

Accessibility Solutions for 3D Virtual Learning Environments

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Abstract – 3D virtual learning environments have the potential to link students who are isolated by disability, geographical location and social circumstances through the establishment of virtual communities, and can enable learners to transcend the limitations of real life in virtual space. Despite the promises, however, those students who can benefit the most from these collaborative rich media experiences may be further disadvantaged by the social, physical, sensory and technological barriers to accessibility imposed by such platforms. This presentation describes a collaborative project aimed at addressing the identified limitations of such platforms. The project, which has been funded by an Australian Learning and Teaching Council grant¹, involves the development of an open source 3D virtual learning platform. Accessibility technologies designed by Virtual Helping Hands Inc. have already been successfully trialed in the 3D virtual world known as *Second Life*. These technologies have informed the development of open source accessibility solutions that will be incorporated into a 3D virtual learning platform to enable students with disabilities to participate in 3D virtual learning experiences

I. INTRODUCTION

3D virtual worlds, such as *Active Worlds*, *There* and *Second Life*, are based on three areas of technology; World Wide Web, Massively Multi-player Online Role-Playing Games and avatar worlds [1]. Such environments provide an Internet based medium through which users represented by their avatar personae can interact with each other via chat, instant messages and voice. Virtual worlds such as *Second Life* also enable members (referred to as residents) to construct their own virtual spaces such as virtual homes and buildings, and to form communities with friends and other residents with whom they share a common interest [2].

Perhaps not surprisingly, 3D virtual learning environments have gained popularity in recent years in fields as varied as health science [3], hospitality and tourism [4], business [5] and for a range of creative and experiential learning activities [6] as educators look for more engaging ways to harness the enthusiasms of the ‘net generation’ [7]. However, such rich media experiences also present many accessibility challenges [8]. As Peters and Ball (2007) have argued, when accessibility is still a challenge in the first place (real world), and remains a challenge in the second place (Web 1.0), the challenges of accessibility in the third place (virtual worlds) have yet to be solved [9].

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This presentation describes a collaborative project aimed at addressing the identified limitations of such platforms. The project, which has been funded by an Australian Learning and Teaching Council grant, involves the development of an open source 3D virtual learning platform. Informed by the work undertaken by Virtual Helping Hands Inc., a range of technological solutions are being developed for an open source 3D virtual learning platform designed to enable students with disabilities to participate in 3D virtual learning experiences.

II. METHODOLOGY

The research questions and the methodology employed in the research study are reported in this section. Preliminary findings are reported in the results section of the paper together with details of the proposed future implementation of the technological solutions to an open source 3D virtual learning platform.

Research Questions

1. What are the features and limitations of 3D virtual worlds as learning environments for students with disabilities?
2. What are appropriate techniques for designing usable and accessible interfaces to 3D virtual learning environments?
3. How can accessibility solutions to 3D virtual learning environments enhance the learning experience for students with disabilities?
4. What adaptations are required to extend accessibility solutions in closed 3D virtual world platforms such as *Second Life* to open source 3D virtual world platforms?

Research Methodology

1. Review the existing literature into the usability/accessibility of current interfaces to 3D virtual environments.
2. Undertake ethnographic research involving participant observation of stakeholders’ interactions and conduct interviews with individuals who identify as disabled in the 3D virtual world, *Second Life*.
3. In collaboration with organizations developing accessibility solutions within 3D virtual worlds such as *Second Life*, develop guidelines for interface design building on the knowledge gained from research into the design of games software and the World Wide Web Consortium’s Web Content Accessibility Guidelines (1999, 2007).
4. Develop accessibility solutions to be incorporated in an open source 3D virtual learning platform.

5. Conduct trials of the 3D virtual learning platform with users who have physical, sensory and/or cognitive disabilities.
6. Modify the platform based on the trials and make available through open source to the community.

III. RESULTS

The project is currently at stage four of the six stage research process. Our reviews of the literature and the findings from ethnographic research undertaken in *Second Life* have identified the following accessibility limitations of 3D virtual platforms:

- The log-in screen of *Second Life* is not accessible for users who are visually impaired and rely on screen reader software or use of a mouse
- The local chat window in *Second Life* is not accessible to screen reader software
- The user Interface of the *Second Life* client is not accessible to screen reader software and does not support a range of alternative accessing devices
- User generated content within *Second Life* is not accessible to visually impaired users
- Tab-index needs to be incorporated to provide a logical order between links and options
- The need for provision of an audio message and a text list of avatars in the vicinity of user's avatar
- Need for a simple author solution enabling users to add descriptive label for all objects and longer descriptions for posters and slides containing text in image format
- Lack of synchronized streaming captions for videos
- Need for text transcriptions for streaming audio
- Need for alternative interactions that do not require the user to target and click with a mouse

Informed by research into the existing accessibility solutions trialed in *Second Life*, the following features will be designed and implemented in an open source 3D virtual learning platform:

- Optional accessible log-in screen that can be included in or accessed from the open-source client. The log in utility must provide the same services to user as does the current login screen.
 - Viewer version and update checking
 - Notification of log-in availability
 - Log-in location in the form of: [region<Location.x,location.y,location.z>]
- Inclusion of links to 3D virtual world resources and materials.
- Text-to-speech engine into the 3D virtual world client—thus allowing text chat to be read aloud by the user's computer.
- Utilize the same text-to-speech system as described above and various other adaptations, to make the 3D virtual world client accessible to screen readers and alternate input/output systems.

- Provision of a set of tools and guidelines to educate and make it easy for builders to incorporate these features into their content.

IV. CONCLUSION

Our research has identified the potential of new and emerging 3D virtual learning platforms as well as the challenges for those most likely to benefit from the opportunity these technologies afford. The accessibility challenges imposed by 3D virtual worlds are particularly complex because of the rich media these applications employ, the dynamic nature of such applications and the control exerted by users who are the creators of the content. 3D virtual worlds and 3D virtual learning platforms in particular, provide unprecedented opportunities for learners with disabilities given the collaborative nature of these environments and the potential for accommodation to individual user's preferences and accessibility needs. The research presented in this poster session demonstrates accessibility solutions under development in *Second Life* that address these challenges within a specified closed 3D virtual world environment. The next stage of our research will be to apply such solutions to an open source 3D virtual learning environment that is accessible for students with disabilities.

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