The First Noble Truth of CyberSpace: People are People (Even When They MOO)

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ABSTRACT

This paper presents major findings from a large research project designed to carefully characterize what "life in LambdaMOO" (a classic social MUD) is like for many of its members. A "convergent methodologies" approach embracing qualitative and quantitative, subjective and objective procedures was used. A rich, extensive database was produced, from which robust patterns could emerge, be considered in context and assessed with some confidence. Results are discussed in terms of four broad categories of interest: 1) users and use, 2) identity 3) sociality and 4) spatiality. These data should help inform the discourse on, and design of, online communities in the future.

KEYWORDS

Virtual communities, MUDs, social computing, network community, identity, shared space, virtual worlds

INTRODUCTION

Imagine logging in to your network server and reading the following:

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>You enter the Living Room.  It is very bright, open and airy here, with large plate-glass windows looking southward over the pool to the lush gardens beyond.  On the north wall, there is a roughly-hewn stonework fireplace.  The east and west walls are almost completely covered with large, well-stocked bookcases...
...An entrance in the northwest corner leads to the kitchen...
>You see the Cuckoo Clock, the Cockatoo, the Scrabble Game and a Map of LambdaMOO here...
>DreamWeaver, HardCore & CeLeRY are here...
>DreamWeaver looks your way and smiles warmly.
>DreamWeaver says,"Hi, you new around here? :-)"
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This is a simulated screenshot illustrating a kind of online interaction that thousands of people experience every day when they log into a social MUD ("Multi-User Domain"). MUDs are a large and growing Internet phenomenon, reflecting one approach to the quest for greater personal connection and community on the Internet. MUDs evolved from early text-based adventure games in the hopes of providing a richer sense of place and "presence" than conversational mechanisms (chat, email) alone can provide [10][11]. MUDs and MOOs ("MUDs, Object-Oriented"), typically still text-based, are shared, persistent, navigable virtual environments in which user-created characters and scriptable objects can interact with one another in surprisingly rich and compelling ways. MUDs now number in the hundreds, with tens of thousands of members worldwide [15]. The screenshot above was derived from LambdaMOO--one of the oldest, largest, and most well-known online communities in use today [4][5]. LambdaMOO is a purely "social"--as opposed to fantasy/adventure (e.g., TrekMUSE) or research/education (e.g., MediaMOO)--MUD [3]. Note how different the kinds of interaction suggested in the screenshot are from anything email or chat lines could easily afford.

A great deal of media attention--and social science research--has been focused on social MUDs recently, and some popular and even provocative claims have emerged. For example, MUD "addiction" (logging in for extremely extended periods of time) is assumed to be a widespread phenomenon [11][15]. Identity--and gender--play with multiple characters (or "morphs") has been portrayed as the primary preoccupation of MUDding, perhaps to the point of promoting a 'post-modern fragmentation of the psychological sense of self' [1][6][14][15]. Others view MUDs as a form of "great good place"[11]--a public, social alternative to home and work of the sort that the sociologist Oldenburg [12] considers essential to community development. Finally, it is commonly held that spatiality, the ability to navigate and explore, gives MUDs an especially compelling sense of place or "presence"[11].

Research reports in which such claims are made can be richly evocative, insightful--and often deeply critical of traditional "objective" psychological research methods [1][3][15]. However, the generality of these claims are difficult to assess, both because they tend to be based primarily on qualitative, anecdotal methods and because of a tendency to use only a small sample of participants, selected either without regard to representativeness or with the explicit intent to highlight diversity rather than giving a sense of what is common to the community as a whole.

In the research project to be described here, our aim was to characterize aspects of "life in LambdaMOO" as experienced by a large proportion of members. We chose to study LambdaMOO in part because much of what's been claimed about social MUDs in general has been based on LambdaMOO (or its direct descendants) in particular. We applied an inclusive, hybrid "convergent methodologies" approach, embracing qualitative and quantitative, subjective and objective methodologies, since each has its strengths as

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well as weaknesses. A rich, extensive database was created from which robust patterns emerged and could be contextualized and assessed with some confidence. This paper reports major findings (from 3 primary studies) in four broad categories of interest: 1) users and use, 2) identity 3) sociality and 4) spatiality. In each category, we focus on empirical findings which, in providing a close characterization of "life in LambdaMOO" also serve to test some popular "hype-otheses" regarding social MUDding.

METHOD

Participants

All participants were active members of LambdaMOO, a social MUD created and maintained by Pavel Curtis of Xerox PARC since 1990. With over 7,000 members worldwide, it is perhaps the oldest and largest MUDs extant. Access is freely available through a widely publicized telnet address. LambdaMOO has grown rapidly, developing its own social and "cultural" norms [4][5].

