

What is a Virtual World? Definition and Classification

Abstract

In 2008, articles by Bell and Schroeder provided an initial platform from which to develop a coherent definition of the term 'virtual worlds'. Yet over the past five years, there has been little development of the term. Instead there is confusion in the literature, with the introduction of new terms which are at times used to classify the type of virtual world and at others are used synonymously with the term virtual world. While the lack of a clear and common understanding of a term is not uncommon in a developing field such as virtual worlds, there are implications for research. This paper aims to reignite the discourse on what a virtual world is and is not. Through review and analysis of the current educational literature, the key characteristics of virtual worlds are identified and used to develop a definition of virtual worlds and emerging. In much the same way as the definition presented in this paper has developed earlier work in order to address confusion within the field, it is expected that the classification of virtual worlds will require future development due to ongoing discourse and technical development.

1. Introduction

Virtual world is an extremely important term yet there is ambiguity in its use within the literature. Despite initial work by Bell (2008) and Schroeder (2008) to ignite development of a definition of virtual worlds, there has been little evidence of an on-going discourse within the literature since. The development of virtual worlds, from text to graphical environments as well as providing a widening range of user experiences, has resulted in a fragmented understanding in the literature of what a virtual world is and is not. To further complicate this problem a variety of terms are used in the literature to label the technology: virtual world (VW); virtual environment (VE); multi-user virtual environment (MUVE); massively-multiplayer online game (MMOG); immersive virtual world (IVW); serious virtual world; social virtual world; and synthetic virtual world.

While the lack of a clear and common understanding of a term is not uncommon in a developing area such as virtual worlds, there are implications. The variety of terms used by authors can cause confusion, such as MUVE and virtual world both used to label Second Life in one article by Honey et al. (2012), while others label Second Life an IVW (McArdle & Bertolotto, 2012), a social virtual world (Jarmon & Sanchez, 2008), or a virtual environment (Singh & Lee, 2009). Virtual environment is in turn used by Minocha et al. (2010) to label Facebook, which highlights a common confusion in academia and the media as to what is and is not a virtual world.

In addition to the variety of terms, there is inconsistency in the definition and description of these terms within the literature. For example while Marsh (2010) describes virtual worlds as either two-dimensional (2D) or three-dimensional (3D), they are only described as 3D by other authors. The inconsistent use of terms (e.g. virtual world, MUVE and SVW) and descriptors (e.g. 2D and 3D), means that it is unclear as to whether these terms are synonymous or refer to subtle differences between applications.

Further evidence of on-going confusion is found in a recent article, in which Duncan et al. (2012) present their taxonomy of virtual world usage in education. This taxonomy is based on an over-extended use of the term 'virtual world' to "encompass any online virtual environment that allows users to play, learn or interact" (p950). The article begins with an initial distinction between MUVES, virtual worlds and virtual learning environments (VLEs),

although it is recognised that the term virtual worlds is used to encompass both MUVES and virtual worlds. World of Warcraft, Second Life and Active Worlds are initially classified as MUVES, although later in the article Second Life and Active Worlds are classified as VLES within the subcategory of 3-D Web technologies. WebCT, Blackboard and Moodle are classified as VLES within the sub-category of learning management system (LMS). It would therefore appear that the authors consider MUVES and virtual worlds to be sub-categories of VLES for the purpose of analysis, however the article refers to all of these applications as virtual worlds.

Although the literature lacks a commonly used and accepted definition of the term ‘virtual world’, Bell (2008) has attempted to address this by reviewing earlier definitions by Bartle (2003) and Castronova (2005), combining elements of each of these to provide a new definition:

“A synchronous, persistent network of people, represented as avatars, facilitated by networked computers” (Bell, 2008, p2)

Bell (2008) goes on to define what is meant by each term used in the definition. He makes a clear distinction between avatars used to represent a user in an application such as Facebook, in which the avatar is a static representation of the user on a website, and avatars in virtual worlds, in which the avatar has agency. Bell’s (2008) description of ‘synchronous’, while describing real-time interactions, is described as including the concept of space and sense of environment. Yet it is unclear as to how synchronous interactions provide the user with a concept of space or sense of environment.

