Framing the Magic

Daria Tsoupikova[*a]

[a]Electronic Visualization Laboratory, University of Illinois at Chicago,
851 S. Morgan St. Rm. 1120 SEO, Chicago, IL, USA 60607-7053

ABSTRACT

This paper will explore how the aesthetics of the virtual world affects, transforms, and enhances the immersive emotional experience of the user. What we see and what we do upon entering the virtual environment influences our feelings, mental state, physiological changes and sensibility. To create a unique virtual experience the important component to design is the beauty of the virtual world based on the aesthetics of the graphical objects such as textures, models, animation, and special effects. The aesthetic potency of the images that comprise the virtual environment can make the immersive experience much stronger and more compelling. The aesthetic qualities of the virtual world as born out through images and graphics can influence the user's state of mind. Particular changes and effects on the user can be induced through the application of techniques derived from the research fields of psychology, anthropology, biology, color theory, education, art therapy, music, and art history. Many contemporary artists and developers derive much inspiration for their work from their experience with traditional arts such as painting, sculpture, design, architecture and music. This knowledge helps them create a higher quality of images and stereo graphics in the virtual world. The understanding of the close relation between the aesthetic quality of the virtual environment and the resulting human perception is the key to developing an impressive virtual experience.

Keywords: Virtual reality, aesthetics, arts, CAVE

1. VIRTUAL AESTHETICS AND ITS INFLUENCE ON THE EMOTIONAL EXPERIENCE

1.1 Introduction

Virtual Reality (VR) art relies upon all traditional and digital art forms, such as painting, sculpture, music, film, photography, computer graphics, animation, design, installation, and others. In many aspects VR is the ultimate art form because of its deep multiple roots in other art areas which serve variety of functions and provide support for its final framework.

Just as Architecture was considered, in a sense, "the mother art"[1], because it housed all other traditional visual and performing arts such as painting, sculpture, music, dance, etc., so it is that in the twenty first century VR completes the circle of the architectural mission by becoming the ultimate host and medium for all other art forms, not only traditional but also digital. In founding VR environments artists and scientists orchestrate the integration of visual, spatial, and performing elements of computer graphics with other elements of animation, design, installation, sculpture, architecture, music, film, photography and others.

The interaction of technology with aesthetic knowledge is the nexus between technology and aesthetics which provides the core of the artist's project and centers the diverse elements together like a trunk of the tree with its roots and branches (Fig.1).

One of the challenges of creating virtual worlds is to find effective ways of representing complex environments. To create a very strong "impression of reality" which allows a "total suspension of disbelief" [2] as to the virtual nature of the experienced reality, the virtual environment must be very convincing. Aesthetics frames the magic of the virtual

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[*] datsoupi@evl.uic.edu, phone: 1 312 996 3002 fax: 1 312 413 7585

world by presenting a coherence that allows for a freedom that is unique to the virtual environment. Just as the picture frame must be one with the painting, the aesthetics must present, enhance, and offer a broader perspective of the concept of the virtual project. The style of the visualization and the artistic theme set the mood of this new virtual world to the user upon his entry. The aesthetics of the virtual environment most forcefully communicates the new essence of the environment to the user.

Aesthetic qualities have very important visual and presentational functions as the artist strives to create the artificial experience. It introduces the atmosphere of the project, delegates the mood while affecting, transforming, and enhancing the emotional experience of the user. Harmonious colors, carefully designed shapes and well organized time-based compositions create a sense of balance and order and induce emotional responses. According to Dynamical Psychology the increasing amount of harmony between the person and the environment creates the feeling of "spiritual joy" [3]. According to this field the more harmonious, beautiful, and unique the aesthetics, the stronger the soulful experience.