Procedures

This was a large, multi-year, multi-study project. The results presented here come from 3 major studies performed primarily in 1994-5, when LambdaMOO provided perhaps the most sophisticated and freely accessible form of online community available. A wide variety of additional methods (with largely converging results) were also used, but space constraints preclude discussing them all in this paper.

Online Survey

For one week, all logins to LambdaMOO were given an invitation to participate in a research survey. MOOers could freely accept, decline or delay participation. Upon acceptance, they entered a "survey room" for uninterrupted survey administration. Approx. 30 questions addressed four categories of interest; various response formats were used. 558 players responded to at least some questions; 515 completed the survey (78% male; 22% female).

Personal Interviews

The survey contained a call for local residents to participate in a follow-up interview conducted by the author. Twelve volunteers (8 male, 4 female) participated in discussions conducted in an unstructured, conversational manner, with questions aimed at evoking a rich sense of each person's experience in LambdaMOO and their views on issues in the categories of interest. Sessions typically lasted 1.5-2 hours, and included a brief map-drawing task. Interviewees' experience estimates ranged between about 1 and 4+ years; mean experience was 19.5 months. Ages ranged from 15-45 yrs; mean age was 26; modal age, 28. Character and user names were changed to protect privacy.

Logging Study

Public status information on character and room objects for the entire system was logged at approximately one minute intervals, 24 hrs/day for approximately two weeks. This procedure allowed precise characterization of "who was where when", including time logged on, user first-connect date, character (morph) count and presenting gender. To protect privacy, no data identifying individual users or the content of interactions were recorded. Two logging studies were conducted over an interval of several months; this report focuses on the data from the second study, which included recording of idle times. Data on over 4,000 users—approximately 6,000 characters (excluding guests), of which 55% were primarily "male-presenting", 34% "female-presenting", 10% other, were taken during a total logging period of 348 hours (25541 time-stamped samples). Data from users seen for less than 10 samples were excluded, leaving a total of 3122 users included in the analysis.

RESULTS & DISCUSSION

The major findings of this project are presented below in terms of the 4 categories of interest: users and use, identity, sociality and spatiality. Statistical analyses of the survey data include chi-square analyses (primarily on forced-choice responses) as well as analyses of variance (ANOVAs). Note that due to rounding errors, not all percentages total to exactly 100%; also, degrees of freedom for error terms vary since not all respondents answered all questions. All results in this project were analyzed for gender and experience effects (and their interactions). For the survey analyses, gender was given by direct report and estimated number of hours in character served as the experience measure. In the logging study, user identities were not known, so we relied on character information to inform the gender and experience analyses. The gender variable used is the modal presenting gender ("MP gender") of all characters of a given user. Since MOOers can specify a wide variety of "genders", MP genders were categorized into 3 groups: primarily "male-presenting" (55%), "female-presenting" (34%) and "other" (neither; many of these were neuter, the default). Experience was estimated by first-connect date for a given user in any character. For ease of analysis and clarity of presentation, experience level was divided into quartiles for the logging study.

In general, for conciseness, only significant effects are reported here; failure to report a gender, experience or interaction effect for any specified analysis implies that it was not statistically significant. Experience effects are reported in terms of an omnibus test over all values of the variable. Results of pairwise comparisons of means are available upon request.

I. User and Use Characteristics

The online survey included several questions on user characteristics. The reported proportion of males (78%) to females (22%) is consistent with previous estimates [4].

	AGE					
GENDER	<16	16-18	19-21	22-24	25-27	27+
Female	01%	09%	36%	23%	14%	14%
Male	04%	09%	36%	19%	13%	19%
ALL	03%	09%	36%	20%	13%	18%

Table 1: Age and Gender Distribution of Survey Respondents.

Table 1 shows the distribution of survey respondents by reported age and gender. As expected, most members are college age, but the range is fairly wide. Similar distributions are found for males and females.

Respondents were asked to estimate "about how many hours (in total) have you been on LambdaMOO" in terms of five response categories: <=10,10-100,100-500,500-1000 and 1000+ hours. The distribution of experience by gender for each of these categories is given in Table 2. Modal experience level for both genders fell into the 10-100 hr. range, but the median experience level was in the 100-500 hr. category. The fairly high proportion of relatively

inexperienced players may reflect increased public awareness due to recent publicity on LambdaMOO. Note that estimated number of hours in character served as the measure of experience for analyses of survey data. While the analyses included all five levels of experience, for clarity of presentation in this paper, data from only the extremes--"novices" (<=10hrs) and "experts" (1000+hrs)--are presented in further tables of results given below.

