Effective Training for Policy Based Management of 3D Multi User Learning Environments

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Abstract
The use of 3D Multi User Virtual Environments (3D MUVE) for teaching and learner support activities has been commended by many considering the unique benefits. 3D MUVE, when used for educational activities with the existing teaching infrastructure, formulate blended learning environments, which are known as 3D Multi User Learning Environments (3D MULE). Appropriately integrated 3D MULE would provide a range of complementary functions to facilitate student learning along with the e-Learning and classroom teaching processes. Nevertheless, the fact that 3D MUVE were not specifically designed to cater for educational needs, but for gaming and entertainment has made teachers and module coordinators to face a significant challenge in designing effective learning and assessment tasks with 3D MULE; a common mistake is to assume and trying to practice identical e-Learning use cases with 3D flavour. With related research, we have successfully shown that policy based management of 3D MULE can overcome the challenge of inconsistent and ineffective learning practices. Unfortunately, the steep learning curve of the 3D MUVE management functions tends to impede the teachers and students on exploring their learning and course delivery objectives within 3D MULE, conveniently. This paper introduces a novel approach of training 3D MULE users to support their teaching and learning. Required competencies were identified considering policy models for 3D MUVE functions and the virtual regions were designed accordingly. This paper presents the design models and architectural considerations for the developed training islands along with evaluation.

Keywords: 3D MULE Learning, Policy Based Management, Training Teachers, Learning Environment Management

1. Introduction
Technology enhanced teaching and learner support practices have been pivotal in modern educational environments. Various system solutions have been developed to implement different teaching and learning content delivery methods associated with e-Learning, which are often referred as blended learning environments. 3D virtual worlds (3D MUVE), quite often, are used to extend the existing e-Learning based blended learning environments by incorporating 3D support for a more attractive and engaging learning experience for the students. 3D MULE are appropriate for educational use due to their alignment with the Kolb's (Kolb et al., 2001) concept of experiential learning, learning through experimentation and exploration. 3D virtual environments engage learners in the exploration, construction and manipulation of virtual objects, structures and metaphorical representations of ideas, demonstrating a high educational potential Dalgarno (et al., 2009). When integrated with existing e-Learning systems, 3D MUVE provide complementary features for higher student engagement with 3D support (Perera et al., 2011a). However, managing 3D MULE without affecting their rich and dynamic features that add value to learning while achieving trust in learning can be a challenge due to the varying levels of student self-regulation and the steep learning curve of 3D MUVE system functions.
For our 3D MULE research, we have been using Second Life (SL) (Linden Labs, 2003) and Open Simulator (2007) MUVE. Identifying the potential of OpenSim based 3D MULE can help for serious teaching and learner support needs; most of our recent 3D virtual world research and development projects are based on OpenSim platform. Furthermore, with the recent trends in 3D MUVE usages it can be seen that a preference has moved towards OpenSim from SL (Allison et al., 2011). This study, as part of the research on facilitating policy based management of 3D MULE, aimed at designing and developing a training environment to support users who are in need of assistance to overcome the steep learning curve challenge of 3D MUVE. The prior training on 3D MUVE functions and their behaviour can help the users by flattening the steep learning curve of the 3D MULE management; as noted, “The learning curve for operating OpenSim is steep” (OpenSim wiki, 2011). Not only does it help the students to start module specific learning rapidly by conveniently engaging in the 3D MULE, but also the teachers can comfortably practice the required management of 3D MULE. Therefore, the main objective is to increase the user awareness of the 3D MUVE system behaviour in general to overcome the steep learning curve barrier, while supporting teachers and course administrators to make required policy considerations to manage their 3D MULE with confidence.

The remaining sections of the paper are as follows: section 2 reveals background details relevant to the research with our experiences on using 3D MULE. Section 3 discusses the training requirements for 3D MULE management and; section 4 explains the design and major parts of the developed training regions. Section 5 presents the developed training regions along with preliminary results of the evaluation. Finally, section 6 discusses the expected future work as part of this research, before concluding.

