Envisioning Cyberspace:  
The Design of On-Line Communities

Peter Anders  
Special Lecturer, School of Architecture, New Jersey Institute of Technology  
anders@hertz.njit.edu

ABSTRACT

The development of the World Wide Web into an active, visual social environment poses unique opportunities for the design professions. Multi-user Domains, social meeting places in cyberspace, are mostly text-based virtual realities which use spatial references to set the stage for social interaction. Over the past year design students at the New Jersey Institute of Technology School of Architecture have investigated several text-based domains. In the course of their work, they envisioned and graphically portrayed these environments as immersive virtual realities through the use of computer animation. Their studies addressed issues ranging from the nature of symbolic motion to social/political structures of these domains.

INTERNET AS SITE

Multi-user Domains (MUDs) are mediated social environments on the Internet. Originally intended for role playing games such as Dungeons and Dragons, they have since developed into elaborate social settings serving online social and professional communities. Despite the spatial qualities of MUDs, few of them are visual. Instead, they are text-based virtual realities which require the user to rely on descriptions of space and motion to create an image of the domain.

The use of text is dictated by the MUD software. Currently there are a variety of MUD types which differ largely in their programming code. MOOs (MUDs Object Oriented), MUSHes (Multi-User Shared Hallucination), MUSes (Multi-User Simulated Environment) are among the many hundred MUDs currently operating on the Internet. The acronyms can be whimsical. The investigators of a MUCK were told that it stood for Many Unemployed College Kids. It actually stands for Multi-user Collective Kingdom. "MUD" and "domain" are here used to generically refer to these types.

The text interface is an efficient medium. It limits memory requirements for the computers and speeds up real-time interaction. It can also conjure an image with a well-crafted description. As a result, MUD users often prefer the verbal environment, arguing that it allows them freedom of interpretation. Some users insist that the introduction of graphics will reduce, rather than enhance, the MUDding experience.

Use of MUDs involves logging on to a computer server, often using Telnet or Gopher programs. Once on, the user types responses to text on the screen, say, the description of room they have "entered". The user might type "N" to leave the room by going north. The scene then changes as a new space description is offered. Users move from place to place by using sequential commands or by teleporting directly to their destination.

Conversation on MUDs is formatted to simulate dialog in a book. If a user, Fred, types "Hey, there. the computer configures this to read "Hey, there!" The result is that the user appears engaged in both the reading and creation of a novel. As users become more familiar with the commands, they gain a greater range of expression and action within the MUD.

For example, the following is taken from a session held by researcher Mike Buldo on his subject MUD, HoloMUCK. Naima and Des are the avatar names of other MUD citizens. "You" refers to Mike and is used only on the machine he is logged onto. Other MUDders' screens see the name of his avatar, Killian. Spelling errors often reflect the speed of interaction since dialog happens in real time.

ACADIA 1996
2) Naïma pages: "They arrived! Well wonders never cease."

page naïma: we d got them on Monday!! thank alot
You page, "we got them on Monday!! thanks alot" to Naïma.

You heard what...
Main Street (800W)
This once-desolate section of Main Street is looking busier these days.
To the north, at 800 W. Main St., stands the Red Dragon Inn.
[Obvious exits: north, w, e]

page dex: are u free tomorrow between 8:00am pager vibrates slightly. and 10. am?? You page, "are u free
tomorrow between 8 and 10. am ??" to Dex.

3) Dex pages: "no, not till tomorrow night"

Time: Tue Oct 31 19:54:33 1995
page dex: awww...the people comming in to review the e project will be on wanna let you meet them...would
you like to be round tomorrow night...n?[s]ade] Give a man a fish and he'll eat for a day. Teach him how to fish
and he'll eat forever.

page dex: awww...the people comming in to review the project will be on wanna let you meet them...i might
be round tomorrow night.dunno
You page, "aww...the people comming in to review the project will be on wanna let you meet them...i might
be round tomorrow night.dunno" to Dex.

