69. Geomatics for social inclusion: low-cost 3D heritage reconstruction and immersive telepresence for elder guides

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Contemporary frameworks recognize cultural heritage as a key driver of human well-being and social inclusion. However, ageing populations with mobility constraints often face barriers to accessing heritage sites, leading to social isolation. This paper presents a methodological framework that leverages low-cost, scalable geomatics workflows and eXtended reality (XR) to bridge these physical barriers. Using the CLIO project as a case study, focusing on minor Waldensian heritage in remote alpine areas, the study explores how immersive telepresence can transform older adults from passive users into active memory guides. The proposed pipeline integrates rapid surveying techniques, such as Mobile Mapping Systems (MMS), Unmanned Aerial Vehicles (UAV), smartphones and 360° cameras, to generate immersive virtual environments. Specifically, a novel 360° video to 3D Gaussian Splatting (3D Gaussian Splatting (3DGS)) workflow is detailed alongside a traditional photogrammetric workflow and compared to ground truth data. A participatory co-design approach was employed to validate the technology from user experience and psychological well-being perspectives. Beyond immediate social outcomes, such as reduced loneliness and digital empowerment, the research highlights the value of accessible geomatics data for preserving intangible heritage and supporting future object-oriented conservation models. The study demonstrates that geomatics, combined with human-computer interaction principles, can serve as the basis for building socially oriented tools to enhance the well-being of vulnerable communities while ensuring the scalable documentation of tangible heritage.