The Use of Virtual Worlds Among People with Disabilities

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Abstract: With their emphasis on 3D graphics and complex interface controls, it would appear that gaming interfaces and virtual worlds have little to offer people with disabilities. On the contrary, virtual worlds serve as a form of augmented reality where users transcend physiological or cognitive challenges to great social and therapeutic benefit. A number of intriguing developments exist within the accessibility sector, particularly for users of Linden Lab's Second Life framework: haptic input devices for the blind, virtual regions developed according to Universal Design principles, communities dedicated to people with cognitive disorders, the use of the avatar as counselor, applications in higher education, and customizable personae that either transcend or represent a disabled person's self-identity.

Keywords: Accessibility, Virtual Worlds, Second Life, Haptics, Visual Impairment, Cognitive Disorders, Universal Design, Learning Disabilities.

I. Introduction

"We need to confront the life-killing stereotype that says we're all about suffering. We need to bear witness to our pleasures."

~ Harriet McBryde Johnson, from her book
Too Late to Die Young: Nearly True Tales from a Life

When Second Life achieved mainstream attention at the close of 2006, collective attitudes regarding virtual worlds were still evolving. These futuristic landscapes, built from bytes of code and populated by self-made identities called *avatars*, offered virtual residents the opportunity to construct new forms of social and physical interaction. As of this writing, many organizations and private-sector businesses are still coming to grips with immersive technology; however, a surprising context has emerged from a sometimes overlooked group of users.

A *virtual world* is a simulated three-dimensional (3D) environment accessed through a computer. More so than a flat website, virtual worlds are delivered via an interconnected network of servers that provide the platform framework. Users can then interact with their environment through animated avatars, customizable objects, instant chat messaging and voice-activation. The use of virtual worlds has been explored for purposes that include entertainment, socialization, education and commerce.

Virtual worlds are sometimes considered an extrapolation of *serious games* – a software or hardware player application developed with gaming technology or design principles, intended for use beyond pure entertainment. These programs are usually deployed for such purposes as education, marketing, advertisement, workplace training, or health awareness. The main difference between a game and a virtual world is in the objective: game players expect to be confronted with obstacles that are intentionally built into the software, while users of virtual worlds seek to engage and navigate their way through a more empathetic environment.

Second Life, a platform created by Linden Lab, is the virtual world that attracts the most attention and name recognition. There are other applications that boast greater numbers of simultaneous users, such

as Blizzard's World of Warcraft, which focus more on gameplay than social interaction, and multi-user virtual environments that provide tools for peer-to-peer collaboration.

From an assistive technology standpoint, it would appear that gaming interfaces and virtual worlds have little to offer people with disabilities. Consider that the experience is largely visual in nature, with multiple interaction paradigms offering deep levels of customization. User inputs often require extensive hand/eye coordination to precisely control an avatar's movements. Some applications use non-persistent sound and fading messages to deliver information; for users who are unaccustomed to this level of multitasking, the resulting cognitive load can be topically severe.

It is interesting, then, that a new form of social literacy has begun to take shape. There exists a vital demographic of virtual world participants with a wide range of disabilities: visual impairments, motor skill disorders, degenerative illness, limited mobility, and cognitive difficulties. Many of these users utilize virtual technology to great social and therapeutic benefit. For these users, avatar-driven 3D environments serve as more than a game. Virtual worlds operate as a form of augmented reality, one where it's possible to transcend a user's physiological or cognitive challenges into something extraordinary.

II. Types of Virtual World Users

To fully understand this emerging paradigm in assistive technology, it's important to recognize how people use virtual world gaming software. Users can fall into any of three categories: **augmentationists**, **immersionists**, or **experimentalists** (Duranske, 2008). All have applications of relevance to people with disabilities.

Augmentationists view the virtual world as a means to enhance their real life existence. They view their virtual personae as extensions of their identities, and they are more willing to disclose their real life identities to others in-world. Many who conduct business online, such as attorneys who practice aspects of virtual law, feel comfortable representing themselves with an avatar who closely resembles their real life appearance (Duranske, 2008).