	EXPERIENCE (HRS IN CHARACTER)				
GENDER	<=10	10-100	100-500	500-1000	1000+
Female	09%	27%	23%	23%	14%
Male	06%	33%	28%	14%	18%
ALL	07%	32%	27%	16%	17%

Table 2: Experience and Gender of Survey Respondents.

Related Experience

To get some idea of the kinds of related experience or skills LambdaMOOers may have, survey respondents were asked to "rate your experience level for each activity" on a 7-pt scale (1="never tried it", 4="intermediate", 7="expert"). Results are shown in Table 3. Overall, the ratings tend to fall in the lower intermediate range; ratings of programming experience are somewhat higher. Significant gender differences in these ratings were found for computer programming ($F(1,513)=62.46$, $p<.001$), video games ($F(1,513)=27.65$, $p<.001$) and "real-life" role-playing games (e.g., "Dungeons & Dragons") ($F(1,513)=23.07$, $p<.001$). Males gave higher ratings than females in each case, but only video games showed a significant (LambdaMOO) experience effect ($F(4,510)= 2.81$, $p<.05$).

RATED (1-7)	ALL	FEM	MAL	NOV	EXP
EXPERTISE:					
Programming	4.3	3.1	4.6	4.3	4.5
Video Games	3.9	3.1	4.1	3.7	4.2
RPGs	3.6	2.7	3.8	3.4	4.2
Other MUDs	2.9	2.7	2.9	2.8	3.3
Other OLCs	3.5	3.6	3.4	3.6	3.6

Table 3: Rated Experience with Specified Activities.

Two further ratings of special interest include that of experience with "other MUDs" and with "other on-line communities (e.g., chat lines)". The overall ratings are in the low-to-moderate range, with those for other OLCs slightly higher than for MUDs. These results do not support the view that MUDding typically involves simultaneous activity in multiple MUDs [15]. Our interviewees reported some experimentation with other MUDs, but primary involvement in only one at a time. (One exception to this rule experimented with several MUDs and considered himself an established member of two). A significant (LambdaMOO) experience effect was found on ratings of experience with other MUDs ($F(4,510)=2.63$, $p<.05$).

Learning Strategies

LambdaMOO can be fairly intimidating to the uninitiated, at least at first. One survey question asked "which did you rely on *most* for guidance when first learning to use LambdaMOO?". Five forced-choice response alternatives were provided, as shown in Table 4. The pattern of results differed reliably by gender (χ^2 (4, N = 558) = 40.69, $p <$ .001). Males were more likely to have sought online guidance, from written material or an online person. Females focused more on personal guidance, online or "in real life". A significant effect of experience was also found (χ^2 (16, N = 559) = 29.89, $p < .05$); experts tended to have relied on help from an online person followed by online written materials, while this order was reversed for the less experienced. Interview reports suggest that this may in part reflect that the MUD was smaller and more friendly towards (relatively much rarer) newcomers earlier on.

LEARNING	ALL	FEM	MAL	NOV	EXP
STRATEGIES:					
Online Written	31%	14%	36%	43%	18%
Offline Written	03%	00%	04%	00%	06%
Online Person	38%	51%	33%	29%	41%
Real-Life Person	14%	23%	12%	14%	18%
Trial and Error	14%	09%	17%	29%	23%

Table 4: Primary Source of Guidance for Learning

Activities on the MUD

A set of questions asked participants to "estimate the percentage of time" spent in various activities (see Table 5). The largest estimate by far was that for social interaction, where a significant gender effect was found ($F(1,564) = 7.32$, $p <.01$), as might have been expected [13]. Experience was associated with more time socializing ($F(4,560)=6.02$, $p < .001$) and building ($F(4, 561) = 11.77$, $p < .001$) and less time exploring the space ($F(4, 563) = 9.54$, $p < .001$). These results converge well with interview reports.

% TIME	ALL	FEM	MAL	NOV	EXP
ESTIMATES:					
Social Interaction	59%	66%	57%	41%	66%
Exploring	14%	11%	15%	37%	05%
Building	14%	11%	15%	05%	17%
Gaming	07%	07%	07%	10%	05%
Other	06%	04%	06%	07%	07%

Table 5: Estimates of % of Time in Various Activities.

MUD Addiction?

