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Virtuality Continuum´s State of the Art

Héctor Olmedo*

Universidad de Valladolid, ETSII, Campus Miguel Delibes s/n, Valladolid, CP. 47001, Spain

Abstract

In order to have a better and global knowledge of the possibilities for implementing applications based on Virtual Reality and Augmented Reality, a state of the art is presented in this paper. Its purpose is making easier for new researchers or developers knowing the situation and capabilities of these technologies. From the definition of the Virtuality Continuum concept, applications are grouped in those using VR and others applying AR techniques. The ones based on a MR are explained too. Relating to the situation of these technologies nowadays, sectors of application, professional profiles, training offers and standards developed are presented with a prediction of future research lines.

1. Introduction

This paper is intending to deeply introduce the situation of Virtual Reality (VR), Mixed Reality (MR) and Augmented Reality (AR). In the first three sections, each one will be presented in a history, components and tools basis. In section 5, a global vision of the situation of these technologies will be presented introducing the sectors where they are applied, the possibilities to learn about them, the required professional profiles and the standards being developed. Having a global knowledge of the situation, a prediction of the future researching lines will be discussed in section 6. Finally, last section will conclude with the point of view of the author.

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* Corresponding author.
E-mail address: holmedor@gmail.com.

2. Virtual Reality

It produces an appearing of reality that allows the user to perceive a sensation of presence inside of it. It is got through producing a set of images watched by the user through screens, head mounted displays, etc. Some equipment are complemented with wearings and gloves with haptic sensors designed to simulate of different tactile stimuli that intensify the sense of reality. There are several definitions for VR: "Synthetic Reality", "Virtual Worlds", "Cyberspace", "Virtual Environments" and more particularly "Presence" but the most appropriate is the definition that says VR consists of interactive tridimensional simulations reproducing environments and real situation [1]. It is said that a VR application must have these conditions:

1. Simulation, referred to the ability of being a system allowing the representation of a reality;
2. Interaction, to control the system or world represented;
3. Perception, allowing lying to the senses through external elements.

2.1. History

It is a relatively new concept despite of being developed at late 1950s visual devices similar to the ones used in VR applications. But not before the late 1980s it is extended the concept of VR, to be exploited at 1990s by scientific, military, visionary and technologic enterprises. Several of the most relevant projects are shown at table 3.

2.2. Components

• Vision devices: Where virtual world is shown (Computer monitor, laptop screen, TV screen, projector, mobile device screen, tablet screen, video console screen, OPI/MUPI, CAVE, etc.)
• VR SW: Program managing virtual data.
• Interaction devices: keyboard and mouse, joysticks, haptic devices, etc.

2.3. Tools

Despite of the existence of a lot of this kind of tools, some of the most popular tools used to develop 3D virtual environments are mentioned at Table 1.

Table 1. VR Tools

VR Tools	Description
Autodesk 3D Studio [2], Blender [3], CINEMA 4D [4], Autodesk Maya [5]	Modeling, animation, simulation and 3D rendering SW for game, movies and motion graphics developers
Adobe Director [6], Adobe Flash [7], Microsoft Silverlight [8]	Application for multimedia SW development
Ajax3D [9], Java3D [10], X3DOM [11]	X3D [12] based API for 3D development
Away3D [13], Unity [14]	3D engine

3. Augmented Reality

It produces a direct or indirect vision of a physical environment from the real world, whose elements are combined with virtual elements at real time. It generates stimuli at real time for the user's interaction that are superposed over the physical environment of the user. It is made through a set of devices adding virtual