You heard what...
Main Street (900W)----Ohio Avenue You are at the intersection of Main Street and Ohio Avenue, very near the
western border of Tantafl Country. This region is very hilly, and covered with a variety of trees—oaks,
maples, and especially pines. Reality still holds sway in this region, but just to the west, the darkened West
Tunnel burrows through a hill and into the unknown regions beyond...

Graphic MUDs are still a technical novelty and their success is mixed. Preliminary efforts (the Palace, World
Chat and Alphaworld) are disappointing. The schematic quality of the contents and their graphics lack the poetry
found in text MUDs. The ephemeral nature of MUDs also argues for spaces which are dynamic, responsive to their social
and subjective nature. While text-based environments have an implicit, logical structure, their image as architecture
is highly subjective to the user. Current graphic MUDs, on the other hand, lose this depth by literally illustrating archi-
tectural environments. In many cases their illustration comes at the expense of poetry.

MUD ARCHEOLOGIES

In the spring and fall semester of 1995, my graduate and undergraduate students at the New Jersey Institute
of Technology's School of Architecture surveyed ten MUDs on the Internet. This work was partially funded by an
NIIT SIR grant for cyberspace research. The study was largely conducted in a CAD supported design studio and
was carried out as a semester-long design assignment.

The MUDs selected were social domains not overtly used for role-playing games. Many MUDs operate as
gaming environments, following the example set by Dungeons and Dragons in the early '80s. The appeal of these
games lies in their setting and participant role-playing. They act as a form of theater, or masque, in which MUDers
can take on one or many identities in the course of play. Brenda Laurel and Sherry Turkle have written extensively
on the psychological and social implications of this activity. The students' selection was limited to text-based MUDs
for maximising the students' design opportunities.

The students, in teams of two, became citizens of their selected MUDs and explored the spaces described
by the text. The team members and their selected MUDs are listed below.

<table>
<thead>
<tr>
<th>MUD</th>
<th>Web Address</th>
<th>Investigators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 1995</td>
<td>ai.chezmoto.mtu.edu 4201</td>
<td>Sean Edwards and Tom Mesuk</td>
</tr>
</tbody>
</table>

ACADIA 1996
Typically, the team would divide the work between a navigator and cartographer. One operated the machine, "moving" from place to place within the MUD. The other charted locations of the places they visited. As the domains were mapped, these diagrams grew increasingly complex. This information was carefully documented to produce a log/sketchbook and a 3D logical adjacency model of the MUD (Figs. 1, 2).

These models, perhaps the first spatial documents of these MUDs, formed a schematic diagram of the domain's spaces. Their coding was intentionally simple. Cubes represented spaces which were accessed directionally, using N, E, S, W or Up and Down commands. Spheres indicated spaces accessible by teleporting or by invoking their names. Points of MUD entry were colored red. Spaces were linked with simple rod connections appropriate to the directions indicated. Other symbols varied from model to model depending on the specifics of the MUD.

The final results were surprising in their complexity. Resembling extremely large molecular models, they documented hundreds of spaces. In many cases the models had to remain unfinished since the MUDs contained many more spaces beyond their main structure. Since MUD structure is dynamic, many of them grew and evolved throughout the study.

Most MUDs mapped easily as flow-chart diagrams. Some, however, had spatial anomalies. A room in DreaMoo described as being west of another, was entered by going east from that room. The nested arrangement of the Chatting Zone spaces would not translate easily to a ball and stick model. The rigorous structure of HoloMUCK forced the creation of pseudo-spaces just to allow movement through it.

**DOMAIN STRUCTURE**

The logical adjacency model of each MUD has a distinct form, like a fingerprint. Often MUDs begin as a verbal diagram of a neighborhood (Jay's House), an existing town (The Chatting Zone) or even the Earth (Meridian).

Once in place, citizens of the MUDs are invited to build their own rooms and buildings. Over time the configuration of the domain changes to the point that not even its operators, the wizards (Note the reference to Dungeons and Dragons!), know the current shape of the community.