Another practical example of an augmentationist would be someone with a physiological disability who chooses to represent him- or herself as authentically as possible. This user will go so far as to outfit his or her avatar with a wheelchair, dark glasses, a guide dog, or other visual attributes signifying a disability.

First-time users tend to start off as pure augmentationists, but they do not remain that way for long (Duranske, 2008). Within a short time, it's possible for a person to become proficient at making choices regarding his or her avatar's appearance and functionality. Some users with disabilities will take advantage of this feature by making the experience easier to navigate. For example, a visually-impaired resident of Second Life may dress her avatar in light colors to help visually track her location on the screen.

It is at this stage that augmentationists become **immersionists** – people who view virtual worlds as an alternative parallel to their real life existence. These types of users generally keep their real life identities separate from that of their avatars, with the idea that the two streams will never cross paths. An example of an immersionist might be someone with Asperger's syndrome who exploits the anonymity of virtual worlds to practice social interaction skills.

Some avatars employ drastic means to differentiate their virtual experience from real life, choosing to discard any attributes common to disability. Rather than depict themselves as "broken" with wheelchairs and canes, they make themselves available for such enjoyable activities as walking, running, surfing, dancing and riding horseback. For people with disabilities that prevent them from engaging in real life physical activities, virtual worlds present a unique opportunity for users to replicate the experience at an immersive level. Interestingly, virtual reality applications have been used to augment rehabilitation therapy for patients struggling with the loss of a limb. Research demonstrates that the brain's perception to pain can be reduced when it is "tricked" into operating a replicative appendage (Ramachandran, 2006).

A third group of virtual world users are the **experimentalists**, who use virtual worlds as a controlled laboratory to conduct training or educational sessions. Experimentalists usually take the form of educators and trainers, or perhaps a counselor working with patients dealing with substance abuse.

Another example of an experimentalist might be someone who seeks to gain empathy by undergoing a simulated experience. The Sacramento Mental Health Center in Second Life provides a virtual replica of their real-world facility, including an authentic representation of a schizophrenic episode. With visual hallucinations and subliminal voices providing an accurate depiction, the site provides visitors an opportunity to directly experience what someone with schizophrenia may go through (Deeley, 2008).

Illustration 1: New Ways is a private practice, located in Second Life, that provides free counseling sessions with a virtual therapist.

Experimentalists also take the form of in-world therapists. New Ways is a private practice located in the Sunshine Therapy Garden in Second Life's Hauwai region and sponsored by the Netherlands emotional support organization, Sensoor. New Ways is staffed by trained volunteers, offering confidential support and non-judgmental listening services free of charge. Residents arrive during regularly scheduled hours and take advantage of a private forum to discuss both in-world and real life problems with their virtual therapist. Although roleplay is prevalent among users of Second Life, some residents do treat their "sessions" as authentic therapy to discuss issues of loneliness, depression or other problems (Sensoor, 2008). There is some evidence that talking to a an anonymous counselor via instant messaging helps people to speak more freely than during a face-to-face session (Mollman, 2008).

III. Human-Computer Interaction in Virtual Worlds – Haptic Interfaces for the Blind

In a 2001 paper, Marc Prensky introduced the concept of *digital immigrants* and *digital natives* to better identify new methodologies in education. According to Prensky, there exists a demarcation between present and past generations with respect to their fluency and familiarity with ubiquitous computing. Those who have grown up with the Internet, email and multiplayer games comprise the group called "natives," while others (the "immigrants") must constantly adapt their mental model to compensate (Prensky, 2001). Digital natives are also more comfortable using complex game interfaces and tend to build their social fabric using online means (Hinton, 2008).

Inspired by these ideas, a professional games programmer and research fellow at the University of Sussex named Gareth White devised the term *digital outcasts* – users who are left behind due to technology that rapidly advances but remains inaccessible (White, 2008). Even though recent surveys indicate more than a fifth of casual gamers have a disability (Ingham, 2008), gaming hardware has not maintained pace with the need to accommodate users with disabilities. Few games support the use of input devices that make affordances for the blind, since this user group is not usually considered during the development lifecycle. However, with thousands of dollars spent in the US alone on alternative means of input, the need for computing hardware for the blind has gained mainstream visibility within the gaming community (White, 2008).