1.2 The union of traditional and digital aesthetics

The virtual environment consists of digital textures, 3D models, animations, sounds and interaction. These elements essentially created as individual pieces using different mediums eventually bring together a sense of unity and continuity into the aesthetics of the world. Their individual aesthetics derive from the traditional art forms. The development of the textures relies upon the principles used in the visual arts, painting and photography in particular. The development of the 3D models relies upon the principles of sculpture in spatial arts. The development of the animation relies upon the principles of Film in time-based arts. The development of the sound relies upon the principles of music in performing arts. Hence, the digital virtual aesthetics appropriates the aesthetic principles of the traditional arts. Empowered by other art forms VR has a potential to offer the ultimate aesthetic experience on demand (Fig.1).
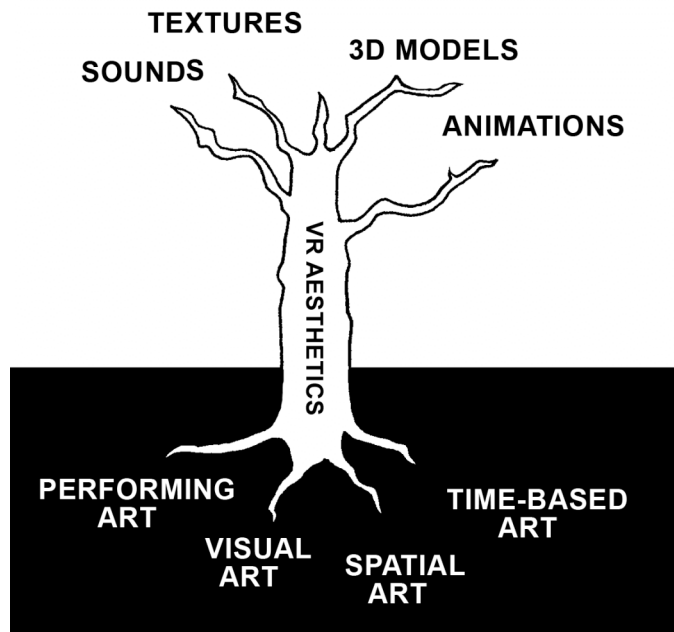

Figure 1. VR aesthetics is based upon traditional arts.

Through motion, touch, feel, hearing, and sight VR gives the opportunity of the profound experience of another reality. It grants the freedom of exploration to the user to transform virtual into real. Film, for example, offers an opportunity to catch up the time, to adjoin, to feel, to look through another reality. To see film is to live another reality and another experience through the sight of another [4]. If seeing a film is to view and hear like during a lecture, then using VR is like the experience of doing the laboratory work. The eventual exposure through practice in VR can transform ideas into

images and images into strong feelings and beliefs. The example of the powerful transformation of ideas into beliefs was described by Andrei Tarkovsky in his film about Andrei Rublev-- a great Russian painter of the 13th century [5].

Andrei Rublev lives in the monastery during his youth raised and educated on the ideas of brotherhood, truth and love unsupported by any real life experience. When the Tatar ghetto conquers Russia Andrei leaves his home monastery and travels to Moscow experiencing dark, violent, dangerous and warring medieval Russia. He realizes that the escape from the hard life he experiences around him lies in the brotherhood, truth and love. The ideas of his youth were empowered by real life experience and grew into as strong belief, which later finds true expression in his paintings.

VR has the potential to affect the user both psychologically more than any other art form because it relies upon the union of traditional and digital aesthetics.

1.3 Color, space, and time in virtual aesthetics
VR aesthetics follows principles based upon the history of traditional 2D and 3D arts. The organizational principles of color, space, time, shape, and the fundamentals of the aesthetics of traditional arts and VR. The knowledge about the color organization used to achieve unity and harmony of the paintings provides the ground for the development of the VR textures. The knowledge about spatial compositions and organization of space used in Sculpture and Architecture provides the base for the development of 3D models and the compositing of virtual architectonics. The knowledge about principles of repetition, rhythm, and organization of time sequences used in Film provides the ground for the development of virtual interaction and animation.