It is a participatory architecture, a kind of architecture without architects. Here we have the electronic equivalent of earlier cultures whose buildings inspired Bernard Rudofsky's study by this name. There are constraints on building, however. The degree of freedom that builders have depends on the wizards. Some MUDs, like HoloMUCK or Jay's House, have stringent codes enforcing the "realism" of proposed additions. The ability to build rooms also is dictated by the wizards.

In most MUDs, particularly MOOs, all objects are descendants of other objects. It is a result of object-oriented programming which allows replication of code modules for editing and reconfiguration. All objects in a MUD have this characteristic whether it is a room, flower pot or wind-up toy. Even the avatars which represent MUD citizens fall into the category of object. They are all related in this curiously genetic way.

Each citizen is allotted an amount of memory to build objects. This increases with the status of the citizen. Getting memory or status in MUDs is a symbolic and social issue, often a result of "who you know". In the study, some researchers achieved high-ranking builder status and eventually became wizards themselves.

Some domains were clearly based on physical models, often based on the hometowns of the administrating wizards. For example, The Chatting Zone is a cyberspace mapping of Ipswich, Ireland, hometown of the MUD's founder. While Meridian maps the entire planet, its point of entry is in Norway, home of its wizard. Oddly, Meridian's server is in Morristown, NJ.
Basing MUDs on actual physical models is an expeditious first step in starting the domain. It saves the wizard the effort of creating the spaces from scratch and lets him or her to make a "home" out of the domain. It also allows easy navigation of the space, keeping the directions simple and places memorable for its users.

For example, JupiterMOO, developed by Pavel Curtis, is based on the layout of XeroxPARC in Palo Alto, California. Its mapping is so accurate that MUDders who visit the actual facility can find their way around the campus. LambdaMOO, one of the largest operating MUDs, was originally based on Curtis personal apartment. Curtis, one of the pioneers of MOOs, has investigated the use of MUDs as social and professional environments. AstroVR, for instance, is a MUD used by professional astronomers, providing them with a "timeless place" for gathering and displaying their findings. In another case, MediaMOO incorporates the architecture of MIT's MediaLab. Its founding wizard, Amy Bruckman, whimsically added a floor to the building to provide space for a ballroom and partying facilities.

As a MUD community develops, the original structure is elaborated, sometimes leaving the real-space reference behind. The resulting geometry can become complex and difficult to map. Most MUDders are allowed to

Figure 1. Logical adjacency model for MediaMOO. This model shows the more rectilinear structure of the MediaLab above contrasted with the comparatively loose construction of later additions below.
Researchers: Michael Lisowski and George Paschalis.

Figure 2. Logical adjacency model for Meridian. The large circular loops represent train lines used to get citizens of the MUD from country to country. The countries of Meridian are "built" by citizens to represent their nationalities or interests. Researchers: Dana Naparano, Keith Kemery.

ACADIA 1996
build their own rooms once they have citizenship. These rooms are often independent of the main logical structure, hovering outside the domain. In DresiMUD, for instance, linking new construction to the main structure requires permission. Not only must the builder petition the wizards, but the creators of connecting spaces. It is a complicated affair, and none of our investigators were able to link their work to the main structures.

This results in constructions which have non-directional connections to the main MUD. Most private spaces, often quite elaborate, can only be accessed by teleporting. Guests may enter these spaces only if they are invited by the owner. As a result, many of the private spaces of the MUDs remained unmappable because of access problems. Often the addresses for teleport access were simply unavailable. This points up one of the advantages of graphic MUDs: Navigation is difficult if one needs to memorize specific addresses. Browsing and discovery are facilitated by visual, non-textual spaces.

The freedom allowed by wizards directly affects the MUD's structure. BayMUD, a San Francisco based MUD, has a laissez-faire approach and over time has evolved into a free-form branching structure. Its logical mapping reflects its incremental and unplanned growth. In contrast, Jay's Place has such severe "reality" requirements that descriptions of nearby cliffs had to be rewritten to reflect the actual rock composition.