As part of a study at the University of Sussex, Gareth White has conducted a series of interviews among blind and visually impaired individuals to identify how they navigate and orient themselves within virtual spaces. The study revealed significant barriers to entry in Second Life, particularly in areas where information was presented graphically rather than with textual equivalents. Many interviewed participants suggested tagging objects with metadata that could be interpretable by screen-readers. Although Linden Lab has released test-to-speech functionality as part of their source code, only a few interface elements provide this interoperability by default (White, 2008).

Among White's investigations are the development of a haptic interface system, extensible to Second Life, that maps keyboard movements through a Logitech Wingman Strike Force 3D joystick. This is one example of a *haptic interface*, a digital input that utilizes a user's sense of touch through a network of embedded sensory perceptors. A few such devices have already entered the consumer marketplace. One example is the Novint Falcon, a 3D touch device intended for the consumer market that allows a user to interact with in-world objects. The controller acts as a joystick, attached to the main body via three motorized arms on hinges, offering players the ability to “hold” or “pick up” objects through force feedback responses. The effect is realistic enough to simulate weight and texture, and its use has been investigated in Second Life as a possible alternative to the keyboard (White, 2008).

These developments have cultivated some exciting research in the ways people with disabilities adapt to 3D graphic environments, especially for users who are blind or have low vision disorders. Braille displays and speech-recognition software provide visually disabled users a means to navigate a digital environment heavy on graphical information. For users who prefer a more tactile experience, however, there exist fertile case studies for haptic input. Members of an Italian research team have been working with the Second Life source code to create two avatar controls called Blind Walk and Blind Vision. Blind Walk measures and responds to feedback upon impact with objects and other avatars; Blind Vision senses the vibrations from objects through a sonar probe, receiving signals of varying strength depending on an object's proximity. In tests with blindfolded users, orientation and collision benchmarks have proven to be successful even among large groups of avatars (De Pascale, 2008).

Haptic technology is not the only development being pursued on behalf of the blind and visually impaired. The use of sound, both synthetic and natural, can be used to increase the fidelity of 3D spatialization within immersive environments. In 2007 a group of IBM students joined with the National Council for the Blind of Ireland to create a prototype for Active Worlds, an online virtual environment similar to Second Life. Making use of 3D audio space, the team developed a suite of tools to help users navigate the world via sound. A text-to-speech functionality reads back any dialog that appears in a text field, and residents are provided audible clues to alert them of nearby objects or approaching avatars (Adams-Spink, 2007).

Finally, an application called TextSL allows Second Life users with visual impairments the ability to interact using the JAWS screen-reader. Based on such text-based online games as Zork, TextSL accepts and gives commands that help avatars speak, move and control objects in-world.

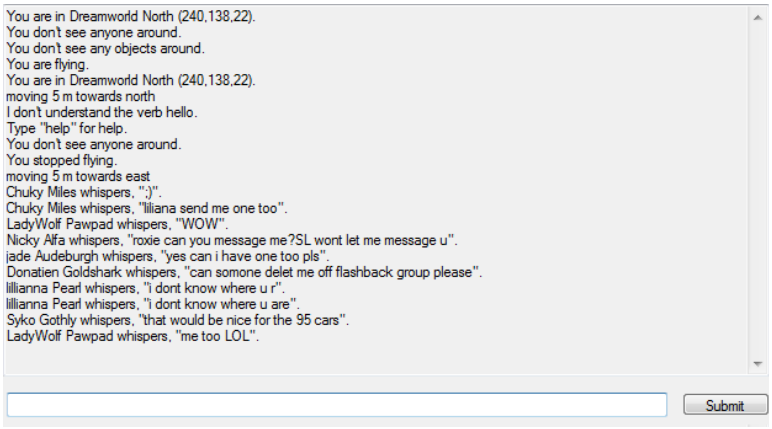

Illustration 2: TextSL provides a way for blind users to access Second Life using the JAWS screen-reader.

