauty as did the Neoclassicists (Janson 670). The Romantic period emphasized nature as a spiritual entity embodying the laws of God and worthy of worship. Nature was the common denominator of all society's transactions, subsuming art, philosophy, science, and religion. "Nature's purity could redeem every evil, since nature itself, as the reflection and immanence of God, was without evil." (Novak 60)

In this Romantic view of nature, the more wild and untouched nature was, the more pure — a fairly unique notion at the time. For although nature was seen to have an intrinsic beauty throughout history, wilderness did not. For many cultures, nature had to be relatively tamed before it could begin to be truly appreciated. Untamed wilderness was often considered wasteland, evil, or simply hostile. In the earliest times, the Greeks worshipped gods embodying various elements of nature, but they delighted only in the gentle face of nature, in the pastoral scene. Wilderness evoked only fear. And later, in Christian times, mountains and the forest became symbols for the sinful and unholy. In the Old Testament, Adam and Eve were cast from the halcyon Garden of Eden into the harsh and desolate wilderness, a story that embedded into Western thought the idea that wilderness and paradise were both physical and spiritual opposites (Nash 15). Even as late as the 17th century, poet Andrew Marvell referred to mountains as “ill-designed excrescences.” French writer Madame de Staël wrote of drawing the curtains of her carriage whenever passing through the unrefined, forbidding Alps (Brooks 18).

European settlers carried this fear of wilderness to the New World. The Americas abounded in untamed wilderness. To the early settlers, wilderness was an obstacle, an impediment to overcome, an enemy to conquer in order to carve out a life for themselves. To the frontiersman, it was a barrier to the riches that lay beyond in the West. In fact, even after the gold rush of 1849 and the exploitation of the West's resources had begun, aesthetic appreciation of the natural wonders was still confined to a few explorers and the artists who accompanied them (Brooks 17).

But as civilization spread across the continent, Americans slowly began to see nature as the escape from urban life that had long inspired European painters. As in England, poets proved

essential to shaping American ideas about nature, enlightening artists to the idea that the wilderness was the most distinctive feature of the New World and its emerging culture. And by 1825, one of the most influential landscape artists to come out of this era, Thomas Cole [1801-1948], had founded the Hudson River School, a group of painters who over the next fifty years were directly responsible for making the wild, pristine forests and mountains nationalistic symbols for the United States (Janson 684). They painted grandiose, romantic landscapes and believed that the landscape in its virgin state, untouched by civilization, was closer to God. In his "Essay on American Scenery" in 1835, Thomas Cole wrote, "Amid [the scenes of pristine wilderness] the consequent associations are of God the creator--they are his undefiled works, and the mind is cast into the contemplation of eternal things" (Novak 62).

But even then, man's encroachment on the land was hard to avoid as industrial development expanded across the country. Up until 1843, Thomas Cole would often filter railroad development and manmade objects out of his paintings in order to retain the unpolluted image of wilderness (Robinson 20). The less a landscape had been touched by man, the more primal and close to God it was. As a result, in most nineteenth- and twentieth-century American landscape paintings, we find obsessive fascination with the heavenly and hellish extremes of nature, as seen in Albert Bierstadt's "Sunset in the Yosemite Valley" below. Fiery sunsets, luscious paradises, and violent seas, the landscapes were depicting nature



"Sunset in the Yosemite Valley," 1868, by Albert Bierstadt.

in its purest form, a time before the manmade destruction of war and industrialization. These extremes of nature were relics of a primeval past that countered the unceasing pollution of these American Holy Lands by modern industry (Rosenblum 36-37).

Unfortunately, the encroaching hand of man was unrelenting. The industrial revolution was in full swing with no end of its expansion in sight. As the American scenery began to shrink, artists like Martin Johnson Heade would choose to paint the marshlands up and down the Atlantic Coast undoubtedly because they were nearly uninhabitable with their unstable ground, constantly changing tides, and salt-water streams (Wilmerding 44). And famous landscape painters of the era like Frederic Edwin Church [1826-1900], William Bradford [1823-1892], and Sanford R. Gifford [1823-1880] even resorted to traveling to the isolated regions of South America, the Arctic, and the Antarctic in pursuit of the new wilderness frontier, which was fast disappearing in the continental United States (Wilmerding 46).