Generally, MUDs in which the wizards exert the most control are more rigorously geometrical and easier to map. The looser structure of more participatory communities, like MediaMOO, make them initially more difficult to navigate. In MediaMOO, organizing spaces like Curtis Commons were later added to provide orientation for the users.

HoloMUCK illustrates the extremes of control. Its server is located at McGill University, in Canada. HoloMUCK's predecessor was called Fire. Originally, its wizards had developed an open MUD, placing minimal restrictions on building proposals. As the MUD developed, the configuration became more and more complex. The founding wizards felt that the illogical nature of the spaces made the MUD unusable. As a result, navigation depended more and more on teleporting and the illusion of the larger MUD structure was lost.

HoloMUCK was recreated using geometry clearly derived from a generic Canadian small town. Two main roads intersect to provide orientation and a river runs through it. The wizards have created one of the most controlled MUD environments found in the study. As in Jay's Place, HoloMUCK's planning stresses the realism of the domain. If a closet were opened to reveal an aircraft hangar, the wizards would not allow its construction in the main MUD structure.

If the failure of the original HoloMUCK was due to its spontaneity, the new MUD suffers from its stifling control. HoloMUCK's wizards have tried to resolve this by letting builders do what they like outside the "city limits". Lying outside the main structure is a free-zone in which spaces may follow any or no logic at all. As a result, most new construction lies outside the rigorous and isolated core. TANSTAALF, TANSTAALF is an acronym for "There ain't no such thing as a free-lunch", possibly an ironic reference to the surrender of freedom in the name of the MUD community.

"REALITY" CHECKS

The failure of some MUDs is due to problems other than politics. MUD size is largely determined by the number of spaces and objects programmed by the citizens. The number of rooms vastly outnumbers the users - especially the number logged on at one time. A paradoxical result is that MUDs with the greatest number of builders seem to have the lowest density population. This explains the apparent vacancy of many MUDs. While there are pockets of activity, large portions of the MUD often remain unused and rarely visited.

An example of this is MediaMOO. This MUD at the Massachusetts Institute of Technology was developed as a learning tool. Its many spaces and student experiments extend far beyond its original configuration. As a result, the investigators often found it largely vacant when they visited. This does not necessarily reflect on the success of the MUD. MediaMOO's spaces are largely navigable with conventional commands. Problems arise when the bulk of a MUD is invisible to its users and only accessible via teleportation, as in University of MOO and portions of BayMUD.

Unsuccessful rooms are like unsuccessful Web homepages. Once built they are rarely modified. Visitors may "hit" on a space once or twice, but without novelty or companionship to engage them, they rarely return. Our researchers found that few fellow MUDders knew the domains as well as they. Many citizens had not explored the main structure since their first few visits.
MUD activity centers on the entry, where users begin their sessions. In the MUD it often appears as a lobby, a town square or visitor center. In LambdaMOO, it is a closet. The area immediately around the entry is also populated but occupancy drops off sharply thereafter. MUDders often prefer teleporting to their destinations rather than sequentially moving through the labyrinth of rooms.

The problem is exacerbated by privatization. As mentioned, private spaces are often not spatially linked to the main MUD structure. The Chatting Zone and the University of MOO apparently have a great number of rooms in which private socializing occurs. Many citizens enter the MUD only to teleport directly to their rooms. In some MUDs citizens enter directly into their rooms, often staying there to monitor the MUD. This depletes the activity in the public portions of the MUD. There usually aren’t enough users logged on to support this stratification.

This polarization between entry and private rooms results from poor spatialization and design. Real cities don’t have single points of entry. Their periphery is open to the traffic of commerce and the population. Even the most private spaces in a city are part of its spatial structure. MUDs, while seemingly based on reality, ignore some fundamental truths of community planning. Teleportation is a symptom of the problem, but not its cause. HoloMUCK forbids teleportation because its wizards feel teleporting destroys the sense of physical community. This solution is misconceived. Teleportation is merely a user’s way around a problem of design.

