The Virtual Environment: Blurring that Fine Line Between Representation and Reality

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This paper presents a graduate thesis work that explores some of the issues involved in the design of virtual environments in cyber space. The premise is that a critical and successful process of creation of such environments calls for the abilities of the architect, who is trained in the conceptualization, analysis, and design of 3-D space. A set of key design elements for creation of such spaces, formulated from an evaluation of selected virtual environments and conversations with several notable virtual environment designers, is presented followed by a description of the application of these to a specific design case study. Based on this experience, the authors make a case for incorporating "traditional architectural design process" for the design of virtual environments.

1. INTRODUCTION

There has been a significant increase in the development and participation in virtual environments. From the early examples of MUDs (Multi-User Dungeons or Domains) and MOOs (MUD Object Oriented) to more recent 3-D environments, such as AlphaWorld™, these environments have continued to develop in terms of their visual detail and level of interaction. Yet, more importantly, it is here that the line between representation and reality becomes blurred as the computer based design and construction of these environments results in an entity created not as a simulation, but as a digital reality.

2. BACKGROUND OF VIRTUAL ENVIRONMENTS

To better understand the nature of virtual space, let us review the evolution of social interaction in virtual environments chronologically.

2.1 MUDs/MOOs

The first virtual environments on the internet were MUDs which began appearing in the late 1970's. In 1990, the first MOO was developed, which allowed for easier creation of MUDs through object oriented programming [Bertol, 1997].[1] Both MUDs and MOOs are text based realities where the details of the environment are conveyed through descriptive paragraphs [Anders, 1996].

2.2 WOOs/The Palace™

The popularity and variations of MUDs has lead to several graphic adaptations, such as WOOs (Web based MOOs) which accompany each description with a rendered picture or photograph. In November of 1995, Time Warner released The Palace™, a virtual chat world, which was derived from earlier environments such as Lucasfilm's Habitat [Rossney, 1996].[2] While MUDs are usually created for a specific purpose or a theme, chat worlds simply exist so that users, located anywhere on the planet, can come together and interact. Participants are represented by the icons of his or her choice, with verbal comments and questions displayed through text balloons appearing above the icon's head, similar to a comic book.

2.3 AlphaWorld™/QUAKE™

In October of 1996, World's Incorporated released AlphaWorld™[3], which is a 3-D environment where each user is represented by a polygonal, rendered avatar[4]. Since each character and the majority of objects and buildings, are visible from all angles, the design of AlphaWorld™ begins to confront much more complex issues than The Palace™ or MUDs. Much of a participant's perception is based on the visual cues of the environment. Id Software's QUAKE™,[5] also released in 1996, is another significant example of a 3-D interactive, virtual environment.

2.4 Virtual Reality Modeling Language (VRML)

An emerging area of virtual environment development on the Web is through VRML, which was conceived in the spring of 1994.[6] Currently, most web pages are constructed using HTML (Hypertext Markup Language), which is inherently 2-D. Yet theorists, such as Mark Pesce, Peter Kennard, and Anthony Parisi, believe that the "WWW should be extended, bringing its conceptual model from two dimensions, out, at a right angle, into three" [Pesce, 1994]. VRML version 1.0, has become the language of choice in developing such sites and a multitude of examples of VRML based structures are publicly accessible[7].

3. COMMENTARY

The intention of all of the environments reviewed above is to create a new forum for interaction, so that globally connected users can assemble and discuss issues in a digital space. The uniqueness of this mode, as Kathryn Best states, "allow[s] for unbiased, anti-hierarchical, and unprejudiced communication" [Best, 1993].

Yet each environment also contains some inherent shortcomings. For instance in MUDs and MOOs, the construction or form of the space is completely up to the individual user's interpretation of the text. With WOOs and The Palace™, environment designs are depicted through the image or backdrop behind the users, which are static depictions and allow for little interaction between participants and their environment. AlphaWorld™ provides for this type of interaction, yet is designed by its users, and the resultant structure has created an environment which can easily be described as confusing. QUAKE™ also provides for similar interaction in adesigned environment, yet as with most video games, is almost completely based on the conditions of the physical world. VRML with its recent multi-user extensions has the most promise, yet design development in version 1.0 has been restricted due to limitations with number of polygons and the complexity of textures.