An important aspect yet to be explored is the assigning of meta data to objects, as well as the ability of screen-readers to interpret these objects' properties as text (not unlike the assigning of ALT text to Web images). Care must also be taken to ensure that blind users are not deluged with an overabundance of granular details for each object in an environment; sighted users selectively filter much of the visual information with the cognitive judgment that machines may lack. (Carter, 2008)

IV. The Use of Virtual Worlds Among Users With Cognitive Disabilities

Virtual worlds carry an important distinction from simulations; they operate as a proxy landscape where the goals of play are created solely by its participants. Everything that resides within the context of operation is user-generated: landscape, sky, buildings, moral codes, fashion trends, economic structure and social culture. The application merely provides a three-dimensional environment for these activities to take place.

Virtual worlds operate as self-designed experiences; human practice is tied to the extensibility of a user's actions through technology. Participants' capabilities can be augmented to comprise an idiomatic skillset, comprising a deep fluency that subsequently influences actions and intent. Avatars can alter their appearance, fly/teleport to far away destinations, interact with other participants or build their own personalized environment. The best-designed experiences are those that dissolve into behavior; virtual interfaces communicate information to users most effectively when they don't interrupt the natural flow of interaction (Dyck, 2003).

Perhaps serving as a tipping point for the way users will ultimately view the Internet, virtual worlds have found a strong and enthusiastic audience among people with cognitive disabilities. Predominant among these users are those who have difficulty processing memory, experience mild to severe interaction anxiety, have limited attention spans and cannot effectively control their emotions.

Through such new forms of articulation as text chatting, avatar gestures or speech-to-text, users are able to practice a variety of social interactions in virtual worlds. They can take part in a conversation, exercise common etiquette or work on overcoming social awkwardness. Perhaps more importantly, people also have the opportunity to meet and discuss their experiences with others.

The Autism Society of America island in Second Life houses an information library, a meeting room, videos, a bulletin board, student artwork and scheduled events. Participation includes group discussions for parents and guardians who are raising a child diagnosed with autism spectrum disorders (ASD), a

term used to define a number of developmental conditions which affect a child's ability to communicate and interact with others.

Brigadoon is another island in Second Life designed to guide users as they become acquainted not only with the virtual experience, but also with each other. One participant credits Second Life with dramatically changing his life and finds he can communicate through a number of different avatars for different occasions. A therapist mentions that Brigadoon provides a safe environment to build the confidence necessary to explore other parts of Second Life, as well as venturing into the real world to test newly-discovered social skills (Deeley, 2008).

Researchers from the Center for Brain Health at the University of Texas have conducted brain-imaging and neurocognitive tests on people with Asperger's before and after virtual therapy sessions. Asperger's is a condition that effects people who have highly-functional learning skills but are deficient in other activities, such as dating or interviewing for a job. Emotional subtleties and body language clues, which other people take for granted in common everyday usage, can be misinterpreted or completely unnoticed by a person with Aperger's.

Illustration 3: View of bulletin board in the Autism Society of America's island in Second Life. The ASA hosts in-world meetings and events.

Researchers believe that virtual worlds such as Second Life can provide greater value than weekly role-play with a therapist (Stein, 2007). Subjects tested after participation demonstrated improvements in social interaction; they were less likely to make inappropriate comments and gained confidence in making small talk. Virtual worlds allow people with the disorder to communicate without forcing face-to-face interaction with another person. Since many with Asperger's do not like to make eye contact with others, they can socialize without the stress of a physical meeting (Phillips, 2008).

There is a difference in the degree of accountability required when interacting with others in a virtual world, compared to that of real life. This can have positive or negative outcomes, depending on a user's intent or the amount of trust placed in another participant. One of the risks of using virtual worlds is that people with cognitive disabilities sometimes cannot distinguish between the realms of practice and putting into action. There are sexual and economics aspects to Second Life, for example, that can be dangerous when patients lack the ability to comprehend appropriateness in different situations. On the one hand, people can socialize free of risk. On the other, people with devious intentions have the opportunity to exercise a dearth of morality in ways they wouldn't otherwise attempt.

Users of virtual worlds often cite the buffer of anonymity that protects their identity, safely behind the fictitious persona of an avatar. Perhaps it is this buffer that helps people be more honest when speaking to others, or that allows them to open up during a virtual therapy session. Being assured of one's anonymity may cultivate the trust necessary to freely discuss one's troubles and wishes. It is also interesting to note that the difficulties one has in-world often manifest from those in real life; behavioral traits tend to become transcendent from one paradigm to the other.