The graphic representation of a domain offers solutions to these problems. If visitors can “see” the extent of the MUD, they might be more inclined to explore it. Presently, the text medium blinds users to distant spaces and blinkers their experience. It limits their exploration to sequential plodding from space to space. They are only aware of the rooms immediately adjacent to themselves. The experience of motion is often like moving through a series of underground chambers. The creation of rooms is often referred to as “digging” a space. This combined with the acronym MUD makes MUDding curiously earthbound. (In fact, the opacity of the Internet for many users belies the term “cyberspace”)

Teleportation is preferred to this movement once destinations are known and citizens are familiar with their domains. However, social activity diminishes as teleporting increases. Teleportation does not allow for the chance encounters and discoveries offered by the illusion of actual movement.

Possible resolutions would include incorporating the private spaces into the main structures of the MUDs. Limiting access to these spaces to spatial motion may also improve activity in the main structure. However, the burden of access should be relieved by providing more access points to the MUD. This would shorten the distance to a destination. If more than one entry is used, each will serve as a node of activity, creating the equivalents of neighborhood pubs and hangouts.

Random entry at these points would also stimulate exploration and interaction. Once the main entry has a critical mass of occupants, additional visitors could be let in elsewhere to spread activity to the lesser frequented areas. It could revitalize the MUD community.

ENVISIONING CYBERSPACE

The next phase of the study was to create two visions of the MUDs: one from a consensus of the subject MUD community; the other a personal interpretation by each investigator. In both cases the ambiguities of the text were used to spark the design process.

After the creation of the logical adjacency models, the investigators interviewed several of their fellow MUD citizens. This came naturally from the mapping phase. Many friendships had been made in the course of charting the domains. Other MUDders were curious about the project and would periodically check on its progress. The wizards were impressed, at times flattered, by the dedication of the researchers to their domains. The citizens were generally enthusiastic about helping with the study.

The results of the interviews were mixed and initially disappointing. The original aim of this phase was to arrive at a consensus vision of what the MUD would be like as a three-dimensional environment. By having the MUDders elaborate on their domains, it was hoped that enough detail would be generated to visualize the spaces. This proved difficult at best.

In only a few cases did respondents provide useful information. When asked to elaborate on a series of spaces, one woman fixed sketches she had made to illustrate what she imagined them to be. This was an exception to the rule. Largely, the responses, though well-meaning, generated no more than the descriptions already provided by the MUD itself. The MUDders were not prepared to embellish these texts and were bemused by the researchers asking such “obvious” questions.
This phase of the study contrasted the researchers' interests with those of their fellow MUDders. The project had been created with the aim of envisioning these cyberspace communities. Most MUDders don't question the use of text; treating it as a given while logged onto the domains. Some feared losing the richness of text to the newer graphical MUDs. To them the MUD is about social interaction, not the setting.

While there is no denying the effectiveness of text, graphic online environments can have their own poetry. If we accept MUDs as "virtual theater", we have to acknowledge the importance of the set. Actors use the set and props to convey subtle information. Leaning on a wall has different implications than facing it, for instance. Sets and props are distinguished by their evocative potential. Visualizing them would allow a subtler manipulation of these devices, "broadening the bandwidth" of the theater.

Many MUD citizens value the subjectivity of the text and bridle at the definition of the MUD space with a fixed design. Architectural issues were found throughout the architecture. This became a theme many of the researchers incorporated into their own designs. Some projects merged text with graphics to provide a hybridized environment, others developed methods to allow MUDders to customize their image of the domain.

In the final phase of the project, the researchers were to individually generate a vision of their MUDs. They were to incorporate anything they might have learned in the course of the study, but were not bound by the information generated in the interviews. Each student was asked to use this opportunity to express a unique quality of being online. This was an effort to define the qualities of cyberreal architecture.

Cyberreal architecture here refers to virtual objects within the computer's illusive space. Unlike CAD drawings or models, they are not part of a design process which culminates in a physical presence. Instead, they operate autonomously within cyberspace to define information content. Common examples of cyberreal objects would be computer icons and windows. They act as symbols of information structures (files, directories). Once spatialized these objects could define meaningful space for location of information much as architecture is used to define institutions, organize contents and orient the users within.