4. IDENTIFYING THE DESIGN PROCESS

To understand the emerging trends and to better address the shortcomings of the current virtual environments, the author interviewed several designers with experienced in the area. The participants included nine individuals who focus specifically on either VRML design, recreational software, or the design of virtual chat worlds. They included VRML designers Mark Connell of Marketcentral's SteelStudio, Tony Delisio of Cybercore Design, Dace Campbell, a research consultant at the University of Washington's HIT Lab, and David Colleen of Planet 9 Studios, QUAKE™ environment designers Marin Gazzari and Tom Kistner, AVARA[7] designers Jason Fowler and Gareth White, and Parker Moore, Art Director for Worlds Incorporated. Based on their responses, the following key elements that are often considered during the design process of virtual environments were identified.

5. KEY DESIGN ELEMENTS:

1. *A technology check:* This focuses on the choice of the software interface, through which the user will perceive the environment, and the selection of the 3-D software engine which will generate the space.

2. *Contiguous virtual walkthroughs:* The sequence of experiences and elements of the design are best evaluated when the designer walks through the level and can be completed as often as necessary as concepts are refined[8].

3. *The creation of an architecturalparti:* Whether the parti is based on a grid, a nodal network, or another pattern, the organization of the spaces is critical to a participants overall understanding of the environment [Campbell, 1996].

4. *Level of detail and number of polygons*: Since processor power and bandwidth are limited commodities (at least as of now), the tradeoff between the amount of photo-realistic detail andenvironment geometry and complexity is an important issue[y].

5. *Scale, ttavigatioti, arid orientation*: Structural details, the dimension of openings, repetitive textures on surfaces, and other participants in the environment are all valuable scale devices which help to diminish levels of disorientation and confusion. Beyond the keyboard controls of the interface, navigation of an environment needs to be assisted by cues which help participants to comprehend the space. Orientation is also a critical issue for it too relates to the level of comprehension and confusion which participants may experience in an environment. A ground plane and virtual gravity can be helpful orientation devices[10], though gravity does not necessary need to be applied on aglobal, environmental level.

6. *The choice of lighting, colors, attd textures:* Lighting and shadows are valuable clues to the organization and perception of form, colors can show contrast between surfaces, and textures can show depth and scale as well as assist in defining surfaces.

7. *Growth Management:* Virtual environments have the ability to be easily changed and modified as they continue to be utilized; yet the designer should play an active role in this continued evolution, in order to continue the development of the original design intent. Therefore the rules for environment development, similar to the zoning and urban planning of the physical world, also need to be established.

6. PROJECT SUMMARY

The author applied the above criteria in a design for a Virtual Community Center for the City of Oxford, Ohio in the U.S.A. The program consisted of a series of community focused spaces including a visitor center (see Fig. 4), a community forum (see Fig. 3), a central gathering space (see Fig. 5), rental spaces (see Fig. 9), an auditorium (see Fig. 8), an art gallery (see Fig. 10), and a non-denominational spiritual space (see Fig. 6).

The design began with the selection of the AlphaWorld™ interface and 3-D engine as the model for the environment. Initial mass models were then constructed in AVARA for the purpose of conducting several virtual walkthroughs. The spatial typology of Oxford's city grid, two central parks, and water tower were used to guide the sequence of space (see Fig. 1). The overall schematic layout of the center focused on the creation of a datum (see Fig. 2) which projected above and below the selected ground plane. This allowed for users in any part of the center a means of reference to assist in orientation or navigation. Textures and detail were kept at a minimum, while lighting and colors were used to separate surfaces. Scale was indicated through opening heights, structural details, and the articulation of surfaces (see Fig. 7).

The sequence of spaces was designed so that participants entering the environment on the landing zone would have a series of visual axes which guide them through the spaces (see Fig. 3 and Fig. 4). As a user became familiar with the central layout of the center, he or she could begin exploring the edges. It is here that the user could switch to the gravity of the spiritual space plane (Fig. 11) or descend down the ramp to the user defined levels (see Fig. 9). On this level, the users were given the freedom to build their own paths and metaphorical links to other virtual environments on planes. The procession of spatial experience then became an education into the possibilities of the virtual environment.

The design process also included those elements of a traditional architectural methodology including early explorations through sketches on yellow trace, mock-up chip board models, peer reviews, desk critiques, and scheduled pin-ups. This was important because each step and series of decisions was questioned, evaluated, and resulted in various modifications and refinements to the final design outcome.

7. DISCUSSION

The application of each one of these elements should be viewed through a critical lens. For example, the enclosure of virtual space does not need to prevent the intrusion of moisture, yet it must aid in the creation of a functional and comprehensible environment. In addition, the majority of those interviewed concluded that virtual designers need a very good sense of conceptualizing and constructing 3-D space. Jason Fowler stated that the current crop of 3-D, interactive games are the last ones that untrained designers are going to be able to handle.