2. Background and Related Work

How 3D MUVE transform the existing e-Learning environments is an interesting research question. Hendaoui (et al., 2008) has discussed this by identifying key research topics to be examined as 3D MUVE are used for teaching. A recent study on use case implementations of 3D MUVE for blended learning approaches (Perera, et al., 2011a) provides extensive insight on possible learning processes while revealing the prevailing challenges at the system and user domains. The challenge of successful integration of 3D MUVE into the existing e-Learning based blended learning environments has been studied as part of this research and provided the research model to investigate the required level of policy based management of 3D MULE.

Second Life follows the concept of Help Island (Linden Labs, 2003), which makes all newly registered users to appear in one of the dedicated islands in the main grid. These islands consist of free content objects, instructions for basic avatar movements and content creation, and virtual spaces for gatherings and content creation. A major limitation of this approach is the instructions, content and the Help Island environment are not designed to support educational requirements, specifically, but to promote and prosper the Linden Lab’s commercial motives through expanding the SL virtual economy.

However, with the increasing use of OpenSim for 3D MULE implementation instead of SL, there is a need of user training facility similar to Help Island concept, but with the educational focus. The common practice has been to use document based laboratory sheets or student guidance, which may not be the ideal way to train students for 3D MUVE and might not be an attractive method to motivate students. Moreover, with the OpenSim based 3D MULE all the activities from system administration to learning environment management become the responsibility of the academics; therefore, a strong need for training these lecturers and module coordinators for the 3D MULE management, emerges, which has been highlighted in the related previous work of (Perera, et al., 2011a), (Allison, et al., 2011). Previous phases of this research have identified the required level of use case mappings, and policy consideration areas based on
3D MUVE functions to manage 3D MULE. Recently, an extensive statistical analysis was performed to identify the major 3D MULE management aspects (Perera, et al., 2012). These related works suggested to provide intuitive and usable training to support academics for managing 3D MULE, and supporting students to interact with the learning environment comfortably; relevant work on this is explained in the paper.

3. Training for 3D MULE Management

As identified in our previous work on this research the policy based management of 3D MULE facilitate the learners without affecting their engagement with the environment and the rich 3D MUVE features that adds value to the learning environment. Use of effective policy considerations for 3D MULE management can facilitate teaching and student support as the learning experiences become more reliable. As we have experienced and observed in our previous work with 3D MULE, defining such policy considerations can be a significant factor for the success of learning activities. Moreover, due to the complex behaviour of 3D MUVE functions and their interdependencies, teachers and course management staff may find it more challenging to implement the defined policies in their 3D MULE; such difficulties can hinder the benefits of 3D MUVE to form dynamic and engaging learning environments.

With our previous findings of this research, we identified two major training requirements that should be provided for effective management and learning in 3D MULE. Essentially, the new users should be trained for the 3D MUVE functions so that they get familiar with the environment before they are given the access to the module specific learning in 3D MULE. This would facilitate the learning environment management as the users (students, mostly) tend to self-regulate their behaviour if they know the activities they should and should not practice while engaged in learning. User ethical behaviour (self-regulation) helps to achieve the objectives of policy based management (Rulghaver et al., 2010). On the other hand, to facilitate the management of 3D MUVE systems, teachers and academic staff should be trained for possible mechanisms that they can rely on for implementing learning environment management policies. For this purpose, we selected the key policy areas with respect to 3D MUVE functions, identified through previous user and system studies (Perera et al., 2011b), as the main components of the training on management of 3D MULE.

4. Training Environment – Design Considerations

For the identified training needs we decided to implement 2 different regions, one for introductory requirements for new users – The Introduction Island, and the other for more advanced training on management functions – The Management Island. Both these regions were part of the Training Island and we tried to minimise the difference of appearance and structure to avoid user confusion and to provide a seamless training experience, should a user visit the both regions in a single session of training.