The logging data provide direct measurements of time spent logged in to LambdaMOO. Figure 1 shows time online in terms of the mean number of hrs/day spent on LambdaMOO by both user experience quartile and MP gender. Overall, users spent a mean of 1.13 hrs/day (or about 8 hrs/week) logged in. Note that this is a very liberal estimate of MUD activity, since it does not take idle time into account. Idle times can be extensive; MUDders commonly report "multitasking"–MUDding while working or performing other tasks. Yet even with this very liberal measure, less than 5% of users were online for over 20 hrs/wk, despite highly publicized suggestions that MUDding for "up to 80 hrs/week may not be uncommon" [15]. A reliable increase with experience ($F(3, 3110)=7.66$, $p<.05$) and experience x MP gender interaction ($F(6, 3110) =1.90$, $p<.05$) were also found. Thus, while many people may spend substantial time in LambdaMOO, and while a small proportion of them may well do so excessively at least some of the time (e.g., during exam

periods), the evidence clearly does not support widespread addiction.

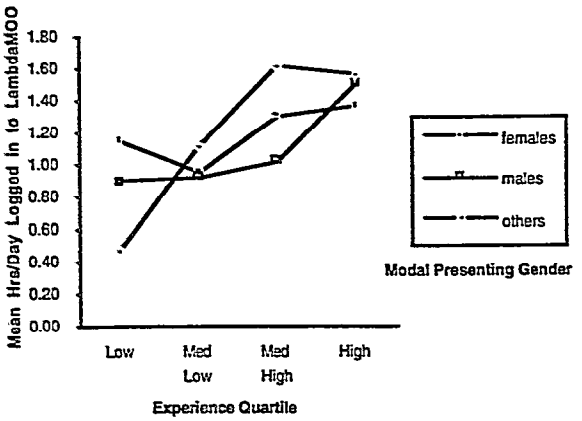

Fig 1: Mean Hrs/Day Logged in to LambdaMOO (Unadjusted for Idle Time)

The picture that emerges here is of a population of users who are mostly male, fairly young, and with some experience programming, playing video games, etc. In general, reported experience with other online communities is moderate, that with other MUDs is slightly lower. Social interaction appears to be the major activity, increasing with experience. Many members may spend several hrs/wk logged on LambdaMOO--which is substantial but not especially surprising for this population. There is little evidence of widespread addiction.

II. Identity

Preferred Mode of Self-Representation

While LambdaMOO is a purely text-based MUD, related systems are being developed incorporating audio, video and/or graphical animation. To explore preferred mode of self-representation, we asked "if you had the choice, which of these alternatives would you choose to use as your self-representation in a system like LambdaMOO?" Results are shown in Table 6. Interestingly, text was most popular overall, followed by animated character; video came in a distant third. Of course, text is the familiar mode for MUDders; a great appreciation for the rich potential of written language was also apparent in the interviews. Males and females showed differing patterns of results here ($\chi^2(3, N = 515) = 8.12, p < .05$); females preferred text most by far while males chose text and animation equally. Experienced users preferred text ($\chi^2(16, N=559) = 29.89.12, p < .05$).

PREFERRED MODE:	ALL	FEM	MAL	NOV	EXP
Text	42%	50%	38%	29%	47%
Audio	07%	04%	08%	00%	06%
Video	14%	09%	15%	14%	18%
Animation	38%	36%	38%	57%	35%

Table 6: Preferred Mode of Self-Presentation.

A further question asked "in a system where you saw images of the characters, how important would it be for your character to look like you?". Responses were given in terms of ratings on a 7-pt scale (1=not important at all, 4=intermediate, 7=extremley important). Overall, mean ratings were moderately low (3.3); still, females (3.6) gave significantly higher ratings than males (3.1) did ($F(1,513)=5.49$, $p<.05$). The gender differences in the pattern of responses to these two questions are supported by interview reports; taken together, they suggest that while women may be less likely to prefer image-based representations overall, if images are to be used, women may prefer more realistic self-representations.

Identity and Role-Play

Sherry Turkle claimed that "you are who you pretend to be" in the MUD, and that "there is no unitary voice...the self is...multiplied without limit." [14]. We explored the issue of identity and role-play in various ways in this project. In the survey, as shown in Table 7, slightly less than half the respondents answered "yes" to a question asking if "you have more than one character (including morphs)". Thus, overall, a slight majority of respondents report having only 1 character (a significant decrease with experience was found ($F(4, 510) = 25.53$, $p < .001$)). In a follow-up question, only those who reported more than one character were asked to give "the total number of characters (including morphs)"; the overall mean for this response was 5. This number appears to be misleadingly high, both from interview reports and from considering the distribution of the data. A small proportion of users gave extremely large numbers in response to this question, driving the mean up.