> Ten years ago, games had small, blocky graphics. Anyone could rearrange those huge pixels to make a picture. Five years ago, hardware became powerful enough to handle much larger, higher resolution images, so game developers had to start hiring real artists instead of doing the artwork themselves. The same thing is happening with 3-D models and architecture in games today. (Fowler, 1997)

The current development of virtual environments, devoid of architects participation, seems to focus more on aesthetic concerns guided by graphic design rather than adefinition and analysis of space. This could be attributed to the novelty of the medium, aesthetic visions of the client, or the difficulty in defining a program specific to virtual space.

The authors contend that this intent to create a place for communal interaction in a 3-D environment necessitates the abilities and attention of architects. Predominant reasons for this are (i) the ability to conceptualize and design 3-D structure, (ii) skills in planning and laying out comprehensible sequence of spaces.

Adaptation of a traditional architectural process was beneficial in the successful completion of Virtual Community Center for Oxford. While the design of a virtual environment frees a designer from code and structural restrictions, it forces him or her to be much more aware of the perceptions and experiences of the potential participant. And perhaps some of these design experiences could find positive applications in the design of physical environments as well.

8. CONCLUSIVE REMARKS

The assessment of this work was mostly done through peer evaluation, and a traditional design jury review. The current state of the technology and the scope of this thesis project did not allow for testing live on-line which would have given us an opportunity to gain valuable input from Digital Citizens, the ultimate users of this space. Instead, it was presented as a series of pre-recorded walk-through animations and dynamic spaces (using Apple's QuickTime VR technology). Reflecting on this experience, it appears that visual and experiential aspects of these environments can be greatly enhanced by the involvement at all stages of design by architects with knowledge and experience in the design of virtual space. However, we contend that the design process will remain a team work requiring participation of individuals with skills in network engineering, computer programming etc. not dissimilar to that of designing physical environments that involve the participation of individuals with expertise in structures, HVAC etc.

As more parts of our current cultural environment become based in virtual worlds, it will be architects who will be relied on to define and create these spaces. As Bernard Tschumi states, "The designs of new conditions for architecture ...means new attitudes towards the activities that take place in the architectural spaces [architects] design: a new attitude towards programs and the production of events" [Tschumi, 1995]. Hopefully, through the utilization of similar and evolving process models, the results will be the even more fantastic, yet comprehensible environments.

ACKNOWLEDGMENTS

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NOTES

1 For an example of a MOO and WOO, visit Sensemedia's Snow at http://sensemedia.net/snow.

2 For more information on The Palace, visit http://www.thepalace.com or read Robert Rossney, "Metaworlds", *Wired*, June, 1996.

3 For more information on AlphaWorld™, visit http://www.worlds.net/alphaworld.

4 Avatar: Based on a Sanskrit word. "Your avatar is an animated figure or icon that represents you when you're in-world. You tell it where to go and what to do. You see what it can see. You don't talk: your avatar does. You don't wave or smile: your avatar does". Rossney, Robert. "Metaworlds." *Wired*, June, 1996, 143.

5 QUAKE is a game which allows up to 16 networked linked

players to battle monsters and each other on highly developed 3-D levels. As with AlphaWorld™, all avatars, objects, and monsters are 3-D polygons which adds to the game's intensity and realism.

[6] For more information, visit http://vag.vrml.org/vrml-1.1.html#Requirements.

[7] Joel Stephens and Mark Connell from MarketCentral's SteelStudio, used VRML version 1 and Cybergate from Black sun Interactive, to create a virtual town center for Congressional candidate McCracken "Ken" Poston during the 1996 elections. The purpose of this site was to create an environment for several virtual town meetings to occur between Ken Poston and concerned Digital Citizens, and the results were quite successful. For more information visit http://www.marketcentral.com/poston.

[8] Ambrosia Software's AVARA is avideogame which also allows for connected users to interact in a 3-D environment. For more information, visit http:\\www.avara.com.

[9] The two AVARA designers, Jason Fowler and Gareth White, both commented that when designing in AVARA, basic environments can be quickly sketched out, constructed, and immediately experienced.

[10] David Colleen, a virtual architect using VRML, said that experience has shown that current clients show a "much higher acceptance of spaces that are visually similar to the real world than to abstract environments."

