Chapter 7
Synergizing RIS, NOMA, UAV, and ISAC in Advanced 6G Technologies for Intelligent Healthcare Human-Computer Interaction

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ABSTRACT

This chapter explores how 6G wireless technology can revolutionize personalized healthcare through advanced human-computer interaction (HCI). Highlighting ultra-high speeds, minimal latency, and extensive connectivity, it discusses innovations such as intelligent telehealth, real-time remote patient monitoring, AR-based consultations, and telesurgery. Special focus is placed on non-orthogonal multiple access (NOMA) for efficient IoT connectivity and unmanned aerial vehicles (UAVs) for remote medical care. Additionally, blockchain and reconfigurable intelligent

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surfaces (RIS) are reviewed for enhancing data security and privacy. The chapter also outlines current challenges and future research directions, emphasizing 6G's critical role in shaping smarter, secure, and immersive healthcare.

1. INTRODUCTION

Healthcare technology is witnessing significant advancements, driven by the rapid evolution of wireless communication technologies. Sixth-generation (6G) wireless networks are emerging with revolutionary potential, including incredibly rapid data transmission alongside minimal latency, extensive linkages, and sophisticated artificial intelligence (AI) features, as described in (Alwis, 2023). 6G technology functions as an infrastructure to develop personalized medical services, and enhanced human-computer interaction brings substantial changes to healthcare applications.

Telehealth systems, which provide benefits, still face problems with delayed network speed, untrustworthy systems, and problems with combining them with developing virtual reality and augmented reality systems. Remote surgery, together with immersive medical training, represents sensitive operations where technical problems create major concerns (Ahmad et al., 2023). The goal of 6G technology is to solve current communication problems so that applications for advanced telehealth and XR healthcare can achieve seamless instant delivery with reliable functions.

A key aspect of the 6G vision includes advanced communication schemes such as non-orthogonal multiple access (NOMA) (Singh et al., 2021), which significantly improves network connectivity and efficiency, particularly vital for handling large volumes of healthcare data generated by Internet of Things (IoT)-based devices (Kharche & Kharche, 2023). Unmanned aerial vehicles (UAVs) integrated with 6G technology will revolutionize healthcare services because they can provide timely medical support and monitor patients in hard-to-reach areas (Nayak & Patgiri, 2020).