CHARACTER QUESTIONS:	ALL	FEM	MAL	NOV	EXP
>1 Character?	49%	54%	47%	00%	70%
If >1, Total #	05	04	05	02	06
Role- Playing	2.7	2.5	2.8	2.7	2.6

Table 7: Responses to Queries re. Characters

To some extent, this might reflect honest answers to the "letter" if not the "intent" of the question—one interviewee used an algorithm to randomly vary the capitalization of letter sequences in his main character's name, thus creating a large number of different (or at least differently spelled) morphs. When extreme values (over 20) were excluded from the analysis, the mean decreased to 2. This was also the mode of the distribution. A reliable increase with experience was found ($F(4,249)=3.59$, $p<.001$); the fact that morphs accumulate unless deliberately deleted might have contributed to this effect. Further evidence on character use will be presented with the logging study results.

A final survey question on the topic of identity and role-playing was: "Do you ever feel that you are role-playing your character (rather than 'being yourself')?". A 7-pt response scale was again used (with 1=never, 4=about half the time, 7=always). Responses to this question were fairly low, with an overall mean of 2.7. This finding accords well with interview reports in which most people said they generally "speak with their own voice" or "are themselves" on LambdaMOO; this will be discussed further below.

Every person we interviewed reported having one primary character on LambdaMOO. These tended be slightly distorted, perhaps idealized or fanciful versions of one's view of oneself [4]; most interviewees expressed concern that the description of the primary character should match how they think of themselves. One exception to this rule had a character humorously described as a vegetable but still reported "being himself" in LambdaMOO. Another

man made a point of representing himself "as himself" in character, with the one exception of changing his stated gender to female. He said this was initially done almost on a lark, to explore how it would affect his reception by others (the received wisdom is that female characters get "hit on" but also helped more). This was the only interviewee (and one of a very few of anyone we spoke with) who reported a primary character of the opposite sex in the MUD (not including "others"). He reported this to be a fascinating experiment, but began to experience great difficulty as time went on, since he had become known in LambdaMOO and built up friendships in his "female" form and began to fear that these friends would feel betrayed if he ever revealed himself to be male. Yet he also felt increasingly inauthentic in these intimate relationships by not doing so. Almost all our interviewees claimed to not role-play their primary character; our most highly experienced interviewee said "I don't (sic) know hardly anyone... who role-plays."

Secondary morphs appear to serve more as short-term, special-purpose tools or costumes than true alternative identities, often used for comedic effect. For example, a commonly reported, if cruel, "game" played among male newbies is for a more skilled male user to assume a seductive female character and later make embarrassing revelations about his unwitting victim. Of course, role-play is a complex concept that occurs along a continuum; one older woman living in a remote area with little social contact reported having a young, sexy secondary character that she occasionally used to "live a little"; but when asked if she thought of the character as an "alter-ego", she replied "Well, it was supposed to be an attempt at humor...." Interestingly, she also reported that many MUDders refused to take her character seriously since it was so stereotypical; she was often assumed to be male "in real life".

Many interviewees reported that over time, they felt a growing awareness of social pressures to maintain the accountability afforded by a single primary identity. As one person put it, "pseudonymity is not anonymity". The sociologist Goffman [9] argued that long-term social cohesion requires stability of self-presentation (including one's appearance, behavior, home and possessions). In a "real" community, concern for one's reputation exerts strong control over the behavior of the individual. Only in ephemeral, anonymous, low-risk situations are social constraints loosened enough to experiment in role-playing with strangers. To the extent that LambdaMOO provides a "real", persistent sense of community, the social constraints described by Goffman should hold. Interview reports suggest that reputation is indeed the currency of the MUD; in general, programming skill and creativity are highly valued, but observing "MUD manners" and showing a willingness to help others is also important. Character appearance, behavior, home and possessions are used to get an impression of what the player is "really like"; deception can be despised. Moreover, a strong interest in getting to know other MUDders "in real life" was expressed (many interviewees had joined BAM, the "Bay Area MOOers" club). Thus, as in the case of the male interviewee who had posed as a female, over the long term, the price of real intimacy may be authenticity.

While the interaction between identity and sociality cannot be discussed at length here, it should be noted that the issue has been surprisingly neglected by previous researchers. Many have focused instead on the personal, psychological significance of "acting out" behaviors that are risky or difficult "in real life", such as gender-swapping or sexual experimentation [6][14][15]. Ironically, the "social laboratory for experimentation with the constructions and reconstructions of the self" that Sherry Turkle and others see in the MUD may be more characteristic of short-term sociality among strangers ("guests" and "newbies") than among those seeking to become community members--or even just to make real friends in the virtual world.

