Preface

INTRODUCTION

Virtual immersive spaces have become popularized first with immersive and persistent gaming multiverses, which then evolved into persistent virtual worlds with differing quests and wider varieties of human-embodied avatars. The types of virtual spaces that humans could interact in and through became more complex and more evocatively real. They encompassed more complex automation in digital objects, artificial intelligence-driven humanoid robots, and in-world physics and environmental spaces.

These virtual spaces enabled rich, mediated learning over distances and time—but in immersive and experiential ways that were unprecedented. The research literature describes role-playing scenarios, with whole regions built up for particular historical or cultural enactments. Rich social gatherings—concerts, dances, parties—are held to bring together human-embodied avatars, which connect also as people out in the real world. Businesses held conventions, rolled out new product lines, offered trainings, and set up automated experiences in 3D synethetic worlds. Budding filmmakers created machinima experiences and showcased their films both in-world and out in the real. Artists created fantastical multisensory objects; dancers collaborated with other dancers for new original performances; architects built creative structures online, and many engaged in co-design and virtual collaborations in immersive spaces. Scientists designed mixed-scale experiences at the nano-level, or they created weather events online. Instructional designers built various simulations of machines, biological ecosystems, environments, and social experiences. These new virtual immersive affordances sparked the interest of those in higher education and corporations.

For readers, it may be a bit of a mystery how *Virtual Immersive and 3D Learning Spaces: Emerging Technologies and Trends* came into being. The initial vision for this text came with the popularization of virtual worlds, immersive collaborative spaces, and 3D simulations, in higher education. These spaces may provide rich experiential and interactive learning for the new generations of learners today. The question then is how these spaces may be exploited for effective learning in terms of the technologies, pedagogical strategies, and directions.

A SELECT TALENT POOL

Once this project was greenlighted, I learned that while the pool of potential talent on a global scale is theoretically wide. There are dozens of electronic mailing lists, hundreds of direct email contacts, organizations, publishers, and many Web-based venues through which to publicize this endeavor—includ-

ing the formidable contacts of the publisher. Yet, from the many who could, there are an elite few who actually delivered the goods on time and with high quality. The authors here bring decades of expertise to the topic, and they were willing to do the heavy lifting of research, writing, revision, and polishing to get this text into your hands.

Academic work has always necessarily been global. There is the camaraderie of shared research and learning work to enhance a field and to move it forward in constructive ways. In this loosely-coupled community, we find plenty of mutual respect and cooperation, in an environment of friendly competition. From this global mix emerge diverse ideas and research approaches. New knowledge may be surfaced through a variety of means: reflection and introspection; qualitative, quantitative, and mixed methods research; and the application of domain-specific, cross-domain, and interdisciplinary explorations.

Some contributors to this book worked singly; others worked on local (and global) teams to evolve their research, analysis, and writing. Each has brought some fresh insights and experiences to virtual immersive learning.

Rewards in publishing are often indirect, without much in the way of financial incentives. Those pursuing tenure may add an extra line to their tenure reports, and professionals may add a snippet to their curriculum vitaes (CVs). Those pursuing grants may add a line about their publications to further polish their professional standings. The truth is that those who've contributed already have long track records of accomplishments and collaborative work. Their writing—which certainly have required many, many long hours of research, analysis, and writing work—have been included in no small measure because of their goodwill and their dedication to their respective fields.

THE BOOK'S ORGANIZATION

Virtual immersive spaces bring with them plenty of promise, of sensory information-rich learning experiences that will enable a much wider range of experiential learning and training—delivered to computer desktops, augmented reality spaces, digital installations, and mobile projective devices. The perceptual affordances of 3D immersions with sound, and the integration of haptics and olfactory interactions, suggest a much wider range of mediated learning than has been achievable in the past. The work of the authors of this text helps push the conceptual and applied boundaries of virtual immersive learning.

This book consists of five sections. Section 1, "Virtual Immersive Spaces and their Popularization," opens with Gavin McArdle, Bianca Schön, and Michela Bertolotto's chapter *Assessing the Application of 3D Collaborative Interfaces within an Immersive Virtual University*. This chapter describes two studies examining the Collaborative Learning Environments with Virtual Reality (CLEV-R) interface for usability and performance in this virtual reality environment. Chapter 2, *Virtual Worlds: Corporate Early Adopters Pave the Way* by Catherine M. J. Lithgow, Judi L. Davidson Wolf, and Zane L. Berge, discusses the affordances of multi-user virtual environments (MUVEs) for training—in a variety of corporate, military, and educational contexts.