The major policy areas we have identified are mapped with 3D MUVE major functional categories; as a result, we were able to design the main training areas (centres) in both islands closely associating with the respective functional category. For example, the functional category Avatar Activities was represented as a Centre for Avatar Mobility Tasks in the Introduction Island to fulfil the basic training needs of new users, whereas the Centre for Avatar Activity Management in the Management Island comprised of training materials for advanced functions available only for administrators or land owners to meet the needs of managing avatar behaviour within the learning environment. Fig. 1 shows the teleport links provided for various centres in the islands; the left inset image shows the centres in the Introduction Island, and the right inset image shows the centres in the Management Island. The places indicated in the middle image are in generic nature and were included in the both islands; these places will be discussed further in the section 4.1.
4.1. Generic places for user training

Four places and constructs of generic nature were identified for facilitating the common needs of the objectives of this training. The idea behind these generic creations is users are given an opportunity to interact with the environment freely and the other users at the same time observing generic content and media types that would not specifically fit into the main policy areas, but facilitate common needs of managing or using 3D MULE. Especially, these places can be used to train the management policies that we have to consider when 3D MUVE are used as learning infrastructure with blended learning activities such as, learning content creation and display, learning activity engagement, and formative and summative assessment & feedback.

The Cinema provides the virtual space to train users through a set of video content on using or managing the learning activities in 3D MULE. The Open Forum is a dedicated place to summarise most of the 3D MUVE interacting functions with possible hot key combinations available in the viewer programs; this enables a rapid familiarity of and efficient interactivities with the environment. The Discussion Rooms are places where group discussions can be hosted for training sessions on using 3D MULE. Finally, the dedicated Sandbox lets the users to practice their learnt environment engaging and management functions without restriction; it helps to make the main training environment to be kept tidy and enforced with some restrictions on terrain alteration and object creation. Fig. 2 shows these places; the main intention of the architectural design is to simulate the real-world buildings to make them felt that their experience is more intuitive and relevant.

4.2 Training Centres for Main Policy Areas

Main policy areas were identified in relationship with the key areas of 3D MUVE functionality, namely: management of land, content, user, group, and avatar activities (Perera et al., 2011b). Training centres were constructed to cover these major policy areas; the centres in Introduction Island cover the basic interactive functions related to these policy areas while the training centres in Management Island provide the training on advanced techniques and administration functions, which are often hard to master without additional support. Since, the main goal of this study is to facilitate the management of 3D MULE, a brief section for each training centre in the Management
Island is given below. Moreover, the corresponding centre in the Introduction Island provides the basic user training common to all users relevant to its policy area; the details of these centres are quite similar to their corresponding centres in Management Island, hence, to avoid redundancy an explicit discussion is not included.

**Training for Land Management** – Three centres containing the relevant training content on 3D environment (land) management at the near-field (parcels), estate (estate & region) and administrator levels were created. Functions on land ownership management, land access management, control of script execution, terraforming, and administrator tools are covered by the training content, among other topics. Lecturers, module coordinators and administrative staff should be capable of implementing effective 3D land related policies to promote engaging student learning and proper management of the 3D MULE.

**Training for Content Management** – Two training centres were constructed to explain the complex content management scenarios such as cyclic permission loss, fair ownership, and composite permission management. Based on the training needs for managing 3D content objects, these two places additionally provide the content manipulation tasks: copy, edit, move and delete defined on the roles of, creator, owner, group, everyone, and the administrator, as well. As we have to rely on 3D content objects for various educational use cases, appropriate management is essential for reliable learning experience and trustworthy assessment of student created content.

**Training for Group Management** – Training for 3D MUVE group management is quite important as the teachers can implement group tasks in 3D MULE, which is one of the important methods for collaborative learning, with the required control. Importantly, the available 3D MUVE group functions are not explicitly designed to support learning activities in student groups compared to the e-Learning applications. Therefore, teachers and course administrators should be trained to transform available 3D MUVE functions and group roles to support educational needs, as applicable.