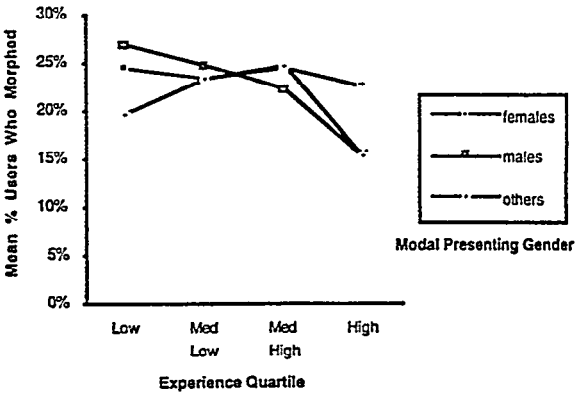

Figure 2: Mean % of Users Changing Character

Identity change

The logging data provide information regarding frequency of identity change, and therefore some sense of relative use of characters. The time-stamped logs show that less than 25% of players *ever* morphed identity–changed character–over the entire 2-week observation period. Of those who did, less than half *ever* changed gender. These data are shown in Figure 2, by experience level and MP gender. A significant effect of experience was found. Users who did morph used a total of 3 characters on average, but the vast majority of their time (mean=81.44%, sd=17.7) was spent in a single "main character". These data are shown in Figure 3; significant (though small) effects of experience ($F(3,689)=2.82$, $p<.05$) and an experience x MP gender interaction ($F(6,689)=2.77$, $p<.05$) were also found.

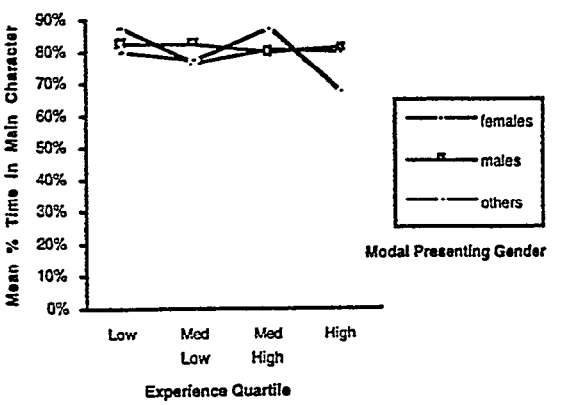

Figure 3: Mean % Time in Main Character (For Morphers)

Taken together, the patterns of results discussed above suggest that while deep explorations of multiple identities may be a major activity for some LambdaMOOers some of the time, this is *not* the primary preoccupation of most members. Indeed, failure to find some identity play (at least

over the short term) would be more surprising in a group containing such a large percentage of adolescents under such little social constraint. The strong prevalence of the single primary character converges well with reports of social pressures constraining identity over the long term; further research on the relation between online identity and sociality—especially over time—is clearly needed.

III. Sociality

Sociality was cited as the primary reason for MUDding by all our interviewees. LambdaMOO's peculiar ability to afford a wide range of creative yet constrained forms of social expression and interaction was also widely appreciated. As described above, most survey respondents reported spending most of their time in social interaction; perhaps not surprisingly, estimates were higher overall for females and showed a reliable increase with experience.

A Great Good Place?

Interview and logging data suggest that most 'personal' socializing in LambdaMOO is done in pairs or small groups, typically privately. Figure 4 shows the mean number of active companions (awake users in the same room simultaneously) per user, by experience level and MP gender. Mean number of companions overall was only 1.48; and a reliable decrease with experience ($F(3,31098)=10.16$, $p<.05$) was found. Thus, while sociality seems to play a primary role in "life in LambdaMOO", these results suggest that it may be typically expressed in a more intimate, private form than characterizations of the MUD as a commons or "great good place" [11] would imply. Further evidence is given below.

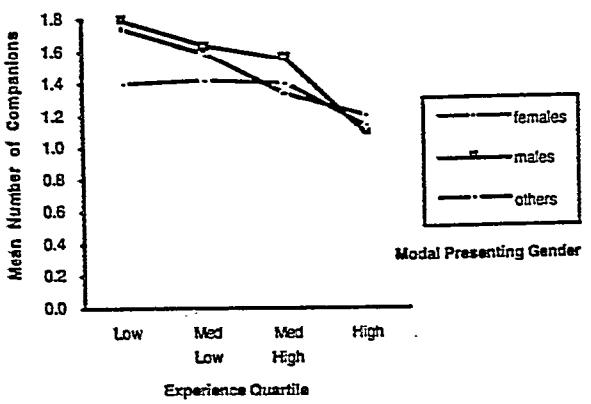

Figure 4: Mean Number of Active Companions per User

In LambdaMOO, location has strong implications regarding who one might be with and the kind of social interaction one might be engaged in. Time-stamped logs show that one place where users spent considerable time was their own private spaces, or "homes." Home-ownership was nearly universal among LambdaMOO members (mean=99%) in the second logging study (up from 78% in the first study, which might reflect an increasing general tendency to build a home immediately upon creating a character to join the MUD). Shared home-ownership, though easy to do, was so extremely rare as to be negligible. Overall, homeowners spent about half (49%) their active time at home. A highly reliable increase in time spent at home was found with increasing experience ($F(3,3062)= 40.32$, $p<.0001$), and significant effects of MP gender ($F(2,3062)=3.18$, $p<.05$), and experience x MP gender interaction ($F(6,3062)=2.42$, $p<.05$) were observed. A trend for "females" to spend more time at home than "males" ($F(1,2747)=2.76$, $p=.09$) did not reach significance (although it did in the first logging study, where "females" were also significantly more likely to own a home).