[11] Tony DeLisio, a VRML designer, commented that his first worlds were surreal with various non-gravity types of experiences. However, "most people do not like flying", so the ground or ground-plane, becomes a valuable tool in orientation.

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ILLUSTRATIONS

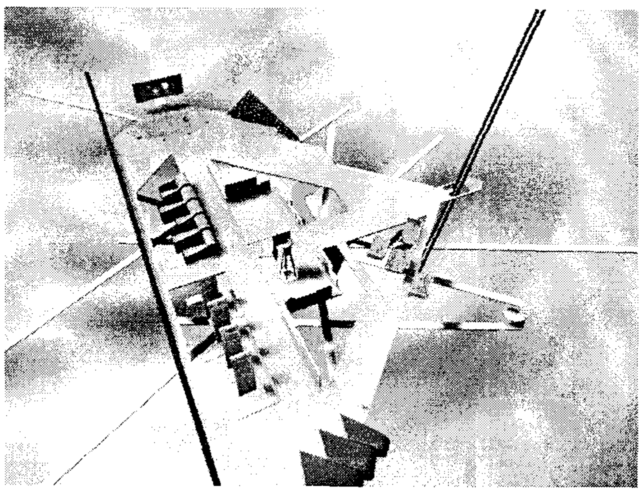

Fig. 1. Entrance perspective.

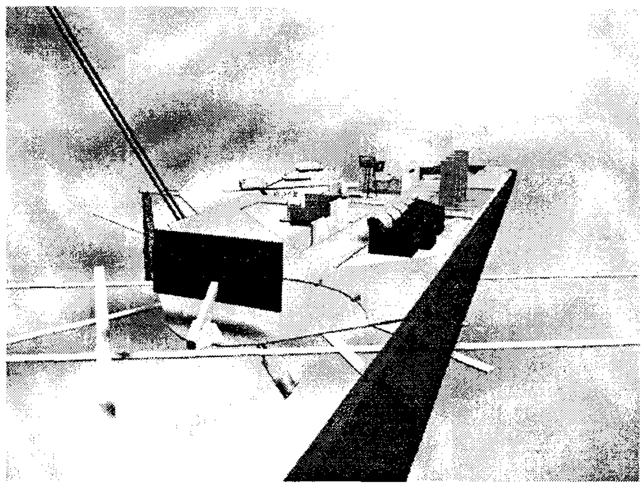

Fig. 2. Datum perspective.

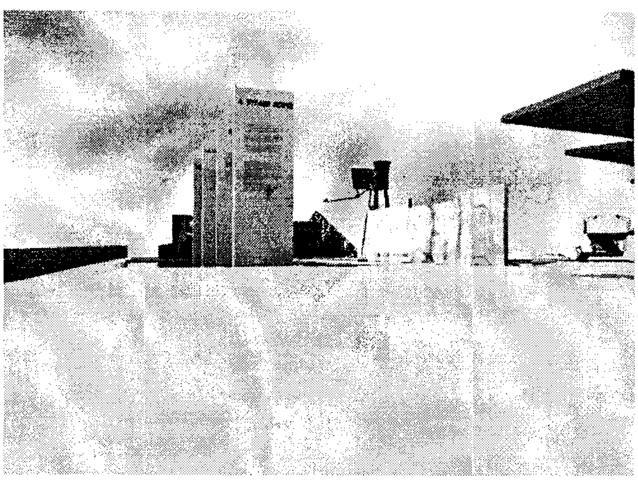

Fig. 3. Landing point axis.

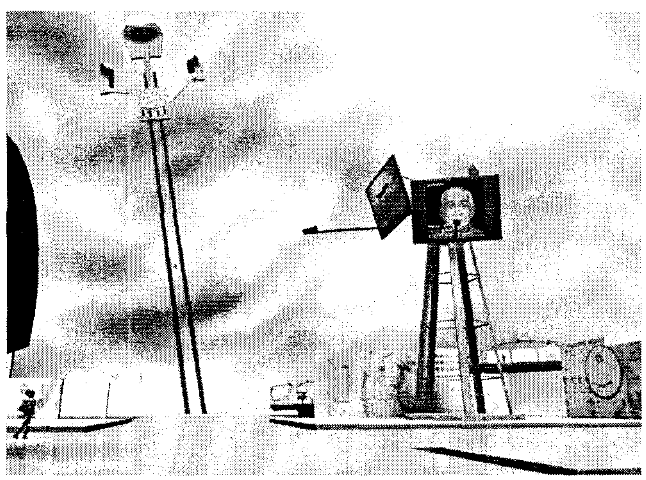

Fig. 6. Spiritual center and water tower.