Although descriptors commonly used in the literature such as ‘immersive’ (e.g. Warburton, 2009; de Freitas et al., 2010; Grenfell & Warren, 2010) are not accounted for in Bell’s definition, in the same issue Schroeder (2008) highlights the immersive qualities of virtual worlds facilitated through the visual nature of the technology. He describes virtual worlds as “persistent virtual environments in which people experience others as being there with them - and where they can interact with them” (p2).

Schroeder (2008) emphasises the importance of accurately defining what virtual worlds are in order to guide research in the area. To achieve this and address the confusion in the literature, there needs to be a clear definition with clearly defined criteria with which to identify different applications as virtual worlds or not. Taking Bell’s (2008) and Schroeder’s (2008) definitions as a starting point, this paper aims to reignite the discourse on what a virtual world is and is not. Through review and analysis of the current literature, the key characteristics of virtual worlds are identified and used to develop a definition of virtual worlds and typology for categorising the different virtual worlds currently available. Each of the defining characteristics of a virtual world is then presented to support the accurate classification of technologies as virtual worlds or not.

2. Method

In order to establish a definition of virtual worlds which resonates with current discourse, a systematic review of 88 peer-reviewed articles was conducted. Articles were selected which provided a description or definition of virtual worlds, or of any of the commonly used terms identified above such as MUVES or IVW. Multiple articles by the same author remained in the review (for example Dickey 2003, 2005a, 2005b & 2011) if they described different applications or there was evidence of change to the author’s definition or

description of virtual worlds, otherwise they were excluded. All articles were accessed by 30th June 2011 some of which were in press.

The descriptions and definitions of virtual worlds presented in each article were analysed using in vivo coding to identify key words or phrases. Codes which emerged in only one article or used by only one author were removed or merged with another. To further refine the set of codes, redundancy was identified in strongly related codes. For example 'build' was merged with 'user-generated content'.

At the end of this process a set of 16 codes was developed, presented in the Findings section which follows. This final set of codes was analysed across terms and the applications they were identified in, such as Second Life and Active Worlds, to examine any notable differences. From this analysis six codes were identified as characterising types of virtual worlds. The remaining codes informed the definition of the term 'virtual world' presented in this paper.

3. Findings and Discussion

This section begins with a brief overview of the 88 articles. This is followed by the 16 codes which were developed and discussion of the findings from the final analysis of these codes, by term and application.

As shown in

Table 1, across articles the most commonly used term was virtual world (63 articles), followed by MUVE (14 articles) and immersive virtual world (8 articles). Social virtual world, serious virtual world, synthetic world, virtual environment and virtual reality were used in three or less articles each. 68 articles provided a description, 11 a definition and 10 provided both. As part of the description or definition, 60 articles specified a particular application, with Second Life the most common (47 articles), followed by Active Worlds (8 articles). Some applications were specified in only one article and are collated under 'other' in **Error! Reference source not found.** which illustrates the frequency with which each term and application appeared within the review. It should be noted that some articles use more than one term (e.g. Honey et al., 2012) and some refer to more than one application (e.g. Johnson & Levine, 2008).

Table 1 Frequency of terms and applications

Term	Application				Total
	Active Worlds	Second Life	Other	None identified	
Immersive Virtual World	1	4		3	8
Multi-User Virtual Environment	1	9	2	4	16
Social Virtual World		2			2
Serious Virtual World			2		2
Synthetic world				3	3
Virtual environment		3			3
Virtual reality		1			1
Virtual world	6	28	4	26	64
Total	8	47	8	36	

Through analysis of the descriptions and definitions presented in each article, a set of 16 codes was developed:

- 3D
- Avatar
- Communication
- Educational
- Facilitated by networked computers
- Goal orientated
- Graphical
- Immersive
- Interact with environment
- Interact with objects
- Interact with people
- Multiple user
- Persistent
- Real-time
- Simulated
- User-generated content

The final analysis aimed to identify any notable differences in codes between terms and applications. From this analysis it is worth noting several points. The first is that both Quest Atlantis (which is described as *educational* and *goal orientated*) and Second Life (which is not) are described as MUVes. This suggests that there may be different ways to categorise the technology. However there are some key features present regardless of terminology. For example, *immersive* was used across terms, not just immersive virtual worlds (IVWs). It is also important to note that the code *goal orientated* included both goal and non-goal orientated virtual worlds indicating a distinguishing feature between different types of virtual worlds.