Just as the pure landscapes were perceptibly dwindling at the end of the 19th century, a new revolutionary art form emerged and quickly turned its lens to the landscape: photography. Peter

Henry Emerson [1856-1936] was an early photographer renowned for his portrayal of the natural scene in this new art form. “Emerson championed what he called naturalistic photography, based on scientific principles and [John] Constable’s landscapes . . . He was a master at distributing tonal masses across a scene, and his photographs are equivalent to fine English landscape paintings of the period” (Janson, 767). The acceptance and respect for the art of landscape photography continued to grow throughout the 20th century.

THE CONSERVATION MOVEMENT



As the expansion of human development began to put quantifiable pressure on the natural systems of the planet, it slowly became clearer to a growing number of people that wilderness was finite and that without check, the negative impact of humanity could permeate every pristine wild land. In the late 19th century, wilderness writers and enthusiasts began mobilizing to try to protect some of the wilderness areas not yet altered by human expansion and the conservation movement was born. The proponents of this movement urged the establishment of state and national parks and forests, wildlife refuges, and national monuments intended to preserve noteworthy natural areas. Some prominent early conservationists included President Theodore Roosevelt, Gifford Pinchot, and John Muir, the founder of the Sierra Club. John Muir, a founding member of the Sierra Club realized early on that in order to protect the wilderness of the California Sierra, he had to get people out there to experience it for themselves, or either somehow bring it to them. He knew that political change only came from large numbers of constituent support. And the only way to garner that support was through awareness. After all, how can people value what they do not know?



Thomas Moran, *Grand Canyon of the Yellowstone*, 1872. Department of the Interior Museum, Washington, D.C.

"Grand Canyon of the Yellowstone," 1872, by Thomas Moran.

Landscape art was an integral asset in creating that awareness, both across the nation and within Congress. America's first national park, Yellowstone, was established in 1872 amidst public support strongly influenced by the great canvases of landscape painter Thomas Moran. In the 1930's, getting Congress to create Kings Canyon National Park was one of the Sierra Club's priority issues and landscape art would once again help amass support for these areas that so many had no other way of experiencing. Ansel Adams lobbied Congress and created an impressive, limited-edition book, *Sierra Nevada: The John Muir Trail*. The photographs in this book directly influenced both Interior Secretary Harold Ickes and President Franklin Roosevelt to embrace the Kings Canyon Park idea. The park was created in 1940. In 1968, Adams was awarded the Conservation Service Award, the Interior Department's highest civilian honor, "in recognition of your many years of distinguished work as a photographer, artist, interpreter and conservationist, a role in which your efforts have been of profound importance in the conservation of our great natural resources."

(http://www.sierraclub.org/ansel_adams/about.asp) In 1979, Ansel Adams was asked to take the official presidential portrait of Jimmy Carter. About the event, Adams's assistant, John Sexton, wrote the following:

Ansel used the 55-minute session as an opportunity to present information directly to the president about the importance of preserving the Alaskan wilderness. It was no coincidence that at the conclusion of this portrait session, Ansel presented the president and the first lady with a beautiful print of *Mount McKinley and Wonder Lake, Alaska*. Not long thereafter, President Carter signed legislation helping to protect the Alaskan wilderness. (Fox, 40)

In 1980, Adams received the Presidential Medal of Freedom, for "his efforts to preserve this country's wild and scenic areas, both on film and on earth. Drawn to the beauty of nature's monuments, he is regarded by environmentalists as a national institution.

(http://www.sierraclub.org/ansel_adams/about.asp)



