Chapter 8
A Comparative Study of Platforms for Multi-User Virtual Environments

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ABSTRACT

Multi-User Virtual Environments (MUVEs) have been found to be engaging and provide an environment in which the elements of discovery, exploration and concept testing, fundamental to the field of science, can be experienced. Furthermore, MUVEs accommodate lifelike experiences with the benefit of the situated and distributed nature of cognition; they also provide virtual worlds to simulate the conditions that are not doable or practicable under real world circumstances making them very relevant to many other fields of study such as history, geography and foreign language learning. However, constructing MUVEs can be expensive and time consuming depending on the platform considered. Therefore, providing the most appropriate platform that requires minimal effort, cost and time will make MUVE deployment in the classroom faster and more viable. In this chapter, the authors provide a comparative study of prominent existing platforms for MUVEs that can be used to identify the right balance of functionality, flexibility, effort and cost for a given educational and technical context. A number of metrics are identified, described and used to enable the comparison. Platform assessment was done in four main metric groups: communication and interaction, characters, features and education. Communication and interaction metrics are used to assess how the communication and interaction is done within the examined platform. Character metrics are employed to measure avatar and agent affordances. Features metrics are defined to compare what the platform offers in terms of technology. Lastly, education metrics are used to identify the value of the associated platform for educational purposes.

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INTRODUCTION

The potential of Multi-User Virtual Environments (MUVEs) inhabited by intelligent agents to gain the interest and attention of school students is clear. For example, in geography a MUVE can allow the student seated in the classroom to visit foreign lands and experience such things as the people, vegetation and buildings, lifestyle and culture of that place. In history, a MUVE can allow both space and time travel by bringing the past to life and breathing new life into content that may otherwise seem to be little more than the memory of dates. In science, MUVE offer the potential for students to try out theories and conduct experiments which may not be otherwise possible due to physical challenges, safety and cost issues.

However, constructing MUVEs can be expensive and time consuming depending on the platform considered. Therefore, providing the most appropriate platform that requires minimal effort, cost and time will make MUVE deployment in the classroom faster and more viable. In this chapter, we provide a comparative study of prominent existing platforms for MUVEs that can be used to identify the right balance of functionality, flexibility, effort and cost for a given educational and technical context. A number of metrics are identified, described and used to enable the comparison. Platform assessment was done in four main metric groups: communication and interaction, characters, features and education. Communication and interaction metrics are used to assess how the communication and interaction is done within the examined platform. Character metrics are employed to measure avatar and agent affordances. Features metrics are defined to compare what the platform offers in terms of technology. Lastly, education metrics are used to identify the value of the associated platform for educational purposes.

The next section provides further motivation for using MUVEs, specifically looking at science education, and concludes by identifying the need for agent platforms to assist that development. Following that a set of metrics for comparing and selecting agent platforms are described. We then use these metrics to provide specific platform comparisons for five prominent agent platforms: Active Worlds, Project Wonderland, The Open Cobalt, Torque Game Builder, and Unity 3D. We conclude with identification of limitations of the comparisons and our summary findings.

BACKGROUND

The classroom of the 21st century inhabited by digital natives requires new media and methods for learning. Not only have student behaviour and interests changed, society and the workplace has changed such that we must equip them for this brave new world.

Education, at the end of the 20th century, no longer prepares individuals for secure, lifelong employment in local industry or services. Rather, the rapid pace of technological change and the globalization of the marketplace have resulted in the need for individuals who have a broad general education, good communication skills, adaptability and commitment to lifelong learning.

Some fields of study are particularly at risk and in need of a technology-makeover.

Our view is that the form of science education we currently offer to young people is outmoded, and fundamentally is still a preparatory education for our future scientists. An advanced technological society such as ours will always require a supply of well-qualified research scientists, but this requirement will be met, as at present, by educating and training only a small minority of the population. On the other hand, the ever-growing importance of scientific issues in our daily lives demands a populace who have sufficient knowledge and understanding to follow science and scientific