The sequence of spaces encountered by the students in the rendition had to match the layout of the logical adjacency model. The models became the focus of much debate since the illusion of space and motion had not been challenged to that point. The logic of the MUD structure (orientation, connection and location) is verifiable, but the nature of the spaces and connections is subject to debate.

POETRY IN MOTION

Motion in a MUD is an illusion created by the text sequence. MUDders issue directional commands to get from place to place. If no directional options are available, they can use the name of the destination to get there. However, teleporting differs little from conventional MUD movement. Both result in a space description with options for exit.

Other means of motion are available. Many MUDs like Purple Crayon and Meridian have modes of public transportation, such as trains or boats, which take MUDders on preselected routes. Some MUDs offer planes or taxis which use teleportation since the destination, once known, can be called out. The experience is sequential and textual, as described before, with the same result. These vehicles are a camouflage for the paradox of bodiless movement.

Motion by the user is entirely symbolic. The symbolistic motion is crucial to the MUD experience. It implies that the user is situated and conflict within the MUD environment. Movement brings the user into the MUD psychologically. It is integral to the MUD's immersive nature.

The investigators were encouraged to view this motion critically, seeing themselves as stage managers in a play. This manager has a unique position in a production. Unlike the actors or audience, the manager is not immersed in the environment. He is charged with realizing the illusion. The students were to create the illusion of motion without necessarily mimicking it.

Several students explored motion in their visualizations. In all cases, the work was presented as computer animations rendered with AutoDesk's 3D Studio. While CAD animations are still a novelty in architecture schools, the dynamic, ephemeral qualities of MUDs demanded the medium. Fades, pans, animation, change of viewing angles, morphing and other cinematic methods became common practice by the end of the study.

These techniques were specifically used to address the illusion of motion. For example, fading into another scene is similar to the experience of reading the description of a space. Entering into an unknown space was also presented as motion seen through the back of the head - like a video camera pointed out the back of a car. The viewer doesn't know where he or she is until the room has already been entered.

ACADIA 1996 61
Figures 3, 4, 5. Formation of rooms from available data “shards”. This portion of an animation shows one interpretation of movement within a MUD. Here, rather than moving from space to space, the users have the spaces coalesce around them. Both the viewer and the environment are in flux. Researcher: Tom Vollaro.
Some investigators interpreted motion relativistically. Rather than the viewer moving around the space, the space would move around the viewer. This reflected the actual user sitting in a chair while manipulating the MUD environment. This was demonstrated in animations where, although the viewer changed direction, only the setting moved while the "sky" did not.

In other cases morphing techniques were used to transform distant buildings into closer buildings, providing a dreamlike quality to the motion. One project by George Wharton III proposed that the MUD was always the same space and that the viewer was fixed. The illusion of motion was provided by a continual morphing of the MUD envelope. "Architectural" ripples in the envelope internally created the illusion of passing buildings.

Morphing can create motion effects in other ways. If rooms transform themselves into a user's destination, a non-spatial movement is effected. One researcher, Susan Sealer, devised buildings which changed shape at the user's whim. Going from one space to another was equated with reshaping the point of departure. In another experiment she changed the focal length of the software cameras. By dynamically reducing the focal length, the original scene was reduced to a point. The succeeding scene seemed to engulf it as it came into view, ultimately replacing the preceding space.

Another investigator, Tom Vollaro, presented his MUD as empty space filled with flying shards of matter[Fig. 3, 4, 5]. When the user wanted to enter a space, the shards would collect around him as though drawn by a magnet until the space was formed. This resulted in a graceful ballet of fragments shattering and reforming as the user "moved" through the MUD.

**SOCIETY AND SELF**

The user's identity while online is represented by a character called an avatar. Avatars often do not have the same name as their owner sometimes disguising the user's identity. The result is a masque which retains the role-playing character of the earlier MUDs. Much has been written on the subject of identity and its effect on MUD communities. Work by Brenda Laurel, Allucquere Stone and Sherry Turkle stand out as compelling investigations of this issue.

