Chapter 1
A Concise Guide of AR Features, Types, Key Technologies, and the Dynamic Applications Landscape

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ABSTRACT

This chapter offers a concise introduction to augmented reality (AR), starting with an overview of its core ideas. The next sections explore the unique features that differentiate AR from other immersive technologies, how AR is classified, and the wide range of applications that AR technology can be applied to. AR's versatility is clear, opening the door for revolutionary effects on user experiences in a variety of industries, including healthcare, education, entertainment, and more. This study envisions a future in which AR becomes more widely integrated, enhancing daily life and creating new opportunities for creativity and discovery as technology continues to erase the lines between the digital and physical worlds.

Figure 1. Realist-virtual continuum
(Milgram & Kishino, 1994)
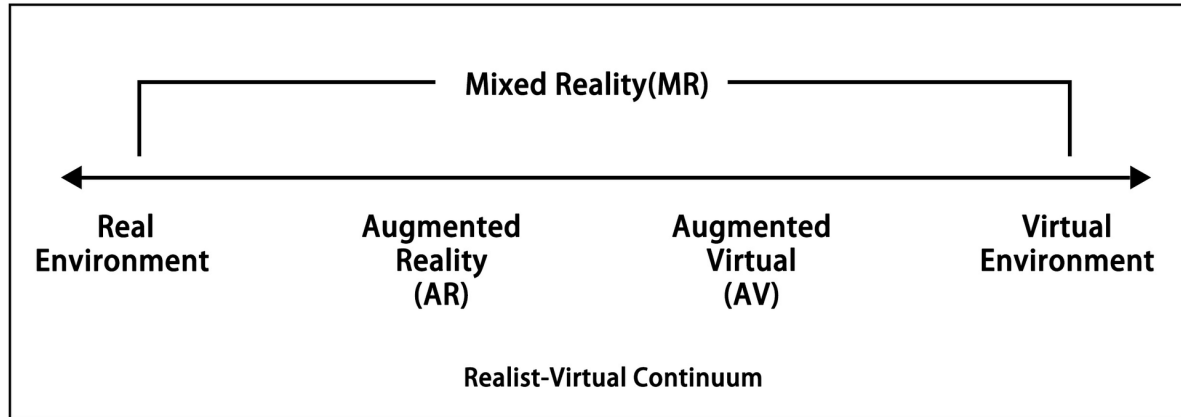
INTRODUCTION

Augmented Reality (AR) is a technology that integrates digital information and virtual content into the real-world environment, enhancing the user's perception and interaction with their surroundings (Doerner et al., 2022). One of the prerequisites for the development of AR is the capacity for imagination, the inclination to supplement something that is not present or even cannot exist in this world, and yet be able to perceive it as a reality, maintaining a connection to the physical environment (Aleksandrova, 2014; Papanastasiou et al., 2019). Although AR technology traces its origins to the realm of interface research in computer science (Sutherland & Mead, 1977), the term "augmented reality" was first coined in 1990 by Tom Caudell, a researcher at Boeing, who had been tasked with modifying expensive diagrams and markers to assist workers on the factory floor (Caudell & Mizell, 1992). The AR research carried out by Ronald Azuma and his team in 1997 (Azuma, 1997) and later in 2001 (Azuma et al., 2001) was highly influential and fruitful. Ronald Azuma proposes to define AR as: combining real and virtual elements, interactive in real-time and registered in 3D.

Because AR is based on technologies developed in VR, it depends on the real world in addition to allowing interaction with the virtual world (Azuma, 1997). Augmented reality is a hybrid of virtual reality (VR) and digital video processing and computer vision technologies (Davies, 2005; Kovalenko et al., 2022). However, as Figure 1, the Realist-Virtual Continuum (Milgram & Kishino, 1994), illustrates, there are significant differences between AR and VR. The actual and virtual worlds are at different ends of the continuum, while "Mixed Reality" is represented by the intermediate transition region. While "Augmented Virtual" is more in line with the virtual world, "Augmented Reality" is more in line with the real one.

Now, AR overlays computer-generated graphics, sounds, or other data onto the physical world, typically viewed through devices like smartphones, AR glasses, or headsets. Moreover, AR finds applications in various fields, including gaming, education, healthcare, and industry, offering users an enhanced and interactive perspective on their environment for practical and immersive experiences while maintaining a connection to the physical world (Iatsyshyn et al., 2020).

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