While some authors describe Second Life as a virtual world, others describe it as a 3D virtual world. While 3D can be used as a pre-fix to describe the type of virtual world, it is listed as a characteristic of virtual worlds by some. Despite this discrepancy across the

literature, *3D* and *graphical* are useful terms to delineate between early text-based MUDs (multi-user dungeon/domain depending on source) and current three-dimensional graphical virtual worlds. It is important to note that from a historical perspective, 2D graphical virtual worlds provided an intermediary step between text-based and 3D virtual worlds prior to the introduction of broadband and improved computer graphics (Bell et al., 2010), however they are uncommon in the current research literature.

Some authors described interacting with people, objects and the virtual environment as discrete features of virtual worlds (e.g. Richardson et al., 2011) whilst others described them as aspects of interacting with the environment (e.g. Braman et al., 2011). In the latter case, the environment includes both objects and people represented as avatars. Thus, as users interact with them in different ways objects, people and the environment were considered in the analysis as separate. In addition it is worth considering that users also 'act' within the virtual environment. That is to say they perform an action which may not be an interaction with a person, place or thing.

Finally some features, particularly *user-generated content*, are not available across all virtual world applications. For example, River City which was developed as a discrete implementation of Active Worlds, does not provide tools to create content. However the standard Active Worlds application provides all users with tools to create objects in the environment.

4. Definition

Through the analysis of codes across terms and applications, the codes *3D*, *educational*, *goal orientated*, *graphical* and *user-generated content*, were identified as criteria with which to distinguish between different virtual worlds. The remaining codes were used to create a final definition of the term virtual world:

A persistent, simulated and immersive environment, facilitated by networked computers, providing multiple users with avatars and communication tools with which to act and interact in-world and in real-time.

As per Bell's (2008) definition, each of the terms used in this definition is a characteristic of the technology and makes a specific contribution to the understanding of the definition. As such they are briefly discussed below.

Persistent: Persistence is a defining characteristic with which to distinguish between video games and virtual worlds. While multiple users can engage in online video games, either working together in a shared environment to achieve a common goal or playing against each other, video games are not persistent. A persistent environment remains whether users are logged in or not, retains the location of people and objects as well as information about object ownership. Thus, if a user creates an object and leaves it within the virtual world, a second user will view the object in the same location whether the first user is online or not. If the second user removes the object from the location, when the first user returns to the location they will no longer be able to view the object. This is achieved through the use of a client-server architecture, in which the central server(s) manages the persistence and interactions by storing serialized versions of the objects the user creates.

Simulated: In 20 articles *simulated* was used as a descriptor of virtual worlds, referring to the computer-simulation of the virtual world. A simulated environment can be designed to be similar to the physical world, which Boulos et al. (2007) note allows users to

engage in otherwise risky behaviour without harming themselves or others. Virtual worlds can also be designed to simulate a fantasy environment. The location of a user within the simulated environment, as represented by their avatar, is often described as being 'in-world'.

Immersive: The term *immersive* refers to the ability of some users to become immersed in the virtual world. However, as noted by Jennett et al. (2008), immersion is a term which is commonly used but seldom defined in the literature on games. This is also true of the literature on virtual worlds.

In a grounded theory study, Brown and Cairns (2004) identify three levels of immersion in gamers: engagement, engrossment and total immersion. Gamers who experienced total immersion, identified a sense of presence within the game in which they were no longer aware of the computer interface. However this was experienced rarely and it was much more common for users to experience engagement, in which they had overcome initial barriers such as learning controls, or engrossment, in which the game controls became 'invisible' and the user was less self-aware and more directly involved in the story of the game.