1.4 The aesthetics of VR reinforces the concept and soulful experience
The effect of unity and harmony of color on the emotions cannot be understated. Observation of the harmony of color in painting and film is limited by the frame of the picture and other confining factors. In VR the user is completely free to move in any direction and experience the color organization of the environment from multiple points of view. The immersion puts the user in the center of surrounding color. To crystallize the concept, the idea should be depicted and presented sincerely, in all instances, and complete.

The more sincerely an artist presents the idea, the more beautiful and harmonious is the environment. Verisimilitude description of the concept enriches the user's experience and makes it more real, and genuine. If the environment leaves the user unmoved by the concepts expressed, then the aesthetics are lacking. The perception of the virtual world is "lived out experienced" by the each individual. The understanding of the artistic image is the perception of beauty on intuitive level.

2. THE BEAUTY AND AESTHETICS OF VR AND ITS COMPONENTS

2.1 Textures, 3D models, special effects
To create a unique virtual experience the important component to design is the beauty of the virtual world based on the aesthetics of the textures, models, animation, and special effects. When the user is immersed into the visual art world, what they see inspires imagination, remembrance and positive feelings. Through aesthetics the immersive effect is much stronger and more compelling.

The development of graphical objects that constitute the VR environment (textures, 3D models, animations, effects, etc.) follow the aesthetics principles of prior art forms. Each component should be designed to greater express the beauty. For example, the textures should be aesthetically appealing from any point of the user's view. They should harmonize with the surrounding objects at any angle and in any possible configuration. Thus in addition to the traditional requirements of the principles of painting, the developer has to consider the time and the interactive components and their possible influences on the environment. 3D models should follow the aesthetic principles of sculpture and, in addition, consider the constantly changing position and orientation of the user. Those additional requirements affect the creative process of development.

Designers and artists express their ideas by creating storyboards before the development of virtual worlds. By creating groups of objects and behaviors, designers are able to describe, represent, and control these imaginary worlds. VR is an ideal world to expresses concepts and communicate ideas. Until the twenty first century these imaginary worlds could be

only drawn on the paper or described in a novel. By developing virtual worlds artists and scientists are able to express their theoretical views about space, storytelling, design, and enhance and juxtapose the current practices of these fields.

The visual impression in VR depends on the 3D models and textures. Today the growing realism of computer graphic techniques provide broader opportunities to depict realistic impressions and imaginary themes. 3D modeling packages provide various techniques for creating unique textures for models such as real-time 3D, and 2D painting with variety of effects in the 3D scene. This allows artists smoother integration between initial sketches, storyboarding, the development stage, and the final virtual presentation. Real-time 3D texture synthesis creates broader opportunities to recreate imaginary worlds or depict subjects more realistically.

With latest improvements in special effects such as clothes, fluids, fur, particles, and dynamics to simulate the physics of motion, 3D modeling and animation can create realistic objects on a more convincing level. For artists, the potential of those new 3D modeling and texturing possibilities for creative aesthetics in VR presents exciting posibilities.

2.2 Aesthetic qualities of the components and their influence on the user experience

Aesthetic qualities of models can dramatically enhance user experience and affect his/her emotions and state of mind. To design a virtual world an artist can borrow aesthetical principles from color theory, art education, design, architecture, entertainment, music, and other fields. For example, color theory explains harmony as a dynamic equilibrium. As the harmony of color is something that is pleasing to the user by creating a sense of order and balance to the visual experience, it helps the brain to comprehend and organize information. On the other hand extreme color usage can be very displeasing and chaotic for the viewer. This methodology successfully applied to the virtual environments can enhance the pleasure.

