

AUGMENTED REALITY THE HORIZON OF VIRTUAL AND AUGMENTED REALITY: The Reality of the Global Digital Age

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Virtual Reality (VR) is 3-D spatial environment in which users can participate in real-time. VR is a computer-generated interface that involves real-time simulation and interactions through multiple sensorial channels. Although virtual reality replaces the real world with a simulated one, Augmented Reality (AR) mixes or overlaps computer-generated virtual objects with real-world scenes or objects. AR enhances one's current perception of reality by integrating virtual objects into a physical scene. AR technology provides a facility to overlap real video images with virtual computer graphics images. This generated virtual objects become, in a sense, an equal part of the natural environment.

Nowadays Augmented and Virtual Reality technologies are increasingly being used in fields such as: entertainment, military; medicine; education; engineering design; robotic; telerobotic; manufacturing, maintenance and repair applications; consumer design; psychological treatments.

This book collects the case studies of AR and VR technologies and applications, new techniques, theory and standards. This book gives information about potential, a continued strength, and penetration of AR and VR technologies in various application domains. It also addresses challenges facing the development of the technology. The book's broader audience is anyone who is interested in the field of AR and VR and the deployment of the technology in various novel applications.

The book is edited by Soha Maad who is an Associate member of HRB Centre for Primary Care Research, Royal College of Surgeons in Ireland. It is consisted of 230 pages covering 13 articles and provides information about potential applications of AR and VR technologies. It is divided into three categories.

The first category considers novel approaches for the development AR and VR technologies. Chapter 1 presents some tools that apply multiple coordinated views or augmented reality to different fields in information visualization.

Chapter 2 explores major challenges associated with AR and addresses the latter of these challenges. Chapter 3 presents a hardware/software co-design strategy based on Field Programmable Gate Array (FPGA) devices and Electronic System-Level (ESL) description tools as an alternative to the traditional software-based approach. The objective of this chapter is to provide a clear vision of the possibilities of FPGA devices and the new development methodologies for embedded AR systems.

The second category considers the penetration of AR and VR technologies in various application domains including healthcare, medicine, assembly, entertainment, etc. Chapters 4 and 5 are covering the penetration of AR and VR technologies in medical and healthcare applications. In Chapter 4 a realistic virtual harp was created to assist individuals with disabilities for their rehabilitation therapy using augmented reality technology and a haptic device. Chapter 5 focuses on activity to facilitate minimally invasive treatment: the development and application of augmented reality (AR) technologies for guidance and navigation during surgical procedures. On the other hand chapters 6, 7, 8, and 9 are covering the penetration of AR and VR technologies in assembly and industrial applications. Chapter 6 speculates the issues and discrepancies involved in the present practice of assembly task, recommend a novel utilization of AR animation technology in this area, and discusses the potentials of using AR animation in guiding product assembly task. Chapter 7 investigates tangible interfaces and AR. A novel and efficient interaction paradigm was developed with the digital master for better perceive, understand and add contents to Engineering Data Management (EDM) knowledge. Chapter 8 gives suggestions for smooth and effective introduction of AR technology to industries. They review how the performance of workers using AR-based manuals is changed by differences in the workers themselves, the work environment and the information presented by HMDs, based on behavioral, physiological and psychological data. In chapter 9, a novel non-rigid registration method for augmented reality applications with the use of AAM algorithm and factorization method which can obtain the 3D shape basis, object configuration and 3D pose simultaneously is introduced. And finally chapters 10 and 11 are covering the penetration of AR and VR technologies in entertainment and service oriented applications Chapter 10 evaluates the effectiveness of augmented reality (AR) user interface for playing card games and chapter 11 studies on the visualization techniques of geographic information in augmented reality environment.

The third category considers the horizon of emerging new potential applications of AR and VR technologies. Chapters 12 assesses the potential of Virtual Reality and Augmented Reality technologies in supporting the dynamics of global financial systems and in addressing the grand challenges posed by unexpected events and crises. Chapters 13 covers the potential support of AR and VR technologies for social application domains and activities and it presents a framework for multi-disciplinary collaboration.

Finally this book presents applications and case studies that provide useful information about challenges, pitfalls, and successful approaches in the practical use of AR and VR technologies. The book is ideal for understanding the potential of those technologies. As a result, the implementations and recommendations are provided about AR and VR technologies in detail could be a good point of view for practitioners and researchers.

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