Section 2, "Immersive Learning Strategies," focuses on factors that enhance achievable learning in 3D environments. Laura Benvenuti and Gerrit C. van der Veer's *Practice what you Preach: Experiences with Teaching Virtual World Concepts in a Virtual World* (Chapter 3) work focuses on the application of a virtual world (Asterix Village) used to effectively teach about virtual worlds and the lessons learned for students, lecturers and researchers. In Chapter 4, *Learning Assignments in Virtual Worlds: Theoretical Systematization and Didactical Requirements*, the authors Tanja Adamus, Nadine Ojstersek, Axel Nattland, and Michael Kerres analyze the types of learning assignments that may best be applied in virtual

worlds based on both learning theory and practice. Ya-Chun Shih, in Chapter 5, *Immersive Language Learning in Collaborative Virtual Environments: The Current Status and Possible Trends*, describes the acquisition of foreign language learning in collaborative virtual environments, with rich strategies to enhance the learning experience. Caroline M. L. Ho asserts the importance of strong learner presence in enactive role plays for learning because of presence-based implications on learner engagement and identity. She shows how discourse behaviors may be analyzed to detect strong vs. weak presence in Chapter 6, *Unpacking Strong vs. Weak Presence in Second Life*.

Section 3, "The Design of 3D Immersive Spaces," examines the way immersive spaces may be constructed for learning. Nita J. Matzen, William Edward Roberts, Penny Barker, and Julie Marklin, in Chapter 7, *Collaborating to Learn: Designing and Building 3D Immersive Virtual Learning Environments for Exploring STEM Concepts in Middle School* highlights a remarkable project that enhances science, technology, engineering and math concepts for middle school learners; theirs is an ambitious and effective project that characterizes the design of challenging fun for learning. Mark J.W. Lee and Barney Dalgarno's *Scaffolding Discovery Learning in 3D Virtual Environments: Challenges and Considerations for Instructional Design* offers a solid model for conceptualizing the scaffolding of discovery learning in immersive spaces—both theoretically and in practice; these authors use their learning from the design of a 3D virtual chemistry laboratory to illuminate their findings. Next, in Chapter 9, *Legal and Ethical Aspects of Teaching in Selected Social Virtual Worlds: A Review of the Literature*, Rosemary S. Talab and Hope R. Botterbusch present fresh insights on the laws and ethics that underpin the design and uses of virtual spaces for learning; they include insights for K-12 through university learning. Otto Borchert, Ben Dischinger, Guy Hokanson, Philip E. McClean, Brian M. Slator, and Bradley Vender, in Chapter 10, *JavaMOO Virtual Cells in Science Learning*, offers an in-depth look at the design of a 3D science learning space about cells. Shalin Hai-Jew, in Chapter 11, *Capitalizing on Immersive Persistence as an Emergent Design Concept (A Position Paper)*, considers some ways to magnify the benefits of time continuance of virtual spaces in terms of learning, digital resource protection, human relationship management, and information exchange and management.

Section 4, "Technological Accessiblity Functionalities" showcases two chapters that enhance human usages of immersive spaces through accessibility affordances. In Chapter 12, Kanubhai K. Patel and Sanjay Kumar Vij's *A Computational Model of Non-Visual Spatial Learning* offers a refreshing and mutli-disciplinary approach to non-visual spatial learning through virtual learning environments, based on the Landmark-Route-Survey (LRS) theory. Nicoletta Adamo-Villani and Kyle Hayward, in *Signing Avatars*, showcase a powerful tool of communications through animated (facial and gestural) signing avatars to improve deaf education in immersive spaces.

Section 5, "Risks in the Immersive Learning," examines the importance of thorough design to avoid learner misconceptions. Miguel A. Garcia-Ruiz, Jayshiro Tashiro, Bill Kapralos, and Miguel Vargas Martin examine the phenomena of potential dangerous misconceptions with serious games in healthcare in Chapter 14: *Crouching Tangents, Hidden Danger: Assessing Development of Dangerous Misconceptions within Serious Games for Healthcare Education*. Shalin Hai-Jew, Roger McHaney, and Brent A. Anders discuss *Mitigating Negative Learning in Immersive Spaces and Simulations* in Chapter 15. This last chapter includes appendices focusing on simulations in business and military applications and the ways that misconceptions may be headed off.

Virtual Immersive and 3D Learning Spaces: Emerging Technologies and Trends evolved from some serendipity and a lot of hard work by many. I hope that these chapters open up a sense of possibilities for effective learning in virtual worlds and also point the way to new directions for the design and deployment of virtual space tools.

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