During preparation for this paper, the author had the opportunity to interview several participants in Second Life. A common thread among those interviewed was the importance of removing the misconceptions many people have about autism. One parent mentioned that the symptoms and severity of ASD can vary greatly from person to person, and that ASD is often is diagnosed as attention-deficit hyperactivity disorder (ADHD). Also of note are the degree to which ASD can manifest one's life and resulting outlook. One parent described the struggles her autistic son had with dyslexia, dysgraphia, dyscalculia and femoral anteversion, while another avatar insisted insisted "I am on spectrum, and I like my way of thinking. I think society is what needs to change." In such cases the virtual world operates as both community builder and educational platform; it was clear from the sessions that those interviewed respond to the presence of ASD in their lives in deeply personal ways.

Illustration 4: View of the Autism Society of America's library in Second Life.

V. Finding Community in Virtual Worlds – Physical and Substance Abuse Therapy

There are an increasing number of people suffering from physical injuries who have successfully used virtual worlds as part of their rehabilitation, and some credit the technology with helping them reclaim their lives. Researchers are only now beginning to appreciate the impact that virtual worlds are having in helping patients adapt to their disability and discover a sense of community.

Illustration 5: Wheelies is a nightclub in Second Life frequented by participants with disabilities, who often depict their avatars with wheelchairs and guide dogs.

Wheelies is a nightclub frequented in Second Life by people with many forms of disability. Sign-language displays provide a sense of advocacy, as do the computer-generated dances specifically created for avatars in wheelchairs. From there, avatars can visit the Accessible Builds demonstration site and preview such items as handicap-friendly housing, life-size board games for the visually impaired and an accessible water slide.

One interesting example of collaborative learning involves a group of nine adults with cerebral palsy, ranging from 30 to 70 years of age, who share the use of a Second Life avatar named Wilde Cunningham. Through the sponsorship of a Boston day-care program called Evergreen, the group members take turns controlling Wilde as they navigate their in-world lives: building houses, meeting with friends, even simple acts such as walking and dressing themselves. Observers reported an improvement in the group's confidence after six months of participation, which has carried over to their real life experience (JMB, 2008).

People with cognitive disabilities often find companionship and understanding in virtual worlds, although no two people with a disability are alike – some are anxious and shy, others are practically shut-ins, while a number are fully employed and functional. Throughout the research for this paper, it was not uncommon to have the subject of conversation changed abruptly, or for the person being interviewed to ask a personal question that was quickly forgotten. Many residents tend to not identify themselves as disabled right away, but they are very open about their experience if genuine interest and empathy is demonstrated. In the end, the virtual experience becomes not only about meeting with peers who have a disability, but also about providing a vehicle to make the issues of accessibility and accommodation more prevalent.

Often forgotten within the context of accessibility are those patients who have recently become disabled – for example, people recovering from traumatic brain injuries. There is evidence that virtual interactions can help patients redevelop dormant cognitive skills and find outlets for creativity, such as 3D modeling or building environments.

Virtual worlds play a large part in recovery because they provide a forum for meaningful involvement. In real life, people with disabilities sometimes feel isolated and stigmatized by others; there is always a feeling that they are nothing more than a source of aggravation to their families or caregivers, even though they may be highly functional and appreciative within their respective communities. With the degree of activity and autonomy afforded by virtual worlds, users have the opportunity overcome any perceptions limiting their capability.

Rehabilitative virtual communities tend to work best when avatars “patients” are permitted to make mistakes. Some users objectify their avatars as a means of distancing themselves, which in some cases can weaken therapies applied in real life. However, there is equal evidence that viewing oneself rationally and objectively is critical to self-growth (Brady, 2008). For example, one can find an alcohol rehab center in Atlanta fully replicated within Second Life, where the in-world environment and therapists' avatars strongly resemble those in real life. David E. Stone, the center's Chief Technology Officer, has mentioned the “online disinhibition” that allows frustrations to be conveyed more honestly in the digital space, which he feels has helped patients respond to therapy with greater impact (Mollman, 2008).