**Training for Avatar Activity Management** – Avatar activities such as fly, gesture, voice, create, touch, etc. are the fundamental mechanisms that students interact with the 3D MULE. It is important that the academics should be aware of the limitations they have on controlling these functions to manage the learning activities. Training content showed the possible misuses and available mechanisms to overcome those.

**Training for User Management** – This training centre explains the functions and best practices for user registration, ownership, and privilege & access management. Training for suitable user management, e.g., user (avatar) naming, can be a vital factor for success and promoting student self-regulation as the amount of student anonymisation in virtual worlds affect their avatar behaviour (Messinger et al., 2008).

5. **Training Islands and Evaluation**

Training content was expressed using natural language with suitable figures to depict the task scenarios or User Interface functions. Since the management and interactive tasks are done through user actions and mainly aims users, it would be meaningful to express the content in natural language; moreover, it adds flexibility and ease of training. Developed Training Island (with both regions) is shown in Fig. 3.

Fig. 4 shows the important creations of virtual content within the training regions; left inset shows an innovative approach of putting a virtual fence to mark the boundary of the region. Not only it gives an appealing view to the users, but also serves as a unique solution to prevent users getting off from the edge of the region; often, the non-deterministic nature of the region edge can cause avatars to freeze or behave unresponsively, affecting the usability of the MUVE interaction. Making the tree image embedded fence a non-phantom we solved this problem in a creative manner. Moreover, the Fig. 4 right inset shows that the training centres were designed to represent
a familiar university environment with suitable architecture for the educational context. The campus environment is simulated to a reasonable level while adding the required flexibility and familiarity by using a common structure for all the training centres.

Figure 3: Training Islands: Introduction Island (left) and Management Island (right)

Figure 4: virtual fence with forest look (left) & constructs for campus setting (right)

Fig. 5 shows various training contents and arrangements used in the designed centres. Some of the training materials are based on the UI functions of the 3D MUVE clients to make users capable of rapid utilisation of management functions as a need arises. Guidance notes and best practices were included to train users not only for mastering 3D MUVE functions but also to help them in their policy making.

Figure 5: Training content in different centres: researchers observe the content

Evaluation of the developed training environment is in progress, and a preliminary study was completed with 2 postgraduate students. The two students were engaged in their Master’s dissertation projects for developing 3D MULE for teaching computer networks. These students had not used 3D MUVE when they started their projects; they were supposed to complete their project familiarisation phase within 2 weeks (16.67% of their project time). They were asked to use Training Islands, and reported that they completed their 3D MUVE training within 5 days (gained 64.28% of time saving, which was used for their project development work). This preliminary result shows the value and the significant support the users get for fulfilling their training needs on 3D MUVE use and 3D MULE management, as a whole. We expect to conduct further user studies to evaluate this statistically.
6. Conclusion and Future Work
This research is in progress; the next step of the research is to evaluate the training environment statistically with a group of participants to see the actual support they get to improve their skills on managing 3D MULE. We further would like to see the usability and educational value of these environments to compare any difference between the two and also to have a view on how this approach of using 3D regions to train users for learning in 3D MULE is viewed by the participants. We look forward to improving these training environments to cater for wider user community consisting of various academic roles in the university and to make this training method a common introductory approach for the students and academic staff when they start their learning activities in 3D MULE. For that, a special archipelago of virtual regions on the university OpenSim grid environment will be allocated as a hub hosting these training islands and connecting the other educational regions through teleport links.

This paper briefly presented the work we have done on designing and developing 3D MULE training regions to support academics and students to improve their skills for interacting and managing 3D MULE. The initial studies about the environments with case studies on two postgraduate projects showed that the researchers involved were benefited by training themselves for their work with 3D MUVE, using this training solution. With the expected future extensions, we believe our Training regions support users for their needs in learning; i.e., Management Island would facilitate the academics for comfortably managing their 3D MULE while students getting help to be familiar with the 3D MUVE functions from the Introduction Island.

7. Acknowledgement
The research is funded by the UK Commonwealth Scholarship and the Scottish Informatics & Computer Science Alliance: project of Scottish Funding Council (SFC).

8. References
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