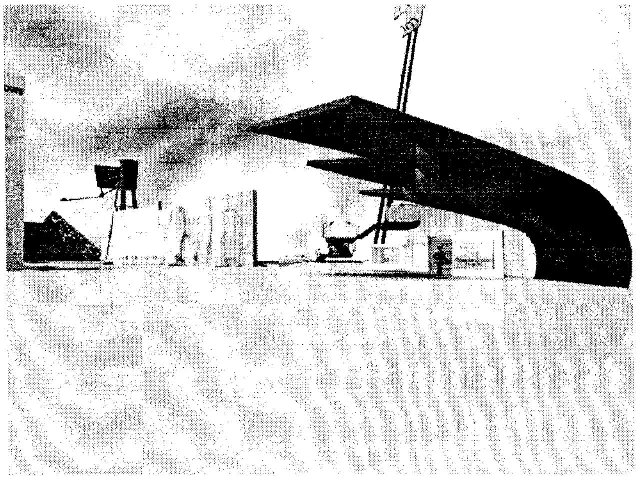

Fig. 4. Visitor center axis.

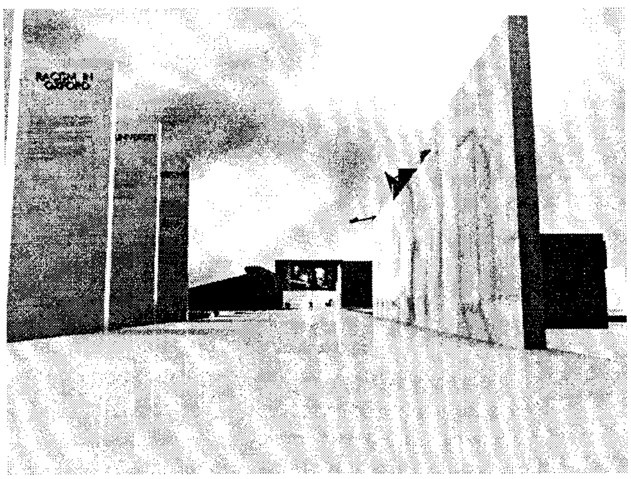

Fig. 5. Center square entrance.

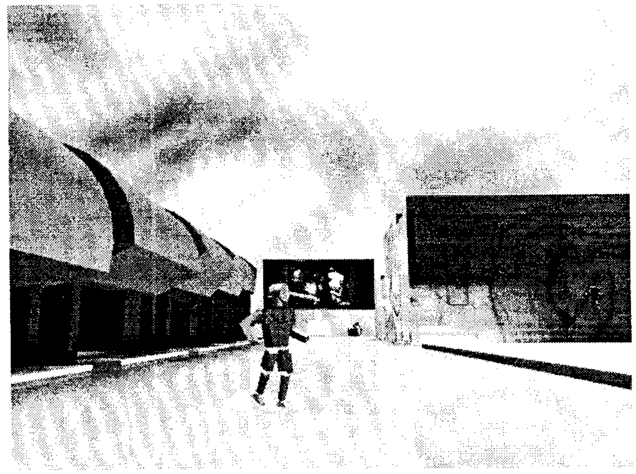

Fig. 7. Uptown axis to auditorium.

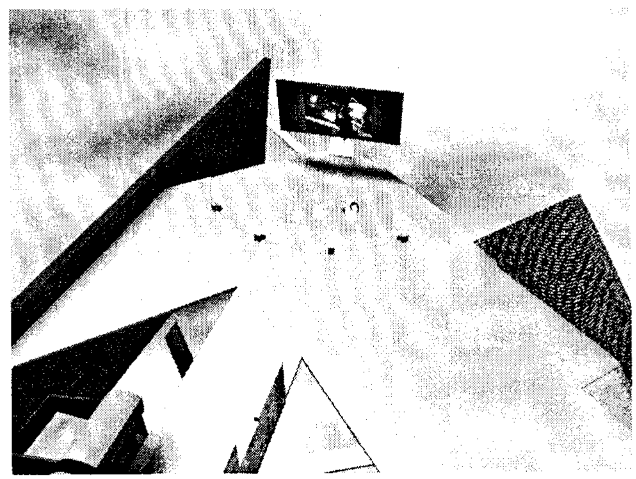

Fig. 8. Auditorium audience.