Architectural principles of symmetry, proportion, repetition, and hierarchy can be used to support the development of virtual architectonics and the organization of spatial compositions. Design principles of emphasis, balance, contrast, directional movement, and rhythm can be utilized to compose environments. Ideally, each individual object of the virtual world must be designed and colored according to its traditional aesthetic principles (texture-visual arts, 3D models-spatial arts, sound – performing etc.) working in harmony and balance with the overall environment at any moment. Traditional aesthetic principles should support the development of the new virtual aesthetic principles which must develop on its own by relying on the creative apprehension by the artist of the past knowledge,

3. CUSTOMISED VR FOR CONTROL USER EMOTIONS

In order to control the user's emotions, the virtual environment must be customized to individual experience. To effectively communicate VR concept virtual storytelling establishes some form of consistency over interactive events in the environment. To address possible directions of the unfolding of the concept in non procedural environment VR requires customized user experience in multilevel computer games. The customized VR can have more control over the user's emotions just like multilevel game structure provides more possibilities for entertainment and emotional excitement of the player. For example, as a user moves, his speed adjusts to the changes in the environment he passes through. The color scheme of the world changes depending on the order of the user's interaction with the events and objects.

The emotions are uncontrollable mental states that can involve complex and broad psychological changes. The emotions could be affected by outside influences. For example the increasing amount of harmony between the person and the environment creates the feeling of "spiritual joy" [3]. Mental states, or emotions, affect mental and physical energy levels [7]. When we experience positive feelings, thinking about doing something fun or interesting, then these expectations produce positive emotions that increase mental and physical energy.

The interaction can detect the psychological and emotional state of the user and presume his/her mood. It can provide means of leading to the final idea of persuasion. The project addresses a broad audience where everyone feels and sees and understands something for himself. Thus, the idea of the project becomes universally communicated with different people on different levels.

The quality of the graphics and the aesthetics of the virtual world can be made to evoke certain emotional changes in the user's state of mind. These changes and effects on the user can be adopted from the art and sciences by researching the fields of color theory, education, art therapy, visual music, design, architecture and art history.

Many artists these days work on the aesthetics of virtual reality, based upon their experiences in traditional arts such as painting, sculpture, design, education and music to create higher quality stereo graphics of virtual worlds. Beautiful painting quality textures, sophisticated special effects, interesting animations, simple and elegant 3D models, and well designed compositions of the virtual spaces, dynamics of the user interactions are characterize internationally famous virtual art projects such as *Beat Box* by Margaret Dolinsky, *PAAPAB* by Dave E. Pape and Josephine Anstey, *Yiggdrasil* by Bino and Cool, *Uzume* by Petra Gemeinboeck, and other. They capitalize on the immersive power of aesthetics to crystallize the idea and strike user emotions with the unforgettable visual atmosphere. In which user emotions transform into the memorable soulful experience.

4. "RUTOPIA 2"

4.1 Concept
"Rutopia2" is a virtual reality art project describing a magic garden with interactive sculptural trees that branches to distant worlds and transverse them into a shared network community. The trees are flexible with dynamic architectural structures based on a singular module – a rectangular screen. As the user approaches the trees they automatically grow. Once fully grown, the screens turn into windows and show views to other worlds. The users can look through the screens to see distant environments just like we can look through a window and see the outside. Virtual windows cross traditional borders of segregated proximities to link the future, the past, the present, the close, the distant, the public and the individual in real time. Thus the garden becomes a communal hybrid of transdisciplinary nature propagating shared telecommunication and collaboration. Its fluent formations are an open source for learning, entertainment, and creativity and allow users to navigate the development of their own experiences.

4.2 Influences and aesthetics
"Rutopia2" combines Russian folkloric structures with futuristic technological paraphernalia. The garden embodies an unattainable world of harmony, based upon folk utopian idealism and a projection design of the future. The project explores the aesthetics of virtual art in its relationship with the art of painting and Russian folk arts, such as wood sculpture, traditional toys and decorative painting. In addition, the development of tile display devices/systems and their potential, such as high-resolution, segmentation, modularity, and parallel computing, contributed in the conceptualization of "Rutopia2".