Several researchers focused their work on the avatar's presence in the MUD. As with motion, presence can be viewed relativistically. Presence is a subtle interaction between the self and the environment and several avatars were designed to manifest this relationship.

One investigator, Dana Naparato, associated light with this issue. When moving from place to place in a text-based MUD, the user activates the descriptions of the rooms. That space is "illuminated" by reading the text. This illumination would remain constant until one avatar met another and engaged in conversation. At that point the light emanating from one avatar focused upon the other, casting the rest of the space into shadow. Attention and forgetting were both illustrated by this simple gesture.

While many avatars in the study were humanoid in shape, there were significant exceptions. In an independent project by one student. The setting of the MUD was invisible and avatars were abstract, illuminated forms [Fig. 6]. When an avatar entered a new space, its color changed. Groups of avatars in a space formed constellations of light, intensifying their color while in dialog. Cyberspace was envisioned as a universe of human constellations.

In another case an investigator created a user interface for MUDding. One side of the screen offered a menu of masks. The other showed a nightclub scene [Fig. 7, 8, 9]. The scene was populated with floating masks of various colors. By selecting a mask from the menu, the user could take on the point of view of any of the avatars in the nightclub. The user could theoretically maintain a dialog with himself by shifting between masks. The same researcher presented other interface screens for navigation purposes [Fig. 10, 11, 12].

Despite the personal mediation of the avatar, MUDs can be surprisingly affecting. Communication seems intimate because of its unearned familiarity. Typing messages alone in a room to another online is similar to a phone conversation. As a result the researchers made a number of friends and acquaintances on MUDs throughout the study period. Some continue to maintain contact.

On a larger scale, these bonds can create subgroups within a larger MUD. These can operate as special interest groups and develop political power. For example in the University of MOO, the wizards' capricious pranks were causing the MUD citizens to call for their removal. Some were even planning to create a new MOO in protest. In other MUDs, social harmony can create enduring loyalties.

The researchers of DreamMOO discovered that a number of their compatriots online were refugees from the now-defunct Metaverse MUD. Metaverse, a fairly elaborate MUD charged its members a fee for use. Apparently, it
was not successful and the server was put to other use. As a result the stranded populous of Metaverse were left to wander cyberspace to find a new home. Our researchers discovered a number of refugees reminiscing about their old domain.

As a tribute to their many MUD compatriots, the researchers presented their analyses and video animations over the Internet on March 8, 1996. They used a color version of CU-SeeMe software to provide live coverage of an event held on the campus at NJIT. Each team presented its results as part of an online dialog with the remote onlookers. The homepage <http://hertz.njit.edu/~anders/> used for the presentation will be used as a gallery for the products of the study. It is planned to have links to the entry points of all MUDs in its display. In this way, MUDders may enter other domains by passing through the homepage way-station. This form of cybereal stepping stone is intended to provide a larger structure for MUDding.

The development of a truly spatial cyberspace will draw on the talents of many disciplines including the fine arts, theatre and architecture. The work done by these students offers the possibility of a new area of architectural endeavor. Architects, trained in spatial design, community planning, aesthetics, graphic communication and the use of computers are in a unique position to contribute to this effort. As spatial MUDs are being created, the input of these skills will be vital to creating a rich, cultural setting for future mediated societies.

The author wishes to acknowledge Michael Hoorn and Alan Leurck for their help in realizing this project.
Figures 7, 8, 9. MUD interface showing avatar options and setting. In this interpretation, avatars may be selected to take on the viewpoint of another citizen. The top image shows the interior of a pub in The Chatting Zone. The second shows the selection of an avatar while the bottom image looks through the avatar's mask at the view beyond. Researcher: George Wharton III.
Figures 10, 11, 12. This sequence is part of an interface designed for MUDding. The images imply that the avatar is stationary. The illusion of motion is conveyed by the morphing of an architectural setting around the avatar. Another screen would show the conventional perspectival motion seen from the avatar's view. Researcher: George Wharton III.
SUGGESTED READING