Whilst in virtual worlds, users' engagement may be influenced by interactivity and representational fidelity (Choi & Baek, 2011). In turn, a user's level of engagement has been found to influence the level of immersion (Brown & Cairns, 2004). Based on the work of Jennett et al. (2008) and Brown and Cairns (2004) immersion in virtual worlds is also likely to be a result of engagement, resulting in a lack of awareness of time, loss of awareness of the world outside the game environment and a sense of presence. Therefore, if users are able to move beyond initial barriers they will be able to engage in activities and have some sense of immersion. From this they may then experience engrossment and possibly total immersion. However immersion is only possible once initial barriers have been overcome.

Facilitated by networked computers: This term was a defining characteristic of virtual worlds identified by Bell (2008). Through a network of computers vast quantities of data about the virtual world are stored and shared. Thus a popular descriptor of virtual worlds is *online*. However to acknowledge the influence of Bell's (2008) definition, the definition presented in this paper uses the descriptor *facilitated by networked computers*.

Multiple users: Without the network of computers it would not be possible for multiple users to engage in a shared environment. While multiple users are characteristic of a variety of technologies including web2.0 tools and online games, the inclusion of *multiple users* in this definition highlights the importance of this characteristic. While users may interact directly with other users, they can also indirectly alter the experience of users they never meet due to the persistent nature of the technology.

Avatars: Each user is represented in the virtual world by an avatar, which has an associated inventory of assets. It is interesting to note that in Hinduism, an avatar is the representation of a god on earth (Parrinder, 1982). This representation could be as a human or animal and allows the god to act within the world and interact with humans.

In virtual worlds avatars also have agency (Bell, 2008). Controlled by the user, they provide a representation of the user within the environment and can be used to interact with others. As such the avatar, rather than the user, is described as interacting with an object in the virtual world, although it is understood that the avatar is controlled by the user. Thus, there is a clear distinction between virtual world avatars and static icon avatars, for example those used on forums or social networking sites, which do not have agency.

Communication tools: Communication tools are essential in virtual worlds, facilitating communication between users. Depending on the application these tools include voice and text based media, through public and private messaging systems.

Act and interact in-world: Facilitated by the network of computers, users are able to perform actions and interact with other people and objects in the simulated environment. As noted, these actions may be through communication tools or mediated by the user's avatar and are often referred to as taking place *in-world*. This term is often used to identify the locus to be in the virtual world. The use of *in-world* aims to address the contentious issue of using the terms *real* and *virtual*. It is argued that the use of *real* and *virtual* creates a dichotomous perspective in current research resulting in inaccurate assumptions, for example between *virtual identity* and *real identity*, (Lehdonvirta, 2010). Instead, *in-world* highlights that the user is performing an action within the virtual world environment.

Real-time: Unlike a simulation in which many hours may pass in a matter of minutes, *real-time* highlights that actions are not only performed synchronously but according to time constraints in the physical world.

5. Classification

The definition of virtual worlds does not distinguish between text and graphical virtual worlds and does not account for all 16 codes derived from the analysis of the literature. To address some of the differences between individual applications, the remaining codes (*graphical*, *3D*, *goal orientated* and *user-generated content*) were used as criterion with which to classify the different types of virtual worlds (Figure 1).