VI. Uses of Virtual Worlds in Higher Education for the Learning Disabled

One of the more intriguing implementation of virtual worlds can be recently found in higher education. Universities are beginning to investigate the use of Second Life as part of their curriculum, particularly for students with disabilities who may benefit from a more collaborative and immersive learning environment. For example, students who have difficulty understanding a concept presented in text may have more success working through visual material at their own pace (McKinney, 2008).

Colleges are also using Second Life to provide virtual walkthroughs during orientation sessions, which can help incoming students with learning disabilities feel more at ease. Bowling Green State University, for example, offers virtual office hours and access to faculty members in advance of students' arrival on campus (McKinney, 2008). There is a belief that students with learning disabilities may be more comfortable asking for help if their anonymity is ensured. The result is a sense of community felt among participants, who might otherwise have trouble adapting without assistance.

There are some challenges in the use of virtual worlds for educational purposes. Students with learning disabilities require timely and structured feedback sessions, something that virtual environments do not

provide by default. Instructors must take the time and effort to fully understand all aspects of the in-world experience. There is the risk that a student with learning disabilities may feel overwhelmed with the amount and degree of sensorial clutter, thus obfuscating the intended educational value of the virtual content. These challenges may be mitigated by emphasizing the use of virtual worlds as a component to learning, rather than as a replacement for classroom instruction (McKinney, 2008).

VII. Universal Design in Virtual Worlds

August 2008 marked the launch of Virtual Ability Island, an environment in Second Life created by the Alliance Library System (ALS) and Virtual Ability, Inc. (VAI) to help residents with disabilities become acquainted with the platform. Funded by a grant from the National Library of Medicine, the island provides a place for residents to find fellowship, training and education on topics related to physical disability, cognitive impairments or other chronic health concerns (Legrand, 2008).

The island was designed visually and experientially to offer the best benefit to users with disabilities, fully available to adaptive services and developed in accordance with Universal Design principles. The island contains the following features: wide ramps scalable for avatars in wheelchairs, bright high-contrast signage more easily trackable by users with visual impairments, smoothly landscaped walkways to accommodate many types of users, and training offered in small sets to decrease fatigue.

Illustration 6: The welcome area of the Virtual Ability Island offers flat, wide pathways for avatars in wheelchairs.

Testing was performed in stages. The first challenge was how to best present signage. Signs needed to be readable by the default camera view, which is angled downward at roughly 15 degrees from eye level, so all signs in the island's Orientation Center were compensated for the height of avatars using wheelchairs. The standard view in Second life includes the avatar in the frame, so signs were placed high off the ground. Paths and walkways were designed with as few stairways as possible, with no bumps that would make an avatar trip while walking. The surrounding land was modeled to meet the paths as closely as possible.

The question could be asked: why is it necessary to implement such strict accessibility features in a virtual world? After all, no avatar in Second Life is actually physically disabled – why depict an avatar with a wheelchair or guide dog? Why emphasize such physical attributes in an environment as ramps and wide paths?

From a development standpoint, creating specification guidelines with Universal Design principles in mind has several benefits. It ensures a baseline modality for such tasks as listening to audio playback, viewing visual material, comprehending written information or interpreting the context of an event. One might argue that immersive environments should be governed by the same principles as other Web-based media as governed by the W3C Web Content Accessibility Guidelines (WCAG 2.0); they need to be perceivable, intuitive, flexible, robust and extensible in use. If media is designed to accommodate users with challenges, the overall experience will be holistically improved for all users.

It is important to realize that successful virtual world environments are built to consider best practices in interface usability. Many first-time avatars have difficulty navigating virtual worlds with a mouse and keyboard, even with relatively minor hand and arm issues. Anything that can make the screen easier to read or the cursor easier to move can benefit the user experience. For those who rely on voice recognition software or alternative input devices, a larger or brighter avatar on the screen can be more precisely controlled. Game interfaces are frequently designed to accommodate customization; interface malleability is often programmed into the console to remap functions at the player's whim, and this personalization is often extended to the presentation layer itself (Dyck, 2003).

