

Are We Ready for a VR Classroom? A Review of Current Designs and a Vision of Future Virtual Reality Classrooms

Chunming Gao

School of Engineering & Technology
University of Washington, Tacoma
Washington, USA
chunming@uw.edu

Yan Bai

School of Engineering & Technology
University of Washington, Tacoma
Washington, USA
yanb@uw.edu

Bryan Goda

School of Engineering & Technology
University of Washington, Tacoma
Washington, USA
godab@uw.edu

ABSTRACT

With the advance of head-mounted virtual reality technology and their lower cost, it is foreseeable that an online course can be delivered in a virtual reality (VR) classroom. This paper introduces head-mounted VR technology, discusses the current designs of VR applications, and depicts a vision of future VR classrooms.

KEYWORDS

Virtual Reality; VR classroom; future classrooms; online learning

1 VR INTRODUCTION

In the past few years, head-mounted devices (HMD) for virtual reality (VR) has garnered both academic and industry interests due to HMDs' enhanced immersive effects and their lower cost. Wearing a VR headset, a user is fully immersed in a 3D virtual environment created by using 3D recordings or 3D programming. Multiple users may reside virtually in the same space, whose presence and activities are represented by avatars [1]. They may interact with each other and interact with the objects and surroundings in the virtual space. We can imagine that a creative virtual classroom enabled by VR technology will inevitably impact online course delivery to the extent that it might foundationally transform the future classrooms [2].

2 CURRENT DESIGNS

Currently most VR applications are developed for 3D video games, of which the features can be readily adopted for educational gamifications. Applications for educational purpose are still in their infancies and prototypes. We examine a few representative educational VR applications developed on HTC Vive VR headset. One application named *Future Classrooms* demonstrated a 3D VR classroom where the user can walk around the classroom, watch video introductions, make module selections, observe 3D videos, and interact with the objects in the 3D virtual space. Some applications demonstrate human body anatomy and physiology.

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In the simulated 3D space, while a recorded audio instructs, the user can examine animated 3D human organs, watch the blood cells flowing in the artery, and interact with the cells. The application *Virtual Desktop* develops an auditorium where the user's desktop can display on the large screen at the front. However, it is still a single user application. In [1], authors developed a virtual conference room where multiple users can enter a virtual room from different locations, interact with each other, and share the same PowerPoint presentations. While current educational applications are mainly single user based, most entertainment applications have already been multiple user based, where users can demonstrate to each other their skills interacting with the objects in the virtual environment. Another category of applications are 3D recordings of places and events which can also be adopted for future classroom applications.

3 A VISION OF FUTURE VR CLASSROOMS

A VR classroom will be highly immersive and highly interactive. The instructions can be in pre-recorded format or delivered live by an instructor. Students will need a VR set to participate. If it is pre-recorded, the advantage is that it can be repeated but without a live instructor's guidance. If it is delivered live, it is fundamentally an online lecture that requires students to attend at the specific time. Either way, the instructor and students do not have to commute to campus while still experience the 3D classroom gatherings. Furthermore, wearing the headset, the learning environment is fully enclosed and students will solely focus on the learning activities. Due to the avatar representations for presence, students will feel fiction-like experiences which would encourage their active participations and collaborations [2]. Additionally, special effect maybe created for demonstrations such as visualizing the data encryption and decryption processes and visualizing the transmissions of wireless signals in 3D space. A VR classroom with so much potential brings an unprecedented opportunity to innovate and transform IT education.

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