Note that since the home is a separate room, conversations within it are private in that they cannot be simply "overheard" by others. Moreover, security conditions at home are controlled by the homeowner. Most interviewees reported using a security system of some sort to limit access to their homes; otherwise anyone else could, say, teleport in at any time. Security was typically accomplished by simply specifying those who are–or are not--allowed entrance. Interview reports also suggest a resolution to the apparent contradiction of findings which suggest that increased experience is associated both with more time spent socializing and with an increased likelihood to be observed be at home, often alone. Highly experienced interviewees reported commonly communicating from home via "remote channels", paging and MOO-mail. The affordances of staying home include the ability to monitor multiple remote conversations at once--or focus on building a program--while still remaining accessible to friends who might check in. We were told that this is fairly widespread among expert users, and this is at least consistent with the data we have.

When not at home, LambdaMOOers spent a mean of 23% of their time in public rooms (with a strong decrease with experience ($F(3,3098)= 14.05$, $p<.0001$) and a trend for "males" to be in public more than other MP genders; in the first logging study, both effects were highly significant). Thus about 77% of their time was spent in private rooms, the vast majority of which are homes (one's own or another's). Interviewees described public spaces primarily as places to meet people, especially initially; many said that most of their "in person" interactions take place with 1 or 2 others, typically in the privacy of someone's home. However, most interviewees also said that they had felt more comfortable in public spaces in earlier times, when the community was much smaller and more closely-knit.

Overall, the pattern of findings strongly suggests that sociality is expressed by LambdaMOO members largely--although not solely--through personal interactions in private circumstances. This tendency may be somewhat greater for females, at least initially, and seems to increase with experience. Our interviewees suggest that most public spaces in LambdaMOO may function more as a way to meet new people or as an occasional diversion than as somewhere to repair to regularly, especially for more experienced members. This pattern converges well with results found in survey data on social patterns among university students [13] who do not report spending a large percentage of free time socializing in "great good places" (also known as "third places", alternatives to the home and work/school place; the British local pub is often cited as a prime example). Of course, as Oldenburg [10] might argue, the creation of such places might well promote greater social cohesion in the community.

LambdaMOO as a whole does not seem to qualify as a "great good place"; the prevalence of small, private, exclusive interactions is especially uncharacteristic. But some features of "great goodness" are found in it: conversation as a primary activity, high accessibility even at "off hours", and a capacity for providing both a playful mood and psychological support [10]. Interview reports suggest that LambdaMOO's "great goodness" may have

peaked early on, when it was a quite small community in which it was possible (and comfortable) to regularly repair with your friends to The Living Room or The Hot Tub and feel that on at least some level you knew and were known by many of the people there. The issue of how "great goodness" might be supported on the large scale, perhaps through the creation of neighborhoods with local hangouts of the third kind, is of primary significance for designers of shared virtual worlds [7]. But the data presented here indicate that we should be sure not to neglect the primary importance: private, personal spaces in online communities.

IV. Spatiality

Sense of Place and Space

Does LambdaMOO provide a stronger sense of "place" than other text-based forms of communication can provide? Interviewees uniformly agreed that it does, although speculations as to why differed. Some cited the ability to navigate and interact with objects, others the great visual detail given in descriptions. Several survey questions explored the sense of place and space afforded by LambdaMOO. Respondents were asked to rate how often "you feel like you are 'in another place' when you are on LambdaMOO" on a 7-pt scale (1=never, 4=about half the time, 7=always); results are shown in Table 11. The overall mean fell in the intermediate range; a reliable increase with experience was found ($F(4, 548) = 2.67$, $p < .05$). Similar results were found for how often "you have a fairly detailed image of that place while you're 'there'." No gender differences were observed in these questions focusing on images and felt experience of place [12].

PLACE & SPACE	ALL	FEM	MAL	NOV	EXP
Another Place	4.5	4.5	4.5	3.9	4.9
Image	4.4	4.4	4.4	3.9	4.5
Mental Map	50%	41%	54%	29%	65%
Custm Nav	45%	36%	47%	14%	65%
Lost	2.8	2.9	2.8	4.2	2.2

Table 11: Survey Results on Place and Space.

