Towards Virtual Reality games

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Towards Virtual Reality Games

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Abstract

Game engines of cinematic quality, broadband networking and advances in Virtual Reality (VR) technologies are setting the stage to allow players to have shared, "better-than-life" experiences in online virtual worlds. We propose a mechanism of merit-based selection of players, as a solution to the long-standing problem of limited access to VR hardware.

1 Games and Virtual Reality: Worlds Apart

Games, including online virtual worlds, populate the entertainment arena of the consumer market. They are engaging, mass produced, inexpensive, targeting wide audiences. Visual realism in games approaches cinematic quality. The amount of 3D content available online today exceeds what can be explored in a single person's lifetime. In contrast to gaming, VR systems require expensive hardware and customized software. They are available for limited audiences. VR systems are difficult to maintain and upgrade. Both the visual quality and the extent of virtual content are typically lower than in games. Nevertheless, VR has one feature that makes it stand out from all other platforms: the unmatched sense of presence, delivered by immersion and body tracking. The ability to make users believe that they actually "are there" has made VR a tool of choice for medical, military, and extreme condition training applications. We discuss a concept of Virtual Reality Games that will combine the best features of games and VR: large persistent worlds experienced in photorealistic immersive settings. We suggest several solutions for bridging the gap between the two platforms.

2 The Current State of Integration of Computer Games and VR

Games are already entering what used to be exclusively VR territory by incorporating elements of body tracking into user interface controls. The remarkable success of Nintendo's Wii underscores the value of physical interactivity in gameplay. Another example is the Sony EyeToy camera, which spawned a family of games that utilize user body motions.

VR technologies are also experiencing steady growth in both high end and inexpensive systems. Optical trackers may cost as little as a single web-camera, and cover a few feet of tracked area. High end trackers, such as PPT from WorldViz are capable of capturing user motions in a 50 x 50 x 3 meter area, with sub-millimeter precision. Head Mounted Displays (HMD) are also advancing rapidly. The model shown in Figure 1 has 1920 x 1200 pixels per eye and 120° field of view. It weighs only 350 grams. More about wearable headsets may be found in Rolf Hainich's book [2006].

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Figure 1: *Using an HMD and motion trackers, players will be able to literally walk into this 3D scene, with 360° viewing. Image credits: Crytek GmbH (Crysis game), Sensics Inc (xSight HMD).*

2.1 Several Examples of Augmented Reality Games

Advances in VR hardware and increased availability of VR equipment have stimulated the creation of novel gaming applications, especially in the field of Augmented Reality (AR). In AR systems, virtual content is fused with real environments. Examples are: Human Pacman game [Cheok et al. 2003], AR Second Life Project at Georgia Tech, where 3D avatars are brought into real scenes [Lang et al. 2008]. In *AR Façade* game [Dow et al. 2008], players are interacting with a virtual couple in a physical apartment, using speech and natural body movements.

2.2 New Interface Devices for VR Games

In 2008, NeuroSky introduced MindSet, a wearable device which may become an icon for the integration of games and VR [1]. MindSet has sensors that read and analyze the brain activity of players in real time. During the game, Brain Computer Interface module translates user intentions into game actions. A similar product, EPOC Neuroheadset, has been announced by Emotiv Systems [2].

To summarize: in the past decade, games and VR systems have been increasingly growing towards each other, including both hardware components and user interface techniques.

Figure 2: *Brain Computer Interface headsets: MindSet by NeuroSky (left), EPOC Neuroheadset by Emotiv Systems (right).*

[1] NeuroSky Inc., http://www.neurosky.com
[2] Emotiv Systems, http://www.emotiv.com

However, VR equipment still costs too much to be a gaming platform for general audiences, deterring game developers from adding support for VR components to game engines. For example, CryENGINE-2 by Crytek does not have an option for stereoscopic rendering, even for single viewport configurations used in mid-range HMDs (V8, eMagine, NVisor, etc). High-end HMDs, such as Wide5 from Fakespace Labs and pSight and xSight series from Sensics, require multipass or tiled rendering, which makes them very hard to integrate into most gaming engines. The gap between games and VR may still be too large to justify efforts to make game software VR-compatible.

3 Making a Virtual Reality Game

Gaming industry operates under "everyone plays" business model, which created a standard platform: a personal computer or a game console and a TV set. In order to bring VR into play, we propose to extend this model to "everyone plays on a console, advancing players continue in VR". Acknowledging that making a full title VR game for a general audience does not seem to be practical, we suggest reducing VR-playable content to short episodes and making them available to selected players. The key elements of the proposed design are described below.

• **VR Game Pockets,** or selected episodes of the game that can be played using VR equipment: HMD, trackers and other devices. For example, a game may have a carnival scene, where players can walk around and try different attractions. Some of these attractions might be VR-enabled, such as a traditional "Whack A Mole" game which lends itself exceptionally well to implementation in VR (Figure 3). This game was described in "The Irresponsible Captain Tylor" anime series in 1993.

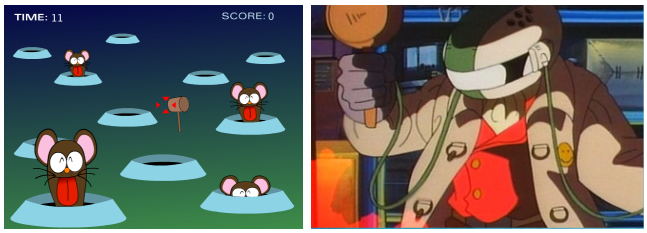

Figure 3: *"Whack-A-Mole" VR Game: the first person view of the field with popping targets (left), the player, wearing an HMD and a tracked hammer (right). Image credits: www.tylor.com.*

Figure 4 shows a more recent and more realistic example. This golf game is currently under development by Avatar-Reality [3], as one of the attractions on Blue Mars Virtual World. Although Blue Mars is designed for non-VR platforms, this episode provides a good illustration of what VR pockets may look like. VR Golf will require tracking of user head and both hands, for making a perfect swing. Travel on the golf course can be conveniently implemented with a virtual golf-car, using a "point-and-go" steering metaphor.

• **Merit-based Selection Among Players** will balance the demand for and availability of VR resources. The game will have a specific scoring system. Progress of all users will be monitored and compared with the number and status of locally available VR stations. The number of advancing players who will be awarded the "VR-status" will depend on availability of VR equipment. The amount of time each user will be allowed to spend in VR will also be quantified by the scoring system.

[3] http://www.avatar-reality.com

Figure 4: *Snapshot from the golf course on Blue Mars Virtual World. Credit: Avatar Reality Inc.*

• **Access to VR Gaming Stations** will be arranged according to the nature of the game and the target audience. For example, in first person shooters, players will begin the game at home. After earning a "VR status", they will continue the game at their local gaming arcades. The merit-based selection mechanism will ensure that there will be no long lines at VR booths. In educational games, developed for schools and colleges, advancing students will use VR stations installed and maintained on campus. VR stations may be also set up at conferences and conventions, especially if these events are co-located with trade shows of VR hardware manufacturers. Government agencies that have their own VR research and training facilities, such as NASA and US Army, might provide support for developing and hosting VR games for recruitment and training.

4 Conclusion

Games and VR have been increasingly adopting technological and social features of each other. However, creating a commercial VR game still remains problematic, because it challenges conventional business practices of game production. Intense competition in the gaming industry allows little room for creating applications that do not immediately improve the gameplay for intended audiences. Perhaps a mixture of funding strategies, both from government institutions and private investors, will provide the impetus for additional development of Massively Multiplayer VR Games that will combine the best features of traditional computer games and VR.

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