"Rutopia 2" depicts the fairy world of harmony and balance based on the folk utopian idealism. Its aesthetic forms derive from Russian folk arts and crafts such as Palekh, Khokhloma, Dymkovo toys, Fedoskino and Lubok. Those styles, named after the best-known Russian regional centers of art, are famous for the diverse methods and techniques, superb workmanship, distinctive features, and narratives -- mostly fairy-tale subjects. Very decorative, with simplified shapes, bold designs and bright flamboyant colors, each of the styles was developed in a specific area which dictated the choice of materials, ornamental patterns, and color palette. Each area had traditional artists, sculptors, and craftsmen who passed their art secrets from father to son. With generalized outlines and clever details they have a very crisp and easily recognizable language of expression. Original in color schemes, subjects, materials, and forms they convey the ideas of harmony, beauty, fantasy with emphasis on the ideal. "Rutopia 2" generalizes those aesthetics in its decorative and detailed compositions and transmits their culture into VR.

Made out of clay, the Dymkovo toys have extremely simple rounded shapes and generalized silhouettes. They are painted in bright ornamental patterns in brilliant magenta, green, yellow and blue against a white background. The antique traditions of Dymkovo come to life in the figures of people, animals, birds, and household items. The Khokhloma style is recognized for the golden background where the golden effect is achieved without gold actually being used. Palekh craftsmen succeeded in evolving a highly original painting style, making expert use of the decorative black background, gracefully shaped expressive figures, sophisticated color schemes, and refined ornamental patterns.

The aesthetics of "Rutopia 2" is based upon their principles of composition, bright colors, simplified shapes, and material culture. The island has a very ornamental topographical texture with three color-emphasized interactive zones

for each of the trees. Once the user enters the interactive zone the simple modular tree grows unfolding its rectangular windows/panels as it changes size. Once the trees are fully grown the island is transformed into a new colored mode with the whole environment reflecting the decorative Lubok style. The windows of the trees convert to the portals that link to remote worlds. Avatars can communicate with each other and explore the remote house world which is represented by the typical log house from old folk stories.

The idea is to create the magic atmosphere in which the user would immediately feel him/herself in a nostalgic dream-like situation. The style emphasizes the non-existing absolutely virtual world which is impossible in everyday life. *Rutopian* aesthetics help to provide the mental and spiritual escape from everyday reality into a magic niche. It serves as a framing device to unite the concepts of the network tree, public sculpture, and futuristic design while maintaining aesthetics principles of the previous centuries.

Figure 2. The Island world with the grown trees.
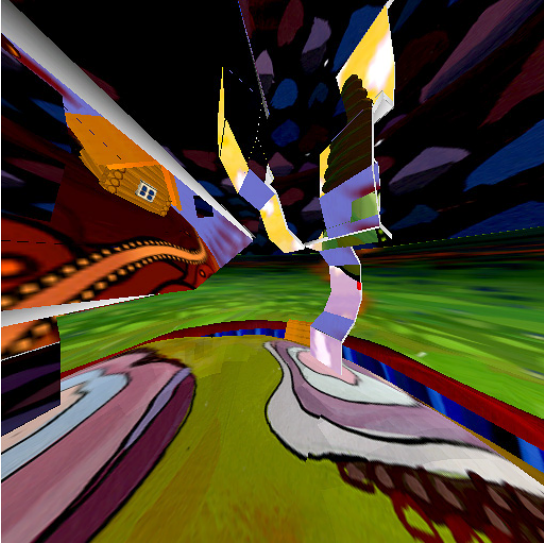
Figure 3. The details of the remote world.

Figure 4. The House world upon the entry.
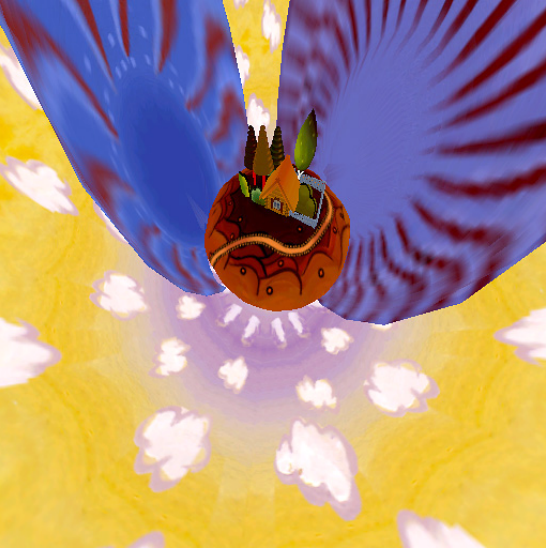
Figure 5. The House world.