But how strong can a spatial metaphor be in a purely text-based realm? Spatiality is a complex and controversial issue in LambdaMOO; to complicate matters, only the public core of LambdaHouse and its environs are now reliably navigable. In recent years, many users have built homes which can only be reached by "teleporting", commands which automatically move characters between locations. Locations can be specified by a room name/number or by a character to "join". Emphasizing the role of the MUD as a social space, interviewees report "joining" as a common mode of transport. The effect of relaxing requirements for spatial navigation is a topic of great controversy among experienced users; many feel that navigation promotes "presence" and even community.

When survey respondents were asked "do you have a 'mental map' of LambdaMOO?", slightly more than half answered "yes". Individual differences in spatial cognition observed in the "real world" were replicated [12]; reliable effects of both gender ($F(1,544) = 5.75, p<.05$) and experience ($F(4,541)=9.79$,$p<.001$) were found. Another question asked "have you customized your navigation in LambdaMOO in any way?". Overall, somewhat less than half of respondents answered "yes" to this question. A gender effect ($F(1,542) = 5.48$, $p<.05$), and a strong increase with experience ($F(4,539) = 10.32, p<.001$) were found. The experience effects might reflect in part that more experienced members may have joined LambdaMOO when navigability was the rule. A final question asked how often "you ever find yourself 'lost' in LambdaMOO". Overall ratings are fairly low; no reliable gender effect was observed but the decrease with experience was still found ($F(4,540) = 23.85$, $p < .001$). Perhaps those who navigated less had less opportunity to get lost. Interviewees report navigating little after an initial exploratory stage, yet do still feel they have retained a good sense of the space.

Logged location data recorded "who was where" during the observation period. A related logging analysis assessed the relative extent of "travel" by members of LambdaMOO. The average user was observed in 8.9 different rooms. This differed with MP gender ($F(2,3379) = 17.85$, $p < .001$) such that "males" traveled most and "others" least, and sharply decreased with experience ($F(3,3379) = 66.73$, $p < .001$). A significant interaction was also found ($F(6,3379) = 4.76$, $p < .001$). Since navigation involves passage through intermediate rooms, it is not surprising to find that males traveled more and that experience was associated with decreased travel. These data converge well with many of the findings discussed above. Additional survey questions and the map-drawing task were used to probe the nature of the "mental models" users have of the space. Patterns of errors in spatial memory were complex, and performance was not high overall, but the expected gender and experience effects were generally replicated, as were common spatial framework patterns (e.g., greater accuracy for front/back than left/right) [12].

The general pattern of findings suggests that at least at its core, the LambdaMOO environment--though purely text-based--does provides a sense of place and space for many members. Patterns of individual differences in spatiality found "in real life" were replicated in this virtual space. The issue of whether and how to promote spatiality in the design of online communities is a complex one, and closely relates to the issues discussed in connection with sociality.

CONCLUSIONS

Shared online worlds are growing increasingly common, and the HCI community is facing many new challenges in understanding, evaluating, and designing these systems. The characterization of LambdaMOO given here stems from a deep, data-driven approach that we believe is sorely needed in this field. Many of our results directly address specific issues cited in calls for further research to inform design [8] and because they provide empirical results, can be used as a basis for direct comparisons with alternative systems.

One of our major "lessons from LambdaMOO" with direct implications for design is the strong focus on social interaction, which seems to only increase with experience, even to the point of superseding any interest in navigating the space. As Whyte, an urban planner (cited by Donath [8]), pointed out for designing real spaces, "What attracts people most, in sum, is other people. If I labor the point, it is because many spaces are designed as though the opposite were true and as though what people liked best are the places they stay away from." Our findings suggest that design in virtual spaces should similarly focus on supporting social interaction in order to function effectively. Otherwise, people may well find ways to circumvent design

elements in order to foster the social practices in which they are most interested.

In some sense, this project serves as a "case study" of a research program incorporating a synergy of qualitative and quantitative, subjective and objective methodologies in the attempt to understand what "life was like" for most people in a given online community at that time. While causal conclusions must be made with great care, robust patterns of convergent observations derived from this approach can be accepted with some confidence. The general observation that major patterns of behavior in this text-based virtual world do not depart radically from those in "real life", while perhaps not especially surprising, should nonetheless underscore for researchers and designers alike the value of putting one's hypotheses to empirical test. The results also highlight the basic import of a theme pointed out by Randy Farmer in 1992 [8]. Even in cyberspace, people are people.

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