Chapter 12
Integration of Augmented Reality and Virtual Reality in Building Information Modeling: The Next Frontier in Civil Engineering Education

Sai Rohit Chenchu Boga
VIT University, Chennai, India

Bhargav Kansagara
VIT University, Chennai, India

Ramesh Kannan
VIT University, Chennai, India

ABSTRACT

In an educational perspective, unlike other disciplines, hands-on practice is difficult to come by in Civil Engineering. By providing a student with a realistic 3D simulation, we propose a concept that improves the understanding of the individual and eliminate guess-work entirely. Our platform that makes education fun and interactive by eliminating the constraints of a conventional teaching environment by incorporating Virtual Reality (VR) or Augmented Reality (AR) as a tool. AR can help the target audience visualize a model (to scale) in all three dimensions in the palm of their hand. This chapter explores the use of interactive 3D game environments in design visualization in Building Information Modeling (BIM) by adopting various available software packages and APIs. VR will allow the prospective customer to enter and explore a structure before it is constructed. This can be achieved by making use of a powerful game engine, in this case, Unity3D. In this chapter, we will describe ways to pivot Unity's functions towards the benefit of civil engineering.

DOI: 10.4018/978-1-5225-2110-5.ch012

INTRODUCTION

As defined by Wikipedia, "Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data" (Wikipedia, 2016a). Augmented Reality helps improve the person's optical sense by superimposing a computer generated image over the user's view of the real world. By contrast, virtual reality replaces the real world with a simulated one. With newer AR technology like adding computer vision and object recognition, the surrounding world of the user becomes interactive and docile. Information about the environment and its objects is overlaid on the real world. See Figure 1.

In technical terms, virtual reality or virtual realities (VR), also known as immersive multimedia or computer-simulated reality, is a computer technology that replicates an environment, real or imagined, and simulates a user's physical presence and environment in a way that allows the user to interact with it (Wikipedia, 2016b). Simply put, Virtual Reality can be defined as the digital emulation of an environment that can be experienced by a person's multiple senses. An individual has more senses than the standard five of taste, touch, smell, sight and hearing. For example, the sense of balance is essential to human locomotion.

Our entire perception of reality is a combination of sensory information processed by our brain. With virtual reality, we present our brain with made-up information, and trick it into believing in a world that doesn't actually exist.

The pace of technological evolution and adoption is growing exponentially in the modern age. Every major stream of science and art rushes to incorporate the next "big thing" developed by technology. We have seen this in the past. We will continue to see the same trends in the future. Beginning before 1900, it took a couple of decades for the telephone to touch 50% of households. It took five years or less for cellphones to accomplish the same level of penetration in 1990. These statistics are reported from the Harvard Business Review (McGrath, 2016). HBR goes on to state that, by analogy, firms with competitive advantages in those areas will need to move faster to capture those opportunities that present

Figure 1. Consumption spreads faster today -Harvard Business Review