4.3 Development and interaction

The graphical elements of the environment were first hand-painted in a variety of details and sizes on the paper using gouache colors. The 3D models based on the storyboard visuals were built using 3D Paint tool in the Maya package. The details of the decorative ornament were simply painted inside the 3D scene and then exported as models and dressing textures. Other textures were painted individually, scanned and applied on the 3D objects using traditional techniques. The 3D paint effect gives the flexibility to the artist to visualize the nuances and details in real-time.

The navigation and interaction of "Rutopia2" is based on the participant proximity to responding objects and interactive areas. The wand interface is used only to control the direction of the movement. The negation of the buttons in the wand interface forces intuitive navigation in the virtual world. The goal is to avoid the preliminary instructions usually required to familiarize the user with virtual environment and its rules of exploration. "Rutopia2" depicts two interconnected worlds – the island world and the house world. Upon the entry the environment has a grayscale color mode. The user can enter the island through one of the two bridges and grow three trees. Each tree consists of about 40-50 segment-windows (Fig. 2). Once the trees are fully-grown, their windows turn on and the island changes its mode from monochrome to color. Participants could view the remote house world by moving close to the windows and peeking into the details of the distant house. By moving through the window, viewers enter the remote house world where they could explore the house, trees, road, and other objects, traditional in Russian fairytales and folk art. (Fig.4, 5).The segments of the trees could be reassembled in different ways through rotations or flips, put together or taken apart similar to tangram [8] puzzle. The linked worlds are projected into screens of the trees with high resolution of details. Looking closer in the structural tree windows allow participants to observe the details of the remote worlds (Fig. 3).

The windows of the trees were made possible by using the new Ygdrasil node *stencilBuffer*. The stencil buffer node acts as a mask covering the areas outside the windows so that only the selected window area allows a view to the other world. The other world consists of two equal parts, the distant part and the close part. The distant part is the remote place where the user goes through the window. The close part is next to the window, and is covered by the stencil buffer mask so that the user can see only the portion of it through the hole of the window. Each third window-hole on the tree was connected to the same view of the house world using alternating repetition. Participants could recognize and visually connect lower and upper parts of the remote house world projected on the different level windows to get an even broader view of the remote environment.

4.4 Network

"Rutopia2" was presented at the IGRID2005 conference where it was demonstrated networked with the Geophysical Center Russian Academy of Sciences (GC RAS), Moscow, Russia. It was a first VR network collaboration between Moscow, Russia and Chicago, USA. The Moscow team used the CAVE simulator mode. In the future there is a plan to install the immersive stereo projection system with tracking at the Moscow site. The project was tested on the 32-bit platform in Chicago and it was shown on a 64-bit platform at the IGRID 2005 conference site. The 64-bit and the advanced network infrastructure provided at the IGRID conference helped us to achieve a higher frame rate than during the pre-conference tests at the Chicago site. The network used CAVEwave/National Lambda Rail connection between San Diego and Chicago sites, SurfNet connection between Chicago and Amsterdam sites, and GLORIAD connection between Amsterdam and Moscow sites.

5. SUMMARY

Virtual aesthetics relies upon the different development mediums and the union of traditional and digital aesthetics has the greatest potential to transform user emotions into the soulful experience. Arthur Clarke, the renowned science fiction writer once said that sufficiently complex technology was indistinguishable from magic. Aesthetics frames the magic of the virtual world by presenting a coherence that allows for a creative freedom of experience that is unique to the virtual environment.

ACKNOWLEDGMENTS

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