We must also consider the ways in which users of virtual worlds approach their disability. For some, it is largely a matter of respect. The appearance of accessibility is very important to many disabled users, who view their disability as an integral part of their identity. Simon Stevens, owner of a disability firm in Coventry UK and a Second Life avatar named Simon Walsh, chose to present himself in-world with a wheelchair. “I don't know how to be nondisabled and I've never wanted to be,” he told the Times Online in March 2008. “It's important that people know; it's part of who I am, plus I'm a disability consultant in Second Life, too, so I've got to look the part” (Deeley, 2008).

Illustration 7: View of the ramps leading to Second Life's Accessible Builds demo site.

Depicting oneself with a disability can also be an issue of comfort resolved through personal customization. People who have had an impairment since birth consider it a part of how they perceive themselves, and some prefer to have their avatar appear that way. The idea of comfort can also be extended to how people want to interact with their environment. In the case of VAI, the angle of a ramp is critical to maintaining authenticity with one's surroundings. For example, a virtual ramp that is too steep may draw criticism from residents who question whether such a ramp would accommodate wheelchair use in real life.

Vivian Sobchack, media theorist and film critic, once wrote that “even the most ordinary images find their value, their substance, their impetus, in the the agency and investments of our flesh.” She was speaking partly about something called *decorporealization* - that point in which a media object, such as a photograph, depicts a persona that is at once representative and interchangeable with our identity of self. The more closely a user can identify with her avatar, the more likely she can transcend herself to a context of extraordinary proportion (Jones, 2008).

Creating a virtual world with Universal Design principles in mind serves as a visual reminder to help users better understand the needs of the disabled. The appearance of accessibility in a physical space, either in a virtual world or in real life, will make a person more likely to use the service and not balk from it. For someone with a physical disability, extra space on a path provides a means of easy navigation from which all users may benefit.

Finally, Universally Designed virtual worlds strengthen the sense of community among both disabled and non-disabled participants. Many users remark “I always wanted a group to understand me,” projecting an idealized view that suddenly becomes manifest upon entering in-world. Users with

disabilities have the same expectations for accessibility, no matter in what context it appears – digital or physical – and the success of any facility is largely subject to meeting these benchmarks.

VIII. Future Developments

Virtual world technologies are being increasingly used in business and educational contexts for planning meetings and presentations, which brings to mind issues of workplace accessibility. Employees with hearing impairments may one day benefit from an IBM platform called SiSi (Say It Sign It). SiSi translates spoken or written words into British Sign Language, using speech recognition technology to animate an avatar in real time during chats, speeches and digital broadcasts. The Royal National Institute for Deaf People has already endorsed the use of SiSi, and there are plans to integrate translation features into future prototypes (Adams-Spink, 2007).

Another recent development is Virtual Worlds User Interface for the Blind, a prototype user interface developed by a division of IBM called alphaWorks. Described as an “accessible rich Internet application” (ARIA), the program runs in a Web browser and provides basic navigation and communication functionality. Using elements already familiar to blind computer users, information from the environment and other avatars is loaded as text and interpreted by screen-reading software. The interface is navigable using keyboard inputs, and the thin-client application minimizes load time on the user's computer. Interestingly, semantic data is contributed by sighted users and delivered as textual data through the interface (Carter, 2008).

Virtual worlds are considered a new paradigm in which to operate, and many advocates are just now coming to grips with the challenges and possibilities available to users with disabilities. It is encouraging to see Linden Lab release the source for its client application of Second Life under a GPL license, which allows anyone to extend or modify the code and explore further possibilities with the technology. It would not be a surprise to see more research being executed within this platform in the future.

Illustration 8: Scene from Second Life's Wheelies island. Many avatars meet here to discuss topics of mutual interest, both in-world and in real life.

While the technological innovations are exciting, it's necessary to also consider the ways that so-called “alternative reality” can apply directly to patients' therapeutic benefit. People who have no mobile ability can have the opportunity to become agile. A community of hearing-impaired users can communicate in real time, spanning multiple geographic locations. Those with visual difficulties may be able to receive and process information by tapping into an elevated sensorial perception.