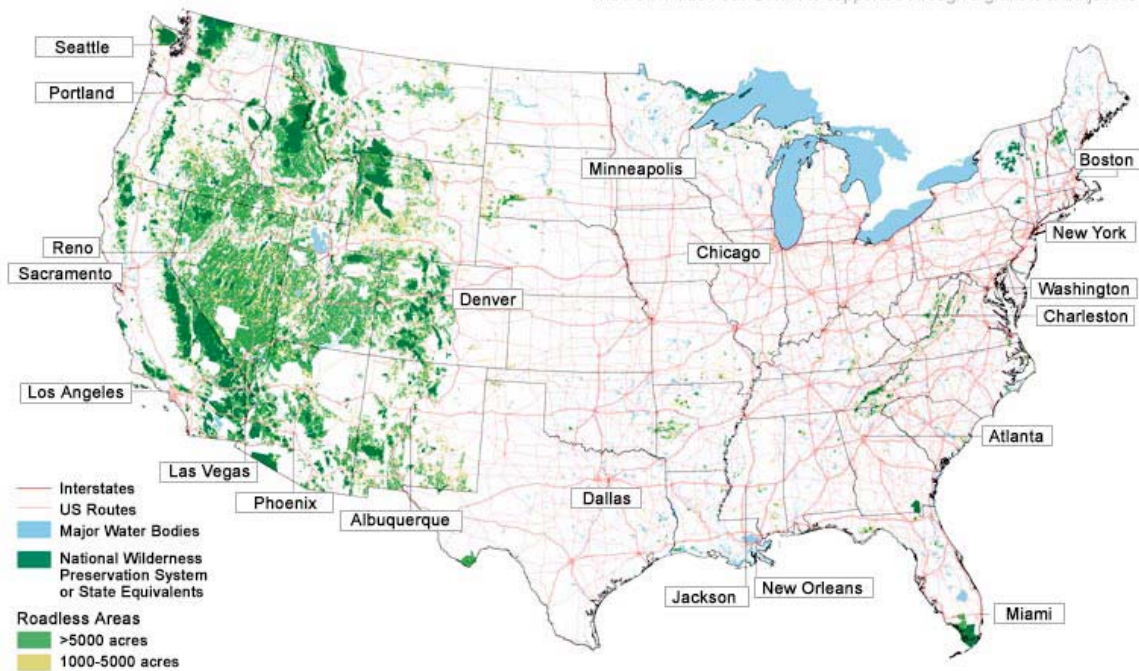
"Mount McKinley and Wonder Lake, Denali National Park, Alaska," 1947, by Ansel Adams.

THE POTENTIAL OF VR



If two-dimensional art forms such as photography and painting, reproducing only the visual aesthetic, can elicit so much support for the protection of these areas, imagine the impact of flying congressmen through that area via a VR experience. Not only would the imagery be vivid, as if they were there, but they would hear the rumble of the wind, they would feel the mist of the clouds on their skin, and have the inner ear sensation of being airborne. They could experience the essence of what it is they are voting to protect, or voting to encroach upon. Scientific-based simulations could even be created in VR of what a tract of land might be like before and after that area is allowed to be logged, strip-mined, or developed in any way. It would be an invaluable education that so many public officials and citizens are currently making decisions without. Ultimately, the exposure of increasingly more people to the inner recesses of the remaining wild places will create awareness and respect for these areas and garner support for their further protection.

Since true wilderness, by definition, is usually quite remote and difficult to visit, escaping the pervasive presence of man often requires hiking or flying miles into an area, a task not easily accomplished by the frail, handicapped, or unfit. When VR eventually becomes indiscernible from reality, it will not only allow many more people to experience these remote, wild areas that could not otherwise get there, it will have the added benefit of eliminating the actual impact of their physically going there. Incredibly, wilderness is currently threatened as much from enthusiastic visitation as from economic development. Wild lands may be in danger of being loved to death. (Nash, xi).



Wilderness Map. The National Wilderness Preservation System (NWPS) is depicted as it existed by the end of 1999; also included are ten areas in Nevada that were added in 2000. It is important to note that many states have wilderness systems that are also shown on the map, although the data is incomplete, especially in Alaska and Maryland. The state of Alaska holds the greatest potential for adding a significant number of areas to the NWPS; Alaska truly remains our last great frontier.

Combine the shrinking areas of wilderness shown in the map above and growing number of people wanting to visit these lands, and the supply of wild lands simply will not be able to keep up with the demand. In 2001, the National Park Service reported that over 279 million people visited a National Park recreationally, about 15.5 million of which stayed overnight, approximately 3.5 million in park lodging, 6.7 million camping, and 2 million in the backcountry (<http://www2.nature.nps.gov/stats/summary2001.pdf>). An August 2000 article in American Demographics Magazine observed that outdoor recreation is “becoming increasingly appealing to every demographic. Today's seniors, laden with free time, unprecedented good health, and generally hefty retirement accounts, are indulging in outdoor activities...[while] environmentally conscious Baby Boomers are flocking to exotic adventure travel destinations...[and] Gen Xers and Ys...have spurred the development of non-traditional outdoor activities.” A 2000 study on outdoor recreation found that the number of Americans who claim to participate in outdoor recreation at least once a month had increased steadily from 50% in 1994 to 78% in 2000.