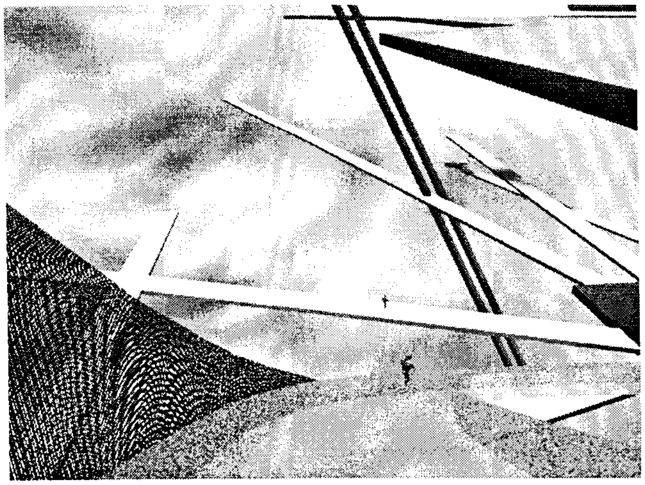

Fig. 9. User defined paths underneath.

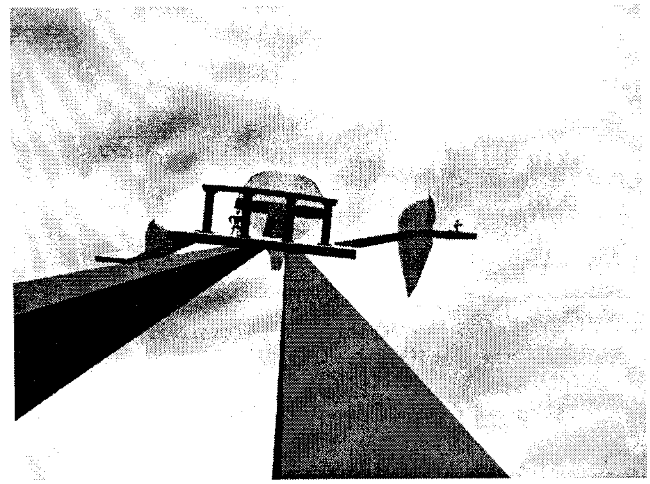

Fig. 11. Ascending to spiritual center

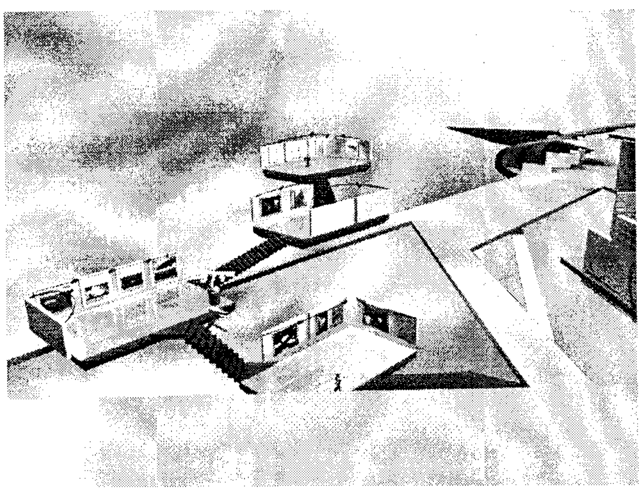

Fig. 10. Gallery overview.

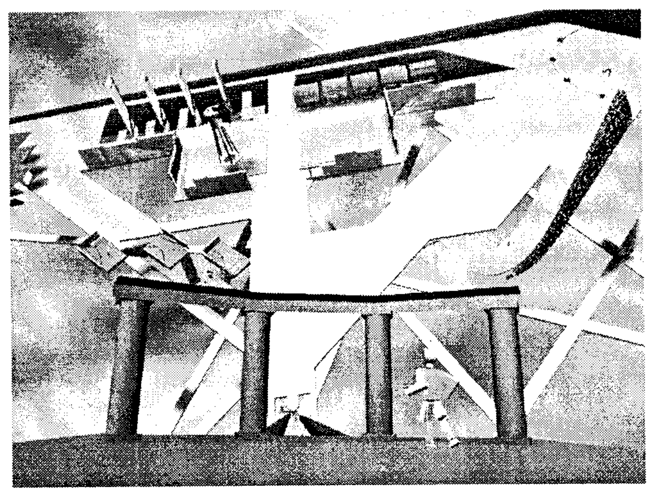

Fig. 12. View from spiritual center.