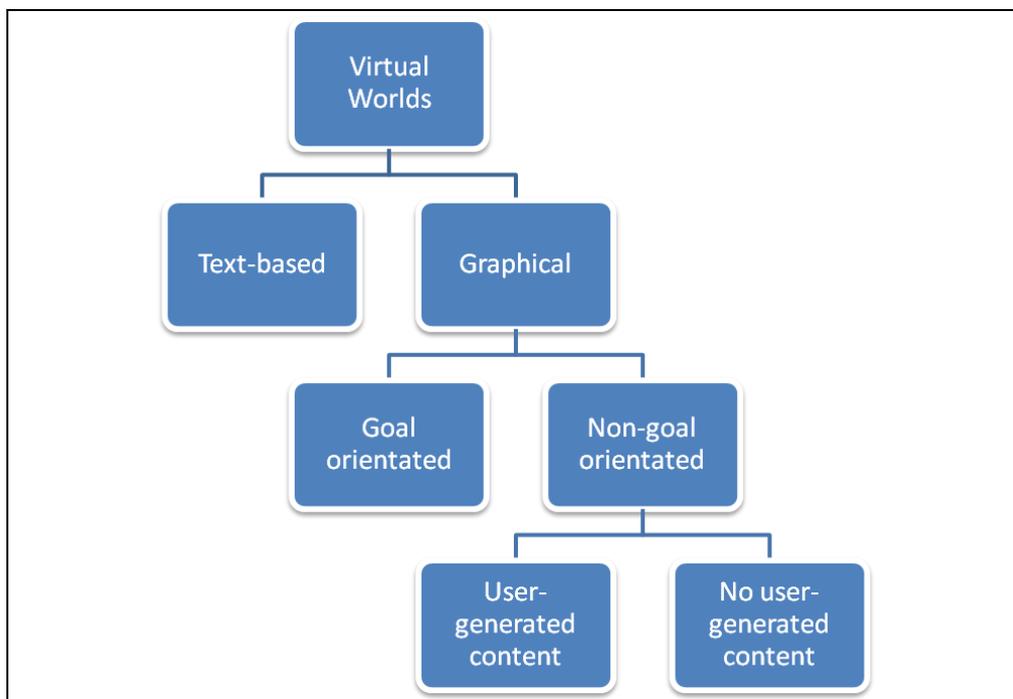


Figure 1 Classification of virtual worlds

The initial distinguishing criterion is whether the virtual world is text-based or graphical. As previously highlighted, from a historical perspective graphical virtual worlds can be further sub-divided into 2D (e.g. The Manor) and 3D, however the use of 2D virtual worlds is uncommon in the more recent research literature.

Having identified whether the virtual world is text-based or graphical, the next criterion considers whether the virtual world is goal orientated or not. There are a wide range of goal orientated virtual worlds designed as games, typically known as MMORPGs (massively-multiplayer online role-playing games) such as World of Warcraft. Other goal orientated virtual worlds such as Quest Atlantis and River City are designed to provide users with an educational experience and are often termed serious virtual worlds. All goal orientated virtual worlds have a pre-designed narrative in which users must achieve goals in order to advance. Non-goal orientated virtual worlds lack this narrative and an inherent set of goals for users to achieve.

Finally, the construction of user-generated content within the virtual world is currently only available in non-goal orientated virtual worlds. Although a certain level of customisation is available in goal-orientated virtual worlds, it is difficult to introduce user-generated content into a pre-determined plot. With further developments this may change in time. Although currently restricted to non-goal orientated virtual worlds, user-generated content is not available in all such virtual worlds, or to the same extent. For example, the now unavailable Lively, Google's browser-based virtual world, did not allow user-generated content. There.com provides users with the opportunity to create content however this needs to be submitted and approved, before it can appear in-world. Whereas Second Life allows users to freely generate and distribute content. The influx of non-goal orientated 3D virtual worlds launched since 2008, tend to avoid user-generated content.

Conclusion

The current ambiguity in the use and understanding of the term *virtual world* limits advancement of research and has the potential to render the term analytically worthless. To address these issues, this paper has presented a definition and set of criteria for the classification of virtual worlds.

The definition has been developed through analysis of definitions and descriptions of virtual worlds and associated terms in the literature. It is designed to be applicable to increasingly popular platforms such as OpenSim as well as future virtual worlds. The classification of virtual worlds has the potential to be further expanded with new technical developments, however the addition of criteria should not be over-extended so as to classify the minutiae.

The meaningful classification of virtual worlds will limit ambiguity in the literature which has emerged through the use of multiple terms each used in different ways in various fields. For example, the term immersive virtual world, suggests that there are virtual worlds which are not immersive. However by definition all virtual worlds are immersive. By comparison a virtual world may or may not be goal orientated.

It is intended that this definition of virtual worlds will provide clarity to researchers, particularly those new to the field. While over time, with further discourse and technical developments, it is expected that the emerging classification of virtual worlds will be developed in to a rich classification system.

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