VIIII. Conclusion

Perhaps the most intriguing element of virtual worlds is how they both represent and impact a cultural divide that transcends technology, from that which we might consider “normal” to something outside of that understanding. For example, in an article published in the Spring 2009 issue of *Access: The inclusive design journal*, Diane Carr reported on the reaction of the Deaf community when Second Life

added a feature enabling verbal interaction via microphone input. The assumption was that voice would now become the “normal” way to converse in-world. Thus was created a controversy between deaf protesters objecting to voice functionality and non-disabled users, who viewed the protesters as “martyrs” requiring “special measures” to cope in Second Life (Carr, 2009).

Such discussions reinforce the importance of considering the social and cultural factors of accessibility, as well as the technology required to enable its implementation. The difference between virtual worlds and other computer programs is the degree to which users identify with their profile, as well as how fiercely they connect and defend their respective communities of practice. Often these aspects of behavior transcend from the offline world to the virtual. As Carr writes, “We need to consider the expectations and assumptions about disability – or any other aspect of identity – that are carried into virtual worlds from our everyday lives.” (Carr, 2009)

This notion of identity permeates our investigation. The art historian Amelia Jones once described a notion of the body as “transcending ... through pure thought—or, more recently, via free-floating Internet subjectivities … heighten(ing) the tension between subject and object; (putting) into play the new relations of signification produced by the emergence of digital representation” (Jones, 2008).

Perhaps we have achieved a time and space principle that allows people with disabilities the opportunity to escape their bodies, if they so choose, or to celebrate the contradistinction of their unique gifts in the presence of their peers. Technology has the potential to enable increasingly nimble forms of engagement, provided accommodations are made for users to access the functionality. There may indeed be a measurable therapeutic benefit. Consider, for example, the importance of distraction as a method of pain management. Now apply this to the idea of fantasy. Both disabled and non-disabled people dream about what they cannot do. What is a fantasy, after all? For some, it is the ability to fly, breathe underwater, or date attractive models. For others, it is the ability to wake up in the morning free of pain, or to communicate with someone besides a home care nurse.

As a digital society, our greatest need remains a sense of advocacy and empathy with respect to users. Companies who design and produce virtual worlds should continue to investigate accessibility improvements in their interface systems, particularly if the case studies for such research prove to be compelling. It's equally important for development and design teams to consider the integration of virtual technology beyond the metaphor of gameplay, both in terms of the software itself and the input devices necessary for its successful operation.

The end in mind to which we must all aspire – game developers, user experience professionals, educators and accessibility advocates – is the endorsement of barrier-free access for technology users of all abilities. As seen from these few examples, virtual worlds are unique in that they can replicate as well as augment our understanding of real life. For people with disabilities, this aspect affords the possibility of melding both digital and analog realms into one holistic experience. The stated being described here is similar to that predicted in the mid-1990's by the writer Nicholas Negroponte: “Computing is not about computers any more. It is about living.”

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Illustrations

Illustration 1: New Ways is a private practice, located in Second Life, that provides free counseling sessions with a virtual therapist. (Screenshot from Second Life taken by the author.)

Illustration 2: TextSL provides a way for blind users to access Second Life using the JAWS screen-reader. (Screenshot from TextSL taken by the author.)

Illustration 3: View of bulletin board in the Autism Society of America's island in Second Life. The ASA hosts in-world meetings and events. (Screenshot from Second Life taken by the author.)

Illustration 4: View of the Autism Society of America's library in Second Life. (Screenshot from Second Life taken by the author.)

Illustration 5: Wheelies is a nightclub in Second Life frequented by participants with disabilities, who often depict their avatars with wheelchairs and guide dogs. (Screenshot from Second Life taken by the author.)

Illustration 6: The welcome area of the Virtual Ability Island offers flat, wide pathways for avatars in wheelchairs. (Screenshot from Second Life taken by the author.)

Illustration 7: View of the ramps leading to Second Life's Accessible Builds demo site. (Screenshot from Second Life taken by the author.)

Illustration 8: Scene from Second Life's Wheelies island. Many avatars meet here to discuss topics of mutual interest, both in-world and in real life. (Screenshot from Second Life taken by the author.)