Chapter 24
Virtual Representations for Cybertherapy:
A Relaxation Experience for Dementia Patients

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ABSTRACT

The development of serious games has enabled new challenges for the healthcare sector in psychological, cognitive, and motor rehabilitation. Thanks to virtual reality, stimulating and interactive experiences can be reproduced in a safe and controlled environment. This chapter illustrates the experimentation conducted in the hospital setting for the non-pharmacological treatment of cognitive disorders associated with dementia. The therapy aims to relax patients of the agitation cluster through a gaming approach through the immersion in multisensory and natural settings in which sound and visual stimuli are provided. The study is supported by a technological architecture including the virtual wall system for stereoscopic wall projection and rigid body tracking.

INTRODUCTION

In the third millennium, the discipline of drawing, in its various forms of representation, is facing a significant challenge in improving the quality of human life. The introduction and the consolidated diffusion of new means of expression and communication have enabled new perspectives of use that embrace very different fields and domains. The concept of Digital Twin contributes enormously to the vision of a Smart Healthcare (Tian et al., 2019) and truly Smart Hospital, where infrastructure, services and people are the crucial aspects to be managed as schematised in Figure 1. The main idea is to have a building with a digital brain and systems that can connect with users' needs and meet them in every respect using advanced approaches and digital technologies. This vision makes the hospital an ideal

place for experimentation as it must master a multitude of challenges simultaneously. Hospitals must reduce labor and operating costs, enable their staff to work more efficiently, optimize space efficiency, and comply with changing regulations without compromising a positive patient experience (Siemens Switzerland Ltd, 2022). In order to deal with these tasks, they are increasingly leveraging digitalization and technological innovations to build resiliency, enhance productivity and meet their strategic objectives. In this framework, high-tech solutions involving cyberspace, advanced robotics, 5G networks, Internet of Things (IoT) and Artificial Intelligence (AI) are therefore brought into play in a synergetic way to evolve and drive future growth and innovation for the healthcare experience. The tools are exploited to provide a virtual-based field to ensure the broadest participation in even more processes revolutionizing hospitals on the human, financial and operational levels. The focus is to seek the machine's efficiency and improve the quality of healthcare treatments and services delivery for the patient's well-being by combining advanced medical concepts and state-of-the-art devices. Within this context, telehealth and Remote Patient Monitoring (RPM) and Virtual Reality (VR) (Riva, 2002) find their place and acceptance by the patient, especially during and after the COVID-19 pandemic. A Smart Hospital is thus a hospital that uses technology to improve the quality of life of its users across the board, overcoming physical and spatial barriers. In this framework, the relation between three-dimensional digital representation, also derived from parametric models, and Virtual Reality technologies, represents an innovative frontier by enabling multi-dimensional scenarios and levels of interdisciplinary collaboration. This combination can be put to the service of the health sector in several areas: the technical knowledge and design, the usability of spaces and information (Ugliotti et al., 2019), training for nurses and caregivers, patient awareness and entertainment, diagnostics and prevention, and physical and psychophysical rehabilitation (Lányi, 2006). Therefore, they can embrace very different points of view of the hospital occupants, from managers and technicians to medical staff and patients and their families.

Figure 1. Smart Hospital framework
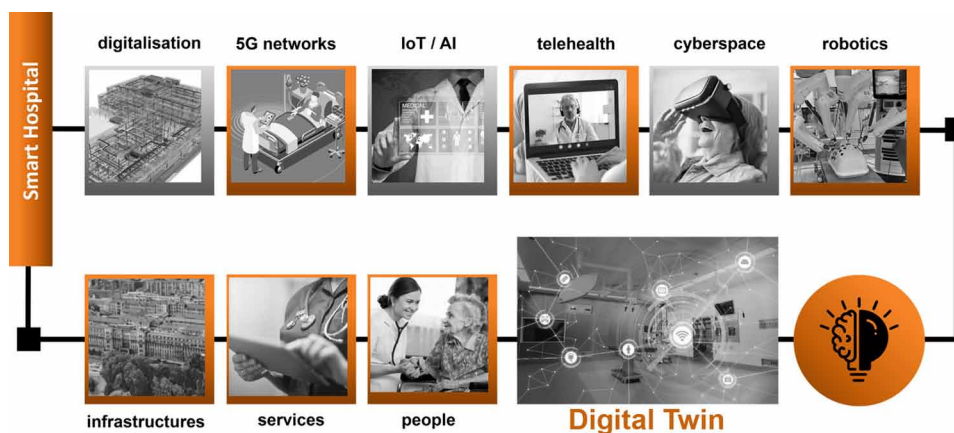
In the context of the scenario outlined, the chapter illustrates the application of Virtual Reality for therapeutic purposes. Compared to telehealth, which uses new technologies to provide health services remotely, cybertherapy employs technology to change the attitudes and behavior of its users, with long-term cognitive and bio-physiological effects (Emmelkamp, 2011). Cybertherapy was born in the United

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