(<http://www.funoutdoors.com/Rec00/index.html>) The human race entered the 20th century with a population of less than 2 billion people. We started 21st century with more than 6 billion. We are now adding one billion people every 14 years. If this rate of growth continues, world population will double in just over 50 years (<http://www.populationconnection.org>). And with a population of the Earth projected to be 7.8 billion by 2050, sheer demand may be the leading impetus for creating nature-based, VR simulations in the future. Otherwise, one may have to sign up on a 10 or more year waiting list, just to go there.

But can a machine reproduce the transcendental peace induced by nature? Will VR simulations of nature be able to adequately provide the escape from our urban, technology saturated lives that our psyches desire? More importantly, can *technology* provide an escape from technology-saturation? Without a doubt, hyperrealism will not be the problem. Many examples already exist today of computer-generated imagery that is indiscernible from reality, and this will continue to advance almost as fast as computing power increases. With more computing power comes the ability to create hyperrealistic imagery in real time; allowing for full interactive immersion. And in natural landscape simulations, thanks to NASA and many other organizations, the data already exists to three-dimensionally replicate the terrain of almost anywhere on Earth right now. This would be a great start for the VR artist on which to build, like light to the photographer. But where the current VR-replacing-reality model breaks down is at the interface level. Today's technology for interfacing humans and their virtual worlds has the greatest amount of advancing to do, which it undoubtedly will.

However, no matter how close the computer can replicate the exact senses felt in reality, unless the immersant is rendered unconscious and awoken within a virtual world, there will always be some part of the user's mind that is aware that he or she is not truly outside. That last little realization, can have a profound effect on whether or not a nature-based simulation can take the place of a nice long walk in the woods. It is feasible to think that in the future we may be able to control the brain enough to overcome that last bit of awareness, but until that time we will have to

consider the virtual world to be similar to what William Gibson calls an “an infinite cage,” infinite in scope, but limited in reality. There will always have to be the slightest bit of pretending thrown in. What Michael Heim describes as the need to “let go, lose the urge for rational control, and allow the boundaries between inner mind and outer body to dissolve.” (Heim, 165).

Therefore, I contend that VR will not be used to replace nature, (unless wilderness completely disappears). VR will be a necessary supplement that will not only satisfy the same emotional needs that have attracted humans to landscape paintings and photographs over the centuries. It will provide us enough solace and escape from our everyday lives so as to sufficiently diminish our want to experience real nature—a necessary, albeit sad, technology, since there is little doubt that our abilities to experience real nature will be reduced while our reverence for it germinates.

From the Renaissance to today, the prevalence of the natural landscape in all mediums of art stands as proof of its lasting appeal and significance to humankind. This art has provided windows into other worlds, into the intangible nature. Landscape art can show us not only the natural scenes too distant and remote to see with our own eyes, but ones that do not exist in the real world—the natural scenes as seen through the perspective and imagination of skilled artists like Albert Bierstadt, Thomas Cole, and Ansel Adams. It is the appeal of the beauty of nature, combined with its steady destruction that will ensure a prominent place for the natural landscape in computer art. VR simulations of natural landscapes will hopefully help slow the decline of wilderness by raising support for conservation and by reducing the impact of millions of future visitors. But as it becomes more and more difficult to experience actual wilderness, VR will be the surrogate for the meditative, spiritual escape that our technology-saturated lives will crave. Of all the virtual worlds and simulations that will be made possible by future technology; in the end, the one most often experienced may be our own—pristine, untouched by mankind.

Ansel Adams wanted his photography to serve an elevated purpose, to use his art to bring people back into the natural world. He wrote to his friend William Zorach “I think the salvation of

art is going to be in its detachment from the shallow fashions of surface-contemporaneous thought. There is a deeper thing to express—to return humanity to some sort of balanced awareness of the natural things—some rocks and sky. We need a little earth to stand on and feel run through our fingers. Perhaps Photography can do this—I am going to try anyhow.” (Fox, 30)

Perhaps VR can carry this pursuit much further—I am going to try anyhow.

APPENDIX

NIGHTFALL



To explore the potential role of the natural landscape in Computer Art, specifically Virtual Reality, I have designed and constructed a device that will simulate the experience of hang gliding. The viewer will be suspended in a harness from the device pictured below. Through a head-mounted display, he or she will be immersed in a computer-generated flight simulation through various natural landscapes. The controller will then regulate the fan speed ("wind") and the viewer's physical orientation based on the visual images of the experience.



The VR Glider.



A frame from the landscape animation, NIGHTFALL, created by Randy Ramsey using Maya 4.0 and Renderman, June 2002.

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